

APPOLO



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Petroleum Products

11th Automobile Engineering Unit 3 - Fuels and their types

Introduction

- For a healthy body, we consume solid food, liquid food and pure air. Similarly, for an engine to operate, it requires fuel. The heat energy released during burning the fuel with air, is converted into mechanical energy via a heat engine. This mechanical energy gives the required tractive force to move the vehicle in the forward direction.

Fossil fuels

- Fossil fuels are available as Solid, Liquid and Gaseous state.

Solid Fuels

- Solid fuel refers to various types of solid material that are used as fuel to produce energy and provide heating, usually released through combustion. Solid fuels include wood, coal and lignite mining under the earth. Initially solid fuels are used in steam engines and boilers. They release less heat energy and emit more ash and emissions.

Liquid Fuels

- Many liquid fuels play a primary role in transportation. Liquid fuels are easy to store, easy to transport, and can be handled with relative ease. They release more heat energy and less emission. Petrol and Diesel fuels are widely used for automobiles.

Robert Augustus Chesebrough

(January 9, 1837 - September 8, 1933) was an American chemist.

He discovered petroleum jelly which he marketed as Vaseline and he founded the Chesebrough Manufacturing Company.

Chesebrough began his career as a chemist clarifying kerosene from the oil of sperm whales.

The discovery of petroleum in Titusville, Pennsylvania, rendered his job obsolete, so he traveled to Titusville to research what new materials might be created from the new fuel.

This led to his discovery of petroleum jelly, which he trade-named as Vaseline.

In 1875, he founded the Chesebrough Manufacturing Company that in 1955 became Chesebrough-Ponds, a leading manufacturer of personal-care products. Chesebrough patented the process of making petroleum jelly (U.S. Patent 127,568) in 1872.

Petrol and Its Properties

- Most liquid fuels are derived from the fossilized remains of dead plants and animals by exposure to heat and pressure in the Earth's crust. From the crude oil, by distillation process, various components like Liquid Petroleum Gas (at 40°C), petrol (40°C to 200°C), Diesel (250°C to 300°C) and residue tar (above 350°C) are extracted.
- Petrol, also known as Gasoline, is a transparent fuel derived from crude oil and is used as fuel in internal combustion engines. Petrol is separated from crude oil from 40°C to 200°C. Petrol is usually a blend of paraffin's, naphthenic, aromatics and olefins.

Element	Percentage by weight
Carbon	79.5 - 87.1
Hydrogen	11.5 - 14.8
Sulphur	0.1 - 3.5
Oxygen	0.1 - 0.3
Nitrogen	0.1 - 2.0

- In petrol have Carbon 79.5% to 87.1%, Hydrogen 11.5% to 14.8%, Sulphur 0.1% to 3.5%, Oxygen and Nitrogen 0.1% to 0.3% and the following special properties are must be in petrol.

Volatility: Volatility refers to the tendency of fuel to vaporize from liquid state to gaseous state. Boiling Point is an indicator of volatility. Higher the boiling point, the less volatile the fuel. A highly volatile fuel is more likely to form a flammable. Petrol should be sufficiently volatile to form combustible vapor. Petrol must be sufficiently volatile to evaporate at low temperature, for easy starting of the engine, but not so volatile as to evaporate in fuel lines, causing vapor lock and thus preventing flow of liquid fuel

Specific Gravity: Specific gravity is the ratio of the density of a substance to the density of a reference substance (usually water). Specific gravity of petrol should be 0.70 to 0.78

Calorific Value: The amount of heat energy produced by the complete combustion when burning 1 kg of a fuel. The calorific value of petrol is 45.8 MJ/kg.

Flash and Fire Point: The fire point of a fuel is the lowest temperature at which the vapor of that fuel will continue to burn for at least 5 seconds after ignition by an open flame. Generally flash point should be high for the fuel. The fire point of a fuel is the temperature at which the vapor produced by that given fuel will continue to burn for at least 5 seconds after ignition by an open flame. In general the fire points can be assumed to be about 15°C - 20°C higher than the flash points. For petrol, at least 10% of fuel should be burn instantly and rest in staged phase.

Viscosity: Resistance to the flow is called as Viscosity and it should be low.

Sulphur Content: Sulphur will corrode and damage the metal parts. During engine operation, Sulphur combines with oxygen to form Sulphur-di-oxide and in presence of water, it forms sulphurous acid. Hence, Sulphur content should be less than 0.1%

Moisture and Sediment Content: Petrol fuel should be free from Moisture and Sediment Content.

Octane Number: This is a measure of auto Ignition resistance in a spark-ignition engine. It represents the volume percentage of iso-octane (C₈H₁₈) in iso-octane (C₈H₁₈) / n-heptane (C₇H₁₆) mixture. Higher the rating, higher the resistance to knock. A higher rating does not indicate more power but fuel can be used in higher compression ratio. The value of Octane number for the available fuel is between 85 to 90.

Diesel and Its Properties

- Diesel fuel is the light oil and is obtained from crude oil by the distillation process at a temperature of 250°C - 300°C. Diesel consists of 85% carbon, 12% Hydrogen and 3% others by weight. These have a boiling point between 250°C and 350°C. Diesel contains more energy than petrol. A diesel engine can be up to 40% more efficient than a spark-ignited petrol engine with the same power output and hence it is widely used in cars, trucks, buses, railway engines etc., The following are the required properties of diesel.

Volatility: The volatility of diesel is less than petrol. The volatility of diesel fuel influences density, auto ignition temperature, flash point, viscosity and cetane number. High volatility promotes vapor lock and low volatility component may not burn completely, thereby increasing smoke deposits.

Specific Gravity: Specific gravity of diesel is higher than petrol and the value should be 0.82 to 0.92

Calorific Value: The amount of heat energy produced by the complete combustion when burning 1 kg of a fuel. The calorific value of diesel is slightly lesser than petrol and the value is 45.5 MJ/kg

Viscosity: The viscosity is a measure of the resistance to flow of the fuel.

- It will decrease as the temperature increases. A high viscosity fuel may cause extreme pressures in the injection systems and will cause reduced atomization and vaporization of the fuel spray. The viscosity of diesel fuel must be low enough to flow freely at its lowest operational temperature, yet high enough to provide lubrication to the moving parts of the finely machined injectors. The fuel must also be sufficiently viscous so that leakage at the pump plungers and dribbling at the injectors will not occur. Viscosity also will determine the size of the fuel droplets, which, in turn, govern the atomization and penetration qualities of the fuel injector spray.

Sulphur Content: The sulphur in fuel will cause wear of the internal components of the engine, such as piston ring, pistons, valves, and cylinder liners. In addition, a high sulphur content fuel requires that the engine oil and filter be changed more often. This is because of formation of acids when sulphur-di-oxide formed during combustion combines with water vapor. The Sulphur content should be less than 0.5%

Moisture and Sediment Content: Cleanliness is an important characteristic of diesel fuel. Fuel should not contain any foreign substances, otherwise, fuel pump and injectors will have poor performance moisturizer. Moisture in the fuel can also damage or cause seizure of injector parts when corrosion occurs.

Cetane Number: The principal measure of diesel fuel quality is its cetane number. A cetane number is a measure of the delay of ignition of a diesel fuel. Higher the cetanering, the easier the engine will start and the combustion process will be smoother within the ratings specified by the engine manufacturer. It denotes the percentage by volume of cetane (chemical name Hexadecane) in a combustible mixture containing cetane and 1-methylnaphthalene. Current diesel fuels have a cetane rating between 45 and 50.

Alternative Fuels

- The sources of fossils fuels are depleting and they are not renewable. At the same time the market requirements of this fuels are increasing day by day. Hence, alternative fuels are highly essential. Alternative fuels, known as non-conventional fuel, there are many materials or substances that can be used as fuels, other than fossil fuels like petrol, diesel. Some well-known alternative fuels include biodiesel, bioalcohol (methanol, ethanol, butanol), chemically stored electricity (batteries and fuel cells), hydrogen, non-fossil methane, non-fossil natural gas, vegetable oil, propane etc.

Alternative Liquid Fuels

Alcohol

- In recent days, Alcohols can be considered as the best alternative fuels. Methanol and ethanol are of high interest as fuels can be produced chemically or biologically. And they have characteristics which allow them to be used in internal combustion engines. The octane ratings are higher leads to less hydrocarbon emission. Also Sulphur content is less.

Methanol

- Methanol, also known as wood alcohol, can be used as an alternative fuel. M85 (a blend of 85 % methanol and 15 % gasoline) and M10 (a blend of 10% methanol and 90% gasoline) are used as fuel and emissions are lower than conventional vehicles. It has high octane number. Methanol is cheap to produce and has a lower risk of flammability when compared to petrol. The cost of fuel is low. However, methanol is corrosive.

Ethanol

- Ethanol is also called as Ethyl alcohol. Ethanol can be produced by fermenting and distilling crops such as corn, barley or wheat. In India, Ethanol is extracted from molasses of sugarcane. It can be blended with gasoline to increase octane levels and improve emissions quality. E85 (a blend of 85 % ethanol and 15 % gasoline) and E10 (a blend of 10% ethanol and 90% gasoline) are used as fuel.

Bio Diesel

- Bio diesel is a domestically produced, renewable fuel that can be manufactured from vegetable oils, animal fats, for use in diesel vehicles. Biodiesel can also be blended with diesel and used in unmodified engines. B20 (i.e 20% biodiesel blended with diesel) is a most common biodiesel blend. B20 has good balance of cost, emissions, cold-weather performance, materials compatibility, and ability to act as a solvent. Biodiesel is safe, biodegradable, reduces air pollutants associated with vehicle emissions, such as particulate matter, carbon monoxide and hydrocarbons.

Gaseous Fuels

- The gaseous fuels are readily mix with atmospheric air without delay and it is inducted in engine. The following gaseous fuels are presently in use.

Liquified Petroleum Gas (LPG)

- Liquified petroleum gas (LPG) also called as Propane is a by product of natural gas processing and crude oil refining. LPG is widely used as a fuel for domestic cooking and heating and now it is also a popular alternative fuel for vehicles. It is stored under pressure (100psi or 680 atm) inside a special tank and is a colorless, odorless liquid. As pressure is released, the liquid propane vaporizes and turns into gas that is used in combustion. An odorant, ethyl mercaptan, is added for leak detection. Propane has a high-octane rating, making it an excellent choice for spark-ignited internal combustion engines. It provides uniform homogenous mixture for all cylinders. The carbon content in LPG is less than petrol and hence, LPG vehicles can produce lower amounts of harmful air pollutants and greenhouse gases, CO₂. The operating cost of the vehicle is reduced by 50%. The use of LPG enhances engine life.

Liquified Natural Gas (LNG)

- Liquified natural gas (LNG), is natural gas in its liquid form. LNG is produced by purifying natural gas and super-cooling it to -161°C to turn it into a liquid. During the process known as liquefaction, natural gas is cooled below its boiling point, removing most of the extraneous compounds found in the fuel. The remaining natural gas is primarily methane (98%) with small amounts of other hydrocarbons.
- The specific gravity of LNG is higher than CNG. The calorific value of LNG is 48MJ/kg and its octane value are 110. Because of LNG's relatively high production cost as well as

the need to store it in expensive cryogenic tanks, the commercial applications of LNG has been limited.

Compressed Natural Gas (CNG)

- Natural gas is primarily extracted from gas and oil wells. Natural gas is an odorless and it is a mixture of hydrocarbon, mainly 95% of methane and 5% of other components like butane, propane, ethane, water vapor etc., Natural gas are stored in tanks under pressure and hence it is called as compressed natural gas. Octane rating is high. Cars and trucks with specially designed engines produce fewer harmful emissions than gasoline or diesel. CNG fuel systems are completely sealed, the vehicles produce no evaporative emissions. Operating cost of the vehicle is low.

Hydrogen

- Many test engines have been developed to use Hydrogen as an alternative fuel. Hydrogen can be produced from diverse domestic resources. Hydrogen is abundant in our environment. It's stored in water(H₂O), hydrocarbons (such as methane, CH₄), and other organic matter. One of the challenges of using hydrogen as a fuel comes from being able to efficiently extract it from these compounds. Hydrogen is also used in zero-emission electric vehicles that run on electricity generated by fuel-cell by the petrochemical reaction. Hydrogen is environmental friendly.

Comparison of Various Fuels

- Commercially fuels are available in different grades like Unleaded Petrol, Speed Petrol, White Petrol, Diesel, Speed Diesel or Premium Diesel etc., Previously, Tetra Ethyl Lead (TEL) is mixed with petrol to increase the octane rating (for antiknocking). However, the lead emission emit from the vehicle is polluting the atmosphere and lead is also poisonous. Hence addition of TEL in petrol is banned and this petrol is called as Unleaded petrol. Various additives are added with fuel to enhance the properties. Such petrol will have high octane rating and called as Speed petrol or premium petrol. Similarly, additives are added with diesel to enhance the cetane rating and such diesel is called as Speed Diesel or Premium Diesel.

Distillation Curve

- From the above curve, it is understood that the most volatile parts of the gasoline evaporate at lower temperature. This petrol vapor is mixes with air and makes the engine to start easy at cold condition. As the working temperature increases, the less volatile parts evaporate and mixes with air. Based on the distillation graph, the required additives during summer and winter season, can be added with fuel to ensure smooth operation of engine.

Reproduction

9th Book

Unit 20 – Organ system in Animals

Introduction

- Living organisms are evolved from the simplest form to complex level of organization. Cells are the basic fundamental units of an organism. These are grouped to form tissues, the tissues into organs and the organs form the organ systems forming an entire organism. The different organs and organ systems of an organism function by depending on one another with harmonious coordination. When we ride a bicycle, our muscular system and skeletal system work together to move our arms for steering and legs for pedalling. Our nervous system directs our arms and legs to work. Simultaneously, respiratory, digestive and circulatory systems work to provide energy to the muscles. All the systems work together in coordination to maintain the body in a homeostatic condition of an organism.
- Organ and organ systems have appeared first in the Phylum platyhelminthes and continues till mammals. Similar groups of cells form tissues like muscle tissue, nervous tissue, etc. Tissues are organised to form organs like heart, brain, etc. Two or more organs together form organ systems and perform common functions like digestion, circulation, nerve impulse transmission in co-ordination via digestive system, circulatory system, nervous system respectively. Division of labour is found among the various organ systems.

Organs Systems	Organs	Functions
Integumentary system	Skin and Skin glands	Protection, Excretion etc.
Skeleton System	Skull, Vertebral column, Sternum, Girdles and Limbs	Give Support, shape and form to the body
Muscular System	Muscle fibres	Contraction and relaxation resulting movement.
Nervous System	Brain, Spinal cord and nerves.	Conduction of nerve impulse
Circulatory System	Heart, blood and blood Vessels	Transportation of respiratory gases, nutritive substances and waste products.
Respiratory System	Respiratory tract and Lungs	Breathing
Digestive System	Digestive tract and digestive	Digestion, Absorption,

	glands	Egestion
Excretory System	Kidneys, Ureters, Urinary bladder and Urethra	Elimination of nitrogenous waste products.
Reproductive System	Testes and Ovary	Gamete formation and development of secondary sexual characters.
Sensory System	Eyes, nose, ears, tongue and skin	Sight, smell, hearing, taste and touch
Endocrine System	Pituitary, Thyroid, Parathyroid, Adrenals, Pancreas, Pineal body, Thymus, Reproductive glands, etc.	Co - ordinates the functions of all organ systems

Human Digestive System

- The food we eat contain not only simple substances like vitamins and minerals but also complex substances such as carbohydrates, proteins and fats. The body cannot use these complex substances unless they are converted into simple substances. The five stages of nutrition process include ingestion, digestion, absorption, assimilation and egestion.
- The process of nutrition begins with intake of food, called ingestion. The breakdown of large complex insoluble food molecules into small, simpler soluble and diffusible particles by the action of digestive enzymes is called digestion. Parts of the body concerned with the digestion of food form the digestive system.
- The digestive system consists of two sets of organs. They are as follows:

Alimentary canal (digestive tract/gastro-intestinal tract): It is a passage starting from the mouth and ending with the anus.

Digestive glands: Glands associated with the alimentary canal are the salivary glands, gastric glands, pancreas, liver and intestinal glands.

Structure of the Alimentary Canal

- Alimentary canal is a muscular coiled, tubular structure. It consists of mouth, buccal cavity, pharynx, oesophagus, stomach, small intestine (consisting of duodenum, jejunum and ileum), large intestine (consisting of caecum, colon and rectum) and anus.

Mouth: The mouth leads into the buccal cavity. It is bound by two soft, movable upper and lower lips. The buccal cavity is a large space bound above by the palate (which separates the wind pipe and food tube), below by the throat and on the sides by the jaws. The jaws bear teeth.

Teeth: Teeth are hard structures meant for holding, cutting, grinding and crushing the food. In human beings two sets of teeth (Diphyodont) are developed in their life time. The first appearing set of 20 teeth called temporary or milk teeth are replaced by the second set of thirty two permanent teeth, sixteen in each jaw. Each tooth has a root fitted in the gum (Thecodont). Permanent teeth are of four types (Heterodont), according to their structure and function namely incisors, canines, premolars and molars.

- Dental formula represents the number of different type of teeth present in each half of a jaw (upper and lower jaw). The types of teeth are denoted as incisors (i), canine (c), premolars (pm) and molars (m).

For Milk teeth in each half of upper and lower jaw:

$$\frac{2, 1, 2}{2, 1, 2} = 10 \times 2 = 20$$

For Permanent teeth in each half of upper and lower jaw:

$$\frac{2, 1, 2, 3}{2, 1, 2, 3} = 16 \times 2 = 32$$

Types of teeth	Number of teeth	Functions
Incisors	8	Cutting and biting
Canines	4	Tearing and Piercing
Premolars	8	Crushing and grinding
Molars	12	Crushing, grinding and mastication.

Salivary glands: Three pairs of salivary glands are present in the mouth cavity. They are: parotid glands, sublingual glands and submaxillary or submandibular glands

Parotid glands are the largest salivary glands, which lie in the cheeks in front of the ears (in Greek Par - near ;otid - ear).

Sublingual glands are the smallest glands and lie beneath the tongue.

Submaxillary or Submandibular glands lie at the angles of the lower jaw.

- The salivary glands secrete a viscous fluid called saliva, approximately 1.5 liters per day. It digests starch by the action of the enzyme ptyalin (amylase) in the saliva which converts starch (polysaccharide) into maltose (disaccharide). Saliva also contain an antibacterial enzyme called lysozyme.
- ✓ **Tongue:** The tongue is a muscular, sensory organ which helps in mixing the food with the saliva. The taste buds on the tongue help to recognize the taste of food. The masticated food in the buccal cavity becomes a bolus which is rolled by the tongue and passed through pharynx into the oesophagus by swallowing. During swallowing, the epiglottis (a muscular flap-like structure at the tip of the glottis, beginning of trachea) closes and prevents the food from entering into trachea (wind pipe).
- ✓ **Pharynx:** The pharynx is a membrane lined cavity behind the nose and mouth, connecting them to the oesophagus. It serves as a pathway for the movement of food from mouth to oesophagus.
- ✓ **Oesophagus:** Oesophagus or the food pipe is a muscular-membranous canal about 22 cm in length. It conducts food from pharynx to the stomach by peristalsis (wave-like movement) produced by the rhythmic contraction and relaxation of the muscular walls of alimentary canal.
- ✓ **Stomach:** The stomach is a wide J-shaped muscular organ located between oesophagus and the small intestine. The gastric glands present in the inner walls of the stomach secrete gastric juice. The gastric juice is colourless, highly acidic, containing mucus, hydrochloric acid and enzymes rennin (in infants) and pepsin.
- Inactive pepsinogen is converted to active pepsin which acts on the proteins in the ingested food. Hydrochloric acid kills the bacteria swallowed along with food and makes the medium acidic while the mucus protects the wall of the stomach. The action of the gastric juice and churning of food in the stomach convert the bolus into a semi-digested food called chyme. The chyme moves to the intestine slowly through the pylorus.
- ✓ **Small intestine:** The small intestine is the longest part of the alimentary canal, which is a long coiled tube measuring about 5 - 7 m. It comprises three parts- duodenum, jejunum and ileum.
- ✓ **Duodenum** is C-shaped and receives the bile duct (from liver) and pancreatic duct (from pancreas).
- ✓ **Jejunum** is the middle part of the small intestine. It is a short region of the small intestine. The secretion of the small intestine is intestinal juice which contains the enzymes like sucrase, maltase, lactase and lipase.

- ✓ **Ileum** forms the lower part of the small intestine and opens into the large intestine. Ileum is the longest part of the small intestine. It contains minute finger like projections called villi (one millimeter in length) where absorption of food takes place. They are approximately 4 million in number. Internally, each villus contains fine blood capillaries and lacteal tubes.
- The small intestine serves both for digestion and absorption. It receives the bile from liver and the pancreatic juice from pancreas in the duodenum. The intestinal glands secrete the intestinal juices.

William Beaumont (1785-1853)

William Beaumont was a surgeon who was known as the 'Father of Gastric Physiology'. Based on his observations he concluded that the stomach's strong hydrochloric acid played a key role in digestion.

- ✓ **Liver:** It is the largest digestive gland of the body which is reddish brown in colour. It is divided into two main lobes, right and left lobes. The right lobe is larger than the left lobe. On the under surface of the liver, gall bladder is present. The liver cells secrete bile which is temporarily stored in the gall bladder. Bile is released into small intestine when food enters in it. It has bile salts (sodium glycolate and sodium tauraglycolate) and bile pigments (bilirubin and biliverdin). Bile salts help in the digestion of fats by bringing about their emulsification (conversion of large fat droplets into small ones).

Functions of Liver

- Controls blood sugar and amino acid levels.
 - Synthesizes foetal red blood cells.
 - Produces fibrinogen and prothrombin, used for clotting of blood.
 - Destroys red blood cells.
 - Stores iron, copper, vitamins A and D.
 - Produces heparin (an anticoagulant).
 - Excretes toxic and metallic poisons.
 - Detoxifies substances including drugs and alcohol.
- ✓ **Pancreas:** It is a lobed, leaf shaped gland situated between the stomach and duodenum. Pancreas acts both as an exocrine gland and as an endocrine gland. The exocrine part of the pancreatic gland secretes pancreatic juice which contains three enzymes- lipase, trypsin and amylase which acts on fats, proteins and starch respectively. The gland's upper surface bears the islets of Langerhans which have endocrine cells and secrete hormones in which α (alpha) cells secrete glucagon and β (beta) cells secrete insulin.

- The intestinal glands secrete intestinal juice called succusentericus which contains enzymes like maltase, lactase, sucrase and lipase which act in an alkaline medium. From the duodenum the food is slowly moved down to ileum, where the digested food gets absorbed

Absorption of food: Absorption is the process by which nutrients obtained after digestion are absorbed by villi and circulated throughout the body by blood and lymph and supplied to all body cells according to their requirements.

Assimilation of food: Assimilation means the incorporation of the absorbed food materials into the tissue cells as their internal and homogenous component. The final products of fat digestion (fatty acids and glycerol) are again converted into fats and excess fats are stored in adipose tissue. The excess sugars are converted into a complex polysaccharide, glycogen in the liver. The amino acids are utilized to synthesize different proteins required for the body.

The small intestine is about 5 m long and is the longest part of the digestive system. The large intestine is a thicker tube, but is about 1.5 m long.

Large intestine: The unabsorbed and undigested food is passed into the large intestine. It extends from the ileum to the anus. It is about 1.5 meters in length. It has three parts- caecum, colon and rectum.

- The caecum is a small blind pouch like structure situated at the junction of the small and large intestine. From its blind end a finger - like structure called vermiform appendix arises. It is a vestigial (functionless) organ in human beings.
- The colon is much broader than ileum. It passes up the abdomen on the right (ascending colon), crosses to the left just below the stomach (transverse colon) and down on the left side (descending colon). The rectum is the last part which opens into the anus. It is kept closed by a ring of muscles called anal sphincter which opens when passing stools.
- The undigested or unassimilated portion of the ingested food material is thrown out from the body through the anal aperture as faecal matter. This is known as egestion or defaecation.

Digestive Glands	Enzymes	Substrate (nutrient)	Products of digestion
Salivary glands	Ptyalin (Salivary amylase)	Starch	Maltose
Gastric glands	Pepsin	Proteins	Peptones
	Rennin (in infants)	Milk protein or caseinogen	Curdles milk to produce casein

			protein
Pancreas	Pancreatic amylase	Starch	Maltose
	Trypsin	Proteins and peptones	Peptides and amino acids
	Chymotrypsin	Protein	Proteoses, peptones, Polypeptide, tri and dipeptides
	Pancreatic lipase	Emulsified fats	Fatty acids and Glycerol
Intestinal Glands	Maltase	Maltose	Glucose and Glucose
	Lactase	Lactose	Glucose and Galactose
	Sucrase	Sucrose	Glucose and Fructose
	Lipase	Fats	Fatty acids and Glycerol

Human Excretory System

- Metabolic activities continuously take place in living cells. All metabolic products produced by the biochemical reactions are not utilized by the body because certain nitrogenous toxic waste substances are also produced. They are called excretory products. In human beings urea is the major excretory product. The tissues and organs associated with the removal of waste products constitute the excretory system.
- The human excretory system consists of a pair of kidney, which produce the urine, a pair of ureters which conduct the urine from kidneys to the urinary bladder, where urine is stored temporarily and urethra through which the urine is voided by bladder contractions.
- If the waste products are accumulated and not eliminated, they become harmful and poisonous to the body. Hence, excretion plays an important role in maintaining the homeostatic condition of the body.
- Some of the excretory organs other than kidneys are skin (removes small amounts of water, urea and salts in the form of sweat) and lungs (eliminate carbon-dioxide and water vapour through exhaling).

Skin

- Skin is the outer most covering of the body. It stretches all over the body in the form of a layer. It accounts for 15% of an adult's human body weight. There are many structures and glands derived from the skin. It eliminates metabolic wastes through perspiration.
- The human body functions normally at a temperature of about 37 °C. When it gets hot sweat glands start secreting sweat, which contains water with small amounts of other chemicals like ammonia, urea, lactic acid and salts (mainly sodium chloride). The sweat passes through the pores in the skin and gets evaporated.

Kidneys

- Kidneys are bean-shaped organs reddish brown in colour. The kidneys lie on either side of the vertebral column in the abdominal cavity attached to the dorsal body wall. The right kidney is placed lower than the left kidney as the liver takes up much space on the right side. Each kidney is about 11 cm long, 5 cm wide and 3 cm thick. The kidney is covered by a layer of fibrous connective tissue, the renal capsules, adipose capsule and a fibrous membrane.
- Internally the kidney consists of an outer dark region, the cortex and an inner lighter region, the medulla. Both of these regions contain uriniferous tubules or nephrons. The medulla consists of multitubular conical masses called the medullary pyramids or renal pyramids whose bases are adjacent to cortex. On the inner concave side of each kidney, a notch called hilum is present through which blood vessels and nerves enter in and the urine leaves out.
 - ✓ **Ureters:** Ureters are thin muscular tubes emerging out from the hilum. Urine enters the ureter from the renal pelvis and is conducted along the ureter by peristaltic movements of its walls. The ureters carry urine from kidney to urinary bladder.
 - ✓ **Urinary bladder:** Urinary bladder is a sac-like structure, which lies in the pelvic cavity of the abdomen. It stores urine temporarily.
 - ✓ **Urethra:** Urethra is a membranous tube, which conducts urine to the exterior. The urethral sphincters keep the urethra closed and opens only at the time of micturition (urination).

Functions of kidney

- Maintains the fluid and electrolytes balance in our body.
- Regulates acid-base balance of blood.
- Maintains the osmotic pressure in blood and tissues.
- Helps to retain the important plasma constituents like glucose and amino acids

Structure of Nephron

- Each kidney consists of more than one million nephrons. Nephrons or uriniferous tubules are structural and functional units of the kidneys. Each nephron consists of Renal corpuscle or Malpighian corpuscle and renal tubule. The renal corpuscle consists of a cup-shaped structure called Bowman's capsule containing a bunch of capillaries called glomerulus. Blood enters the glomerular capillaries through afferent arterioles and leaves out through efferent arterioles. The Bowman's capsule continues as the renal tubule which consists of three regions proximal convoluted tubule, U-shaped hair pin loop, the loop of Henle and the distal convoluted tubule. The distal convoluted tubule opens into the collecting tubule. The nitrogenous wastes are drained into renal pelvis which leads to ureters and stored in the urinary bladder. Urine is expelled out through the urethra.

Mechanism of Urine Formation

The process of urine formation includes the following three stages.

- Glomerular filtration
- Tubular reabsorption
- Tubular secretion

Glomerular filtration: Urine formation begins with the filtration of blood through epithelial walls of the glomerulus and Bowman's capsule. The filtrate is called as the glomerular filtrate. Both essential and non-essential substances present in the blood are filtered.

Tubular reabsorption: The filtrate in the proximal tubule consists of essential substances such as glucose, amino acids, vitamins, sodium, potassium, bicarbonates and water that are reabsorbed into the blood by a process of selective reabsorption.

Tubular secretion: Substances such as H^+ or K^+ ions are secreted into the tubule. This tubular filtrate is finally known as urine, which is hypertonic in man. Finally the urine passes into collecting ducts to the pelvis and through the ureter into the urinary bladder. When the urinary bladder is full the urine is expelled out through the urethra. This process is called micturition. A healthy person excretes one to two litres of urine per day.

Two healthy kidneys contain a total of about 2 million nephrons, which filter about 1700-1800 litres of blood. The kidneys reabsorb and redistribute 99% of the blood volume and only 1% of the blood filtered becomes urine.

Dialysis or Artificial kidney: When kidneys lose their filtering efficiency, excessive amount of fluid and toxic waste accumulate in the body. This condition is known as kidney (renal) failure. For this, an artificial kidney is used to filter the blood of the patient. The patient is said to be put on dialysis and the process of purifying blood by an artificial kidney is called haemodialysis. When renal failure cannot be treated by drug or dialysis, the patients are advised for kidney transplantation.

First kidney transplant

In 1954, Joseph E. Murray and his colleagues at Peter Bent Brigham Hospital in Boston, USA performed first successful kidney transplant between Ronald and Richard Herrick who were identical twins. The recipient Richard Herrick died after 8 years of transplantation.

Human Reproductive System

- The capacity to reproduce is one of the most important characteristics of living beings. There is a distinct sexual dimorphism in human beings i.e., males are visibly different from females in physical build up, external genital organs and secondary sexual characters.
- The reproductive systems of male and female consist of many organs which are distinguished as primary and secondary sex organs. The primary sex organs are gonads, which produce gametes (sex cells) and secrete sex hormones. The secondary sex organs include the genital ducts and glands which help in the transportation of gametes and enable the reproductive process.
- The reproductive organs become functional after attaining sexual maturity. In males, sexual maturity is attained at the age of 13-14 years. In females, it is attained at the age of 11-13 years. This age is known as the age of puberty. During sexual maturity, hormonal changes take place in males and females and secondary sexual characters are developed under the influence of these hormones.

Male Reproductive System

- Human male reproductive system consists of testes (primary sex organs), scrotum, vas deferens, urethra, penis and accessory glands.

Testis: A pair of testes lies outside the abdominal cavity of the male. These testes are the male gonads, which produce male gametes (sperms) and male sex hormone (Testosterone). Along the inner side of each testis lies a mass of coiled tubules called epididymis. The Sertoli cells of the testes provide nourishment to the developing sperms.

Scrotum: The scrotum is a loose pouch-like sac of skin which is divided internally into right and left scrotal sacs by muscular partition. The two testes lie in the respective scrotal sacs. It also contains many nerves and blood vessels. The scrotum acts as a thermoregulator organ and provides an optimum temperature for the formation of sperms. The sperms develop at a temperature of 1-3°C lower than the normal body temperature.

Vas deferens: It is a straight tube which carries the sperms to the seminal vesicles. The sperms are stored in the seminal plasma of seminal vesicle, which is rich in fructose, calcium and enzymes. Fructose is a source of energy for the sperm. The vas deferens along with

seminal vesicles opens into ejaculatory duct which expels the sperm and its secretions from seminal vesicles into the urethra.

Urethra: It is contained inside the penis and conveys the sperms from the vas deferens which pass through the urethral opening. The accessory glands associated with the male reproductive system consist of seminal vesicles, prostate gland and Cowper's glands. The secretions of these glands form seminal fluid and mixes with the sperm to form semen. This fluid provides nutrition and helps in the transport of sperms.

The sperm is the smallest cell in the male body. A normal male produces more than 500 billion sperm cells in his life time. The process of formation of sperms is known as spermatogenesis.

Female Reproductive System

- The female reproductive system consists of ovaries (primary sex organs), oviducts, uterus and vagina.

Ovaries: A pair of almond-shaped ovaries is located in the lower part of abdominal cavity near the kidneys in female. The ovaries are the female gonads, which produce female gametes (eggs or ova) and secrete female sex hormones (Oestrogen and Progesterone). A mature ovary contains a large number of ova in different stages of development.

Fallopian tubes (Oviducts): These are paired tubes originating from uterus, one on either side. The terminal part of fallopian tube is funnel-shaped with finger-like projections called fimbriae lying near the ovary. The fimbriae pick up the ovum released from ovary and push it into the fallopian tube.

Uterus: Uterus is a pear-shaped muscular, hollow structure present in the pelvic cavity. It lies between urinary bladder and rectum.

Development of foetus occurs inside the uterus. The narrower lower part of uterus is called cervix, which leads into vagina.

Vagina: The uterus narrows down into a hollow muscular tube called vagina. It connects cervix and the external genitalia. It receives the sperms, acts as birth canal during child birth (parturition).

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Unit 13 - Structural Organization of Animals

Introduction

- The variety in nature and habits of animals in the biosphere are quite amazing and interesting. What we see around us may be just few, but there are innumerable species living in this world. You have learnt in lower classes about the classification of animal kingdom. We will recall here that 'Kingdom Animalia' is divided into two groups, Invertebrates and Chordates.
- There occurs a great diversity in the habit, habitat, structural organisation and mode of reproduction between the animals existing on earth. In this chapter, you will understand the structural morphology and anatomy of an Invertebrate (Leech) and a Vertebrate (Rabbit).
- The scientific name of the Indian cattle leech is *Hirudinariagranulosa* which belongs to Phylum Annelida. Annelids are metamerically segmented worms with well developed organ systems.
- The scientific name of the common rabbit is *Oryctolagusuniculus*. It represents Phylum Chordata and Class Mammalia. Mammals occupy the highest group in the animal kingdom and show advancement over the other groups of animals. They are warm blooded and possess covering of hair on the body. Mammary gland in females is the most striking feature of a mammal.

Respiratory System

- Respiration takes place through the skin in leech. Dense network of tiny blood vessels called as capillaries containing the haemocoelic fluid extend in between the cells of the epidermis. The exchange of respiratory gases takes place by diffusion. Oxygen dissolved in water diffuses through the skin into haemocoelic fluid, while carbon dioxide diffuses out. The skin is kept moist and slimy due to secretion of mucus which also prevents it from drying.

Circulatory System

- In leech, circulation is brought about by haemocoelic system. There are no true blood vessels. The blood vessels are replaced by channels called haemocoelic channels or canals filled with blood like fluid. The coelomic fluid contains haemoglobin.
- There are four longitudinal channels. One channel lies above (dorsal) the alimentary canal, one below (ventral) the alimentary canal. The other two channels lie on either (lateral) side of the alimentary canal which serve as heart and have inner valves. All the four channels are connected together posteriorly in the 26th segment.

Nervous System

- The central nervous system of leech consists of a nerve ring and a paired ventral nerve cord. The nerve ring surrounds the pharynx and is formed of suprapharyngeal ganglion (brain), circumpharyngeal connective and subpharyngeal ganglion. The subpharyngeal ganglion lies below the pharynx and is formed by the fusion of four pairs of ganglia.

Excretory System

- In leech, excretion takes place by segmentally arranged paired tubules called nephridia. There are 17 pairs of nephridia which open out by nephridiopores from 6th to 22nd segments.

Reproductive System

- Leech is hermaphrodite because both the male and female reproductive organs are present in the same animal.

Male Reproductive System

- There are eleven pairs of testes, one pair in each segment from 12 to 22 segments. They are in the form of spherical sacs called testes sacs. From each testis arises a short duct called vas efferens, which join with the vas deferens. The vas deferens becomes convoluted to form the epididymis or sperm vesicle, to store spermatozoa.
- The epididymis leads to a short duct called ejaculatory duct. The ejaculatory ducts on both sides join to form the genital atrium. The atrium consists of two regions, the coiled prostate glands and the penial sac consisting of penis that opens through the male genital pore.

Female Reproductive System

- It consists of ovaries, oviducts and vagina. There is a single pair of ovary in the 11th segment on the ventral side. Each ovary is a coiled ribbon-shaped structure.
- The ova are budded off from the ovary. From each ovary runs a short oviduct. The oviducts of the two sides joins together, to form a common oviduct. The common oviduct opens into a pear-shaped vagina which lies mid-ventrally in the posterior part of the 11th segment.

Development

- Internal fertilization takes place. This is followed by cocoon formation. Cocoon is also known as egg case which is formed around the 9th, 10th and 11th segments.
- Development is direct and proceeds in cocoon which contain one to 24 embryos.

- Young leech resembling the adult emerges.

Parasitic Adaptations of Leech

- Leeches lead a parasitic mode of life by sucking the blood of vertebrates and show several important adaptations in their structure.
 - Blood is sucked by pharynx.
 - Anterior and posterior ends of the body are provided with suckers by which the animal attaches itself to the body of the host.
 - The three jaws inside the mouth, causes a painless Y-shaped wound in the skin of the host.
 - The salivary glands produce hirudin which does not allow the blood to coagulate. Thus, a continuous supply of the blood is maintained.
 - Parapodia and setae are completely absent
 - Blood is stored in the crop. It gives nourishment to the leech for several months. Due to this reason there is no elaborate secretion of the digestive juices and enzymes

Blood letting is a technique of bleeding in a patient to remove toxic impurities from the body

Habit and Habitat

- Rabbits are gentle and timid animals. They show leaping movement and live in burrows.
- They are distributed throughout the world. They are herbivorous animals feeding on grass and vegetables like turnips, carrots and lettuce. Rabbits are gregarious (moving in groups) animals.

The pygmy rabbit was listed as a threatened species in Washington in 1990, because of decline in its population size and distribution due to habitat loss. In March 2003, the Columbia Basin Pygmy Rabbit was federally listed as an endangered species

Shape, Size and Colouration: It has an elongated and cylindrical body. Males and females are of the same size. They grow about 45 cm in length and weigh about 2.25 kg as adult. The colour varies from white to black and white. Body is covered with fur which serves to keep it warm.

Body-division: The body of the rabbit is divisible into the head, neck, trunk and tail.

Head: Head is ovoid, flattened and bears a truncate snout. It contains mouth, external nares, eyes, ears and vibrissae. The mouth is a transverse slit-like bounded by upper lip and lower lip. Just above the mouth are two oblique openings called nostrils. From each side of the

upper lip tactile hairs or vibrissae (whiskers) project outwards. A pair of large, movable external ear or pinnae is situated at the top of the head.

Neck: The neck connects the head with the trunk. It helps to turn the head.

Trunk: The trunk is divisible into an anterior thorax and a posterior abdomen. In females, four or five teats or nipples are present on the ventral surface between the thorax and abdomen.

- The trunk bears two pairs of pentadactyl limbs. The forelimbs are shorter than the hind limbs. All the digits bear claws.
- The anus is present at the posterior end of the abdomen at the base of tail. In females on the ventral side a slit like vulva is present. In males penis is present in the ventral side of anus. The male has a pair of testes enclosed by scrotal sacs.

Tail: The tail is short. It is used to give signals to other rabbits in the event of danger.

Integument (Skin): The integument forms the outer covering of the body. The structures which are derived from it are hairs, claws, nails and glands like sweat glands, sebaceous glands and mammary glands.

- Mammary glands are modified glands of the skin. They secrete milk and help in nourishing young ones. The sweat glands and sebaceous glands embedded in the skin regulate the body temperature.

Coelom (Body cavity)

- Rabbit is a coelomate animal. The body is divisible into thoracic cavity and abdominal cavity separated by transverse partition called diaphragm. Diaphragm is the characteristic feature of mammals. Breathing movements are brought by the movement of the diaphragm.
- Lungs and heart lie in the thoracic cavity, whereas, abdominal cavity encloses digestive and urinogenital system.

Digestive System

- The digestive system includes the alimentary canal and the associated digestive glands. The alimentary canal consists of mouth, buccal cavity, pharynx, oesophagus, stomach, small intestine, caecum, large intestine and anus.
- Mouth is a transverse slit bounded by upper and lower lips. It leads into the buccal cavity. The floor of the buccal cavity is occupied by a muscular tongue. Jaws bear teeth.

- The buccal cavity leads into the oesophagus through the pharynx. Oesophagus opens into the stomach followed by small intestine. Caecum is a thin walled sac present at the junction of small intestine and large intestine. It contains bacteria that helps in digestion of cellulose. The small intestine opens into the large intestine which has colon and rectum. The rectum finally opens outside by the anus.

Digestive glands

- The digestive glands are salivary glands, gastric glands, liver, pancreas and intestinal glands. The secretions of digestive glands help in digestion of food in the alimentary canal.

Dentition in Rabbit

- Teeth are hard bone-like structures used to cut, tear and grind the food materials. The two sets of teeth in the life of an animal is called diphyodont dentition. The two types of teeth are milk teeth (young ones) and permanent teeth (in adults).
- In rabbit the teeth are of different types. Hence, the dentition is called heterodont. There are four kinds of teeth in mammals viz. the incisors (I), canines (C), premolars (PM) and molars (M). This is expressed in the form of a dental formula.
- Dental formula is the simple method of representing the teeth of a mammal. The number of each kind of tooth in the upper and the lower jaws on one side is counted.

the lower jaws on one side is counted.

Dental formula is $(I \frac{2}{1}, C \frac{0}{0}, PM. \frac{3}{2}, M \frac{3}{3})$

in rabbit which is written as $\frac{2033}{1023}$. Canines

- Canines are absent. The gap between the incisors and premolar is called diastema. It helps in mastication and chewing of food in herbivorous animals.

Respiratory System

- Respiration takes place by a pair of lungs, which are light spongy tissues enclosed in the thoracic cavity. The thoracic cavity is bound dorsally by the vertebral column and ventrally by the sternum, laterally by the ribs. On the lower side of the thoracic cavity is the dome shaped diaphragm.
- Each lung is enclosed by a double membranous pleura. Atmospheric air passes through the external nostril and nasal passages into the pharynx. From the pharynx it passes through the glottis into the wind pipe.

- The anterior part of the wind pipe is enlarged to form the larynx or voice box with its wall supported by four cartilaginous plates. Inside the larynx lies the vocal cord and its vibrations result in the production of sound. The larynx leads into trachea or wind pipe.
- Tracheal walls are supported by rings of cartilage which help in the free passage of air. The epiglottis prevents the entry of food into the trachea through the glottis. The trachea divides into two branches called the bronchi one entering into each lung and dividing into further branches called bronchioles which end in alveoli.

The respiratory events consist of inspiration (breathing in) and expiration (breathing out) allowing exchange of gases (oxygen and carbon dioxide). Inspiration is an active process while expiration is a passive process.

Circulatory System

- The circulatory system is formed of blood, blood vessels and heart. The heart is pear shaped and lies in the thoracic cavity in between the lungs. It is enclosed by pericardium, a double layered membrane.
- The heart is four chambered with two auricles and two ventricles. The right and left auricles are separated by interauricular septum, similarly right and left ventricles are separated by interventricular septum.
- The right auricle opens into the right ventricle by right auriculoventricular aperture, guarded by a tricuspid valve. The left auricle opens into the left ventricle by left auriculoventricular aperture guarded by a bicuspid valve or mitral valve. The opening of the pulmonary artery and aorta are guarded by three semilunar valves.
- The right auricle receives deoxygenated blood through two precaval (superior vena cava) and one postcaval (inferior vena cava) veins from all parts of the body. The left auricle receives oxygenated blood from the pulmonary veins from the lungs. From the right ventricle arises pulmonary trunk which carries the deoxygenated blood to the lungs and from the left ventricle arises the systemic arch (aorta) which supplies oxygenated blood to all parts of the body.

Nervous System

- The nervous system in rabbit is formed of the central nervous system (CNS), peripheral nervous system (PNS) and autonomic nervous system (ANS).
- CNS consists of brain and spinal cord. PNS is formed of 12 pairs of cranial nerves and 37 pairs of spinal nerves. ANS comprises sympathetic and parasympathetic nerves.
- Brain is situated in the cranial cavity and covered by three membranes called an outer duramater, an inner piamater and a middle arachnoid membrane. The brain is divided into forebrain (prosencephalon), midbrain (mesencephalon) and hindbrain (rhombencephalon).

- Forebrain consists of a pair of olfactory lobes, cerebral hemispheres and diencephalon. The right and left cerebral hemispheres are connected by transverse band of nerve tissue called corpus callosum.
- The midbrain includes the optic lobes. The hindbrain consists of the cerebellum, pons varolii and medulla oblongata.

Urinogenital System

- It comprises the urinary or excretory system and the genital or reproductive system. Therefore, they are usually described as urinogenital system in vertebrates.

Excretory system

- Each kidney is made of several nephrons. It separates the nitrogenous wastes from blood and excretes it in the form of urea. Kidneys are dark red, bean shaped organs situated in the abdominal cavity. From each kidney arises the ureters which open posteriorly into the urinary bladder and leads into a thick walled muscular duct called urethra.

Reproductive System

- Sexual dimorphism is exhibited in rabbits. The male and female sexes are separate and are morphologically different.

Male Reproductive system

- The male reproductive system of rabbit consists of a pair of testes which are ovoid in shape. Testes are enclosed by scrotal sacs in the abdominal cavity. Each testis consists of numerous fine tubules called seminiferous tubules. This network of tubules lead into a coiled tubule called epididymis, which lead into the sperm duct called vas deferens. The vas deferens join in the urethra just below the urinary bladder. The urethra runs backward and passes into the penis.
- There are three accessory glands namely prostate gland, cowper's gland and perineal gland. Their secretions are involved in reproduction.

Female reproductive system

- The female reproductive system of rabbit consists of a pair of ovaries which are small ovoid structures. They are located behind the kidneys in the abdominal cavity.
- A pair of oviducts opens into the body cavity by a funnel shaped opening from each side of the ovary. The anterior part of the oviduct is the fallopian tube. It leads into a wider tube called the uterus. The uterus join together to form a median tube called vagina. The common tube is formed by the union of urinary bladder and the vagina and is called the

urinogenital canal or vestibule. It runs backwards and opens to the exterior by a slit-like aperture called vulva.

- A pair of Cowper's gland and perineal gland are the accessory glands present in the female reproductive system.



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Unit 16 - Plant Animal Harmones

Human Endocrine Glands

- Endocrine glands in animals possess a versatile communication system to coordinate biological functions. Exocrine glands and endocrine glands are two kinds of glands found in animals. Endocrine glands are found in different regions of the body of animals as well as human beings. These glands are called ductless glands. Their secretions are called hormones which are produced in minute quantities. The secretions diffuse into the blood stream and are carried to the distant parts of the body. They act on specific organs which are referred to as target organs.

The branch of biology which deals with the study of the endocrine glands and its physiology is known as 'Endocrinology'. Thomas Addison is known as Father of Endocrinology. English physiologists W. M. Bayliss and E. H. Starling introduced the term hormone in 1909. They first discovered the hormone secretin.

- Exocrine glands have specific ducts to carry their secretions e.g. salivary glands, mammary glands, sweat glands.

Endocrine glands present in human and other vertebrates are

- Pituitary gland
- Thyroid gland
- Parathyroid gland
- Pancreas (Islets of Langerhans)
- Adrenal gland (Adrenal cortex and Adrenal medulla)
- Gonads (Testes and Ovary)
- Thymus gland

Pituitary Gland

- The pituitary gland or hypophysis is a pea shaped compact mass of cells located at the base of the midbrain attached to the hypothalamus by a pituitary stalk. The pituitary gland is anatomically composed of two lobes and perform different functions. They are the anterior lobe (adenohypophysis) and the posterior lobe (neurohypophysis). The intermediate lobe is non-existent in humans.
- The pituitary gland forms the major endocrine gland in most vertebrates. It regulates and controls other endocrine glands and so is called as the "Master gland".
- Hormones secreted by the anterior lobe (Adenohypophysis) of pituitary

- The anterior pituitary is composed of different types of cells and secrete hormones which stimulates the production of hormones by other endocrine glands. The hormones secreted by anterior pituitary are
 - Growth Hormone
 - Thyroid stimulating Hormone
 - Adrenocorticotrophic Hormone
 - Gonadotropic Hormone which comprises the Follicle Stimulating Hormone and Luteinizing Hormone
 - Prolactin

Growth hormone (GH)

- GH promotes the development and enlargement of all tissues of the body. It stimulates the growth of muscles, cartilage and long bones. It controls the cell metabolism.
- The improper secretion of this hormone leads to the following conditions.

Dwarfism: It is caused by decreased secretion of growth hormone in children. The characteristic features are stunted growth, delayed skeletal formation and mental disability.

Gigantism: Oversecretion of growth hormone leads to gigantism in children. It is characterised by overgrowth of all body tissues and organs. Individuals attain abnormal increase in height.

Acromegaly: Excess secretion of growth hormone in adults may lead to abnormal enlargement of head, face, hands and feet.

Thyroid stimulating hormone (TSH)

- TSH controls the growth of thyroid gland, coordinates its activities and hormone secretion.

Adrenocorticotrophic hormone (ACTH)

- ACTH stimulates adrenal cortex of the adrenal gland for the production of its hormones. It also influences protein synthesis in the adrenal cortex.

Gonadotropic hormones (GTH)

- The gonadotropic hormones are follicle stimulating hormone and luteinizing hormone which are essential for the normal development of gonads.

Follicle stimulating hormone (FSH)

- In male, it stimulates the germinal epithelium of testes for formation of sperms. In female it initiates the growth of ovarian follicles and its development in ovary.

Luteinizing hormone (LH)

- In male, it promotes the Leydig cells of the testes to secrete male sex hormone testosterone. In female, it causes ovulation (rupture of mature graafian follicle), responsible for the development of corpus luteum and production of female sex hormones estrogen and progesterone.

Prolactin (PRL)

- PRL is also called lactogenic hormone. This hormone initiates development of mammaryglands during pregnancy and stimulates the production of milk after child birth.

Hormones secreted by the posterior lobe (Neurohypophysis) of pituitary

The hormones secreted by the posterior pituitary are

- Vasopressin or Antidiuretic hormone
- Oxytocin

Vasopressin or Antidiuretic hormone (ADH)

- In kidney tubules it increases reabsorption of water. It reduces loss of water through urine and hence the name antidiuretic hormone.
- Deficiency of ADH reduces reabsorption of water and causes an increase in urine output (polyuria). This deficiency disorder is called Diabetes insipidus.

Oxytocin

- It helps in the contraction of the smooth muscles of uterus at the time of child birth and milk ejection from the mammary gland after child birth.

Thyroid Gland

- The thyroid gland is composed of two distinct lobes lying one on either side of the trachea. The two lobes are connected by means of a narrow band of tissue known as the isthmus. This gland is composed of glandular follicles and lined by cuboidal epithelium. The follicles are filled with colloid material called thyroglobulin.

An amino acid tyrosine and iodine are involved in the formation of thyroid hormone. The hormones secreted by the thyroid gland are

- Triiodothyronine (T3)
- Tetraiodothyronine or Thyroxine (T4)

Functions of thyroid hormones

The functions of thyroid hormones are

- Production of energy by maintaining the Basal Metabolic Rate (BMR) of the body.
- Helps to maintain normal body temperature.
- Influences the activity of central nervous system.
- Controls growth of the body and bone formation.
- Essential for normal physical, mental and personality development .
- It is also known as personality hormone.
- Regulates cell metabolism.

Thyroid Dysfunction

- When the thyroid gland fails to secrete the normal level of hormones, the condition is called thyroid dysfunction. It leads to the following conditions

Hypothyroidism

- It is caused due to the decreased secretion of the thyroid hormones. The abnormal conditions are simple goitre, cretinism and myxoedema.

Goitre

- It is caused due to the inadequate supply of iodine in our diet. This is commonly prevalent in Himalayan regions due to low level of iodine content in the soil. It leads to the enlargement of thyroid gland which protrudes as a marked swelling in the neck and is called as goitre.

Cretinism

- It is caused due to decreased secretion of the thyroid hormones in children. The conditions are stunted growth, mental defect, lack of skeletal development and deformed bones. They are called as cretins.

Myxoedema

- It is caused by deficiency of thyroid hormones in adults. They are mentally sluggish, increase in body weight, puffiness of the face and hand, oedematous appearance.

Hyperthyroidism

- It is caused due to the excess secretion of the thyroid hormones which leads to Grave's disease. The symptoms are protrusion of the eyeballs (Exophthalmia), increased metabolic rate, high body temperature, profuse sweating, loss of body weight and nervousness.

Parathyroid Gland

- The parathyroid glands are four small oval bodies that are situated on the posterior surface of the thyroid lobes. The chief cells of the gland are mainly concerned with secretion of parathormone.

Functions of Parathormone

- The parathormone regulates calcium and phosphorus metabolism in the body. They act on bone, kidney and intestine to maintain blood calcium levels.

Parathyroid Dysfunction

- The secretion of parathyroid hormone can be altered due to the following conditions.

Removal of parathyroid glands during thyroidectomy (removal of thyroid) causes decreased secretion of parathormone. The conditions are

- Muscle spasm known as Tetany (sustained contraction of muscles in face, larynx, hands and feet).
- Painful cramps of the limb muscles

Pancreas (Islets of Langerhans)

- Pancreas is an elongated, yellowish gland situated in the loop of stomach and duodenum. It is exocrine and endocrine in nature. The exocrine pancreas secretes pancreatic juice which plays a role in digestion while, the endocrine portion is made up of Islets of Langerhans
- The Islets of Langerhans consists of two types of cells namely alpha cells and beta cells. The alpha cells secrete glucagon and beta cells secrete insulin.

Functions of Pancreatic hormones

- A balance between insulin and glucagon production is necessary to maintain blood glucose concentration.

Insulin

- Insulin helps in the conversion of glucose into glycogen which is stored in liver and skeletal muscles.
- It promotes the transport of glucose into the cells.
- It decreases the concentration of glucose in blood.

Glucagon

- Glucagon helps in the breakdown of glycogen to glucose in the liver.
- It increases blood glucose levels.

Diabetes mellitus

The deficiency of insulin causes Diabetes mellitus. It is characterised by

- Increase in blood sugar level (Hyperglycemia).
- Excretion of excess glucose in the urine (Glycosuria).
- Frequent urination (Polyuria).
- Increased thirst (Polydipsia).
- Increase in appetite (Polyphagia).

Human insulin was first discovered by Fredrick Banting, Charles Best and MacLeod in 1921. Insulin was first used in treatment of diabetes on 11th January 1922.

Adrenal Gland

- The adrenal glands are located above each kidney. They are also called supra renal glands.
- The outer part is the adrenal cortex and the inner part is the adrenal medulla. The two distinct parts are structurally and functionally different.

Adrenal Cortex

- The adrenal cortex consists of three layers of cells. They are zonaglomerulosa, zonafasciculata and zonareticularis

Hormones of Adrenal Cortex

The hormones secreted by the adrenal cortex are corticosteroids. They are classified into

- Glucocorticoids
- Mineralocorticoids

Functions of adrenocortical hormones

Glucocorticoids

- The glucocorticoids secreted by the zonafasciculata are cortisol and corticosterone
 - They regulate cell metabolism.
 - It stimulates the formation of glucose from glycogen in the liver.
 - It is an anti-inflammatory and anti-allergic agent.

Mineralocorticoids

- The mineralocorticoids secreted by zonaglomerulosa is aldosterone
 - It helps to reabsorb sodium ions from the renal tubules.
 - It causes increased excretion of potassium ions.
 - It regulates electrolyte balance, body fluid volume, osmotic pressure and blood pressure.

Adrenal Medulla

- The adrenal medulla is composed of chromaffin cells.They are richly supplied with sympathetic and parasympathetic nerves.

Hormones of Adrenal Medulla

It secretes two hormones namely

- Epinephrine (Adrenaline)
- Norepinephrine (Noradrenaline)
- They are together called as “Emergency hormones”. It is produced during conditions of stress and emotion. Hence it is also referred as “flight, fright and fight hormone”.

Functions of adrenal medullary hormones

Epinephrine (Adrenaline)

- It promotes the conversion of glycogen to glucose in liver and muscles.
- It increases heart beat and blood pressure.
- It increases the rate of respiration by dilation of bronchi and trachea.
- It causes dilation of the pupil in eye.
- It decreases blood flow through the skin.

Norepinephrine (Noradrenalin)

- Most of its actions are similar to those of epinephrine.

Reproductive Glands (Gonads)

- The sex glands are of two types the testes and the ovaries. The testes are present in male, while the ovaries are present in female.

Testes

- Testes are the reproductive glands of the males. They are composed of seminiferous tubules, Leydig cells and Sertoli cells. Leydig cells form the endocrine part of the testes. They secrete the male sex hormone called testosterone.

Functions of testosterone

- It influences the process of spermatogenesis.
- It stimulates protein synthesis and controls muscular growth.
- It is responsible for the development of secondary sexual characters (distribution of hair on body and face, deep voice pattern, etc).

Ovary

- The ovaries are the female gonads located in the pelvic cavity of the abdomen. They secrete the female sex hormones
 - Estrogen
 - Progesterone
- Estrogen is produced by the Graafian follicles of the ovary and progesterone from the corpus luteum that is formed in the ovary from the ruptured follicle during ovulation.

Functions of estrogens

- It brings about the changes that occur during puberty.
- It initiates the process of oogenesis.
- It stimulates the maturation of ovarian follicles in the ovary.
- It promotes the development of secondary sexual characters (breast development, high pitched voice etc).

Functions of progesterone

- It is responsible for the premenstrual changes of the uterus.
- It prepares the uterus for the implantation of the embryo.
- It maintains pregnancy.
- It is essential for the formation of placenta

Thymus Gland

- Thymus is partly an endocrine gland and partly a lymphoid gland. It is located in the upper part of the chest covering the lower end of trachea. Thymosin is the hormone secreted by thymus.

Functions of Thymosin

- It has a stimulatory effect on the immune function.
- It stimulates the production and differentiation of lymphocytes.

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10th Full book

Unit 17 - Reproduction in Animals

Sexual Reproduction in Human

- In human beings the male and female reproductive organs differ anatomically and physiologically. New individuals develop by the fusion of gametes. Sexual reproduction involves the fusion of two haploid gametes (male and the female gametes) to form a diploid individual (zygote).
- Organs of the reproductive system are divided into primary and secondary (accessory) sex organs.
 - Primary reproductive organs include the gonads (Testes in male and Ovaries in female).
 - **Accessory sex organs**
 - **Male:** Vas deferens, epididymis, seminal vesicle, prostate gland and penis.
 - **Female:** Fallopian tubes, uterus, cervix and vagina.

The secondary (accessory) sex organs include those structures which are involved in the

- Process of ovulation
- Fusion of the male and female gametes (fertilization)
- Division of the fertilized egg upto the formation of embryo
- Pregnancy
- Development of foetus
- Child birth.

Male Reproductive Organ - Structure of Testes

- Testes are the reproductive glands of the male that are oval shaped organs which lie outside the abdominal cavity of a man in a sac like structure called scrotum. Now we shall study the various cells which are present in the testes.
- Each testes is covered with a layer of fibrous tissue called tunica albuginea. Many septa from this layer divide the testes into pyramidal lobules, in which lie seminiferous tubules, cells of Sertoli, and the Leydig cells (interstitial cells).
- The process of spermatogenesis takes place in the seminiferous tubules. The Sertoli cells are the supporting cells and provide nutrients to the developing sperms. The Leydig cells are polyhedral in shape and lie between the seminiferous tubules and secrete testosterone. It initiates the process of spermatogenesis.

Female Reproductive Organ - Structure of Ovary

- The ovaries are located on either side of the lower abdomen composed of two almond shaped bodies, each lying near the lateral end of fallopian tube. Each ovary is a compact structure consisting of an outer cortex and an inner medulla. The cortex is composed of a network of connective tissue called as stroma and is lined by the germinal epithelium. The epithelial cells called the granulosa cells surround each ovum in the ovary together forming the primary follicle. As the egg grows larger, the follicle also enlarges and gets filled with the fluid and is called the Graafian follicle.

Gametogenesis

- The formation of the sperm in male and the ovum in female is called gametogenesis. It involves spermatogenesis (formation of spermatozoa) and oogenesis (the formation of ova). Gametes with haploid cells are produced through gametogenesis.

Structure of Human Sperm

- The spermatozoan consists of head, a middle piece and tail. The sperm head is elongated and formed by the condensation of nucleus. The anterior portion has a cap like structure called acrosome. It contains hyaluronidase an enzyme that helps the sperm to enter the ovum during fertilization. A short neck connects the head and middle piece which comprises the centrioles. The middle piece contains the mitochondria which provides energy for the movement of tail. It brings about sperm motility which is essential for fertilization.

Structure of Ovum

- The mature ovum or egg is spherical in shape. The ovum is almost free of yolk. It contains abundant cytoplasm and the nucleus. The ovum is surrounded by three membranes. The plasma membrane is surrounded by inner thin zonapellucida and an outer thick corona radiata. The corona radiata is formed of follicle cells. The membrane forming the surface layer of the ovum is called vitelline membrane. The fluid-filled space between zonapellucida and the surface of the egg is called perivitelline space.

Puberty

- The reproductive system in both males and females becomes functional and an increase in sex hormone production resulting in puberty. This phenomenon tends to start earlier in females than in males. Generally boys attain puberty between the age of 13 to 14 years, while girls reach puberty between 11 to 13 years. In male, the onset of puberty is triggered by the secretion of the hormone testosterone in the testes, in female the secretion of estrogens and progesterone from the ovary. The secretion of both male and female hormones are under the control of the pituitary gonadotropins luteinizing hormone (LH) and follicle stimulating hormone (FSH).

Menstrual Cycle-Process of Ovulation

- The cyclic events that take place in a rhythmic fashion during the reproductive period of a woman's life is called menstrual cycle. In human females the menstrual cycle starts at the age of 11-13 years which marks the onset of puberty and is called menarche, and ceases around 48-50 years of age and this stage is termed menopause. The reproductive period is marked by characteristic events repeated almost every month in physiologically normal women (28 days with minor variation) in the form of a menstrual flow. The menstrual cycle consists of 4 phases.
 - Menstrual or Destructive Phase
 - Follicular or Proliferative Phase
 - Ovulatory Phase
 - Luteal or Secretory Phase
- These phases show simultaneous synchrony of events in both ovary and uterus. Changes in the ovary and the uterus are induced by the pituitary hormones (LH and FSH) and ovarian hormones (estrogen and progesterone).

Phase	Days	Changes in Ovary	Changes in Uterus	Hormonal Changes
Menstrual Phase	4-5 days	Development of Primary Follicles	Breakdown of Uterine endometrial lining leads to bleeding	Decrease in Progesterone and Oestrogen
Follicular phase	6 th - 13 th days	Primary follicles grow to become a fully mature Graafian follicle	Endometrium regenerates through Poliferation	FSH and Oestrogen increase
Ovulatory phase	14 th day	The Graafian follicle ruptures, and releases the Ovum (Egg)	Increase in endometrial thickness	LH Peak
Luteal Phase	15 th - 28 th days	Emptied Graafian follicle develops into corpus luteum	Endometrium is prepared for implantation if fertilization of egg takes place, if fertilization does not occur corpus luteum degenerates, Uterine wall	LHS and FSH Decrease, corpus luteum Produces progesterone and its level increases

			ruptures, bleeding starts and unfertilized egg is expelled	followed by a decline, if menstrual bleeding occurs.
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Fertilization to Foetal Development

Fertilization

- Fertilization in human is internal and occurs in the oviduct of the female genital tract. It takes place usually in the ampulla of the fallopian tube. An oocyte is alive for about 24 hours after it is released from the follicle. Fertilisation must take place within 24 hours. The sperm enters into the ovum and fuses with it, resulting in the formation of a 'zygote'. This process is called fertilization. The zygote is a fertilized ovum.

Cleavage and Formation of Blastula

- The first cleavage takes place about 30 hours after fertilization. Cleavage is a series of rapid mitotic divisions of the zygote to form many celled blastula (Blastocyst) which comprises an outer layer of smaller cells and inner mass of larger cells.

Implantation

- The blastocyst (fertilized egg) reaches the uterus and gets implanted in the uterus. The process of attachment of the blastocyst to the uterine wall (endometrium) is called implantation. The fertilized egg becomes implanted in about 6 to 7 days after fertilization

Gastrulation

- The transformation of blastula into gastrula and the formation of primary germ layers (ectoderm, mesoderm and endoderm) by rearrangement of the cells is called gastrulation. This takes place after the process of implantation.

Organogenesis

- The establishment of the germ layers namely ectoderm, mesoderm and endoderm initiates the final phase of embryonic development. During organogenesis the various organs of the foetus are established from the different germ layers attaining a functional state.

Formation of Placenta

- The placenta is a disc shaped structure attached to the uterine wall and is a temporary association between the developing embryo and maternal tissues. It allows the exchange of food materials, diffusion of oxygen, excretion of nitrogenous wastes and elimination of carbon dioxide. A cord containing blood vessels that connects the placenta with the foetus is called the umbilical cord.

Pregnancy (Gestation)

- It is the time period during which the embryo attains its development in the uterus. Normally gestation period of human last for about 280 days. During pregnancy the uterus expands upto 500 times of its normal size.

Parturition (Child Birth)

- Parturition is the expulsion of young one from the mother's uterus at the end of gestation. Oxytocin from the posterior pituitary stimulates the uterine contractions and provides force to expel the baby from the uterus, causing birth.

Sometimes ovaries releases two eggs and each is fertilised by a different sperm, resulting in Non-Identical Twins (Fraternal Twins). If single egg is fertilised and then divides into two foetus, Identical Twins develop.

Lactation

- The process of milk production after child birth from mammary glands of the mother is called lactation. The first fluid which is released from the mammary gland after child birth is called as colostrum. Milk production from alveoli of mammary glands is stimulated by prolactin secreted from the anterior pituitary.
- The ejection of milk is stimulated by posterior pituitary hormone oxytocin.

Reproductive Health

- According to World Health Organization (WHO) reproductive health means a total well being in all aspects of reproduction, ability to reproduce and regulate fertility, women's ability to undergo pregnancy and safe child birth, maternal and infant survival and well being.
- Several measures were undertaken by the government to improve the reproductive health of the people by launching National Health Programmes such as the
 - Family Welfare Programme
 - Reproductive and Child Health Care (RCH) Programme

Family welfare programme: The National Family Welfare Programme is a comprehensive scheme which includes:

- Maternal and child health care (MCH)
- Immunization of mothers, infants and children.
- Nutritional supplement to pregnant women and children.
- Contraception with health education, to motivate couples to accept contraceptive methods and to have small family norms, which improve economic status, living status and the quality of life.

Reproductive and Child Health Care (RCH) Programme: It has integrated all services which include

- Pregnancy and child birth
- Postnatal care of the mother and child
- Importance of breast feeding
- Prevention of reproductive tract infections and sexually transmitted diseases.

Population Explosion and Family Planning

- Population explosion defined as the sudden and rapid rise in the size of population, especially human population. Realizing the dangers inherent in population growth, the Government of India has taken several measures to check population growth and introduced family planning. India has been one of the first country in the world to launch the nation wide family planning programme in 1952.
- Family planning is a way of living that is adopted voluntarily by couples on the basis of knowledge and responsible decisions to promote the health and welfare of the family group and society. The WHO (World Health Organisation) has also stressed the importance of family planning as global strategy health for all.

The inverted red triangle is a symbol of family planning in India for family welfare. It is displayed prominently at all hospitals, primary health clinics and family welfare centres where any help or advice about family planning is available free of cost. The symbol is displayed along with a slogan Small Family, Happy Family.

Contraception

- Contraception is one of the best birth control measures. A number of techniques or methods have been developed to prevent pregnancies in women. The devices used for contraception are called contraceptive devices. Common contraceptive methods used to prevent pregnancy are discussed here
- Barrier methods

- Hormonal methods
- Intra-Uterine Devices (IUDs)
- Surgical methods

Barrier Methods

- This method prevents sperms from meeting the ovum. Its entry into the female reproductive tract is prevented by barrier.

Condom: Condom prevents deposition of sperms in the vagina. Condoms are made of thin rubber or latex sheath. Condom also protect against sexually transmitted diseases (STD) like syphilis, AIDS.

Diaphragm (Cervical cap): Vaginal diaphragm fitting into the vagina or a cervical cap fitting over the cervix. This prevents the entry of sperms into the uterus.

Hormonal Methods

- Hormonal preparations are in the form of pills or tablets (contraceptive pills). These hormones stop (interfere with ovulation) the release of egg from the ovary.

Intra-Uterine Devices (IUDs)

- The intrauterine device (IUD) are contraceptive devices inserted into the uterus. There are two synthetic devices commonly used in India are Lippe's Loop and Copper-T made of copper and plastic (non irritant). This can remain for a period of 3 years. This reduces the sperm fertilizing capacity and prevents implantation. This also helps to give adequate time interval between pregnancies.

Surgical Methods

- Surgical contraception or sterilization techniques are terminal methods to prevent any pregnancy. This procedure in males is vasectomy (ligation of vas deferens) and in females it is tubectomy (ligation of fallopian tube). These are methods of permanent birth control.

Urinary Tract Infection (UTI)

- Many diseases affect both women and men, but a few diseases occur at a higher frequency in woman. Woman are susceptible to UTI from the bacteria that are present on skin, rectum or vagina. This will enter the urethra, before moving upwards. The types of UTI are:

Cystitis or Bladder infection

- Bacteria lodged in the urinary bladder thrive and multiply leading to inflammation. It is most common in the age group of 20 to 50.

Kidney Infection

- The bacteria can travel from the urinary bladder and upward to ureter and affect one or both the kidneys. It also infects the blood stream and leads to serious life-threatening complications.

Asymptomatic Bacteriuria

- The bacteria present in the urinary bladder which may not show any symptoms.

Personal Hygiene

- Hygiene is the practice of healthy living and personal cleanliness. Personal hygiene is caring of one's own body and health. Social hygiene is proper care of the surrounding environment. The main aspect of hygiene are body hygiene, food hygiene, sanitary hygiene and hygienic environment.

Body Hygiene

- Washing is vital to all age group of people which maintains our personal hygiene. A daily bath regularly keeps skin clean and free of germs. Hair should be kept clean by frequent washing. Mouth wash should be done after every meal. We should wash our hands many times during the day.
- Cloth towels used to dry our hands or body should be dried after each use and laundered regularly. Clothes, handkerchief, undergarments and socks should be washed daily. Washing prevents body odour, infections and skin irritation.

Toilet Hygiene

- The toilet has a lot to do with personal hygiene and general health as it is a place that cannot be avoided and used regularly. Parents should guide and practice their children on how to use the toilets at home, in schools and other public places so that it will protect the children from various contagious infections and diseases. The following measures can ensure toilet hygiene
 - The floors of the toilet should be maintained clean and dry. This helps to reduce the bad odour and also infection.
 - Toilet flush handles, door knobs, faucets, paper towel dispensers, light switches and walls should be cleaned with disinfectants to kill harmful germs and bacteria.

- Hands should be washed thoroughly with soap before and after toilet use.

Menstrual and Napkin Hygiene

- Women's health depends upon the level of cleanliness to keep them free from skin and genitourinary tract infection.

Menstrual hygiene

- Maintaining menstrual hygiene is important for the overall health of women. The basic menstrual hygiene ways are
 - Sanitary pads should be changed regularly, to avoid infections due to microbes from vagina and sweat from genitals.
 - Use of warm water to clean genitals helps to get rid of menstrual cramps

Wearing loose clothing rather than tight fitting clothes will ensure the airflow around the genitals and prevent sweating.

12th Zoology

Chapter 1- Reproduction in Organisms

Modes of reproduction

- All modes of reproduction have some basic features such as synthesis of RNA and proteins, replication of DNA, cell division and growth, formation of reproductive units and their fertilization to form new individuals. Organisms exhibit two major modes of reproduction namely asexual and sexual reproduction. Reproduction by a single parent without the involvement of gamete formation is asexual reproduction and the offspring produced are genetically identical. Asexual reproduction is usually by amitotic or mitotic division of the somatic (body) cells, hence is also known as somatogenic or blastogenic reproduction. When two parents participate in the reproductive process involving two types of gametes (ova and sperm), it is called sexual reproduction.

Asexual reproduction

- Asexual reproduction is wide spread among different organisms. It is common in members of Protista, Bacteria, Archaea and in multicellular organisms with relatively simple organisation. The offsprings show “uniparental inheritance” without any genetic variation. The different modes of asexual reproduction seen in animals are fission, sporulation, budding, gemmule formation, fragmentation and regeneration.
- Fission is the division of the parent body into two or more identical daughter individuals. Four types of fission are seen in animals. They are binary fission, multiple fission, sporulation and strobilation.
- In binary fission, the parent organism divides into two halves and each half forms a daughter individual. The nucleus divides first amitotically or mitotically (karyokinesis), followed by the division of the cytoplasm (cytokinesis). The resultant offsprings are genetically identical to the parent. Depending on the plane of fission, binary fission is of the following types
 - Simple irregular binary fission
 - Transverse binary fission
 - Longitudinal binary fission
 - Oblique binary fission
- Simple binary fission is seen in Amoeba like irregular shaped organisms, where the plane of division is hard to observe. The contractile vacuoles cease to function and disappear. The nucleoli disintegrate and the nucleus divides mitotically. The cell then constricts in the middle, so the cytoplasm divides and forms two daughter cells.

- In transverse binary fission, the plane of the division runs along the transverse axis of the individual. e.g. Paramecium and Planaria. In Paramecium the macronucleus divides by amitosis and the micronucleus divides by mitosis.
- In longitudinal binary fission, the nucleus and the cytoplasm divides in the longitudinal axis of the organism. In flagellates, the flagellum is retained usually by one daughter cell.
- The basal granule is divided into two and the new basal granule forms a flagellum in the other daughter individual. e.g. Vorticella and Euglena.
- In oblique binary fission the plane of division is oblique. It is seen in dinoflagellates. e.g. Ceratium
- In multiple fission the parent body divides into many similar daughter cells simultaneously. First, the nucleus divides repeatedly without the division of the cytoplasm, later the cytoplasm divides into as many parts as that of nuclei. Each cytoplasmic part encircles one daughter nucleus. This results in the formation of many smaller individuals from a single parent organism. If multiple fission produces four or many daughter individuals by equal cell division and the young ones do not separate until the process is complete, then this division is called repeated fission e.g. Vorticella.
- In Plasmodium, multiple fission occurs in the schizont and in the oocyte stages. When multiple fission occurs in the schizont, the process is called schizogony and the daughter individuals are called merozoites. When multiple fission occurs in the oocyte, it is called sporogony and the daughter individuals are called sporozoites.
- During unfavorable conditions (increase or decrease in temperature, scarcity of food) Amoeba withdraws its pseudopodia and secretes a three-layered, protective, chitinous cyst wall around it and becomes inactive. This phenomenon is called encystment. When conditions become favourable, the encysted Amoeba divides by multiple fission and produces many minute amoebae called pseudopodiospore or amoebulae. The cyst wall absorbs water and breaks off liberating the young pseudopodiospores, each with a fine pseudopodia. They feed and grow rapidly to lead an independent life.
- In some metazoan animals, a special type of transverse fission called strobilation occurs. In the process of strobilation, several transverse fissions occur simultaneously giving rise to a number of individuals which often do not separate immediately from each other e.g. Aurelia. Plasmotomy is the division of multinucleated parent into many multinucleated daughter individuals with the division of nuclei. Nuclear division occurs later to maintain normal number of nuclei. Plasmotomy occurs in Opalina and Pelomyxa (Giant Amoeba).
- During unfavourable conditions Amoeba multiplies by sporulation without encystment. Nucleus breaks into several small fragments or chromatin blocks. Each fragment develops a nuclear membrane, becomes surrounded by cytoplasm and develops a spore-

case around it. When conditions become favourable, the parent body disintegrates and the spores are liberated, each hatching into a young amoeba.

- In budding, the parent body produces one or more buds and each bud grows into a young one. The buds separate from the parent to lead a normal life. In sponges, the buds constrict and detach from the parent body and the bud develops into a new sponge.
- When buds are formed on the outer surface of the parent body, it is known as exogenous budding e.g. Hydra. In Hydra when food is plenty, the ectoderm cells increase and form a small elevation on the body surface. Ectoderm and endoderm are pushed out to form the bud. The bud contains an interior lumen in continuation with parent's gastro-vascular cavity. The bud enlarges, develops a mouth and a circle of tentacles at its free end. When fully grown, the bud constricts at the base and finally separates from the parent body and leads an independent life.
- In Noctiluca, hundreds of buds are formed inside the cytoplasm and many remain within the body of the parent. This is called endogenous budding. In freshwater sponges and in some marine sponges a regular and peculiar mode of asexual reproduction occurs by internal buds called gemmules is seen. A completely grown gemmule is a hard ball, consisting of an internal mass of food-laden archaeocytes. During unfavourable conditions, the sponge disintegrates but the gemmule can withstand adverse conditions. When conditions become favourable, the gemmules begin to hatch.
- In fragmentation, the parent body breaks into fragments (pieces) and each of the fragment has the potential to develop into a new individual. Fragmentation or pedal laceration occurs in many genera of sea anemones. Lobes are constricted off from the pedal disc and each of the lobe grows mesenteries and tentacles to form a new sea anemone.
- In the tapeworm, Taeniasolium the gravid (ripe) proglottids are the oldest at the posterior end of the strobila . The gravid proglottids are regularly cut off either singly or in groups from the posterior end by a process called apolysis. This is very significant since it helps in transferring the developed embryos from the primary host (man) to find a secondary host (pig).
- Regeneration is regrowth in the injured region. Regeneration was first studied in Hydra by Abraham Trembley in 1740. Regeneration is of two types, morphallaxis and epimorphosis. In morphallaxis the whole body grows from a small fragment e.g. Hydra and Planaria. When Hydra is accidentally cut into several pieces, each piece can regenerate the lost parts and develop into a whole new individual. The parts usually retain their original polarity, with oral ends, by developing tentacles and aboral ends, by producing basal discs. Epimorphosis is the replacement of lost body parts. It is of two types, namely reparative and restorative regeneration. In reparative regeneration, only certain damaged tissue can be regenerated, whereas in restorative regeneration severed body parts can develop. e.g. star fish, tail of wall lizard.

Power of Regeneration

Sponge when macerated and squeezed through fine silk cloth, the cluster of cells pass through, and these can regenerate new sponges. This technique is used for cultivation of sponges.

Sexual reproduction

- Sexual reproduction involves the fusion of male and female gametes to form a diploid zygote, which develops into a new organism. It leads to genetic variation. The types of sexual reproduction seen in animals are syngamy (fertilization) and conjugation. In syngamy, the fusion of two haploid gametes takes place to produce a diploid zygote. Depending upon the place where the fertilization takes place, it is of two types. In external fertilization, the fusion of male and female gametes takes place outside the body of female organisms in the water medium. e.g. sponges, fishes and amphibians. In internal fertilization, the fusion of male and female gametes takes place within the body of female organisms. e.g. reptiles, aves and mammals.
- Different kinds of syngamy (fertilization) are prevalent among living organisms. In autogamy, the male and female gametes are produced by the same cell or same organism and both the gametes fuse together to form a zygote e.g. Actinosphaerium and Paramecium. In exogamy, the male and female gametes are produced by different parents and they fuse to form a zygote. So it is biparental. e.g. Human - dioecious or unisexual animal.
- In lower organisms, sometimes the entire mature organisms do not form gametes but they themselves behave as gametes and the fusion of such mature individuals is known as hologamy e.g. Trichonympha. Paedogamy is the sexual union of young individuals produced immediately after the division of the adult parent cell by mitosis. In merogamy, the fusion of small sized and morphologically different gametes (merogametes) takes place. The fusion of morphological and physiological identical gametes (isogametes) is called isogamy.
- e.g. Monocystis, whereas the fusion of dissimilar gametes is called anisogamy (Gr. An-without; iso-equal; gam-marriage). Anisogamy occurs in higher animals but it is customary to use the term fertilization instead of anisogamy or syngamy. e.g. higher invertebrates and all vertebrates.
- Conjugation is the temporary union of the two individuals of the same species. During their union both individuals, called the conjugants exchange certain amount of nuclear material (DNA) and then get separated. Conjugation is common among ciliates, e.g. Paramecium, Vorticella and bacteria (Prokaryotes).

- **Phases of life cycle:** Organisms have three phases – Juvenile phase, reproductive phase and senescent phase. Juvenile phase/ vegetative phase is the period of growth between the birth of the individual upto reproductive maturity. During reproductive phase/ maturity phase the organisms reproduce and their offsprings reach maturity period. On the basis of time, breeding animals are of two types: seasonal breeders and continuous breeders. Seasonal breeders reproduce at particular period of the year such as frogs, lizards, most birds, deers etc., Continuous breeders continue to breed throughout their sexual maturity e.g. honey bees, poultry, rabbit etc., Senescent phase begins at the end of reproductive phase when degeneration sets in the structure and functioning of the body.

PARTHENOGENESIS

(Gr. Parthenos - virgin, Genesis-produce)

- Development of an egg into a complete individual without fertilization is known as parthenogenesis. It was first discovered by Charles Bonnet in 1745. Parthenogenesis is of two main types namely, Natural Parthenogenesis and Artificial Parthenogenesis. In certain animals, parthenogenesis occurs regularly, constantly and naturally in their life cycle and is known as natural parthenogenesis.

Natural parthenogenesis are of different types:

Arrhenotoky: In this type only males are produced by parthenogenesis. eg: honey bees

Thelytoky: In this type of parthenogenesis only females are produced by parthenogenesis.eg: Solenobia

Amphitoky: In this type parthenogenetic egg may develop into individuals of any sex. Eg: Aphis

- Natural parthenogenesis may be of two types, viz., complete and incomplete. Complete parthenogenesis is the only form of reproduction in certain animals and there is no biparental sexual reproduction. These are no male organisms and so, such individuals are represented by females only. Incomplete parthenogenesis is found in some animals in which both sexual reproduction and parthenogenesis occurs. e.g. In honeybees; fertilized eggs (zygotes) develop into queen and workers, whereas unfertilized eggs develop into drones (male). In paedogenetic parthenogenesis (paedogenesis) the larvae produce a new generation of larvae by parthenogenesis. It occurs in the sporocysts and Redia larvae of liver fluke. It is also seen in the larvae of some insects. e.g. Gall fly. In artificial parthenogenesis, the unfertilized egg (ovum) is induced to develop into a complete individual by physical or chemical stimuli. e.g., Annelid and seurchin eggs
- Animals are classified mainly into three groups namely - Oviparous, Viviparous and Ovoviviparous depends on the site of development of embryo and whether they lay eggs (unfertilized or fertilized) or give birth to young ones. In Oviparous (L.,Ovum-egg-, Parere- to produce) animals (egg laying animals), the young hatch from eggs laid outside the mother's body. e.g. reptiles and birds (their eggs are covered by hard

calcareous shells), invertebrates, fishes and amphibians (eggs are not covered by hard calcareous shells but covered by a membrane). Viviparous (L., Vivus - alive, Parere - to produce) animals give rise to young ones.

- Viviparity is a type of development in which the young ones are born alive after being nourished in the uterus through the placenta. Majority of mammals including human beings are viviparous. In Ovoviviparous animals, the embryo develops inside the egg and remains in the mother's body until they are ready to hatch. This method of reproduction is similar to viviparity but the embryos have no placental connection with the mother and receive their nourishment from the egg yolk. Ovoviviparity is seen in fishes like shark.

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Chapter 2 – Human Reproduction

- Every organ system in the human body works continuously to maintain homeostasis for the survival of the individual. The human reproductive system is essential for the survival of the species. An individual may live a long healthy life without producing an offspring, but reproduction is inevitable for the existence of a species.

The reproductive system has four main functions namely,

- to produce the gametes namely sperms and ova
- to transport and sustain these gametes
- to nurture the developing offspring
- to produce hormones

The major reproductive events in human beings are as follows:

- **Gametogenesis:** Formation of gametes by spermatogenesis and oogenesis.
 - **Insemination:** Transfer of sperms by the male into the female genital tract.
 - **Fertilisation:** Fusion of male and female gametes to form zygote, called fertilisation.
 - **Cleavage:** Rapid mitotic division of the zygote which convert the single celled zygote into a multicellular structure called blastocyst.
 - **Implantation:** Attachment of blastocyst to the uterine wall.
 - **Placentation:** Formation of placenta which is the intimate connection between foetus and uterine wall of the mother for exchange of nutrients.
 - **Gastrulation:** Process by which blastocyst is changed into a gastrula with three primary germ layers
 - **Organogenesis:** Formation of specific tissues, organs and organ systems from three germ layers.
 - **Parturition:** Expulsion of the foetus from the mother's womb.
- These functions are carried out by the primary and accessory reproductive organs. The primary reproductive organs namely the ovary and testis are responsible for producing the ova and sperms respectively. Hormones secreted by the pituitary gland and the gonads help in the development of the secondary sexual characteristics, maturation of the reproductive system and regulation of normal functioning of the reproductive system. The accessory organs help in transport and to sustain the gametes and to nurture the developing offspring.

Human reproductive system

- The male reproductive system comprises of a pair of testes, accessory ducts, glands and external genitalia
- Testes are the primary male sex organs. They are a pair of ovoid bodies lying in the scrotum. The scrotum is a sac of skin that hangs outside the abdominal cavity. Since

viable sperms cannot be produced at normal body temperature, the scrotum is placed outside the abdominal cavity to provide a temperature 2-3°C lower than the normal internal body temperature. Thus, the scrotum acts as a thermoregulator for spermatogenesis.

- Each testis is covered by an outermost fibrous tunica albuginea and is divided by septa into about 200 - 250 lobules each containing 2-4 highly coiled testicular tubules or seminiferous tubules. These highly convoluted tubules which form 80 percent of the testicular substance are the sites for sperm production.
- The stratified epithelium of the seminiferous tubule is made of two types of cells namely Sertoli cells or nurse cells and spermatogonic cells or male germ cells. Sertoli cells are elongated and pyramidal and provide nourishment to the sperms till maturation. They also secrete inhibin, a hormone which is involved in the negative feedback control of sperm production. Spermatogonic cells divide meiotically and differentiate to produce spermatozoa.
- Interstitial cells or Leydig cells are embedded in the soft connective tissue surrounding the seminiferous tubules. These cells are endocrine in nature and secrete androgens namely the testosterone hormone which initiates the process of spermatogenesis. These cells are endocrine in nature and are characteristic features of the testes of mammals. Other immunologically competent cells are also present.
- The accessory ducts associated with the male reproductive system include rete testis, vasa efferentia, epididymis and vas deferens. The seminiferous tubules of each lobule converge to form a tubulus rectus that conveys the sperms into the rete testis. The rete testis is a tubular network on the posterior side of the testis. The sperms leave the rete testis and enter the epididymis through the vasa efferentia. The epididymis is a single highly coiled tube that temporarily stores the spermatozoa and they undergo physiological maturation and acquire increased motility and fertilizing capacity. The epididymis leads to the vas deferens and joins the duct of the seminal vesicle to form the ejaculatory duct which passes through the prostate and opens into the urethra. The urethra is the terminal portion of the male reproductive system and is used to convey both urine and semen at different times. It originates from the urinary bladder and extends through the penis by an external opening called urethral meatus.
- The accessory glands of the male reproductive system include the paired seminal vesicles and bulbourethral glands also called Cowper's gland and a single prostate gland. The seminal vesicles secrete an alkaline fluid called seminal plasma containing fructose sugar, ascorbic acid, prostaglandins and a coagulating enzyme called vesiculase which enhances sperm motility. The bulbourethral glands are inferior to the prostate and their secretions also help in the lubrication of the penis. The prostate encircles the urethra and is just below the urinary bladder and secretes a slightly acidic fluid that contains citrate, several enzymes and prostate specific antigens. Semen or seminal fluid is a milky white fluid which contains sperms and the seminal plasma (secreted from the seminal vesicles, prostate gland and the bulbourethral glands). The seminal fluid acts as a

transport medium, provides nutrients, contains chemicals that protect and activate the sperms and also facilitate their movement.

- The penis is the male external genitalia functioning as a copulatory organ. It is made of a special tissue that helps in the erection of penis to facilitate insemination. The enlarged end of the penis called glans penis is covered by a loose fold of skin called foreskin or prepuce.
- The female reproductive system is far more complex than the male because in addition to gamete formation, it has to nurture the developing foetus. The female reproductive system consists of a pair of ovaries along with a pair of oviducts, uterus, cervix, vagina and the external genitalia located in the pelvic region. These parts along with the mammary glands are integrated structurally and functionally to support the process of ovulation, fertilisation, pregnancy, child birth and child care.
- Ovaries are the primary female sex organs that produce the female gamete, ovum. The ovaries are located one on each side of the lower abdomen. The ovary is an elliptical structure about 2-4 cm long. Each ovary is covered by a thin cuboidal epithelium called the germinal epithelium which encloses the ovarian stroma. The stroma is differentiated as the outer cortex and inner medulla. Below the germinal epithelium is a dense connective tissue, the tunica albuginea. The cortex appears dense and granular due to the presence of ovarian follicles in various stages of development. The medulla is a loose connective tissue with abundant blood vessels, lymphatic vessels and nerve fibres. The ovary remains attached to the pelvic wall and the uterus by an ovarian ligament called mesovarium.
- The fallopian tubes (uterine tubes or oviducts), uterus and vagina constitute the female accessory organs. Each fallopian tube extends from the periphery of each ovary to the uterus. The proximal part of the fallopian tube bears a funnel shaped infundibulum. The edges of the infundibulum have many finger like projections called fimbriae which help in collection of the ovum after ovulation.

Female uterus contains one of the strongest muscles of the human body.

- The infundibulum leads to a wider central portion called ampulla. The last part of the oviduct is the isthmus which is short and thick walled connecting the ampulla and infundibulum to the uterus.
- The uterus or womb is a hollow, thick-walled, muscular, highly vascular and inverted pear shaped structure lying in the pelvic cavity between the urinary bladder and rectum. The major portion of the uterus is the body and the rounded region superior to it, is the fundus. The uterus opens into the vagina through a narrow cervix. The cavity of the cervix called the cervical canal communicates with the vagina through the external orifice and with the uterus through the internal orifice. The cervical canal along with vagina forms the birth canal.

- The wall of the uterus has three layers of tissues. The outermost thin membranous serous layer called the perimetrium, the middle thick muscular layer called myometrium and the inner glandular layer called endometrium. The endometrium undergoes cyclic changes during the menstrual cycle while myometrium exhibits strong contractions during parturition.
- Vagina is a large fibromuscular tube that extends from the cervix to the exterior. It is the female organ of copulation. The female reproductive structures that lie external to the vagina are called as the external genitalia or vulva comprising of labia majora, labiaminora, hymen and clitoris
- The Bartholin's glands (also called greater vestibular glands) are located posterior to the left and right of the opening of the vagina. They secrete mucus to lubricate the vagina and are homologous to the bulbourethral glands of the male. The Skene's glands are located on the anterior wall of the vagina and around the lower end of the urethra. They secrete a lubricating fluid and are homologous to the prostate gland of the males.
- The external opening of the vagina is partially closed by a thin ring of tissue called the hymen. The hymen is often torn during the first coitus (physical union). However in some women it remains intact. It can be stretched or torn due to a sudden fall or jolt and also during strenuous physical activities such as cycling, horseback riding, etc., and therefore cannot be considered as an indicator of a woman's virginity.
- The mammary glands are modified sweat glands present in both sexes. It is rudimentary in the males and functional in the females. A pair of mammary glands is located in the thoracic region. It contains glandular tissue and variable quantities of fat with a median nipple surrounded by a pigmented area called the areola. Several sebaceous glands called the areolar glands are found on the surface and they reduce cracking of the skin of the nipple. Internally each mammary gland consists of 2-25 lobes, separated by fat and connective tissues. Each lobe is made up of lobules which contain acini or alveoli lined by epithelial cells. Cells of the alveoli secrete milk. The alveoli open into mammary tubules. The tubules of each lobe join to form a mammary duct. Several mammary ducts join to form a wider mammary ampulla which is connected to the lactiferous duct in the nipple. Under the nipple, each lactiferous duct expands to form the lactiferous sinus which serves as a reservoir of milk. Each lactiferous duct opens separately by a minute pore on the surface of the nipple.
- Normal development of the breast begins at puberty and progresses with changes during each menstrual cycle. In non-pregnant women, the glandular structure is largely underdeveloped and the breast size is largely due to amount of fat deposits. The size of the breast does not have an influence on the efficiency of lactation.

Gametogenesis

- Gametogenesis is the process of formation of gametes i.e., sperms and ovary from the primary sex organs in all sexually reproducing organisms. Meiosis plays the most significant role in the process of gametogenesis

Spermatogenesis

- Spermatogenesis is the sequence of events in the seminiferous tubules of the testes that produce the male gametes, the sperms. During development, the primordial germ cells migrate into the testes and become immature germ cells called sperm mother cells or spermatogonia in the inner surfaces of the seminiferous tubules. The spermatogonia begin to undergo mitotic division at puberty and continue throughout life.
- In the first stage of spermatogenesis, the spermatogonia migrate among sertoli cells towards the central lumen of the seminiferous tubule and become modified and enlarged to form primary spermatocytes which are diploid with 23 pairs i.e., 46 chromosomes.
- Some of the primary spermatocytes undergo first meiotic division to form two secondary spermatocytes which are haploid with 23 chromosomes each. The secondary spermatocytes undergo second meiotic division to produce four haploid spermatids. The spermatids are transformed into mature spermatozoa (sperms) by the process called spermiogenesis. Sperms are finally released into the cavity of seminiferous tubules by a process called spermiation. The whole process of spermatogenesis takes about 64 days. At any given time, different regions of the seminiferous tubules contain spermatocytes in different stages of development. The sperm production remains nearly constant at a rate of about 200 million sperms per day.
- Spermatogenesis starts at the age of puberty and is initiated due to the increase in the release of Gonadotropin Releasing Hormone (GnRH) by the hypothalamus. GnRH acts on the anterior pituitary gland and stimulates the secretion of two gonadotropins namely Follicle Stimulating Hormone (FSH) and Lutenizing Hormone (LH). FSH stimulates testicular growth and enhances the production of Androgen Binding Protein (ABP) by the sertoli cells and helps in the process of spermiogenesis. LH acts on the Leydig cells and stimulates the synthesis of testosterone which in turn stimulates the process of spermatogenesis.

Structure of human spermatozoan

- The human sperm is a microscopic, flagellated and motile gamete. The whole body of the sperm is enveloped by plasma membrane and is composed of a head, neck and a tail. The head comprises of two parts namely acrosome and nucleus. Acrosome is a small cap like pointed structure present at the tip of the nucleus and is formed mainly from the Golgi body of the spermatid. It contains hyaluronidase, a proteolytic enzyme, popularly known as sperm lysin which helps to penetrate the ovum during fertilisation. The

nucleus is flat and oval. The neck is very short and is present between the head and the middle piece. It contains the proximal centriole towards the nucleus which plays a role in the first division of the zygote and the distal centriole gives rise to the axial filament of the sperm. The middle piece possesses mitochondria spirally twisted around the axial filament called mitochondrial spiral or nebenkern. It produces energy in the form of ATP molecules for the movement of sperms. The tail is the longest part of the sperm and is slender and tapering. It is formed of a central axial filament or axoneme and an outer protoplasmic sheath. The lashing movements of the tail push the sperm forward. The human male ejaculates about 200 to 300 million sperms during coitus. It is estimated that around 60 percent of sperms must have normal shape of which at least 40 per cent must show vigorous motility for normal fertility.

The sperm is the smallest human cell and the ovum or egg is the largest human cell.

Oogenesis

- Oogenesis is the process of development of the female gamete or ovum or egg in the ovaries. During foetal development, certain cells in the germinal epithelium of the foetal ovary divide by mitosis and produce millions of egg mother cells or oogonia. No more oogonia are formed or added after birth. The oogonial cells start dividing and enter into Prophase I of meiotic division I to form the primary oocytes which are temporarily arrested at this stage. The primary oocytes then get surrounded by a single layer of granulosa cells to form the primordial or primary follicles. A large number of follicles degenerate during the period from birth to puberty, so at puberty only 60,000 to 80,000 follicles are left in each ovary.

- Out of the million eggs women possess during birth, only about 300 to 400 will ovulate before menopause.
- On the other hand, males produce more than 500 billion sperms in their life time

- The primary follicle gets surrounded by many layers of granulosa cells and a new theca layer to form the secondary follicle. A fluid filled space, the antrum develops in the follicle and gets transformed into a tertiary follicle. The theca layer gets organized into an inner theca interna and an outer theca externa. At this time, the primary oocyte within the tertiary follicle grows in size and completes its first meiotic division and forms the secondary oocyte. It is an unequal division resulting in the formation of a large haploid secondary oocyte and a first polar body. The first polar body disintegrates. During fertilisation, the secondary oocyte undergoes second meiotic division and produces a large cell, the ovum and a second polar body. The second polar body also degenerates. The tertiary follicle eventually becomes a mature follicle or Graafian follicle. If fertilisation does not take place, second meiotic division is never completed and the egg disintegrates. At the end of gametogenesis in females, each primary oocyte gives rise to only one haploid ovum.

Structure of ovum

- Human ovum is non-cleidoic, alecithal and microscopic in nature. Its cytoplasm called ooplasm contains a large nucleus called the germinal vesicle. The ovum is surrounded by three coverings namely an inner thin transparent vitelline membrane, middle thick zonapellucida and outer thick coat of follicular cells called corona radiata. Between the vitelline membrane and zonapellucida is a narrow perivitelline space.

Menstrual cycle

- The menstrual or ovarian cycle occurs approximately once in every 28/29 days during the reproductive life of the female from menarche (puberty) to menopause except during pregnancy. The cycle of events starting from one menstrual period till the next one is called the menstrual cycle during which cyclic changes occurs in the endometrium every month. Cyclic menstruation is an indicator of normal reproductive phase

Menstrual cycle comprises of the following phases

- Menstrual phase
- Follicular or proliferative phase
- Ovulatory phase
- Luteal or secretory phase

Menstrual phase

- The cycle starts with the menstrual phase when menstrual flow occurs and lasts for 3-5 days. Menstrual flow is due to the breakdown of endometrial lining of the uterus, and its blood vessels due to decline in the level of progesterone and oestrogen. Menstruation occurs only if the released ovum is not fertilized. Absence of menstruation may be an indicator of pregnancy. However it could also be due to stress, hormonal disorder and anaemia.

Follicular or proliferative phase

- The follicular phase extends from the 5th day of the cycle until the time of ovulation. During this phase, the primary follicle in the ovary grows to become a fully mature Graafian follicle and simultaneously, the endometrium regenerates through proliferation. These changes in the ovary and the uterus are induced by the secretion of gonadotropins like FSH and LH, which increase gradually during the follicular phase. It stimulates follicular development and secretion of oestrogen by the follicle cells.

Ovulatory phase

- Both LH and FSH attain peak level in the middle of the cycle (about the 14th day). Maximum secretion of LH during the mid cycle called LH surge induces the rupture of

the Graafian follicle and the release of the ovum (secondary oocyte) from the ovary wall into the peritoneal cavity. This process is called as ovulation.

Luteal or secretory phase

- During luteal phase, the remaining part of the Graafian follicle is transformed into a transitory endocrine gland called corpus luteum. The corpus luteum secretes large amount of progesterone which is essential for the maintenance of the endometrium. If fertilisation takes place, it paves way for the implantation of the fertilized ovum. The uterine wall secretes nutritious fluid in the uterus for the foetus. So, this phase is also called as secretory phase. During pregnancy all events of menstrual cycle stop and there is no menstruation.
- In the absence of fertilisation, the corpus luteum degenerates completely and leaves a scar tissue called corpus albicans. It also initiates the disintegration of the endometrium leading to menstruation, marking the next cycle.

POLY CYSTIC OVARY SYNDROME (PCOS)

PCOS is a complex endocrine system disorder that affects women in their reproductive years. Polycystic means 'many cysts'. It refers to many partially formed follicles on the ovaries, which contain an egg each. But they do not grow to maturity or produce eggs that can be fertilized. Women with PCOS may experience irregular menstrual cycles, increased androgen levels, excessive facial or body hair growth (hirsutism), acne, obesity, reduced fertility and increased risk of diabetes. Treatment for PCOS includes a healthy lifestyle, weight loss and targeted hormone therapy.

Menstrual disorders

- Absence of menstruation is called amenorrhoea. If menarche does not appear till the age of 18, it is called primary amenorrhoea. Absence of menstruation for over three consecutive months is secondary amenorrhoea.
- Polymenorrhoea is a term used to describe a menstrual cycle that is shorter than 21 days. It may be due to hyperactivity of the anterior pituitary gland causing frequent ovulation, psychological disturbances and malnutrition. Chronic pelvic inflammation by certain sexually transmitted diseases (STD) such as chlamydia or gonorrhoea can cause inflammation in the uterus causing polymenorrhoea.
- Pain associated with menstruation is called dysmenorrhoea. It is the most commonly reported menstrual disorder. There are two types of dysmenorrhoea viz primary and secondary dysmenorrhoea. Primary dysmenorrhoea is pain or cramps during menstrual period and is caused by secretions of prostaglandin in the uterus. Secondary dysmenorrhoea is caused by a disorder in the reproductive system like endometriosis or uterine fibroids.

- Heavy and prolonged menstrual period that disrupts a woman's normal activities is referred to as menorrhagia. Menorrhagia may be due to hormonal imbalance, ovarian dysfunction, uterine fibroids and may also be due to cancer of the ovary, uterus or cervix.
- Oligomenorrhoea is a condition with infrequent menstrual periods. It occurs in women of childbearing age. Some variation in menstruation is normal, but a woman who regularly goes more than 35 days without menstruating may be diagnosed with oligomenorrhoea.

Menstrual hygiene

- Menstrual hygiene is vital for good health, well-being, dignity, empowerment and productivity of women. The impact of poor menstrual hygiene on girls is increased stress levels, fear and embarrassment during menstruation. This can keep girls inactive during such periods leading to absenteeism from school.
- Clean and safe absorbable clothing materials, sanitary napkins, pads, tampons and menstrual cups have been identified as materials used to manage menstruation. Changing sanitary material 4-5 hours as per the requirement, provides comfort, cleanliness and protection from infections. It also helps in enhancing the quality of life of women during this period. Used sanitary napkins should be wrapped in paper and disposed. It should not be thrown in open areas or drain pipe of toilets. Flushing of sanitary napkins in the drain pipes causes choking of the drainage line leading to water pollution.

Disposal of Napkins

The ecofriendly way to dispose menstrual waste scientifically and hygienically is to destroy the sanitary napkins using incinerators. Measures are being taken to install incinerators and napkin vending machines in washrooms of schools , colleges and public facilities

Menopause

- Menopause is the phase in a women's life when ovulation and menstruation stops. The average age of menopause is 45-50 years. It indicates the permanent cessation of the primary functions of the ovaries.

Fertilisation and implantation

- Fertilisation occurs when a haploid sperm fuses with a haploid ovum to form a fertilized egg or diploid zygote.

- The sperms deposited in the female reproductive tract undergo capacitation, which is a biochemical event that enables the sperm to penetrate and fertilise the egg. Fertilisation occurs only if the ovum and sperms are transported simultaneously to the ampullary isthmic junction of the fallopian tube.
- Before a sperm can enter the egg, it must penetrate the multiple layers of granulosa (follicular) cells which are around the ovum forming the corona radiata. The follicular cells are held together by an adhesive cementing substance called hyaluronic acid. The acrosomal membrane disintegrates releasing the proteolytic enzyme, hyaluronidase during sperm entry through the corona radiata and zonapellucida. This is called acrosomal reaction. Once fertilisation is accomplished, cortical granules from the cytoplasm of the ovum form a barrier called the fertilisation membrane around the ovum preventing further penetration of other sperms. Thus polyspermy is prevented.
- The first cleavage produces two identical cells called blastomeres. These produce 4 cells, then 8 and so on. After 72 hours of fertilisation, a loose collection of cells forms a berry shaped cluster of 16 or more cells called the morula
- Under the influence of progesterone, smooth muscles of the fallopian tube relax and the dividing embryo takes 4-5 days to move through the fallopian tube into the uterine cavity and finally gets implanted in the uterine wall. At this point the embryo consists of a fluid filled hollow ball of about 100 cells, called the blastocyst. The blastocyst is composed of a single layer of large flattened cells called trophoblast and a small cluster of 20-30 rounded cells called the inner cell mass. The inner cell mass of the blastocyst develops into the embryo and becomes embedded in the endometrium of the uterus. This process is called implantation and it results in pregnancy.
- If the fertilised ovum is implanted outside the uterus it results in ectopic pregnancy. About 95 percent of ectopic pregnancies occur in the fallopian tube. The growth of the embryo may cause internal bleeding, infection and in some cases even death due to rupture of the fallopian tube.

Twins are two offsprings produced in the same pregnancy.

- Monozygotic (Identical) twins are produced when a single fertilised egg splits into two during the first cleavage. They are of the same sex, look alike and share the same genes.
- Dizygotic (Fraternal) twins are produced when two separate eggs are fertilised by two separate sperms. The twins may be of the same sex or different sex and are non-identical.
- Siamese (United) twins are the conjoined twins who are joined during birth.

Maintenance of pregnancy and embryonic development

- The inner cell mass in the blastula is differentiated into epiblast and hypoblast immediately after implantation. The hypoblast is the embryonic endoderm and the epiblast is the ectoderm. The cells remaining in between the epiblast and the endoderm

form the mesoderm. Thus the transformation of the blastocyst into a gastrula with the primary germ layers by the movement of the blastomeres is called gastrulation. Each germ layer gives rise to specific tissues, organs and organ systems during organogenesis.

- The extra embryonic membranes namely the amnion, yolk sac, allantois and chorion protect the embryo from desiccation, mechanical shock and help in the absorption of nutrients and exchange of gases. The amnion is a double layered translucent membrane filled with the amniotic fluid. It provides a buoyant environment to protect the developing embryo from injury, regulates the temperature of the foetus and provides a medium in which the foetus can move. The yolk sac forms a part of the gut and is the source of the earliest blood cells and blood vessels.
- The allantois forms a small out pocketing of embryonic tissue at the caudal end of the yolk sac. It is the structural base for the umbilical cord that links the embryo to the placenta and ultimately it becomes part of the urinary bladder. The chorion is the outermost membrane which encloses the embryo and all other membranes and also helps in the formation of the placenta.
- The trophoblast cells in the blastocyst send out several finger like projections called chorionic villi carrying foetal blood and are surrounded by sinuses that contain maternal blood. The chorionic villi and the uterine tissues form the disc-shaped placenta. Placenta is a temporary endocrine organ formed during pregnancy and it connects the foetus to the uterine wall through the umbilical cord. It is the organ by which the nutritive, respiratory and excretory functions are fulfilled. The embryo's heart develops during the fourth week of pregnancy and circulates blood through the umbilical cord and placenta as well as through its own tissues.
- The primary germ layers serve as the primitive tissues from which all body organs develop. The ectoderm gives rise to the central nervous system (brain and spinal cord), peripheral nervous system, epidermis and its derivatives and mammary glands. The connective tissue, cartilage and bone, muscles, organs of urinogenital system (kidney, ureter and gonads) arise from the mesoderm. The endodermal derivatives are epithelium of gastrointestinal and respiratory tract, liver, pancreas, thyroid and parathyroids.
- Human pregnancy lasts for about 280 days or 40 weeks and is called the gestation period. It can be divided for convenience into three trimesters of three months each. The first trimester is the main period of organogenesis, the body organs namely the heart, limbs, lungs, liver and external genital organs are well developed. By the end of the second trimester, the face is well formed with features, eyelids and eyelashes, eyes blink, body is covered with fine hair, muscle tissue develops and bones become harder. The foetus is fully developed and is ready for delivery by the end of nine months (third trimester).
- During pregnancy, the placenta acts as a temporary endocrine gland and produces large quantities of human Chorionic Gonadotropin (hCG), human Chorionic

Somatomammotropin (hCS) or human Placental Lactogen (hPL), oestrogens and progesterone which are essential for a normal pregnancy. A hormone called relaxin is also secreted during the later phase of pregnancy which helps in relaxation of the pelvic ligaments at the time of parturition. It should be noted that hCG, hPL and relaxin are produced only during pregnancy. In addition, during pregnancy the level of other hormones like oestrogen and progesterone, cortisol, prolactin, thyroxine, etc., is increased several folds in the maternal blood. These hormones are essential for supporting foetal growth.

Parturition and lactation

- Parturition is the completion of pregnancy and giving birth to the baby. The series of events that expels the infant from the uterus is collectively called “labour”. Throughout pregnancy the uterus undergoes periodic episodes of weak and strong contractions. These contractions called Braxter-Hick’s contractions lead to false labour. As the pregnancy progresses, increase in the oestrogen concentration promotes uterine contractions. These uterine contractions facilitate moulding of the foetus and downward movement of the foetus. The descent of the foetus causes dilation of cervix of the uterus and vaginal canal resulting in a neurohumoral reflex called Foetal ejection reflex or Ferguson reflex. This initiates the secretion of oxytocin from the neurohypophysis which in turn brings about the powerful contraction of the uterine muscles and leads to the expulsion of the baby through the birth canal. This sequence of events is called as parturition or childbirth.
- Relaxin is a hormone secreted by the placenta and also found in the corpus luteum. It promotes parturition by relaxing the pelvic joints and by dilatation of the cervix with continued powerful contractions. The amnion ruptures and the amniotic fluid flows out through the vagina, followed by the foetus. The placenta along with the remains of the umbilical cord called “after birth” is expelled out after delivery.
- Lactation is the production of milk by mammary glands. The mammary glands show changes during every menstrual cycle, during pregnancy and lactation. Increased level of oestrogens, progesterone and human Placental Lactogen (hPL) towards the end of pregnancy stimulate the hypothalamus towards prolactin - releasing factors. The anterior pituitary responds by secreting prolactin which plays a major role in lactogenesis.
- Oxytocin causes the “Let-Down” reflex- the actual ejection of milk from the alveoli of the mammary glands. During lactation, oxytocin also stimulates the recently emptied uterus to contract, helping it to return to pre - pregnancy size.

When normal vaginal delivery is not possible due to factors like position of the baby and nature of the placenta, the baby is delivered through a surgical incision in the woman’s abdomen and uterus. It is also termed as abdominal delivery or Caesarean Section or ‘C’ Section.

Colostrum

Colostrum, a nutrient rich fluid produced by the human female immediately after giving birth, is loaded with immune, growth and tissue repair factors. It acts as a natural antimicrobial agent to actively stimulate the maturation of the infant's immune system. No artificial feed can substitute the first milk, with all its natural benefits and therefore should be definitely fed to the baby after birth.

- The mammary glands secrete a yellowish fluid called colostrum during the initial few days after parturition. It has less lactose than milk and almost no fat, but it contains more proteins, vitamin A and minerals.
- Colostrum is also rich in IgA antibodies. This helps to protect the infant's digestive tract against bacterial infection. Breast milk is the ideal food for infants as it contains all the constituents in suitable concentration and is easily digestible. It is fully sufficient till about 6 months of age and all infants must be breast fed by the mother to ensure the growth of a healthy baby.

12th book

Chapter 3 – Reproductive Health

- Reproductive health represents a society with people having physically and functionally normal reproductive organs. Healthy people have healthier babies and are able to care for their family, and contribute more to the society and community. Hence, health is a community issue. Reproductive system is a complex system controlled by the neuro-endocrine system, hence, it is important to take necessary steps to protect it from infectious diseases and injury.

Need for reproductive health-Problems and strategies

- India is amongst the first few countries in the world to initiate the 'Family planning programme' since 1951 and is periodically assessed every decade. These programmes are popularly named as 'Reproductive and Child Health Care (RCH). Major tasks carried out under these programmes are:
 - Creating awareness and providing medical assistance to build a healthy society.
 - Introducing sex education in schools to provide information about adolescence and adolescence related changes.
 - Educating couples and those in the marriageable age groups about the available birth control methods and family planning norms
 - Creating awareness about care for pregnant women, post-natal care of mother and child and the importance of breast feeding.
 - Encouraging and supporting governmental and non-governmental agencies to identify new methods and/or to improve upon the existing methods of birth control.

Globally, about 800 women die every day of preventable causes related to pregnancy and childbirth; 20 per cent of these women are from India. Similarly India's infant mortality rate was 44 per 1,000 live. Although, India has witnessed dramatic growth over the last two decades, maternal mortality still remains high as in comparison to many developing nations.

Health care programmes such as massive child immunization, supply of nutritional food to the pregnant women, JananiSurakshaYojana, JananiShishuSurakshaKaryakaram, RMNCH+A approach (an integrated approach for reproductive, maternal, new born, child and adolescent health), PradhanMantriSurakshitMatritvaAbhiyan, etc., are taken up at the national level by the Government of India

Amniocentesis and its statutory ban

- Due to small family norms and the skewed choice for a male child, female population is decreasing at an alarming rate. Amniocentesis is a prenatal technique used to detect any chromosomal abnormalities in the foetus and it is being often misused to determine the sex of the foetus. Once the sex of the foetus is known, there may be a chance of female foeticide. Hence, a statutory ban on amniocentesis is imposed.

Social impact of sex ratio, female foeticide and infanticide

- The sex ratio is the ratio of males to the females in a population. In India, the child sex ratio has decreased over the decade from 927 to 919 female for every 1000 males. To correct this ratio, steps are needed to change the mind set and attitudes of people, especially in the young adults. Female foeticide and infanticide is the manifestation of gender discrimination in our society.
- Female foeticide refers to 'aborting the female in the mother's womb'; whereas female infanticide is 'killing the female child after her birth'. These have resulted in imbalance in sex ratio. In UNDP's GII 2018 (United nations developmental programmes gender inequality index) reflected that India was ranked at 135 out of 187 countries due to availability of very few economic opportunities to women as compared to men.
- In order to prevent female foeticide and infanticide, Government of India has taken various steps like PCPNDT Act (Preconception and Prenatal diagnostic technique act-1994) enacted to ban the identification of sex and to prevent the use of prenatal diagnostic techniques for selective abortion. Various measures are taken by the Government to ensure survival, provision of better nutrition, education, protection and empowerment of girls by eliminating the differences in the sex ratio, infant mortality rate and improving their nutritional and educational status. POCSO Act (Prevention of children from sexual offences), Sexual harassment at workplace (Prevention, prohibition and redressal) Act and the changes in the Criminal law based on the recommendations of Justice Verma Committee, 2013 aims at creating a safe and secure environment for both females and males.

Population explosion and birth control

- Increased health facilities and better living conditions have enhanced longevity. According to a recent report from the UN, India's population has already reached 1.26 billion and is expected to become the largest country in population size, surpassing China around 2022. To overcome the problem of population explosion, birth control is the only available solution. People should be motivated to have smaller families by using various contraceptive devices. Advertisements by the Government in the media as well as posters/bills, etc., with a slogan Naamiruvarnamakkuiruvar (we two, ours two) and Naamiruvarnamakkuoruvar (we two, ours one) have also motivated to control

population growth in Tamilnadu. Statutory rising of marriageable age of the female to 18 years and that of males to 21 years and incentives given to couples with small families are the other measures taken to control population growth in our country.

Birth control methods

- The voluntary use of contraceptive procedures to prevent fertilization or prevent implantation of a fertilized egg in the uterus is termed as birth control. An ideal contraceptive should be user friendly, easily available, with least side effects and should not interfere with sexual drive. The contraceptive methods are of two types - temporary and permanent. Natural, chemical, mechanical and hormonal barrier methods are the temporary birth control methods.

Natural method is used to prevent meeting of sperm with ovum. i.e., Rhythm method (safe period), coitus interruptus, continuous abstinence and lactational amenorrhoea.

Periodic abstinence/rhythm method Ovulation occurs at about the 14th day of the menstrual cycle. Ovum survives for about two days and sperm remains alive for about 72 hours in the female reproductive tract. Coitus is to be avoided during this time.

Continuous abstinence is the simplest and most reliable way to avoid pregnancy is not to have coitus for a defined period that facilitates conception.

Coitus interruptus is the oldest family planning method. The male partner withdraws his penis before ejaculation, thereby preventing deposition of semen into the vagina.

Lactational amenorrhoea Menstrual cycles resume as early as 6 to 8 weeks from parturition. However, the reappearance of normal ovarian cycles may be delayed for six months during breast-feeding. This delay in ovarian cycles is called lactational amenorrhoea. It serves as a natural, but an unreliable form of birth control. Suckling by the baby during breast-feeding stimulates the pituitary to secrete increased prolactin hormone in order to increase milk production. This high prolactin concentration in the mother's blood may prevent menstrual cycle by suppressing the release of GnRH (Gonadotropin Releasing Hormone) from hypothalamus and gonadotropin secretion from the pituitary.

Barrier methods In these methods, the ovum and sperm are prevented from meeting so that fertilization does not occur.

Chemical barrier Foaming tablets, melting suppositories, jellies and creams are used as chemical agents that inactivate the sperms in the vagina.

Mechanical barrier Condoms are a thin sheath used to cover the penis in male whereas in female it is used to cover vagina and cervix just before coitus so as to prevent the entry of ejaculated semen into the female reproductive tract. This can prevent conception. Condoms should be discarded after a single use. Condom also safeguards the user from AIDS and STDs. Condoms are made of polyurethane, latex and lambskin.

Diaphragms, cervical caps and vaults are made of rubber and are inserted into the female reproductive tract to cover the cervix before coitus in order to prevent the sperms from entering the uterus.

Hormonal barrier

- It prevents the ovaries from releasing the ova and thickens the cervical fluid which keeps the sperm away from ovum.

Oral contraceptives – Pills are used to prevent ovulation by inhibiting the secretion of FSH and LH hormones. A combined pill is the most commonly used birth control pill. It contains synthetic progesterone and estrogen hormones. Saheli, contraceptive pill by Central Drug Research Institute (CDRI) in Lucknow, India contains a non-steroidal preparation called centchroman.

Intrauterine Devices (IUDs)

- Intrauterine devices are inserted by medical experts in the uterus through the vagina. These devices are available as copper releasing IUDs, hormone releasing IUDs and non-medicated IUDs. IUDs increase phagocytosis of sperm within the uterus. IUDs are the ideal contraceptives for females who want to delay pregnancy. It is one of the popular methods of contraception in India and has a success rate of 95 to 99%.

Copper releasing IUDs differ from each other by the amount of copper. Copper IUDs such as Cu T-380 A, Nova T, Cu 7, Cu T 380 Ag, Multiload 375, etc. release free copper and copper salts into the uterus and suppress sperm motility. They can remain in the uterus for five to ten years.

Hormone-releasing IUDs such as Progestasert and LNG – 20 are often called as intrauterine systems (IUS). They increase the viscosity of the cervical mucus and thereby prevent sperms from entering the cervix.

Non-medicated IUDs are made of plastic or stainless steel. Lippes loop is a double S-shaped plastic device.

Permanent birth control methods are adopted by the individuals who do not want to have any more children.

- Surgical sterilisation methods are the permanent contraception methods advised for male and female partners to prevent any more pregnancies. It blocks the transport of the gametes and prevents conception. Tubectomy is the surgical sterilisation in women. In this procedure, a small portion of both fallopian tubes are cut and tied up through a small incision in the abdomen or through vagina. This prevents fertilization as well as the entry of the egg into the uterus. Vasectomy is the surgical procedure for male sterilisation. In this procedure, both vas deferens are cut and tied through a small

incision on the scrotum to prevent the entry of sperm into the urethra. Vasectomy prevents sperm from heading off to penis as the discharge has no sperms in it.

Medical termination of pregnancy (MTP)

- Medical method of abortion is a voluntary or intentional termination of pregnancy in a non-surgical or non-invasive way. Early medical termination is extremely safe upto 12 weeks (the first trimester) of pregnancy and generally has no impact on a women's fertility. Abortion during the second trimester is more risky as the foetus becomes intimately associated with the maternal tissue. Government of India legalized MTP in 1971 for medical necessity and social consequences with certain restrictions like sex discrimination and illegal female foeticides to avoid its misuse. MTP performed illegally by unqualified quacks is unsafe and could be fatal. MTP of the first conception may have serious psychological consequences.

Sexually transmitted diseases (STD)

- Sexually transmitted diseases (STD) or Venereal diseases (VD) or Reproductive tract infections (RTI) are called as Sexually transmitted infections (STI). Normally STI are transmitted from person to person during intimate sexual contact with an infected partner. Infections like Hepatitis-B and HIV are transmitted sexually as well as by sharing of infusion needles, surgical instruments, etc with infected people, blood transfusion or from infected mother to baby. People in the age of 15 to 24 years are prone to these infections. The bacterial STI are gonorrhoea, syphilis, chancroid, chlamydia and lymphogranulomavenereum. The viral STI are genital herpes, genital warts, Hepatitis-B and AIDS. Trichomoniasis is a protozoan STI, and candidiasis is a fungal STI. STI caused by bacteria, fungi and protozoa or parasites, can be treated with antibiotics or other medicines, whereas STI caused by virus cannot be treated but the symptoms can be controlled by antiviral medications. Latex condoms usage greatly reduces the risk, but does not completely eliminate the risk of transmission of STI

Prevention of STDs

- Avoid sex with unknown partner/ multiple partners
- Use condoms
- In case of doubt, consult a doctor for diagnosis and get complete treatment.

According to World Health Organization (WHO), 2017 more than one million people globally acquires a sexually transmitted infection every day. India has the third largest HIV epidemic in the world, with 2.1 million people living with HIV

TNHSP (Tamilnadu health systems project), a unit of the Health and family welfare department of the Government of Tamilnadu does free screening for cervical and breast cancer.

STD and their symptoms

Name of the Disease	Causative agent	Symptom	Incubation Period
Bacterial STI			
Gonorrhoea	Neisseria gonorrhoeae	<p>Affects the Urethra, rectum and throat and in females the cervix also get affected.</p> <p>Pain and pus discharge in the genital tract and burning sensation during Urination</p>	2 to 5 days
Syphilis	Treponema palladium	<p>Primary Stage</p> <p>Formation of painless ulcer on the external genitalia.</p> <p>Secondary Stage</p> <p>Skin lesions, rashes, Swollen joints and fever and hair loss.</p> <p>Tertiary Stage</p> <p>Appearance of chronic ulcers on nose, lower legs and palate. Loss of movement, mental disorder, visual impairment, heart problems, gummas(Soft non - cancerous growths) etc.</p>	10 to 90 days.
Chlamydia	Chlamydia trachomatis	Trachoma, affects the cells of the columnar epithelium in the	

		urinogenital tract, respiratory tract and conjunctiva	
Lymphogranuloma Venereum	Chlamydia trachomatis	Cutaneous or mucosal genital damage, urethritis and endocervicitis Locally harmful ulcerations and genital elephantiasis	2 to 3 weeks or upto 6 weeks
Viral STI			
Genital herpes	Herpes simplex virus	Sores in and around the vulva, vagina, urethra in female or sores on or around the penis in male. Pain during urination, bleeding between periods. Swelling in the groin nodes.	2-21 days (average 6 days)
Genital Warts	Human Papilloma virus (HPV)	Hard outgrowths (Tumour) on the external genitalia, cervix and Perianal region	1-8 months
Hepatitis - B	Hepatitis - B virus (HBV)	Fatigue, jaundice, fever, rash and stomach pain Liver cirrhosis and liver failure occur in the later stage.	30-80 days
AIDS	Human immunodeficiency virus (HIV)	Enlarged lymph nodes, prolonged fever, prolonged diarrhoea, weight reduction, night sweating.	2 to 6 weeks even more than 10 years.
Fungal STI			

Candidiasis	Candida albicans	Attacks mouth, throat, intestinal tract and vagina. Vaginal itching or soreness, abnormal vaginal discharge and pain during urination	-
Protozoan STI			
Trichomoniasis	Trichomonas vaginalis	Vaginitis, greenish Yellow vaginal discharge, itching and burning sensation, urethritis, epididymitis and prostatitis	4-28 days

Cervical cancer

- Cervical cancer is caused by a sexually transmitted virus called Human Papilloma virus (HPV). HPV may cause abnormal growth of cervical cells or cervical dysplasia.
- The most common symptoms and signs of cervical cancer are pelvic pain, increased vaginal discharge and abnormal vaginal bleeding. The risk factors for cervical cancer include
 - Having multiple sexual partners
 - Prolonged use of contraceptive pills
- Cervical cancer can be diagnosed by a Papanicolaou smear (PAP smear) combined with an HPV test. X-Ray, CT scan, MRI and a PET scan may also be used to determine the stage of cancer. The treatment options for cervical cancer include radiation therapy, surgery and chemotherapy.
- Modern screening techniques can detect precancerous changes in the cervix. Therefore screening is recommended for women above 30 years once in a year. Cervical cancer can be prevented with vaccination. Primary prevention begins with HPV vaccination of girls aged 9 - 13 years, before they become sexually active. Modification in lifestyle can also help in preventing cervical cancer. Healthy diet, avoiding tobacco usage, preventing early marriages, practicing monogamy and regular exercise minimize the risk of cervical cancer.

Infertility

- Inability to conceive or produce children even after unprotected sexual cohabitation is called infertility. That is, the inability of a man to produce sufficient numbers or quality of sperm to impregnate a woman or inability of a woman to become pregnant or maintain a pregnancy.
- The causes for infertility are tumours formed in the pituitary or reproductive organs, inherited mutations of genes responsible for the biosynthesis of sex hormones, malformation of the cervix or fallopian tubes and inadequate nutrition before adulthood. Long-term stress damages many aspects of health especially the menstrual cycle. Ingestion of toxins (heavy metal cadmium), heavy use of alcohol, tobacco and marijuana, injuries to the gonads and aging also cause infertility.

Other causes of infertility

- Pelvic inflammatory disease (PID), uterine fibroids and endometriosis are the most common causes of infertility in women.
- Low body fat or anorexia in women. i.e. a psychiatric eating disorder characterised by the fear of gaining weight.
- Undescended testes and swollen veins (varicocoele) in scrotum.
- Tight clothing in men may raise the temperature in the scrotum and affect sperm production.
- Under developed ovaries or testes.
- Female may develop antibodies against her partner's sperm.
- Males may develop an autoimmune response to their own sperm.

All women are born with ovaries, but some do not have functional uterus. This condition is called Mayer-Rokitansky syndrome

Assisted reproductive technology (ART)

- A collection of procedures, which includes the handling of gametes and/or embryos outside the body to achieve a pregnancy, is known as Assisted Reproductive Technology. It increases the chance of pregnancy in infertile couples. ART includes intra-uterine insemination (IUI), in vitro fertilization, (IVF) Embryo transfer (ET), Zygote intra-fallopian transfer (ZIFT), Gamete intrafallopian transfer (GIFT), Intra-cytoplasmic sperm injection (ICSI), Preimplantation genetic diagnosis, oocyte and sperm donation and surrogacy.

Intra-uterine insemination (IUI)

- This is a procedure to treat infertile men with low sperm count. The semen is collected either from the husband or from a healthy donor and is introduced into the uterus through the vagina by a catheter after stimulating the ovaries to produce more ova. The

sperms swim towards the fallopian tubes to fertilize the egg, resulting in normal pregnancy.

In vitro fertilization (IVF) or Test tube baby

- In this technique, sperm and eggs are allowed to unite outside the body in a laboratory. One or more fertilized eggs may be transferred into the woman's uterus, where they may implant in the uterine lining and develop. Excess embryos may be cryopreserved (frozen) for future use. Initially, IVF was used to treat women with blocked, damaged, or absent fallopian tubes. Today, IVF is used to treat many causes of infertility. The basic steps in an IVF treatment cycle are ovarian stimulation, egg retrieval, fertilization, embryo culture, and embryo transfer.
- Egg retrieval is done by minor surgery under general anesthesia, using ultrasound guide after 34 to 37 hours of hCG (human chorionic gonadotropin) injection. The eggs are prepared and stripped from the surrounding cells. At the same time, sperm preparation is done using a special media. After preparing the sperms, the eggs are brought together. 10,000-1,00,000 motile sperms are needed for each egg. Then the zygote is allowed to divide to form 8 celled blastomere and then transferred into the uterus for a successful pregnancy. The transfer of an embryo with more than 8 blastomeres stage into uterus is called Embryo transfer technique.

Cryopreservation (or freezing) of embryos is often used when there are more embryos than needed for a single IVF transfer. Embryo cryopreservation can provide an additional opportunity for pregnancy, through a Frozen embryo transfer (FET), without undergoing another ovarian stimulation and retrieval.

Zygote intra-fallopian transfer (ZIFT)

- As in IVF, the zygote upto 8 blastomere stage is transferred to the fallopian tube by laparoscopy. The zygote continues its natural divisions and migrates towards the uterus where it gets implanted.

Intra uterine transfer (IUT)

- Embryo with more than 8 blastomeres is inserted into uterus to complete its further development.

Gamete intra-fallopian transfer (GIFT)

- Transfer of an ovum collected from a donor into the fallopian tube. In this the eggs are collected from the ovaries and placed with the sperms in one of the fallopian tubes. The zygote travels toward the uterus and gets implanted in the inner lining of the uterus.

Intra-cytoplasmic sperm injection (ICSI)

- In this method only one sperm is injected into the focal point of the egg to fertilize. The sperm is carefully injected into the cytoplasm of the egg. Fertilization occurs in 75 - 85% of eggs injected with the sperms. The zygote is allowed to divide to form an 8 celled blastomere and then transferred to the uterus to develop a protective pregnancy.

Surrogacy

- Surrogacy is a method of assisted reproduction or agreement whereby a woman agrees to carry a pregnancy for another person, who will become the newborn child's parent after birth. Through in vitro fertilization (IVF), embryos are created in a lab and are transferred into the surrogate mother's uterus.

Male infertility prevention

- Azoospermia is defined as the absence of spermatozoa in the ejaculate semen on at least two occasions and is observed approximately in 1% of the population.
- Micro-testicular sperm extraction (TESE) Microsurgical sperm retrieval from the testicle involves a small midline incision in the scrotum, through which one or both testicles can be seen. Under the microscope, the seminiferous tubules are dilated and small amount of testicular tissue in areas of active sperm production are removed and improved for sperm yield compared to traditional biopsy techniques.

Detection of foetal disorders during early pregnancy

Ultrasound scanning

- Ultrasound has no known risks other than mild discomfort due to pressure from the transducer on the abdomen or vagina. No radiation is used during this procedure. Ultrasonography is usually performed in the first trimester for dating, determination of the number of foetuses, and for assessment of early pregnancy complications.

There are several types of ultrasound imaging techniques. As the most common type, the 2-D ultrasound provides a flat picture of one aspect of the baby. The 3-D image allows the health care provider to see the width, height and depth of the images, which can be helpful during the diagnosis. The latest technology is 4-D ultrasound, which allows the health care provider to visualize the unborn baby moving in real time with a three-dimensional image

Amniocentesis

- Amniocentesis involves taking a small sample of the amniotic fluid that surrounds the foetus to diagnose for chromosomal abnormalities.
- Amniocentesis is generally performed in a pregnant woman between the 15th and 20th weeks of pregnancy by inserting a long, thin needle through the abdomen into the

amniotic sac to withdraw a small sample of amniotic fluid. The amniotic fluid contains cells shed from the foetus.

Chorionic villus sampling (CVS)

- CVS is a prenatal test that involves taking a sample of the placental tissue to test for chromosomal abnormalities.

Foetoscope

- Foetoscope is used to monitor the foetal heart rate and other functions during late pregnancy and labour. The average foetal heart rate is between 120 and 160 beats per minute. An abnormal foetal heart rate or pattern may mean that the foetus is not getting enough oxygen and it indicates other problems.

BREAST SELF EXAMINATION AND EARLY DIAGNOSIS OF CANCER

Breast is divided into 4 quadrants and the center (Nipple) which is the 5th quadrant.

Each quadrant of the breast is felt for lumps using the palm of the opposite hand.

The examination is done in both lying down and standing positions, monthly once after the 1st week of menstrual cycle.

This way if there are lumps or any deviation of the nipple to one side or any blood discharge from the nipple we can identify cancer at an early stage.

Mammograms are done for women above the age of 40 years and for young girls and women below 40 years. Ultrasound of the breast aids in early diagnosis.

- A hand-held doppler device is often used during prenatal visits to count the foetal heart rate. During labour, continuous electronic foetal monitoring is often used.

- Vitamin E is known as anti-sterility vitamin as it helps in the normal functioning of reproductive structures.
- Sex hormones were discovered by Adolf Butenandt.
- 11th July is observed as World Population Day.
- 1st December is observed as World AIDS Day.
- NACO (National AIDS Control Organisation) was established in 1992.
- Syphilis and gonorrhoea are commonly called as international diseases.

Geography
6th term - II
unit - 1 Resources

- Resource is anything that fulfills human needs. When anything is of some use it becomes valuable. All resources have value. The value can be either commercial or non-commercial. Commercial resources have great economic value. (e.g.) Petroleum. The Non-commercial resources are very abundant in availability (e.g.) Air.
- Resources can be natural, man-made and human resources.

Natural Resources:

- All resources that have been directly provided by nature are called Natural resources. The air, water, soil, minerals, natural vegetation and wild life around us are all natural resources. The use of any natural resource depends on the place it is available, the form in which it is available and the technology necessary to avail it.

Classification of Natural Resources

- Natural resources can be classified into different groups depending on origin, development, renewability, distribution, ownership etc.
- A. On the basis of origin:** On the basis of origin, resources can be classified into biotic and abiotic resources.
 - i. All living resources are biotic resources, plants, animals and other microorganisms are biotic resources.
 - ii. Abiotic resources are non-living things. Land, water, air and minerals are abiotic resources.
- The biotic resources were mere substances till they were recognized by humans. According to the human needs the substances were collected by the ancient men and preserved for use. In the beginning, man had only three basic needs-food, clothing and shelter. He collected things through primary activities such as hunting, food gathering, fishing and forestry. Later when food became scarce, they had to cultivate and that became agriculture and the cattle were also reared on their farms to fulfill their basic needs.
- The abiotic resources were also sought after by the early men. They went in search of better landforms where they had enough water resources for agriculture and their cattle. They were in need of tools right from hunting to agriculture. Primarily the tools were only made of stones. Later man dug the earth for better abiotic resources and found copper first and iron later. He also mined precious metals simultaneously for making ornaments. Later mining became one of the leading primary activities and still holds an important place among the economic activities.

B. On the basis of development: Based on the level of development, resources can be divided into actual and potential resources.

- i. Actual resources are resources that are being used and the quantity available is known. (e.g.) Coal at Neyveli.
- ii. Potential resources are resources that are not being used in the present and its quantity and location are not known. The technology to extract such resources is also yet to be developed. (e.g.) Marine yeast found in the Bay of Bengal and Arabian Sea.

C. On the basis of exhaustibility: On the basis of renewability resources can be classified as renewable resources and non-renewable resources.

- i. Resources once consumed can be renewed with the passage of time are called renewable resources. (e.g.) Air, Water, Sunlight. Misuse of such resources can also limit its available quantity. So, they have to be used wisely.
 - ii. Natural resources which are limited can be called non-renewable resources. They become exhausted after use and the time they take to replace does not match the life cycle. (e.g.) Coal, petroleum, natural gas and other minerals.
- The resources which cannot renew themselves are either scarce or totally absent. So man is in search of new resources and is conducting several researches. He confirms that a substance is a resource only after research. He tries to harness it and also searches the regions where it may be found in. They are potential resources. Wind energy is one such example. The places where the wind energy can be utilized are still unknown.

D. On the basis of distribution: On the basis of distribution, resources can be classified into localized resources and universal resources.

- i. When resources are present in specific regions they are called localized resources. (e.g.) Minerals.
- ii. Some resources are present everywhere such resources are called universal resources. (e.g.) Sunlight and air.

E. On the basis of ownership: Based on ownership resources can be classified into Individual resources, Community-owned resources, National resources and International resources.

- i. Individual resources are resources privately owned by individuals. (e.g.) Apartments.

- ii. Community-owned resources are resources which can be utilised by all the members of the community. (e.g.) Public parks.
- iii. National resources are resources within the political boundaries and oceanic area of a country. (e.g.) Tropical forest regions of India.
- iv. International resources are all oceanic resources found in the open ocean. Resources found in this region can be utilized only after an international agreement. (e.g.) Ambergris.

Man-made resources:

- Natural resources are modified or processed by technology into man-made resources. (e.g.) sugarcane processed to get sugar. All structures built by man can also be called man-made resources. (e.g.) Bridges, Houses, Roads.
- This transforming of raw materials into finished goods is called Secondary Activities. Man's skills and ideas are the basic requirements for these activities.

Human resource:

- Human resources are groups of individuals who use nature to create more resources. Though human beings are basically natural resources, we classify human beings separately. Education health, knowledge and skill have made them a valuable resource. (e.g.) Doctors, Teachers, Scientists. Tertiary activities are basically concerned with the distribution of primary and secondary products through a system of transport and trade (e.g) Banking, Trade and Communications. The quantity and quality of institutions and organizations involved in making the professionals decide the human resource of a country.

Gandhian thought on Resources: There is enough for everybody's need and not for anybody's greed. Mahatma Gandhi blamed "human beings" for depletion of resources because of

- i. over exploitation of resources
- ii. Unlimited needs of human beings. So, conservation is very important.

Resource planning/ Management

- Resource planning is a technique or skill of proper utilization of resources. Resource planning is necessary because
 - i. Resources are limited, their planning is quite necessary so that we can use them properly and at the same time we can save them for our future generation.
 - ii. Resources are not only limited but also they are unevenly distributed over the different parts of the World.

iii. It is essential for the production of resource to protect them from over exploitation.

Conservation of resources:

- Careful use of resources is called conservation of resources. Resources are being used at a very fast rate due to the rapid increase in population. So, natural resources are depleting fast; wisely using resources can control the depleting ratios.
- Development is necessary without affecting the needs of the future generations. If the present needs of resources are met and the conserving of resources for the future are balanced, we call it sustainable development. Sustainable development can take place when
 - i. The reasons of depletion are identified.
 - ii. Wastage and excess consumption is prevented.
 - iii. Reusable resources are recycled.
 - iv. Pollution is prevented.
 - v. Environment is protected.
 - vi. Natural vegetation and wild life are preserved.
 - vii. Alternative resources are used.
- The easiest way to conserve resources is to follow the '3R's: Reduce, Reuse and Recycle.

NOTE

- ❖ Anything becomes a resource only when its use is discovered. The needs of human beings are ever changing. According to the ever changing needs, resources keep changing. Time and Technology are two important factors that determine whether a substance is a resource or not. for example: Sun's energy to generate electricity was made possible after the invention of solar panels (technology); and the receding of coal and petrol was in need of an inexhaustible resource (time).
- ❖ Marine yeast have greater potential than the terrestrial yeast. They can be used in baking, brewing, wine, bio-ethanol and pharmaceutical protein production.
- ❖ Tropical rain forests are called the 'World's largest Pharmacy' as 25% of the natural vegetation are medicinal plants. (e.g.) Cinchona.
- ❖ Ambergris is an extract from the sperm whale. A pound (0.454kg) of sweet – smelling ambergris is worth US \$63,000 and used in perfume industries.

7th term - II
Unit - 1 Resources

Introduction

- A country's social, economic and political strength lies in the distribution, utilization and conservation of its resources. Anything which can be used for satisfying the human needs is called resource. Natural resources are resources that exist without action of humankind. Natural resources are obtained from environment. Many natural resources are essential for human survival. Resources always cannot be consumed in their original form, but they must be processed into usable commodities and usable things.

Importance of resource

- Natural resources satisfy daily needs of man such as food, clothing and shelter.
- Natural resources also contribute immensely to boost up a nation's economy
- On the basis of origin, resources may be divided into two types. They are:

1. Biotic resources
2. Abiotic resources

1. Biotic resources

- Biotic resources are found in the biosphere which are obtained from living and organic materials. It includes forests, crops, birds, animals, fishes, man and materials that can be obtained from them. Fossil fuels such as coal and petroleum are also included in this category because they are formed from decayed organic matter

2. Abiotic resources

- Abiotic resources are the non-living parts of an environment. Examples of abiotic resources include land, water, air, sunlight and heavy metals including ores such as gold, iron, copper, silver etc.

- On the basis of renewability, resources can be divided into two types. They are:

1. Renewable resources
2. Non - renewable resources

1. Renewable resources

- A renewable resource is a resource which can be used repeatedly and replaced naturally. Renewable resources harvested and used rationally will not produce pollution. The use of renewable resources and energy sources is increasing worldwide.

Example: solar energy, wind energy, and hydropower.

Solar energy

- The sun produces energy in the form of heat and light. Solar energy is not harmful to the environment. Photovoltaic devices or solar cells, directly convert solar energy into electricity. Individual solar cell in group panel can perform small applications from charging calculator, watch batteries, to large such as to power residential dwellings. Photovoltaic power plants and concentrating solar power plants are the largest solar applications covering acres. India, China, Japan, Italy and States of America are major utilizers of solar energy in the world

Kamuthi solar power project is one of the largest solar power projects in the world. It is situated in Ramanathapuram District in Tamilnadu. The Kamuthi solar power project was completed on 21st September 2016. Investment of this project is around 4,550 Crores. The installed capacity of this project is 648 MW.

Major wind farms in India

S. No.	Wind Forms	District	State	Installed Capacity (MW)
1.	Muppandal	Kanyakumari	Tamil Nadu	1,500
2.	Jaisalmer	Jaisalmer	Rajasthan	1,064
3.	Brahmanvel	Dhule	Maharashtra	528
4.	Dhalgaon	Sangli	Maharashtra	278
5.	Damanjodi	Damanjodi	Odisha	99

Hydropower

- Water is considered as a great source of energy. At present, water is used for producing hydroelectric power. Hydroelectricity is generated from moving water with high velocity and great falls with the help of turbines and dynamos. Hydroelectricity power is the cheapest and most versatile source of energy out of all the known energy. Hydroelectric power is a renewable resource. China, Canada, Brazil, United States of America, Russia, India, Norway and Japan are some countries producing hydroelectricity. China is the largest producer of hydro-electricity

Wind energy

- Wind power is clean energy since wind turbines does not produce any emissions. In recent years, wind energy has become one of the most economical and renewable energy technologies. The Classic Dutch windmill harnessed the wind's energy hundreds of years ago. Modern wind turbines with three blades dot the landscape today, turning wind into electricity. Major wind energy producing countries are United States, China, Germany, Spain, India, United Kingdom, Canada and Brazil.

S. No.	Hydro - electricity project	Installed Capacity (MW)	State
1.	Tehri Dam	2,400	Uttarakhand
2.	Srisaïlam Dam	1,670	Andhra Pradesh
3.	NagarjunaSagar Dam	960	Andhra Pradesh
4.	SardarSarovar Dam	1,450	Gujarat
5.	BhakraNangal Dam	1,325	Punjab
6.	Koyna Dam	1,960	Maharashtra
7.	Mettur dam	120	Tamil Nadu
8.	Idukki dam	780	Kerala

S.No.	Name of the Project	Country	River	Installed Capacity in MW
1.	Three gorges Dam	China	Yangtze	22,500
2.	Itaipu Dam	Brazil and Paraguay	Parana	14,000
3.	Xiluodu Dam	China	Jinsha	13,860
4.	Guri Dam	Venezuela	Caroni	10,235

5.	Tucuruí Dam	Brazil	Tocantins	8,370
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Three Gorges Dam in China is the largest hydroelectricity project in the world. It's construction started in 1994 and ended in 2012. The installed capacity of the dam is 22,000MW.

Non-renewable resources

- Natural resources that once consumed and cannot be replaced is called non-renewable resources. Continuous consumption of non-renewable resources ultimately leads to exhaustion. Examples of non-renewable resources include fossil fuels such as coal, petroleum, natural gas and mineral resources such as iron, copper, bauxite, gold, silver and others. Non-renewable resources can be divided into three types. They are:
 - Metallic resources
 - Non - Metallic resources
 - Fossil fuel resources

Metallic resources

- Metallic resources are the type of resources that are composed of metals. These are hard substances, which are the good conductors of heat and electricity. Example for metallic resources are iron, copper, gold, bauxite, silver, manganese, etc.

Iron

- Iron is the fourth most common element in the Earth's crust and the most widely available metal. Magnetite and hematite are the common ore for iron, which occurs normally in the rocks of the crust. Iron ore is the key raw material in making steel and 98% of the iron ore extracted is used to make Steel. Pure iron ore is very soft, but its strength is increased many folds by adding small amount of carbon and manganese. It's low cost and high earth strength makes it usable in engineering applications, such as the construction of machinery and machine tools, automobiles, construction of large ships, structural components of building, bridges etc.
- Iron ore is mined in about 50 countries. Among the iron ore producing countries China, Australia, Brazil, India and Russia are the principal producers accounting for 85% of the world's total output of iron ore. These countries have 70% of the total reserves of the world. Jharkhand, Odisha, Madhya Pradesh, Chhattisgarh, Karnataka and Goa account for over 95 per cent of the total reserves of India. Iron ores found at Kanjamalai in Tamil Nadu.

Copper

- Copper is one of the first metals known and used by man. Copper ranks as the third most consumed industrial metal in the world after Iron and Aluminium. Copper is good conductor of heat and electricity. About three quarters of copper is used to make electrical wires, telecommunication cables and electronics.
- Chile is the world's number one country in the production of copper. Other copper producing countries are Peru, China, United States, Congo and Australia.

Gold

- It is a rare and precious metal. Hence, it has high demand in world markets. Formerly, it was used for minting coins, but now it is used for making ornaments and in dentistry. It is regarded as a symbol of prosperity and a form of wealth.
- China is the world's largest producer of gold. Also, Australia, Russia, United States, South Africa and Canada are the major producers of gold. Among these countries, Australia has 9500 tons reserves of gold ore and it is world's leading country in gold ore reserves. Karnataka is the largest producer of gold in India. Kolar Gold Field is one of the deepest mines of the world.

Bauxite

- Aluminium is produced from bauxite ore. There are several ores that contain aluminium but bauxite contains more aluminium. Aluminium has wide range of uses compared to other metals. Aluminium is light in weight, tough and cheaper, which makes it popular metal for constructional purpose. It is mainly used in the construction of aircrafts, ship, automobiles, railway coaches and etc. Aluminium is a good conductor of electricity and heat, hence, it is used for making electrical cables. It is highly resistant to corrosion. By the addition of small quantities of other metals to aluminium, it creates superior alloy than pure aluminium.

E.g: Duralumin.

- Australia is the world's leading bauxite producer. Apart from that, China, Brazil, India, Guinea, Jamaica and Russia also play an important role in bauxite production. One fourth of the bauxite mineral deposits found in Guinea alone. Odisha, Gujarat, Jharkhand, Maharashtra, Chhattisgarh, Tamil Nadu and Madhya Pradesh are the main bauxite producing states in India. The bauxite deposits are mainly found in the Shervaroy hills of Salem district, Tamil Nadu

Silver

- Silver is also a precious metal like gold. It has a wider variety of uses than gold. It is used in making jewellery, dentistry, photographic goods, electroplating industry and in the

manufacture of luxury goods. About two-third of silver is used for monetary purposes. Likegold, silver also resists corrosion.

- Mexico is the world's leading silver producer. Following Mexico, Peru, China, Russia, Australia and Chile produce more silver. More than 50% of silver is found only in South American countries.

Manganese

- Manganese is a steel-greyed, hard, shiny and brittle metal. The common ores of manganese are Pyrolusite Manganese, Psilomelane and Rhodochrosite. Manganese is essential for the production of good quality Steel. Manganese is used in making electrical batteries. It is also used as colouring material in bricks, pottery, floor tiles. Manganese compounds are used in making disinfecting liquids, bleaching powder, fertilizers etc.
- South Africa is the world's leading producer of manganese. The significant producers of manganese in the world are China, Australia, Gabon, Brazil and India. All these producers have large reserves of manganese and are significant exporters in the world.

Non-metallic resources

- Non-metallic resources can be described as the resources that do not comprise of metals. These are not hard substances, and are not good conductors of heat and electricity. Example for non-metallic resources are mica, limestone, gypsum, dolomite, phosphate, etc.

Mica

- Muscovite and Biotite are the common ores of Mica. It is one of the indispensable minerals used in electrical and electronics industry. It is used as an insulating material in electrical industry. In powder form, it is used for making lubricating oils and decorative wallpapers.
- China is the world's top producer of mica. Russia, Finland, United States, Turkey and Republic of Korea also play a major role in the production of mica. About 95 per cent of India's mica is found in just three states of Andhra Pradesh, Rajasthan and Jharkhand.

Limestone

- Limestone is a sedimentary rock, composed mainly by skeletal fragments of marine organisms such as coral, foraminifera and molluscs. About 10% of sedimentary rocks are limestones. Mostly limestone is made into crushed stone and used as a construction material. It is used for facing stone, floor tiles, stair treads, windows sills and many other purposes. Crushed limestone is used in smelting and other metal refining process. Portland cement is made from limestone.

- China produces more than half of limestone production in the world. Beside this, United States, India, Russia, Brazil and Japan also produce more Limestone. Madhya Pradesh, Rajasthan, Andhra Pradesh, Gujarat, Chhattisgarh and Tamil Nadu Produce over three-fourths of the total limestone of India. In Tamil Nadu, Large scale limestone reserve found in Ramanathapuram, Tirunelveli, Ariyalur, Salem, Coimbatore and Madurai districts.

Fossil fuel resources

- Fossil fuel resources are normally formed from the remains of dead plants and animals. They are often referred to as fossil fuels and are formed from hydrocarbon. When fossil fuels are burned, they become a great source of heat energy. Example for fossil fuel resources are coal, petroleum and natural gas.

Coal

- This is the most abundantly found fossil fuel that forms when dead plant matter is converted into peat. It is used as a domestic fuel, in industries such as iron and steel, steam engines to generate electricity. Electricity produced from coal is called Thermal Power.

Coal is classified into four types based on carbon content. They are:

1. Anthracite
2. Bituminous
3. Lignite
4. Peat.

The leading coal producers of the world are China. Beside this, India, USA, Australia, Indonesia and Russia also produce more coal. The coal producing areas of India are Raniganj in West Bengal, Neyveli in Tamil Nadu, Jharia, Dhanbad, and Bokaro in Jharkhand.

Most of the coal deposit that we use now, were formed about 300 million years ago. Much of the earth was covered with steamy swamps. As the plants and trees are dead, their remains were buried underneath the swamps. Eventually, they were transformed into coal beneath the ground due to excessive heat and pressure.

Petroleum

- Petroleum is found between the layers of rocks and is drilled from oil fields located in Offshore and coastal areas. This is sent to refineries which process crude oil and produce variety of products like diesel, petrol, kerosene, wax, plastics and lubricants. Petroleum and its derivatives are called Black Gold as they are very valuable.

- The chief petroleum producing countries are Saudi Arabia, Iran, Iraq and Qatar. The other major producers are USA, Russia, Venezuela, Kuwait, UAE and Algeria. The leading producers in India are Digboi in Assam, Bombay High in Mumbai and the deltas of Krishna and Godavari rivers.

Natural gas

- Natural gas is found with petroleum deposits and is released when crude oil is brought to the surface. It can be used as a domestic and industrial fuel.
- More than 50% of the global natural gas reserves are found in United States of America, Russia, Iran and Qatar.
- In India, Krishna and Godavari Delta, Assam, Gujarat and some areas of offshore in Mumbai have natural gas resources.



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Unit 1 - Rocks and Soil

Rocks

- The rocks are the solid mineral materials forming a part of the surface of the earth and other similar planets. The earth's crust (Lithosphere) is composed of rocks. A rock is an aggregate of one or more minerals. Rock is an important natural resource and is found in solid state. It may be hard or soft in nature. An estimation reveals that there are 2,000 different types of minerals found on the earth surface out of which only 12 are the basic minerals commonly found all over the earth. Minerals are chemical substances which exist in nature. They may occur either in the form of elements or compounds.

Classification of Rocks

- According to the mode of formation the rocks are classified into three types as follows.

1. **Igneous Rocks,**
2. **Sedimentary Rocks**
- and 3. **Metamorphic Rocks**

Igneous Rocks

- The igneous rocks are formed by the solidification of molten magma. These rocks are also called as the 'Primary Rocks' or 'Parent Rocks' as all other rocks are formed from these rocks. **Characteristics of Igneous Rocks**

1. These rocks are hard in nature
2. These are impermeable
3. They do not contain fossils
4. They are associated with the volcanic activities
5. These rocks are useful for construction works

Types of Igneous Rocks

1. Extrusive Igneous Rocks, 2. Intrusive Igneous Rocks

- **Extrusive Igneous Rocks:** Can you visualize the lava comes out from a volcano? Lava is actually a fiery red molten magma comes out from the interior of the earth on its surface. After reaching the earth surface the molten materials get solidified and form rocks. Rocks formed in such a way on the crust are called Extrusive igneous rocks. These rocks are fine grained and glassy in nature due to rapid solidification. Basalt found in the north western part of peninsular India is the example for this type of rock.

1. **Intrusive Igneous rocks:** The molten magma sometimes cools down deep inside the earth's crust and becomes solid. The rocks formed this way is called 'Intrusive Igneous Rocks'. Since they cool down slowly, they form large grains. Intrusive Igneous rocks are of two types. The deep seated rocks are called 'Plutonic rocks' and the ones formed at shallow depths are called 'Hypabysal rocks'. Granite, Diorite and Gabbro are the examples of plutonic rocks and Dolerite is an example of hypabysal rocks. Since the intrusive Igneous rocks consist of large crystals, they are also called as 'Crystalline rocks'.

Sedimentary Rocks

- The word 'Sedimentary' has been derived from Latin word 'Sedimentum' means settling down. The sedimentary rocks are formed by the sediments derived and deposited by various agents. Due to high temperature and pressure, the undisturbed sediments of long period cemented to form sedimentary rocks. Sedimentary rocks consist of many layers which were formed by the sediments deposited at different periods. As it consists of many strata, it is also known as 'Stratified rocks'. Characteristics of Sedimentary rocks
 1. They have many layers.
 2. They are non-crystalline rocks.
 3. They contain fossils.
 4. They are soft and get eroded easily

Types of Sedimentary Rocks

1. **Organic Sedimentary Rocks:** These rocks are formed as a result of the decomposition of dead plants and animals. It contains fossils. Chalk, Talc, Dolomite and Limestone rocks are of this category.
2. **Mechanical Sedimentary Rocks:** These rocks are formed from the disintegration of igneous and metamorphic rocks. The natural agents erode and transport these rocks and deposit them at some places. After a long period of time, they cemented to form rocks. Sandstone, Shale and Clay are the examples of rocks of this type.
3. **Chemical Sedimentary rocks:** These are formed by precipitating of minerals from water. It is formed usually through evaporation of chemical rich solutions. These rocks are also called as evaporates. Rock Salt is an example of this kind.

Metamorphic Rocks

- The word Metamorphic is derived from two Greek words "Meta" and "Morpha", Meta means change and Morpha means shape. When Igneous and sedimentary rocks subject to high temperature and pressure, the original rocks get altered to form a new kind of rock called metamorphic rocks. Metamorphism is of two types. They are 1. Thermal Metamorphism: If the change in the rocks is mainly caused by high temperature, the process is called as thermal metamorphism. 2. Dynamic Metamorphism: If the change in the rock is mainly caused by high pressure, the process is called as Dynamic Metamorphism.

✓ **Formation of Metamorphic Rocks from Igneous rocks**

- Granite into gneiss caused by dynamic metamorphism.
- Basalt into slate caused by thermal metamorphism.

✓ **Formation of Metamorphic Rocks from Sedimentary rocks**

- Sandstone into quartz caused by thermal metamorphism.
- Shale into slate caused by thermal metamorphism.

✓ **Characteristics of Metamorphic Rocks**

- Metamorphic rocks are mostly crystalline in nature.
- They consist of alternate bands of light and dark minerals.

Rock cycle

- Igneous rocks are the primary rocks formed first on the earth. These rocks are weathered, eroded, transported and deposited at some places to form sedimentary rocks. The Igneous and Sedimentary rocks are changed into metamorphic rocks under the influence of temperature and pressure. The metamorphic rocks are also get disintegrated and deposited to form sedimentary rocks. Formation of igneous rocks takes place when there is an outflow of molten materials. Like this, the rocks of the earth crust keeps on changing from one form to another form under various natural forces and agents. The endless process is referred as Rock Cycle.

Uses of rocks

- Rocks have been used by mankind throughout the history. Rocks are highly valuable and important to almost all aspects of our economy. The minerals and metals in rocks have been found essential to human civilization. Rocks are used for many purposes in our life and some of them are given below. Rocks are useful for making

- | | |
|------------------------|--|
| 1. Cement | 6. Kerb stone, |
| 2. Writing chalk, | 7. Ornament, |
| 3. Fire, | 8. Roofing materials, |
| 4. Building materials, | 9. Decorative materials, |
| 5. Bath scrub, | 10. These are valuable source of minerals such as gold, diamond, sapphire etc. |

Soil and its Formation

- Soil is a mixture of organic matter, minerals, gases, liquids and organisms that together support life. Soil minerals form the basis of soil. It forms on the surface of the earth. It is known as the 'skin of the earth'. Soils are produced from rocks (parent material) through the processes of weathering and natural erosion. Water, wind, temperature change, gravity, chemical interaction, living organisms and pressure differences all help break

down parent material. It leads to the formation of loose material. In course of time, they further break down into fine particles. This process release the minerals locked in the rock fragments. Later on, the vegetative cover which develop in that region forms humus content in the soil. This way the soil gets matured gradually.

- **Soil Composition:** The basic components of soil are mineral, organic matter, water and air. It consists of about 45% mineral, 5% organic matter, 25% of water and 25% air. It is only a generalized fact. The composition of soil varies from place to place and time to time.
- **Soil profile:** The soil profile is defined as the vertical section of the soil from the ground surface and extends downwards.
- **Classification of soils:** Soils are classified on the basis of their formation, colour, physical and chemical properties. Based on these, soil is classified into six major types. They are: Alluvial soil, Black soil, Red soil, Laterite soil, Mountain soil, Desert soil
- **Alluvial soil:** These soils are found in the regions of river valleys, flood plains and coastal regions. These are formed by the deposition of silt by the running water. It is the most productive of all soils. It is suitable for the cultivation of sugarcane, jute, rice, wheat and other food crops.
- **Black soils:** These soils are formed by weathering of igneous rocks. Black soil is clayey in nature. It is retentive of moisture. It is ideal for growing cotton.
- **Red Soils:** These soils are formed by weathering of metamorphic rocks and crystalline rocks. The presence of iron oxide makes this soil brown to red in colour. It is usually found in semi-arid regions. It is not a fertile soil. It is suitable for millet cultivation.
- **Laterites soils:** These are the typical soils of tropical regions. These soils are found in the regions which experienced alternate wet and dry condition. As these soils are formed by the process of leaching, it is infertile. It is suitable for plantation crops of tea and coffee.
- **Mountain soils:** These soils are found over the slopes of mountain. Soils in these regions are thin and acidic. However characteristic of soil differs from region to region based on the altitude.
- **Desert soils:** These are sandy soil found in the hot desert regions. These soils are porous and saline. Since it is infertile agriculture in these soils are not so successful.
- **Soil Erosion:** Soil erosion is the removal or destruction of the top layer of soil by natural forces and human activities. Soil erosion reduces the fertility of soil which in turn reduces the agricultural productivity. Running water and wind are the major

agents of soil erosion. Sheet erosion, Rill erosion and Gully erosion are the major types of soil erosion.

Layers of Soil

O-Horizon or Humus	This layer is dominated by organic material (leaves, needles, twigs, moss and lichens).
A- Horizon or Top Soil	It is a part of top soil, composed of organic matter mixed with mineral matter.
E- Horizon or Elevated layer	E-Stands for elevated layer. This layer is significantly leached of clay, iron, and aluminum oxides, which leaves a concentration of ore
B- Horizon or Sub-soil	This layer reflects the chemical or physical alteration of parent material. Thus iron, clay, aluminum and organic compounds are found accumulated in this horizon.
C- Horizon or Parent Rock	Partially weathered parent material accumulates in this layer.
R- Horizon Parent Rock	This layer consists of unweathered part of bed rock.

Soil conservation

- Soil conservation is the process of protecting the soil from erosion to maintain its fertility. The methods that are widely practiced for conserving soil are afforestation, controlled grazing, construction of dams, Crop rotation, Strip farming, contour ploughing, terrace farming, checking shifting cultivation, wind break etc.,

Uses of soils

- Soil is one of the important natural resource. It is a basic requirement for plant growth and supports various life forms on the earth.
 - ✓ The minerals present in the soil enhance and nourishes the crops and plants.
 - ✓ It is used in making of ceramics or pottery.
 - ✓ It is a source of material for construction and handicraft works.
 - ✓ It acts as natural filter of water and purifies it.
 - ✓ Soil supports ecosystem and play an important role in land management.
- Rocks and soils are the important renewable natural resources. Both of them play an important role in everyday life of human beings as well as economic development. Nowadays rock-based companies are in increase which provide employment to a sizeable population. Soils attract human settlement and other economic activities. As India is an agricultural country, the proper management of soil resource will lead to sustainable food production besides its use for various other purposes. So, the soil resources must be conserved.

10th book
Unit 4. Resources and Industries

Introduction

- Any matter or energy derived from the environment that is used by living things including humans is called a natural resource. Natural resources include air, water, soil, minerals, fossil fuels, plants, wild life etc. Many natural resources are used as raw materials. They play a vital role in the economic development of any region. Natural resources are classified on several basis. Based on continued availability, the resources are categorised into two types. Renewable Resources are those which have natural regeneration after their utilisation. Solar energy, wind energy, biogas, tidal energy, wave energy etc. are the renewable resources. Non- Renewable resources are the sources that cannot be replaced again after utilisation. Coal, petroleum, natural gas etc. fall under this category.

Minerals

- Mineral is a natural substance of organic or inorganic origin with definite chemical and physical properties. The process of extracting mineral from the earth is known as mining. The mines near the earth crust are known as open pit mines while the deep mines are known as shaft mines.

Types of Minerals

- On the basis of chemical and physical properties, minerals are broadly grouped under two categories. They are metallic and non-metallic minerals.

a. Metallic Minerals

- Metallic minerals are the minerals which contain one or more metallic elements in them. Metallic minerals occur in rare, naturally formed concentrations known as mineral deposits. These deposits consist of a variety of valuable metals such as iron, manganese, copper, bauxite, nickel, zinc, lead, gold etc.

i. Iron ore

- Iron ore is the most widely distributed elements of the earth crust, rarely occurs in a free state. It enters into the composition of many rocks and minerals especially from igneous and metamorphic rocks. The total recoverable reserves of iron ore in India are about 9602 million tons of haematite and 3408 million tons of magnetite. About 79% haematite deposits are found in Assam, Bihar, Chhattisgarh, Jharkhand, Odisha and Uttar Pradesh. About 93% magnetite deposits occur in Andhra Pradesh, Goa, Karnataka, Kerala and Tamil Nadu. Karnataka alone contributes about 72% of magnetite deposits of India.

Iron ores are rocks and minerals from which metallic iron can be economically extracted. The ores are usually rich in iron oxides and vary in colour from dark grey, bright yellow, or deep purple to rusty red. The iron is usually found in following form.

Form of Iron ores	Iron Content (%)
Magnetite	72.4%
Hematite	69.9%
Goethite	62.9%
Limonite	55%
Siderite	48.2%

- Jharkhand is the leading producer of iron ore with 25% the country's production. Singhbhum, Hazaribagh, Dhanbad and Ranchi districts are its major producers. Odisha with 21% production ranks second. Sundargarh, Mayurbhanj, Sambalpur and Keonjhar districts are its major producers. The magnetite production of Chhattisgarh is 18% (Rajgarh and Bilaspur are its leadings districts) and the Karnataka is 20% (Chikmangalur, Chitradurga, Shimoga and Dharwad districts are its major producers). Andhrapradesh and Karnataka produce about 5% each. Kurnool, Guntur, Cuddapah and Anantapur districts in Andhra Pradesh and Salem, Namakkal, Tiruvannamalai, Tiruchirappalli, Coimbatore, Madurai and Tirunelveli districts in Tamil Nadu are notable for the production of iron ore. SAIL (Steel Authority of India Limited): The Ministry of Steel is responsible for planning and development of iron and steel industry in India.

ii. Manganese

- Manganese is a silvery grey element. It is very hard and brittle in nature. It is always available in combination with iron, laterite and other minerals. It is an important mineral used for making iron and steel and serves as basic raw material for alloying. It is the most important mineral for making iron and steel. Nearly 10 kg manganese is required for manufacturing one ton of steel. It is also used in the manufacturing of bleaching powder, insecticides, paints and batteries. Manganese deposits occur mainly as metamorphosed bedded sedimentary deposits. The largest deposits of manganese is found in Odisha(44%) followed by Karnataka (22%), Madhya Pradesh (12%), Maharashtra & Goa(7% each), Andhra Pradesh (4%) and Jharkhand (2%). Rajasthan, Gujarat, Telengana and West Bengal together constitute about 2% of the India's manganese resource. Nagpur, Bhandara and Ratnagiri districts in Maharastra and

Balaghat and Chhindwara districts in Madhya Pradesh are the leading producers. Odisha is the third largest producer with 24% (Sundargarh, Kalahandi, Koraput and Bolangir districts are the major ones). Other producers are Andhra Pradesh (13%) and Karnataka (6%). Srikakulam, Visakhapatnam, Cuddapah and Guntur districts in Andhra Pradesh and the districts of Shimoga, Bellary, Chitradurga and Tumkur are the important districts of Karnataka. It is the most important mineral for making iron and steel. India is the fifth largest producer of manganese in the world.

iii. Copper

- Copper is the first metal that prehistoric man has started using for many purposes. Being flexible, it can be made into utensils of any shape. Brass and Bronze are obtained when the copper alloys with zinc and tin respectively. Copper has been commonly used for making cooking utensils and other objects of common utility. In modern days, it is extensively used in vast variety of electrical machinery, wires and cables. Largest reserves of copper ore is in the state of Rajasthan (53.81%) followed by Jharkhand (19.54%) and Madhya Pradesh (18.75%). The states of Andhra Pradesh, Gujarat, Haryana, Karnataka, Maharashtra, Meghalaya, Nagaland, Odisha, Sikkim, Tamil Nadu, Telangana, Uttarkhand and West Bengal account for 7.9% of the total copper reserves of India.
- Jharkhand is the largest producer of copper with 62% of India's production. Singhbhum and Hazaribagh districts are its leading producers of copper. Odisha is the other major producer with 50.2% production. Rajasthan ranks third with 28% production. The districts of Khetri, Alwar and Bhilwara are notable in this state. The states of Uttarkhand (Dehradun and Garhwal districts), Andhra Pradesh (Guntur, Kurnool and Nellore districts), Karnataka (Chitradurga and Hassan districts) and Tamil Nadu contributes about 7% of production each.

iv. Bauxite

- Bauxite is an important ore from which aluminium is extracted. It is found in the rock consisting mainly of hydrated aluminium oxides. Bauxite is widely distributed as surface deposits in the areas of laterite soil. Being light in weight and tough, aluminium is used in the manufacture of aircrafts and automobile engines. Bauxite is also used in the manufacture of cement and chemicals. The main bauxite deposits occur in Odisha - 50.2%, Gujarat - 15.8% (Junagadh, Amreli and Bhavnagar districts), Jharkhand - 11.9% (Ranchi and Gumila districts), Maharashtra - 9.9% (Sindhudurg and Ratnagiri), Chhattisgarh - 6.2% (Ballarpur and Durg districts), and Tamil Nadu - 2.7%. Being light in weight and tough, aluminium is used in the manufacture of aircrafts and automobile engines. Bauxite is also used in the manufacture of cement and chemicals. Orissa is the largest producer of bauxite in India with approx. 1,370.5 million tonnes. India's State and Central Government is very supportive in production of Bauxite and other Industrial Minerals in Orissa, Jharkhand, Tamil Nadu.

b. Non-Metallic Minerals

- These minerals do not contain metal in them. Mica, limestone, gypsum, nitrate, potash, dolomite, coal, petroleum etc are the non-metallic minerals.

i. Mica

- In ancient time, Mica was used in ayurvedic medicine. Mica became very popular with the development of electrical industry. Abhrak is a good quality mica. It is translucent, easily splittable into thin sheets, flat, colourless, elastic and incompressible. Mica is used in making of insulating properties, as it withstands high voltage and has low power loss factor. Since it is a non-conductor of electricity, it is exclusively used in electrical goods. It is also used in making of lubricants, medicines, paints and varnishes.
- The major deposits of mica are found in Andhra Pradesh(41%) with Nellore, Visakhapatnam, West Godavari and Krishna are its major districts. Other important states in mica deposits are Rajasthan(21%) and Odisha(20%). Bhilwara, Jaipur and Ajmer are the notable districts in Rajasthan and, Rayagada, Bolangir and Sundargarh districts are the major producers in Odisha. Dhanbad, Palamu, Ranchi and Singhbhum districts are the major mica mines in Jharkhand state.

ii. Lime Stone

- Limestone is associated with rocks composed of either calcium carbonate or the double carbonate of calcium and magnesium or mixture of both. Limestone also contains small quantities of silica, alumina, iron oxides, phosphorous and sulphur. Limestone is used in the industries of chemicals for soda ash, caustic soda, bleaching powder, paper, cement, iron and steel, glass and fertilizers. The major producing areas: Andhra Pradesh produces about 20% with major concentration in Cuddapah, Kurnool and Guntur districts. Telengana also accounts for about 20% of the country's production with the districts of Nalgonda, Adilabad, Warangal and Karimnagar as major producers. Rajasthan produces about 18% (Jodhpur, Ajmer, Bikaner and Kota districts), Madhya Pradesh about 12% (Jabalpur and Satna districts) and Tamil Nadu about 8.4% (Salem, Kancheepuram, Tiruchirappalli, Thoothukkudi, Tirunelveli and Virudhunagar districts) of limestone production of India. In terms of the reserves of limestone, the state of Karnataka leads with 27%, followed by Andhra Pradesh and Rajasthan (12% each), Gujarat (10%), Meghalaya (9%), Telangana (8%), Chhattisgarh and Madhya Pradesh (5% each) and the remaining by other states.

iii. Gypsum

- Gypsum is a hydrated sulphate of calcium which occurs as white, opaque or transparent minerals in beds of sedimentary rocks such as limestone, sandstone and shale. Gypsum is used in the manufacture of cement, fertilizers, wall board, plaster of paris and in soil conditioning. The state of Rajasthan alone accounts for 81% of its reserves. 14% of its reserves is found in Jammu and Kashmir and 2% in Tamil Nadu. The remaining 3%

resources are found in the states of Gujarat, Himachal Pradesh, Karnataka, Uttarakhand, Andhra Pradesh and Madhya Pradesh. Rajasthan produces 82% of the country's production. Jodhpur, Bikaner and Jaisalmer are notable districts. Jammu and Kashmir produces 14% of country's gypsum. Baramula, Doda and Uri districts are its major producers. The states of Gujarat (Bhavnagar and Jamnagar districts), Uttarakhand (Dehradun and Mussourie districts), Andhra Pradesh (Nellore, Guntur and Prakasam districts) and Tamil Nadu are the other producers with about 4% each.

Energy Resources

- The resources from which the electricity generated are called energy resources. Electricity is an important component of our life. No day to day activity takes without the use of this energy. It is also the key factor for all economic activities and industrial development. Energy resources can be classified into renewable and non-renewable. Coal, petroleum, natural gas and nuclear minerals are the sources of non-renewable energy. Water, sun light, wind, bio gas, tides etc., are the sources of renewable energy.

Non-Renewable Energy

a. Coal

- Coal is an inflammable organic substance composed mainly of hydrocarbons. Coal is available in the form of sedimentary rocks. It is used in the generation of thermal power. It has close association with the industrial development of any country. Since it is a valuable one, it is called as "Black Gold". Based on carbon content, it is classified into the following types.

Anthracite: contains 80 to 90% carbon

Bituminous: contains 60 to 80% carbon

Lignite: contains 40 to 60% carbon

Peat: contains less than 40% carbon

- Coal is an important source of energy in India with its varied and innumerable uses. It can be converted into gas, oil, electricity and thermal power. Besides, it forms a basic raw material for the production of chemicals, dyes, fertilizers, paints, synthetic and explosives. Indian coal is mostly associated with Gondwana series of rocks and is primarily found in Peninsular India. The states of Jharkhand, Odisha, West Bengal and Madhya Pradesh alone account for nearly 90% of coal reserves of the country. About 2% of India's coal is of tertiary type and is found mostly in Assam and Jammu & Kashmir.
- Jharkhand is the largest coal producing state in the country followed by Odisha, Chhattisgarh, West Bengal, Madhya Pradesh, Andhra Pradesh and Maharashtra. The major coal fields of Jharkhand are Bokaro, North Karanpura, South Karanpura, Giridih, Ramgarh, Daltongunj and Rajmahal. Talcher and Ranapur in Odisha, Korba and Chirmiri in Chhattisgarh, Umaria and Singrauli in Madhya Pradesh, Tandur, Singareni, Kothagudem and Ramagundam in Andhra Pradesh, Wardha, Ballarpur, Chanda and

Kampati in Maharashtra and, Raniganj, Asansol and Mejia in West Bengal are the other major coal fields of India.

- Indian lignite (brown coal) deposits occur in the southern and western parts of Peninsular India particularly in Tamil Nadu, Pudhucherry and Kerala. The Ministry of coal has over-all responsibility of determining policies and strategies in respect of exploration and development of coal resource in India. Coal India Limited (CIL), NLC India Limited (NLCIL) and Singareni Collieries Company limited (SCCL) are its public sector undertakings.

b. Petroleum (or) Crude oil

- The word petroleum has been derived from two Latin words petro (meaning - Rock) and oleum (meaning oil). Thus petroleum is oil obtained from rocks of the earth. Therefore, it is also called mineral oil. Petroleum is an inflammable liquid that is composed of hydrocarbons which constitute 90-95% of petroleum and the remaining is chiefly organic compounds containing oxygen, nitrogen, sulphur and traces of organo-metallic compounds. Petroleum is used as a source of power and fuel for automobiles, aeroplanes, ships and locomotives. Lubricants, kerosene, vaseline, tar, soap, terylene and wax are its by-products. Oil in India is obtained from both from on-shore and off-shore areas. As of 2017, the total estimated crude oil reserves of the country is 604.10 million tons. From this, 324.24 million tons (54%) are found in onshore and 279.86 million tonnes (46%) are in offshore areas. The production of crude oil fluctuates from year to year from 2011-12 to 2017-18 but only with marginal variations. The change is invariably negative. In natural gas production also the trend is negative except the last year. The change is high in the first three years and it is low to moderate in the remaining years.

Western coast offshore oil fields	Eastern coast offshore fields
Mumbai high oil fields (largest 65%)	Bharmaputra valley (Dibrugarh and Sibsagar districts of upper Assam.)
Gujarat coast (2 nd largest)	Digboi oil fields (oldest fields in country)
Bassein oil field, south of Mumbai high	Nahoratiya oil fields (south west of digboi)
Aliabet oil field, south of Bhavanagar	Moran - Hugrijian oil fields (sibsagar districts of assam)
Ankleshwar	Rudrasagar - Lawa oil fields (sibsagar districts of assam)
Cambay - Luni Region	Surrma valley (Badarpur, Masimpur, Patharia)
Ahmedabad Kalol Region	Offshore of Andaman and Nicobar, Gulf of

	mannar, Baleshwar coast, Punjab, Haryana and Uttar Pradesh.
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c. Natural Gas

- Natural gas usually accompanies the petroleum accumulations. It is naturally occurring hydro carbon gas mixture consisting primarily of methane, but commonly includes varying amounts of other higher alkanes and sometimes a small percentage of carbon dioxide, nitrogen and hydrogen sulphides. It is formed when layers of decomposed plants and animals are exposed to intense heat and pressure over thousands of years. It is used as a source of energy for heating, cooking and electricity generation. It is also used as fuel for vehicles and as a chemical feedstock in the manufacture of plastics and other commercially important organic chemicals.
- India has a very large proportion of tertiary rock and alluvial deposits particularly in the extra peninsular India. These sedimentary rocks, which were once under the shallow seas, hold the possibility of harbouring oil and gas deposits. The highest concentration of natural gas is found in the Bombay high and basseim oil fields. Jagatia and Gogha in Gujarat, Nahorkatiya and Moran in Assam, Neypaltur, Mangmadam in Thanjavur district in Tamil Nadu, Baranura and Atharnure ranges in Tripura, Barmer and Charaswala in Rajasthan, Miao Pung and Laptang areas in Arunachal Pradesh, Firozpur district in Punjab, Mausar and Maradpur areas in Jammu and Kashmir and Medinipur in West Bengal are the other areas where natural gas reserves have been discovered. The Gas Authority of India Ltd [GAIL] is doing pioneer work in the field of natural gas exploration. Discovery of gas made rapid strides in the 1985. Oil strikes at Cauvery offshore, at Nanda in Cambay basin and Tarot in Jaisalmer basin in Rajasthan were major discoveries during 1988-89. Recently, it has been found that Krishna- Godavari delta has reserves of Natural gas.

Conventional Energy Sources

a. Thermal power

- Thermal power is generated using fossil fuels like coal, diesel, petroleum and Natural gas. National Thermal Power Corporation [NTPC] was established in 1975. At present NTPC has 13 coal based super thermal power projects and 7 gas / liquid fuel based combined cycle projects in the states of Assam, Bihar, Jharkhand, Chhattisgarh, Mizoram and West Bengal. It accounts for over 90% of the installed capacity. Tamil Nadu produces about 5% of the total thermal electricity produced in India. Neyveli, Mettur, Thoothukudi and Ennore (Chennai) are the important thermal power stations in Tamil nadu.

b. Nuclear power

- The energy released during nuclear fission or fusion is used to generate electricity. Nuclear energy is generated mainly from the minerals of Uranium and Thorium. Nuclear power programme in India was initiated in 1940's when 'Tata Atomic research commission was incorporated in August 1948. The first nuclear power station was setup at Tarapur near Mumbai in 1969 with the capacity of 320 mw. Later atomic reactors were installed at Rawatbhata (335 MW), near Kota in Rajasthan (100 MW), Kalpakkam (440 MW) and Kudankulam (2,000 MW) in Tamil Nadu and Narora (235 MW) in Uttar Pradesh, Kaiga in (235 MW) in Karnataka and Kakrapara (235 MW) in Gujarat.

Renewable or Non-Conventional Energy Resources

a. Hydro power

- Power generated from water is termed as hydroelectricity. Hydro power is the energy harnessed from running water. Hydro power is considered as one of the most economic and non-polluting sources of energy. It contributes nearly 7% of global electricity production. The cost of production of hydroelectricity is relatively low, making it a competitive source of renewable energy. It is also a flexible mode of power generation as the quantity of production can either be increased or decreased very quickly adapting to changing demands. India is fortunate to have a large potential of hydro- power potential. It is quite unevenly distributed in India. Of the total hydro-electric potential of the country, rivers of Assam, Arunachal Pradesh, Manipur, Nagaland and Tripura account for 30.4%, eastward flowing rivers of the peninsular India 20.9%, westward flowing rivers of the western Ghats (South of the Tapti) 10.5%, the Ganga Basin (excluding the potential of Nepal) 11.7%, the Indus Basin 16.0% and the rivers of central India 10.5%.

b. Solar Energy

- Solar Power is the conversion of sunlight into electricity, either directly using photovoltaic (PV) or indirectly using concentrated solar power (CSP). Concentrated solar power systems use lenses or mirrors and tracking system to focus a large area of sunlight into a small beam. Photovoltaic convert light into an electric current using the photovoltaic effect. The mass objectives of the solar thermal energy programme, being implemented by the Ministry of Non-Conventional Energy Source (MNES) are market development, commercialisation and utilisation of heat energy requirement of different applications in domestic, institutional and industrial sectors. Solar power is used in water heaters, refrigerators, drying, street lighting, cooking, pumping, power generator, photovoltaic cells, salon parts etc. Andhra Pradesh, Gujarat, Rajasthan, Maharashtra and Madhya Pradesh are the major solar power producers.

c. Wind Energy

- Wind energy is extracted from air flow using wind turbines. It is a cheap and pollution free source of energy. Power from wind mills are used for pumping water and to sail propel ships. Wind power is plentiful, renewable, widely distributed, clean and produces no greenhouse gas emissions during operation. These plants occupy only a less space. The development of wind power in India began in 1986 with first wind farms were set up in coastal areas of Gujarat (Okha), Maharashtra (Ratnagiri) and Tamil Nadu (Thoothukudi) with 55 KW Vestas wind turbines. The capacity has significantly increased in the last few years. India has the fourth largest installed wind power capacity in the world.

d. Biomass Energy

- Bio energy may be obtained through bio-degradable materials like animal dung, kitchen wastes, water hyacinth, agricultural residues and city wastes etc. It is clean and cheap source of energy. India has a potential of about 18 GW of energy from Biomass. Currently, about 32% of total primary energy used in India is derived from Biomass. Energy derived from biomass is mostly used for domestic purposes.

e. Tidal and wave Energy

- There are two main sources of ocean energy. They are Ocean tides and Ocean waves. It is estimated that India possesses 8,000-9,000 MW of tidal energy potential. The Gulf of Cambay is the best suited area with about 7,000 mw potential of tidal energy. This is followed by Gulf of Kachch (1,000MW) and sunder bans (100MW). At present a 900mw tidal power plant is proposed to be set up in the Gulf of Kachch region. Wave energy potential in India is estimated to be 40,000 MW. An wave energy power plant of 150 KW(maximum) has been installed at vizhinjam near Thiruvananthapuram. An another plant of this kind has been set up near Andaman& Nicobar Islands.

Industries

- It refers to the activities which converts the raw materials into finished products. This sector is called as the value addition sector. On the basis of the source of raw materials, Industries are classified into the Agro based industries, Forest based industries and Mineral based industries.

Agro based industries

- These industries draw their raw materials from agricultural sector. The following part discusses the agro based industries in India.

a. Cotton Textile Industry

- Textile is a broad term which includes cotton, jute, wool, silk and synthetic fibre textiles. This sector in India with 3400 textiles mills with installed capacity of more than 50

million spindles and 842000 rotors is the second largest in the world. Traditional sectors like hand loom, handicrafts and small power-loom units are the biggest source of employment for millions of people in rural and semi urban areas. The cotton textile industries contribute about 7% of industrial output, 2% of India's GDP and 15% of the country's export earnings. It is one of the largest sources of employment generation in the country. With over 45 million employees, the total employment in this industry is well over 25million worker. At present there are 1,719 textiles mills in the country. Out of which 188 mills are in public sector, 147 in cooperative sector and 1,284 in private sector. Currently, India is the third largest producer of cotton and has the largest loomarc and ring spindles in the world. At present, cotton textile industry is the largest organized modern industry of India. About 16% of the industrial capital, 14% of industrial production and over 20% of the industrial labour of the country are engaged in this industry. The higher concentration of textile mills in and around Mumbai, makes it as "Manchester of India". Presence of black cotton soil in Maharastra, humid climate, presence of Mumbai port, availability of hydro power, good market and well developed transport facility favour the cotton textile industries in Mumbai. The major cotton textile industries are concentrated in the states of Maharashtra, Gujarat, West Bengal, Uttar Pradesh and Tamil Nadu. Coimbatore is the most important centre in Tamil Nadu with 200 mills out of its 435 and called as "Manchester of SouthIndia". Erode, Tirupur, Karur, Chennai, Thirunelveli, Madurai, Thoothukudi, Salem and Virudhunagar are the other major cotton textiles centres in the state.

b. Jute Textiles

- Jute is a low priced fibre used mainly for making package materials like gunny bags. Today jute is blended with cotton and wool to produce textiles. India is the largest producer of jute goods contributing 35% of the world's total output. This is the second important textile industry in India after cotton textiles. Jute is the golden fibre which meets all the standards of goods packing with its natural, renewable, bio degradable and eco-friendly products. The first jute mill in India was established at Rishra near, Kolkata in 1854 by the English man George Auckland.
- India tops in the production of raw jute and jute goods and second in the export of jute goods next to Bangladesh. Jute production includes gunny bags, canvas, pack sheets, jute web, carpets, cordage, hessians and twines. Now jute is also being used in plastic furniture and insulation bleached fibres to blend with wool. It is also mixed with cotton to make carpet and blankets. The major jute producing areas are in West Bengal and concentrated along the Hooghly river within the radius of six kilometre of Kolkata. Titagarh, Jagatdat, Budge-Budge, Haora and Bhadreswar are the chief centres of jute industry. Andhra Pradesh, Bihar, Uttar Pradesh, Assam, Chhattisgarh and Odisha are the other jute goods producing areas.

c. Silk Industry

- India has been well known for the production of silk. Since the ancient times, India is the second largest producer of raw silk next only to China. Sericulture is a labour intensive

industry and provides employment to 7.56 million people make to weaker and marginalised sections of society. Karnataka is the largest producer of silk with an average of 8200 metric tons every year which is about one third of the total silk production of India. Other major producers of silk are West Bengal, Jammu Kashmir, Bihar, Jharkhand, Chhattisgarh, Uttar Pradesh, Punjab, Assam and Tamil Nadu states. India exports exclusively silk fabrics, silk scarves, dress material and sarees. It exports to the principal countries like Europe, U.S.A, U.K, Russia, Saudi Arabia, Kuwait and Singapore.

d. Sugar Industry

- Sugar can be produced from sugar cane, sugar-beets or any other crop which have sugar content. In India, sugar cane is the main source of sugar. At present this is the second largest agro based industry of India after cotton textiles. India is the world's second largest producer of sugar cane after Brazil. This industry provides employment to 2.86 lakh workers. Sugar industry is decentralized and located near the sugarcane growing areas as they are weight loosing and bulky to transport. Uttar Pradesh is the largest producer of sugar, producing about 50% of the country's total. Other major producers are Maharashtra, Uttar Pradesh, Karnataka, Andhra Pradesh, Tamil Nadu, Bihar, Punjab, Gujarat, Haryana and Madhya Pradesh states. These states account for more than 90% of the sugar mills and sugar production.

Forest based industries

- Forest provide us with different types of material which are used as raw material for certain industries like paper, lac, sports goods, plywood etc.

a. Paper industry

- Paper Industry has emerged as a diversified and specialized industry in India that produces numerous types of papers that comes in various use such as sheet paper, paper boxes, tissues, paper bags, stationery, envelopes and printed-paper products such as books, periodicals, and newspapers. In India the Soft wood is the principal raw material used for making paper especially newsprint and high class printing papers. Paper is the pre-requisite for education and literacy and its use is an index of advancement in these two fields as well as the overall well-being of the society.
- The first successful effort was made in 1867 with the setting up of the RoyalBengal paper mills at Ballyganj near Kolkata. Subsequent successful efforts were made at Lucknow in 1879, Titagarh in 1882, Pune in 1887, Raniganj in 1892, Kankinra in 1892 and Naihati in 1918. The raw materials for paper industry includes wood pulp, bamboo, salai and sabai grasses, waste paper and bagasse. West Bengal is the largest producer of paper in the country followed by Madhya Pradesh, Odisha and Tamil nadu states.

Mineral based industries

- Mineral based industries use both metallic & non-metallic minerals as raw materials. The major mineral based industry of country is the iron steel industry

a. Iron and steel industries

- Iron and steel industry is called a basic metallurgical industry as its finished product is used as raw material by host of other industries. Several industries like engineering, heavy machines and machine tools, automobile, locomotives and railway equipment industries use iron and steel as their primary raw material. Due to this, the steel producing capacity of a country is generally taken as an indicator of its level of industrial development. The modernization of the industry was started in 1907 with the establishment of Tata Iron and Steel Company at Sakchi, now called Jamshedpur. Iron and steel industry of India is mainly concentrated in the states of Jharkhand, West Bengal and Odisha. Proximity to the coal fields of Jharia, Raniganj, Bokaro and Karanpura and the iron ore mines of Mayurbhanj, Keonjar and Birona are responsible for this. This area also has sufficient deposits of limestone, dolomite, manganese, silicon and dolomite which are required for the industry.

S.N O	Name of Industry	Place	Establishment year	Product
1.	Tata Iron and Steel Company (TISCO)	Jamshedpur, Jharkhand	1911	Pig Iron
2.	Indian Iron and steel Company (IISCO)	Burnpur, Hirapur, Kulti, West Bengal	1972	Pig Iron & Crude steel
3.	Visweshwaraya Iron Steel Ltd (VISL)	Bhadravati, Karnataka	1923	Alloy and Sponge steel
4.	Hisdustan Steel Ltd (HSL) Collaborated with Russia	Bhilai, Chattisgarh	1957	Railway Equipment's and Ship Building
5.	Hindustan Steel Ltd (HSL) Collaborated with Germany	Rourkela, Odisha	1965	Hot and Cold rolled sheets, Galvanized sheets and electrical plates
6.	Hindustal Steel Ltd (HSL) Collaborated with United Kingdom	Durgapur, west Bengal	1959	Alloy steel, Construction materials and railway

				equipment's
7.	Hisdustan Steel Ltd (HSL) Collaborated with Russia	Bokaro, Jharkhand	1972	Sludge and Slog
8.	Salem Steel Ltd	Salem, Tamil Nadu	1982	Stainless Steel
9.	Vijayanagar Steel Plant	Tornagal, Karnataka	1994	Flat steel and Long Steel
10.	Visakhapatnam Steel Plant (VSO)	Visakhpatnam, Andhra Pradesh	1981	Hot Metal

Automobile Industry

- India is set to emerge not only as a large domestic market for automobile manufacturers, but also as a crucial link in the global automotive chain. It is one of the most dynamic industrial groups in India. The first automobile industry of India was started in 1947. The industry is the Premier Automobiles Ltd located at Kurla (Mumbai). It was followed by the Hindustan Motors Ltd at Uttarpara (Kolkata) in 1948. At present, India is the 7th largest producer of automobile manufacturers which include two wheelers, commercial vehicles, passenger car, jeep, scooty, scooters, motor cycles, mopeds and three wheelers. Major centres are at Mumbai, Chennai, Jamshedpur, Jabalpur, Kolkata, Pune, New Delhi, Kanpur, Bengaluru, Sadara, Lucknow and Mysuru. Tata Motors, Maruti Suzuki, Mahindra & Mahindra and Hindustan Motors are the largest passenger car manufacturers of Indian companies in the country. Presence of foreign car companies such as Mercedes Benz, Fiat, General Motors, Toyota and the recent entry of passenger car manufacturers BMW, Audi, Volkswagen and Volvo makes the Indian automobile sector a special one. Tata Motors, Ashok Leyland, Eicher Motors, Mahindra & Mahindra and Ford Motors are the major Indian companies which manufacture commercial vehicles. MAN, ITEC, Mercedes-Benz, Scania and Hyundai are the foreign companies engage in the manufacture of commercial vehicles. Twowheeler manufacturing is dominated by Indian companies like Hero, Bajaj Auto and TVS.
- The automobile industries are found in four clusters viz; Delhi, Gurgaon and Manesar in North India, Pune, Nasik, Halol and Aurangabad in West India, Chennai, Bengaluru and Hosur in South India and Jamshedpur and Kolkata in East India. Electrical and Electronic

Industries

- Heavy electrical industries manufacture equipment used for power generation, transmission and utilization. Turbines for steam and hydro power plants, boilers for

thermal power plants, generators, transformers, switch gears etc. are the chief products of this industry. The most important company in the field of heavy electrical is Bharat Heavy Electricals Ltd (BHEL). It has its plants at Hardwar, Bhopal, Hyderabad, Jammu, Bengaluru, Jhansi and Tiruchirappalli. This Industry covers a wide range of products including television sets, transistor sets, telephone exchanges, cellular telegram, computers and varied equipment's for post and railway, defence and meteorological department. Bengaluru is the largest producer of electronic goods in India, hence it is called as the "Electronic Capital of India". The other major producers of electronic goods centers are Hyderabad, Delhi, Mumbai, Chennai, Kolkata, Kanpur, Pune, Lucknow, Jaipur and Coimbatore.

Software Industry

- India is home to some of the finest software companies in the world. The software companies in India are reputed across the globe for their efficient IT and business related solutions. The Indian Software Industry has brought about a tremendous success for the emerging economy. In India, software industry began in 1970 with the entry of Tata Consultancy Services (TCS). Along with this, L & T, InfoTech, i-Flex, Accenture, Cognizant, GalexE Solutions India Pvt Ltd and ITC InfoTech are the major software industries in the country. At present, there are more than 500 software companies all over India. It exports software service to nearly 95 countries in the world. The main centres of IT parks are located in Chennai, Coimbatore, Thiruvananthapuram, Bengaluru, Mysuru, Hyderabad, Visakhapatnam, Mumbai, Pune, Indore, Gandhi Nagar, Jaipur, Noida, Mohali and Srinagar.

Major challenges of Indian Industries

Industries in India face many problems. Some major problems are listed below.

- Shortage and fluctuation in Power Supply.
- Non- availability of large blocks of land.
- Poor access to credit.
- High rate of interest for borrowed loan.
- Non- availability of cheap labourers.
- Lack of technical and vocational training for employees.
- Inappropriate living conditions nearby industrial estates.

12th book
Unit 3. RESOURCE

Introduction

Have you heard about **Voyager 1** launched in 1977 still is travelling at the speed of **62140 km/ hour or 17 km/sec.**? Do you know what fuel is used in it? It is **hydrazine**. What, do you think, would be the future fuel? It is certainly going to be **hydrogen**. Think about how hydrogen stands as an important future fuel.

- A resource is a naturally occurring exploitable material that a society perceives to be useful to its economic and material wellbeing. Willing, healthy and skilled workers also constitute a valuable resource, but without access to materials such as fertile soil or petroleum, human resources are limited in their effectiveness.
- Resources are the basis of the economic development of any nation. Different countries are at different levels of economic development primarily because of the variation in the availability of natural resources. The US and west European countries are economically prosperous because they possess vast natural and human resources and technology. On the other hand, in most parts of Africa and Asia, though they are naturally rich in resources, due to their lack of knowledge, the resources are unutilized and they are not used in the service of man.

Classification of Resources

- Resources are classified on various bases. Based on the continual availability, resources are classified in to **renewable** and **non-renewable resources**.
- The resources which can always be used again and again are known as **renewable resources**. It means these resources have natural regeneration and are inexhaustible. Air, water, solar energy etc. are examples of renewable resources. **Non-renewable resources** are available in finite quantities and cannot be obtained once if they are utilized. If these resources are used in large scale, they will get exhausted soon and as such these resources are called as **exhaustible resources**. Coal, oil and minerals are examples of this type.
- On the basis of origin, the resources are classified in to **biotic** and **abiotic resources**. When a resource is originated from living organism, the resource is known as **biotic resource**. Coal, mineral oil and forests are examples of biotic resources. **Abiotic resources** are composed of non-living inorganic matter. Air, land, water and minerals are examples of this type.
- On the basis of status of development, the resources are classified in to **potential resources** and **developed resources**. Potential resources are those which are known to exist and may be used in the future. Until the resource is extracted and put in to use, it remains a potential resource. **Developed resources** are those which have been surveyed

and their quality and quantity have been determined for utilisation. The development of resources depends on technology and level of their feasibility. Petroleum resource from Mumbai High is an example of Developed resources.

- Apart from the above classifications, the resources which are available in nature are known as **natural resources** and the one created by man is known as **man-made resource**. Similarly the air like resources which exist everywhere is called as **ubiquitous resources** and the resources which are concentrated only at specific places are known as **localised resources**. This kind of resource may exercise great influence on the economic development of the respective regions.

Mineral Resources

- A homogeneous, naturally occurring substance which has a definite chemical composition is called a mineral. They can be identified by their physical properties and chemical components. Minerals exist in different types based on their formation. Minerals play an indispensable part of our daily activities. Almost everything we use, from a tiny particle to a huge building or a big ship all, is made up of minerals. Minerals are one of the most valuable resources of the earth. All the stages of human development or progress have been named after them. For example, stone age, copper age, bronze age and Iron Age.
- They are exhaustible or non-renewable. Besides, they are distributed very unevenly. They are generally found in the form of ores. The ore contains several impurities. Minerals are separated from the ores involving a number of distinct processes.
- A country's economic development is depending on the minerals. There are several types of minerals, but according to their characteristics and commercial use.

Uses of Minerals

- Minerals are basic and essential raw materials in our daily lives and are vital for economic, social and technological development. They are used,
 - ❖ In the construction of buildings, bridges and settlement.
 - ❖ As raw materials in industries
 - ❖ As fuels
 - ❖ In the manufacture of defiance equipment's.
 - ❖ In the field of communication like manufacturing telephone, wires, cables, electronic devices etc.
 - ❖ In making of alloys for various purposes.
 - ❖ In making of ornaments.
 - ❖ In the manufacture of fertilizers, pesticide, fungicides etc.

Mode of Occurrence of Minerals

- Minerals are generally found in 'Ores'. It is actually an accumulation of any mineral mixed with other elements. Minerals generally occur in many forms. They are

1. Veins and lodes

- Minerals generally occur in the cracks, crevices, faults and joints of the igneous and metamorphic rocks. Minerals in smaller occurrence are called a 'Vein' and a larger occurrence is called a 'lode, for example, Copper and Gold are found in lodes and veins.

2. Beds or Layers

- Minerals that are formed as a result of deposition, accumulation and concentration generally occur in horizontal layers. E.g. Coal, Potash, etc.

Residual mass of weathered particles

- When the decomposed rocks are washed away by water, the soluble particles are removed, leaving a mass containing ores. Such occurrences are called residual mass. E.g. Bauxite

3. Alluvial deposits or placer deposits

- These are the deposits found in the sands of valley floor and at the foot hills. These deposits consist of the minerals such as Gold, Silver and Platinum.

The world distribution of minerals

- Metallic Minerals** The minerals which contain metal in them are called as metallic minerals.

Iron - Ore

- It is the basic mineral and the backbone of industrial development of the world. Iron Ore is the most widely distributed element of the earth's crust and it rarely occurs in a free state. It is found as the composition of many rocks and minerals. Iron-ore makes up 4.6% of the earth crusts. Iron is found in the form of Iron - ore. They are classified into 4 categories.

- Magnetite: It is red in colour and has 72% of pure Iron
- Hematite: It is black in colour and has 70% of pure Iron
- Limonite: Its colour varies from dark brown to yellow and has 50% of pure iron.
- Siderite: It is brown in colour and contains only 30% of pure iron is present.

- The iron content of these ores is highly variable. If the iron content is less than 30% in an ore, it is considered to be uneconomical. Iron is mixed with fixed proportions of Manganese, Nickel, Chromium or Vanadium to make different varieties of steel.

Distribution of Iron ore

- Iron - ore is unevenly distributed in the world. Good quality Iron ore is found in Australia, Brazil, Russia, China, USA, Ukraine, Canada, etc. Russia has the largest proven reserves of iron ore in the world.
- Australia is the largest producer of Iron ore in the world. Other leading producers are China, Brazil, India and Russia. The Majority of Iron ore is (84%) produced by 5 countries alone.

Iron ore

Rank	Country	Production (metric ton)	Share (%)
1	Australia	531,075,350	33.72
2	China	345,841,000	21.99
3	Brazil	271,275,900	17.22
4	India	124,852,650	7.93
5	Russia	55,550,000	3.53
	Others		15.64

Major Iron Ore Fields in the World

Country	Iron ore fields
Australia	Mt. Bruce, Mt. Goldsworthy, Mt. whaleback, etc.
China	Manchuria Region, Shandong, Sinkiang region, etc.
Brazil	Itabria in south east region.
India	Chhattisgarh and Baster region, Odisha, Chitradurg, Kdermukh, Mayurbbanj, region etc.

Russia	Ural region, Kuzbas, Angara, etc.
U.S.A	Messabi range, Marquette range, cornwall, Albama, Appalachin region, etc.
Germany	Rhur basin.
Ukraine	Krivoi rog.

Manganese ore

- It is a kind of Ferro-alloy used to manufacture the special quality steel. A little manganese added to iron, removes gases and acts as a 'Cleanser' in the manufacturing process. Nearly 6 Kg of manganese is used for making one ton of steel.
- Manganese is used for special quality steel making; it makes steel anti - corrosive, hard and clean. It helps to increase toughness, strength and durability to resist oxidation in blast furnaces. It is used to produce alloys with Copper, Bronze, and Nickel. It is used for producing heavy machinery, tools, bleaching powder, insecticides and paints.

Distribution and production of Manganese ore

- South Africa, Australia, China, Gabon, Kazakhstan, Brazil, India, Ghana, Ukraine and Mexico are the major countries possessing manganese ore. South Africa is the largest producer of manganese ore in the world, followed by Australia. The other leading manganese producers are China, Gabon and Brazil. India is the 8th largest producer of manganese in the world though it possesses the largest reserves of manganese in the world.

Manganese-Ore Production

Rank	Country	Production (metric ton)	Share (%)
1	South Africa	4,754,560	30.84
2	Australia	2,388,500	15.50
3	China	2,150,000	13.95
4	Gabon	1,658,500	10.76
5	Brazil	1,141,684	7.04

	others		21.54
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Copper

Rank	Country	Production (metric ton)	Share (%)
1	Chile	5,552,600	27.20
2	Peru	2,353,859	11.53
3	China	1,851,000	9.10
4	United states	1,430,000	7.00
5	Congo	1,035,631	5.07
	Others		40.13

Copper

- It is a non - ferrous, soft brown metal. It is a good conductor, with high luster, density and melting point. Copper occurs in three forms as native metal in its pure state, as oxides and as sulphide.
- The chief ore of copper is copper pyrite. It yields nearly 76% of the world production of copper. Copper is extracted by the process of crushing, concentration, roasting, smelting and refining. It was discovered in the earliest stage of civilization. Copper is one of the first metals known and used by man. It is found in the igneous and metamorphic rocks. Copper is unfortunately very soft, but by mixing with tin, bronze can be obtained and mixing with zinc, brass can be obtained which is harder and tougher than pure copper. Copper is used in
 - Electrical Engineering
 - Metallurgical Industries
 - Making of alloys and making tubes, pipes, pumps, radiators and boilers. They are also used in the production of a wide range of ornamental materials.

Production and distribution of Copper

- Copper deposits are found in almost every country. The main producers are Chile, Peru, China, USA and Congo. Chile is the largest producer of Copper in the world. It produces

27.20% of the world Copper, followed by Peru, which produces 11.53%. India holds 35th rank and it produces only 0.15% of the world's production.

Bauxite

- Bauxite is an important ore which is the main source of Aluminum. It is an impure raw material. It generally occurs as an ingredient of chemical compounds in highly complex minerals such as Cryolite, Corundum and Kaolin. Bauxite occurs quite near the surface and is generally mined by open cast method. It has a wide range of applications which include construction of buildings, utensils and airplane parts.

Production and world distribution of Bauxite

- The main Bauxite producers are Australia, China, Brazil, Guinea and India. The World's greatest Bauxite producers and exporters are the countries located in the tropical and sub-tropical region. Australia is the largest producer of bauxite in the world. India is the 5th largest producer of bauxite in the world.

BAUXITE (ORE)

Rank	Country	Production MT	Share in %
1	Australia	83,516,578	29.31
2	China	65,000,000	22.81
3	Brazil	39,244,200	13.77
4	Guinea	31,117,131	10.92
5	India	24,644,632	8.66
	others		14.53

Gold

- Gold is a precious metal which occurs in alluvial or placer deposits or as reefs or lodes in the underground. Gold is used extensively for jewellery and also in dentistry, glass and porcelain dyes, in medicines and other industries. The purity of gold is expressed in terms of carat. China, Australia, Russia, USA and Canada are the leading producers of gold in the world. India ranked 33rd position in the gold production in 2016.

GOLD

Rank	country	Production	Share in %
1	China	453,500	14.11
2	Australia	282,421	8.79
3	Russia	262,380	8.16
4	United states	222,211	6.91
5	Canada	165,034	5.13
	Others		56.90

Do you know?

Fool's Gold refers to pyrite of Iron Sulphide because of its similarity in shape and colour to actual gold.

Platinum

- Platinum is a rare metal. It is costlier than gold. It has a very high melting point. It is a heavy, malleable, ductile, highly inactive, silverish, white transition metal. It is one of the densest metal almost twice as dense as lead. Platinum is found with other rare metals such as osmium, Palladium, Iridium and rhodium. Platinum is also used in industrial applications. South Africa is the largest producer of platinum in the world. The other leading producers are Russia, Zimbabwe, Canada and USA.

Platinum

Rank	Country	Production Kg	Share in%
1	South Africa	133,241	71.75
2	Russia	21,860	11.77
3	Zimbabwe	15,110	8.14
4	Canada	9,300	5.01
5	USA	3,891	2.10
	Others		1.33

Non- metallic minerals

- The minerals which do not contain metal in them are called as non-metallic minerals.

Mica

- Mica is a Latin word micare means to shine, to flash or to glitter. Mica has a crystalline and layered structure and can be split into very thin sheets. It does not react to water, acids, oil or solvents. It is lightweight, flexible and strong. It can resist extremely high temperatures or sudden changes in temperature and is able to withstand high voltages and insulate with low power loss. It can absorb or reflect light, which enables a decorative effect and protects against ultra-violet (UV) light.

Major Uses of Mica

- Mica has several applications. There are several main sectors where the use of mica is identified. They are the paint and coatings sector, Cosmetics and personal care companies, Plastics and printing ink manufactures the electronics sector, the automotive sector, the construction industry and the oil industry.

Phosphate

- Phosphate occurs in the sedimentary rocks or as phosphate nodules. Another source is bird dropping of Guano. It is the most important source of phosphorus. It is mainly used in fertilizer. China is the largest producer of Phosphate in the world. The other leading producers are Morocco, USA, Russia and Peru. The Guano deposits are found in Peruvian and Chilean deserts in South America. India is the 20th largest producer of Phosphate in the world.

Phosphate (2016)

Rank	Country	Production MT	Share in %
1	China	43,319,400	51.58
2	Morocco	8,601,000	10.24
3	USA	7,615,000	9.07
4	Russia	48,36,00	5.76
5	Peru	4,103,220	4.78
	Others		18.57

Do you know?

Agencies involved in the exploration of minerals in India. GSI, ONGC, MECL, NMDC, IMB, BGML, HCL, NALCO are the departments involved in mining in different states of India.

Energy Resources

- Resources may be classified into renewable and non-renewable resources. Mineral resources like coal, Petroleum and natural gas are the exhaustible or non-renewable resources. They cannot be replaced once they are consumed. Coal and petroleum are the fossil fuels, on which the modern culture relies so much.
- Energy gives motion to our industrial machines and vehicles. It is the primary input in the production of goods and services. The wheel of progress moves with the flow of energy. The energy resources may be classified into two types.

(i) Nonrenewable sources of Energy

- Once these resources are used, they cannot be regained again. In other words, they are exhaustible. They are coal, Petroleum natural gas and atomic fuels.

Coal

- Coal is a fossil fuel. It is a flammable, black or brown sedimentary rock and is mainly composed of carbon. It is the altered remains of prehistoric vegetation that originally accumulated in swamps and peat bogs. The dense forest plants were converted into coal due to intense pressure and heat inside the earth by the process of carbonization. Most of the coal resources of the world were formed during the carboniferous period (280 to 350 million years ago). The quality of the coal is determined by its carbon content. The following types of coal have been identified on the basis of their physical properties. They are,

(i) **Peat** is the first stage of transformation of wood into coal and it has only 30 to 35% of carbon.

(ii) **Lignite or Brown** coal is the inferior quality and contains 35-45% carbon

(iii) **Bituminous or coking coal** is the second best variety of coal and contains 70-90% of carbon. It is the most widely spread and most widely used variety of coal. It is the most popular coal in commercial use.

(iv) **Anthracite** is the best quality coal, which contains more than 95% of carbon. It is very hard but emits very less smoke and leaves very less ash. However its deposits are limited.

Production and world distribution of Coal

- Coal reserves are found in more than 70 countries of the world but the major coal reserves occur in the USA, Russia, China and South Africa. China is the largest producer of steam coal in the world followed by India. The other leading producers of steam coal are USA, Indonesia, and South Africa etc.

Steam coal – It is used for producing steam and it has high sulphur content.

Steam Coal

Rank	Country	Production (metric ton)	Share in %
1	China	2,49,793,000	47.42
2	India	601,131,000	11.44
3	United states	553,936,000	10.54
4	Indonesia	459,469,000	8.74
5	South Africa	253,452,000	4.82
	others		17.04

HOTS

Why is hydrogen used as fuel in rockets?

China was the largest producer of coking coal in the world in 2016 followed by Australia. The other leading producers of coking coal are Russia, India and USA.

Cooking Coal

Rank	Country	Production MT	Share in %
1	China	591,998,000	54.67
2	Australia	189,302,000	17.48
3	Russia	83,800,000	7.74

4	India	61,661,000	5.69
5	United states	50,645,000	4.68
	Others		9.74

Major Coal Mining Centres

Country	Mining centers
China	Shansi, shantung, Fushun, Shenyang, etc.
India	Bokaro, jaria, korba, ranikanch, singerni, etc.
U.S.A	Arkansas, colorodo, illionions, Indiana, Michigan etc.
Australia	Bowen basin, Brisbane, Canberra, Sydney, New-castle, Tasmania, etc.
Russia	Moscow-Tula region, Chokot, basin, Ob basin, etc.

Trade

- The main exporters of coal in the world are Australia, Indonesia, Russia, Colombia and South Africa and the main importers are China, India, Japan, Korea and Germany.

Uses of Coal

- Man has used coal for hundreds of years. But it has gained importance only after industrial revolution. It contributes about 25% of global energy demand. Coal is used for various purposes. It is used as a source of steam energy, electrical energy, domestic fuel, metallurgical coke, chemical industries and byproducts such as Ammonium sulphate, Naphthalene, Phenol, Benzene, etc.

Petroleum (or) Mineral oil

- Petroleum is a mineral that exists under the surface of the earth in liquid, solid and gaseous forms. Liquid petroleum may be in the form of crude oil. The solid form may be mineral waxes or asphalts. The gaseous form is natural gas. It is a main source of energy in the World due to its multiple uses. The human activities are directly or indirectly depend on the use of petroleum or its sub products.

Formation and occurrence of mineral oil

- It is formed by slow chemical and bio chemical decomposition of the remains of organic matter in sedimentary rocks. It is found in the pores of the sedimentary rocks. Oil is

lighter than water hence, floats over water. Drilling of oil wells is the hole drilled in the earth's crust and when it reaches the rock cap, the natural gas comes out first with a great pressure. When the pressure of gas subsides, petroleum starts flowing out when the pressure of natural gas is released.

Petroleum reserves of the world

- The west Asia or Middle East is has the largest petroleum reserves, which is about 60% of the world's oil reserve. The total estimated world's oil reserves in 2008 were 1,243 (109 bbl). Saudi Arabia, Canada, Iran, Iraq and Kuwait have large reserves of petroleum.

Production and world distribution of petroleum

- The petroleum producing countries of the world can be grouped in to five geographical regions:
 1. West Asia (or) Middle East region
 2. American region
 3. Russian region
 4. East & south Asian region and
 5. African region
- Saudi Arabia is the largest oil producer of the world with 13.62% of the world output of oil. Russia is the second largest producer in the world. India is placed at 24th position in petroleum production in the world. The distribution of oil is naturally uneven; Middle East contains 60% of global reserves and rest of the world only 40%.

Petroleum

Rank	Country	Share in %
1	Saudi Arabia	13.62
2	Russia	12.72
3	USA	12.62
4	Iraq	5.09
5	Iran	5.03
6	china	4.64
	Others	46.28

Trade

- The world leading exporters of petroleum are Saudi Arabia, Russia, Iraq, UAE and Canada and the main importers are USA, China, India, Japan and Korea.

Do you know?

OPEC is the short form of the “Organisation of Petroleum Exporting Countries. It was formed in 1960 at Bagdad convention. Initially it comprised of Saudi Arabia, Iran, Iraq, Kuwait and Venezuela. Later on added in eight countries Libya, Algeria, Qatar, UAE, Nigeria, Ecuador and Angola, Indonesia left from OPEC in recently.

Major Petroleum Production Centres

Country	Production centres
Saudi Arabia	Ghawar, Abquiaq, Abuhadriya, etc.
Russia	Volga-Caspian region, Kamchatka- Sakhalin region, Ob Lena basin.
U.S.A	Tennessee- new york, ohino, Indiana, Pennsylvania, Texa, Mississippi, gulf of California, etc.
Iraq	Kirkuk, Mosul, Daura, etc.
China	Taching, Chinchou, Yemen, south china sea, etc.

Natural Gas

- It is the cheapest source of energy. It is found along with or without petroleum. It is considered as an environment friendly fuel because of its low carbon dioxide emissions. Therefore, this is the only fuel for the present century and it is also called green energy. A powerful odorant, ethanethiol is added, so that leaks can be detected easily. It is prepared by refining petroleum or wet natural gas.

Natural gas reserves and Production

- The known natural gas reserve in the world is about 6254 trillion cubic feet. Most of these reserves are found in Russia, Iran, Qatar, UAE, Saudi Arabia, USA etc. USA has the largest reserve and is the leading producer of natural gas in the world followed by Russia. India is the 28th producer of natural gas in the world. It is widely used as a fuel in industries and domestic cooking purposes. Petrochemical industries use it as fuel and raw material. It is also used in chemical industries, artificial rubber, plastic, fertilizers, ink, and carbon and as artificial lighting.

Natural Gas

Rank	Country	Production (metric ton)	Share (%)
1	United states	755,010	20.56
2	Russia	641,000	17.45
3	Iran	202,440	5.51
4	Qatar	181,250	4.94
5	Canada	157,179	4.28
	Others		47.28

Trade

- Russia, Qatar, Norway, Canada and Algeria are the leading exporters of Natural gas in the world. Japan, Germany, China, Italy and Turkey are the leading importers of natural gas.

Nuclear Energy

- It is commonly said, this energy holds the key of future. Energy contained within the nucleus of an atom is called nuclear energy. Heavy metals like Uranium, Thorium, Radium, Plutonium and Lithium are the main sources of nuclear energy. However Uranium is the most important source of nuclear energy. The nuclear energy production was started first in USA in 1950. Nuclear energy now provides about 11% of the World's electricity. At present there are more than 450 operable fission reactors in the world. The world's first commercial nuclear power station Calder Hall at Wind scale, England was opened in 1956.

Uranium (U₃O₈)

Rank	Country	Production (metric ton)	Share (%)
1	Kazakhstan	29,113	38.89
2	Canada	16,666	22.26
3	Australia	7,352	9.82

4	Namibia	4,302	5.75
5	Niger	4,101	5.48
	Others		17.80

Do you know?

Most devastating nuclear accidents

1. Three mile Island- March 28, 1979 USA
2. Chernobyl - April 29, 1986, Russia
3. Fukushima Daiich- March 11, 2011, Japan

Renewable sources of Energy:

- All regions of the world are facing the twin problems of fast increasing demand for energy and limited supplies and rapidly depleting conventional sources of energy. Under these circumstances, non-conventional sources of energy are getting more importance. These sources are renewable, clean and non-polluting. They are solar, wind, geothermal, wave, tidal energy, bio-gas etc.

Hydel Power

- Hydro electricity is produced by using the potential energy of water falling from a certain height. The falling water spins the turbine blades and energy is produced. It is a clean eco-friendly and renewable source of energy. It contributes nearly 7% of the world electricity production. China has the largest potential followed by Brazil, Indonesia, Canada and Zaire. China is the largest producer of Hydroelectricity in the world, followed by Canada.

Solar energy

- It is based on mechanical conversion of solar energy into electricity. It is available in abundance but only in the recent period it gets more importance due to technological development. Solar energy is used for various purposes.

Do you know?

Noor Complex is the world's largest concentrated solar power (CSP) plant, located in the Sahara Desert.

Kamuthi, the world's largest single solar power plant

Kamuthi Solar Power Project is a photovoltaic power station spread over an area of 2,500 acres (10 km²) in Kamuthi, Ramanathapuram district. The project was commissioned by Adani Power. With a generating capacity of 648 MW at a single location, The Kamuthi Solar Power Project was completed on 21 September 2016. Around 8,500 workers installed an average of 11 MW of capacity per day to complete the project within 8 months. The entire solar park is connected to a 400 kV substation of the Tamil Nadu Transmission Corp. The solar panels are cleaned daily by a self-charged robotic system.

- USA is the major producer of solar cells at present. It is simply the energy provided by the sun, which makes production of solar electricity possible. **Solar power in India** is a fast developing industry. The country's solar installed capacity reached 26 GW as of 30 September 2018. India expanded its solar-generation capacity 8 times from 2,650 MW on 26 May 2014 to over 20 GW as on 31 January 2018. The country added 3 GW of solar capacity in 2015-2016, 5 GW in 2016-2017 and over 10 GW in 2017-2018, with the average current price of solar electricity dropping to 18% below the average price of its coal-fired counterpart.

Wind Energy

- The wind is a clean, free and readily available renewable energy source. Wind turbines are capturing the wind's power and converting it to electricity. Wind power has become a pillar in their strategies to phase out fossil and nuclear energy. Wind energy is now the second fastest growing source of electricity in the world. It fulfills about 5% of world's electricity demand. The world's largest wind farm is in Altamont pass in California. India is emerging as a major wind power producer of world. The important wind farms in India - (i).The largest wind farms in India are Muppandal in Kanyakumari District of Tamil Nadu and Jaisalmer wind park in Rajasthan. They are the first and second largest wind farms of India. Based on the location of its generation it is classified into:

1. Onshore wind energy and
2. Offshore wind energy

1. Onshore wind energy -Energy generated from the plants located on the land is known as onshore wind energy. Onshore wind has the advantage of being one of the most affordable renewable energy sources. It is cheaper than any other renewable source of energy but it requires more area to install than any other energy.
2. Offshore wind energy -It refers to the use of wind farms developed in seas and oceans. The largest offshore wind farms are currently in the U.K and Germany. These two countries installed 2/3 capacity. London Array is the largest offshore wind farm in the world. The first offshore wind farm is planned near Dhanuskodi in Tamil Nadu.

Tidal energy - It is a renewable energy powered by the natural raise and fall of ocean water. Its production is very small. The first tidal power station was located in La Rance in France. The largest tidal power station is at Sihwa Lake in South Korea and it is the largest tidal power producer in the world. There are three different category of sources from which the tidal energy is generated. The sources are tidal streams, barrages and tidal lagoons.

- India's first attempt to harness tidal power for generating electricity would be in the form of a 3MW plant at the Durgaduani creek in Sunderbans delta of West Bengal. The Gulf of Kutch and Cambay in Gujarat and the Ganges delta in Sunderbans, the world's largest mangrove, are the 3 sites identified as potential areas for tidal power generation in India.

Geo Thermal Energy

- Geo thermal energy is derived from the natural heat of the earth. The United States is the world's largest producer, and the largest geothermal development in the world is The Geysers north of San Francisco in California, the U.S. In India, exploration and study of geothermal fields started in 1970. The GSI (Geological Survey of India) has identified 350 geothermal energy locations in the country. The most promising of these is in Puga valley of Ladakh. The estimated potential for geothermal energy in India is about 10000 MW. There are seven geothermal provinces in India: the Himalayas, Sohana, West coast, Cambay, Son-Narmada-Tapti (SONATA), Godavari, and Mahanadi.

Conservation of Resources

- It takes millions of years for the formation of minerals. Compared to the present rate of consumption, the replenishment rate of minerals is very slow. Hence, mineral resources are finite and non-renewable. Due to this, it is important to conserve the mineral resources.

Ways of Conserving Resources

- ❖ Controlling population growth will reduce the demand for resources.
- ❖ Creating social awareness regarding the importance of conservation of resources
- ❖ Reusing and recycling of resources.
- ❖ Using the renewable source of energy as an alternative to non-renewable resources.
- ❖ Developing the usage methods which minimize the wastages.
- ❖ Propagating the environmental ill effects caused by various products.
- ❖ Choosing the products with less packaging.

APPOLO STUDY CENTRE CHENNAI

6th History

(Term II)

2. Great Thinkers and New Faiths

Intellectual Awakening

The Sixth Century BC (BCE) is regarded as an important period in the history of ancient India. As a land mark period in the intellectual and spiritual development in India, historian Will Durant has rightly called it the “shower of stars”.

Sources

Literary sources

Angas	-	Jain texts
Tripitakas and Jatakas	-	Buddhist texts

Causes for the Rise of Intellectual Awakening and the Birth of Buddhism and Jainism. There were several reasons for the rise of new intellectual awakening. Some of the exploitative practices that paved way for new faiths include:

- The complex rituals and sacrifices advocated in the later Vedic period
- Expensive sacrificial ceremonies
- Superstitious beliefs and practices that confused the common man.
- Upanishads taught as alternative to sacrificial rites were too philosophical, which a layperson could not understand.
- Slavery, caste system, gender discrimination also contributed to the new awakening.

Origin of Jainism

Jainism is one of the world’s oldest living religions. Jainism grounds itself in 24 Tirthankaras. A ‘Tirthankara’, is the one who revealed religious truth at different times. The first Tirthankara was Rishabha and the last one was Mahavira. Jainism gained prominence under the aegis of Mahavira, during the sixth century BC (BCE).

Mahavira (The Great Hero)

Vardhamana, meaning ‘prosperous’, was a kshatriya prince. However, at the age of 30, he renounced his princely status to adopt an ascetic life. He undertook intense meditation. After twelve and a half years of rigorous penance, Vardhamana attained omniscience or supreme knowledge, known as Kevala.

Thereafter, he became Jina meaning ‘one who conquered worldly pleasure and attachment’. His followers are called Jains. Mahavira reviewed the ancient Sramanic

traditions and came up with new doctrines. Therefore he is believed to be the real founder of Jainism.

Original name	-	Vardhamana
Place of Birth	-	Kundhagrama near Vaishali, Bihar
Parents	-	Siddharth, Trishala
Place of Death	-	Pavapuri, Bihar

Unique Teachings of Jainism

- Jainism denies God as the creator of Universe.
- Basic philosophy of Jainism is Ahimsa or 'non -Violence'.
- Ultimate aim of Jainism is attaining moksha or ending the cycle of birth - death - rebirth.
- Jains reject the belief in Last judgement, where God, a supreme being, decides who goes to heaven or hell.
- Jainism advocates that the goodness or quality of one's life is determined by one's karma.

Tri-rathnas or Three Jewels

Mahavira exhorted the three - fold path for the attainment of moksha and for the liberation from Karma. They are:

- Right Faith
- Right Knowledge
- Right action

Jain Code of Conduct

Mahavira asked his followers to live a virtuous life. In order to live a life filled with sound morals, he preached five major principles to follow.

They are:

Ahimsa	-	not to injure any living beings
Satya	-	to speak truth
Asteya	-	not to steal
Aparigraha	-	not to own property
Brahmacharya	-	Celibacy

Digambaras and Svetambaras Jainism split into two sects.

Digambaras

- Digambaras are orthodox and conservative followers.
- Monks of the digambara sect, do not wear any clothing and live naked.
- They are forbidden to have any kind of possessions.
- Digambaras believe that women cannot achieve nirvana or liberation directly.

Svetambaras

- The Svetambaras are considered progressive.
- Monks of Svetambaras sect, wear white robes. They are permitted to have Rajoharana (broom with wollen threads), begging bowl and book.
- Svetambaras believe that women are equally capable of achieving liberation as men.
- Reasons for the Spread of Jainism

The following are the main reasons for the wide acceptance of Jainism in India

- Use of people's language.
- Intelligible teachings.
- Support from rulers and traders.
- Perseverance of Jain monks.
- Influence of Jainism (Samanam) in Tamil Nadu
- In ancient Tamil literature, Jainism is referred to as Samanam.
- There is a Samanar Hill or Samanar Malai in Keelakuyilkudi village, 15 km away from Madurai. The images of Tirthankaras created by Jain monks are found in the hill. It is a protected monument of Archaeological Survey of India.
- In Arittapatti, a small village 25 km from Madurai, on one side of Kalinjmalai hill there are Jain caves called Pandavar Padukkai. Pandavar Padukkai is the bed of Jain saints.
- There is a reference to Aravor Palli, place of living for Jain monks, in Manimegalai.
- According to Silapathikaram, when Kovalan and Kannagi were on their way to Madurai, Gownthiyadigal a female jain monk blessed the couple and accompanied them.
- Puhar, Uraiyur, Madurai, Vanchi (Karuvur), Kanchi all had Jain monasteries.
- Jina Kanchi - Thiruparthikundram, a village in Kanchipuram, has two ancient Jain temples. This village was once called Jina Kanchi.

Buddhism

Gautama Buddha

Gautama Buddha was the founder of Buddhism. His real name was Siddhartha. Like Mahavira, he was also a Kshatriya prince belonging to the ruling Sakya clan. When Siddhartha was only seven days old his mother died. So he was raised by his step mother Gautami.

Original name	-	Siddhartha
Place of Birth-		Lumbini Garden, Nepal
Parents	-	Suddhodana, Maya devi
Place of Death	-	Kushi Nagar, UP

Four Great Sights

- At the age of 29, Siddhartha saw four sorrowful sights. They were:
- An uncared old man in rags with his bent back.
- An sick man suffering from an incurable disease.
- A man's corpse being carried to the burial ground by weeping relatives.

An ascetic

Enlightenment

Buddha, the Awakened or Enlightened One, realised that the human life was full of misery and unhappiness. So at the age of 29 he left his palace and became a hermit. He sacrificed six years of his life towards penance. Nonetheless deciding that self-mortification was not a path to salvation, Buddha sat under a Pipal tree and undertook a deep meditation near Gaya.

- Buddha's Four Noble Truths
- Life is full of sorrow and misery.
- Desire is the cause of misery.
- Sorrows and sufferings can be removed by giving up one's desire.

The desire can be overcome by following the right path (Noble eight-fold path)

Eight Fold Path

- Right view
- Right Thought
- Right Speech
- Right Action
- Right Livelihood
- Right Effort
- Right Knowledge
- Right Meditation

The teachings of Lord Buddha were simple and taught in a language which people used for communication. Since the teachings addressed the everyday concern of the people, they could relate to them. He was opposed to rituals and sacrifices.

Teachings of Buddha

- Buddha's teachings are referred to as dhamma.
- Buddhism accepted the Theory of Karma - meaning that the quality of man's life depends on his deed.
- Buddha neither accepted nor denied the existence of God, but believed in the laws of universe.
- Buddha asserted that attaining nirvana is the ultimate aim of life.
- Buddha advocated ahimsa or non-violence.

- Buddha had rejected the caste system.
- The Wheel of life – represents the Buddhist view of the world.

Buddhist Sangha

Buddha laid foundation for a missionary organization called Sangha, meaning 'association' for the propagation of his faith. The members were called bhikshus (monks). They led a life of austerity.

Buddhist Sects

Hinayana	Mahayana
<ul style="list-style-type: none"> • Did not ship idols or images of Buddha. 	<ul style="list-style-type: none"> • Worshiped images of Buddha.
<ul style="list-style-type: none"> • Practiced austerity. 	<ul style="list-style-type: none"> • Observed elaborate rituals
<ul style="list-style-type: none"> • Believed that Salvation of the individual as its goal. 	<ul style="list-style-type: none"> • Believed that salvation of all beings as its objective
<ul style="list-style-type: none"> • Used Prakrit language. 	<ul style="list-style-type: none"> • Used Sanskrit language
<ul style="list-style-type: none"> • Hinayana is also known as Theravada. 	<ul style="list-style-type: none"> • Spread to Central Asiam Ceylon, Burma, Nepal, Tibet, China, Japan, where middle path was accepted.

Causes for the Spread of Buddhism

- Simplicity of the teachings of Buddha in local language appealed to people.
- Buddhism rejected elaborate religious customs whereas the practice of orthodox Vedic religion insisted on expensive rituals and sacrifices.
- Buddha's emphasis was on observance of Dhamma.
- Buddhist Sanghas played an important role in spreading the messages of Buddha.
- Royal patronage under Ashoka, Kanishka and Harsha also helped the causes of Buddhism.
- Viharas or the Buddhist monasteries became great centres of education. One such centre was Nalanda, where Hiuen Tsang, the Chinese pilgrim, studied for many years.

Jainism and Buddhism - Similarities and Dissimilarities		
Similarities	Dissimilarities	
	Jainism	Buddhism
<ul style="list-style-type: none"> • Both Mahavira and Buddha hailed from royal families. Yet they renounced royal privileges and chose to adopt an ascetic life. • Denied the authority of Vedas. • Taught in the language of the common 	<ul style="list-style-type: none"> • It followed extreme path. • It remained in India only. • It does not believe in the 	<ul style="list-style-type: none"> • It followed middle path. • It spread across many parts of the world. • It emphasise on

<p>people.</p> <ul style="list-style-type: none"> • Admitted disciples from all the castes and from both the genders. • Opposed blood sacrifices. • Believed in the doctrine of Karma. • Emphasized on right conduct and right knowledge instead of performing religious ceremonials and rituals as the means to achieve salvation. 	<p>existence of god, but believes life in every living being.</p>	<p>ANATMA (no eternal soul) and ANITYA (impermanence).</p>
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Influence of Buddhism in Tamilnadu

- Buddhism spread to Tamil Nadu much later than Jainism.
- Manimekalai, one of the epics of the post-Sangam age is a Buddhist literature.
- There is an elaborate description about Kanchipuram in classical epic Manimegalai.
- Kanchipuram was a famous Buddhist Centre, from where Dinnaga, the famous Buddhist logician, and Dharmapala, a great scholar of Nalanda University hailed.
- Hieun Tsang who visited Kanchipuram in the seventh century A.D(CE). noticed the presence of 100 feet stupa built by Ashoka there.

NOTE

- ❖ The word Jain derives from the Sanskrit word Jina, which means conquering self and the external world.
- ❖ Omniscience - It is the ability to know everything or be infinitely wise.
- ❖ **What is Karma?**

The belief that a person's actions in this life determine the quality of his or her later part of the current life and the next incarnation. Moksha - Liberation from the cycle of birth and death Gautama Swami, a chief disciple of Mahavira, compiled the teachings of Mahavira, called Agama sidhantha.

- ❖ Chaitya - A Buddhist shrine or a meditation hall.
- ❖ Viharas - Monasteries/living quarters for monks.
- ❖ Stupas - Built over the remains of Buddha's body, they are monuments of great artistic value.
- ❖ Frescoes (paintings) Frescoes on the ceilings and walls of the Ajanta caves in Aurangabad, Maharashtra - depict the Jataka Tales.
- ❖ Middle path - It refers to neither indulging in extreme attachment to worldly pleasure nor committing severe penance.

9th History

4. Intellectual Awakening and Socio-Political Changes

Introduction

The discovery of iron marked the beginning of the second phase in the history of civilisations. The invention of smelting of iron transformed both production and warfare. Before iron, copper and its alloy, bronze, which were expensive, were employed in production. The copper or bronze edges became blunt quickly and so implements, whether weapons or ploughs, made of bronze could not be used effectively. Iron ore, in contrast, was available in abundance compared to copper or bronze. The effect of iron axe on agriculture was immense. The iron axe enabled cultivators to clear the jungles and the iron plough was used to break the hardest soil. The Assyrian Empire, which made use of iron technology, was ascendant by the beginning of the seventh century BCE. Small kingdoms or city states emerged in China, Asia Minor (modern Turkey), Greece, Italy, Palestine, Lebanon and North Africa.

A new civilisation began to develop in northern India, with the revival of trade and urbanization during the sixth century BCE. In this period of major political and social changes in north India, Buddha and Mahavira were born. In the century following their death, Buddhism and Jainism took root as major religions in India. This meant that new religious orders were coming up with many followers, propagating new beliefs and philosophies. Similarly Zoroastrianism in Persia and Confucianism and Taoism in China became popular during this period.

Religion in the Sixth Century BCE

The new civilisations that emerged in the new Iron Age had certain common features. They were characterised by the proliferation of new crafts, growth of long-distance trade, building of cities and towns, rise of universalistic religions and evolution of a code of conduct. Sixth century BCE was, therefore, a period of exceptional development in all spheres of life such as material, cultural and intellectual. About this time, we find that a number of prominent men, great thinkers and founders of new religions lived, making it a period of great historical importance. Philosophical and religious thinkers such as Confucius in China, Zoroaster in Iran and Mahavira and Buddha in India gained popularity in sixth century BCE.

Confucia

In the sixth century BCE, two great thinkers were born in China: Confucius and Lao-Tse. They laid down the systems of morals and social behaviour for individuals and communities. But after their death, temples were built in their memory and the philosophy they taught was developed into a religion. Known as Confucianism and Taoism

respectively, their books were held in great reverence in China. Confucianism exerted a big influence on not only the political class of China but also on the common people.

Confucius (551-478 BCE)

Confucius was born in the Shantung province of China in 551 BCE. He studied history, poetry, philosophy and music. He is the author of five important works:

1. The Book of Records, which is chiefly ethical, providing guidelines for the regulation of human society;
2. The Book of Odes, illustrating the sound principles of morality in songs;
3. The Book of Changes dealing with metaphysics;
4. The Spring and Autumn Annals, a code of political morality; and
5. The Book of History narrating the events and legends of the early religions of China.

Five Cardinal Principles of Confucius' Ethics

1. Humaneness
2. Righteousness
3. Propriety;
4. Wisdom
5. Trustworthiness

Confucius said that wisdom grows from the family, and that the foundation of society is the disciplined individual in an orderly family. The superior man, according to him, is not merely intelligent or scholarly, but his character should be exemplary. The superior man of Confucius possesses three virtues: intelligence, courage and goodwill. Though Confucius insisted on children obeying parents and wife her husband, he also clearly proposed that "when the command is wrong a son should resist his father and a minister should resist the prince." When asked about government, he said that there are three requisites for it: "That there should be sufficiency of food, sufficiency of military equipment and confidence of the people in their ruler."

The philosophy of Confucius gave the Chinese people an awareness about their political rights. It also clearly listed the government's duty towards the people. Confucius felt that the government should work with an ideal. In matters of national life, Confucius felt that the people in the nation are the actual and proper source of political sovereignty. He advised that the ruler must appoint persons of character in the government to govern the people impartially. Confucianism is often characterised as a system of social and ethical philosophy rather than as a religion.

Taoism

Lao-Tse, the greatest of the pre-Confucian philosophers, was 53 years older than Confucius. Lao-Tse was born in 604 BCE. Disgusted with the intrigues of politicians and the prevailing corruption of his time, he left China to live in a peaceful abode. Lao-Tse wrote a

book in two parts, running into 5,000 words. He then disappeared from the place and no one knew where he died. His book Tao Teh Ching is a guide to the conduct of life.

Teachings of Lao-Tse (Taoism)

- ✓ The cause of human unhappiness in the world is human selfishness. Selfishness creates unlimited human desires, which can never be satisfied.
- ✓ Innature, all the things act in a natural way. The law of human conduct must correspond with nature.
- ✓ Humans live a life under the regulation of someone. This is because they have acquired knowledge and have not remained innocent. On the basis of their acquired knowledge, they have built up an urban civilisation and have made themselves unhappy.

Zoroastrianism

Zoroastrianism is one of the oldest of the revealed world religions. It remained as the state religion of three great Iranian empires, which flourished from the 6th century BCE and dominated much of the Near and Middle East. Zoroaster of Persia is the founder of Zoroastrianism. Zoroaster was pained to find his people worshipping primitive deities. He revolted against it and proclaimed to the world that there is one god, Ahura Mazda (the Lord of Light). The holy book of Zoroastrians is Zend Avesta. It is a collection of sacred literature of different epochs, containing religious hymns, invocations, prayers, confessions, laws, myths and sacred reminiscences. The doctrines and rituals of the Zoroastrians have much similarity to those of the Vedas.

The language of Avesta bears similarity to that of the Indo-Aryan. Linguists have established a close relationship between Indo-Aryan and the languages of West Asia, in particular Iran. The old Iranian language dates back to the second millennium BCE. Later, it incorporated languages of Dravidians and those of aboriginals of the Indian sub-continent. According to the historian Romila Thapar, the old Iranian and Indo-Aryan speakers originally belonged to a single group and later split up because of dissensions.

Teachings

Zoroaster taught that the great object of religion, state or society is the cultivation of morality. The highest religious conception is purity of thought, word and deed. He asserted that Ahura Mazda has seven qualities: (1) light; (2) good mind; (3) right; (4) dominion; (5) piety; (6) well-being; and (7) immortality. Ahura Mazda is omniscient (knows everything), omnipotent (all powerful) and omnipresent (is everywhere). In Zoroastrianism, sacrifice and image worship were discarded. Fire was worshipped as a symbol of the deity and considered the highest form of worship. Charity was made an essential part of religion, and service to the poor was particularly emphasised. Human virtues did not mean only prayer, meditation, sacrifices and rituals. It meant much more, such as fighting evil, making efforts for good and assisting the activity of Ahura Mazda.

This religion ceased to exist in its place of origin, as in the wake of Muslim conquest of Persia (Iran), many of the Zoroastrian families fled to different countries, including India between the eighth century and tenth century CE. With their dwindling numbers and in the face of coercive measures adopted by the Arabs to push through their new faith, as well as the incidents of destruction of fire temples and killing of priests, Zoroastrianism went into a decline. The Parsis, who came to India from Persia first as merchants and later in the wake of persecution, brought Zoroastrianism with them and they have been practicing it ever since.

Impact of Iron Technology in India

In the Gangetic valley, people learnt to produce crops more than that was required for subsistence. So, another section of people took up some professional crafts as their livelihood. Like the farmers, these craftsmen also had to rely on a group of people who collected raw materials and distributed the craft products. Early urbanisation happened in two ways. One was as a result of some villages specialising in black smithy, pottery, carpentry, cloth weaving and the like. The other was on account of the congregation of specialised craftsmen in villages close to where the raw materials were available and where markets were present. Such a concentration enabled villages to evolve into towns and exchange centres. Vaisali, Shravasti, Rajagriha, Kausambi and Kashi were some significant commercial centres of the Gangetic plain.

Religion: Post-Rig Vedic

Three more Vedas – Yajur, Sama and Atharva – were composed after the Rig Veda. Manuals of rituals called Brahmanas, specifying rhyming words to be sung, and two commentaries on certain Rig Vedic hymns called Aranyakas, containing knowledge to be learnt secretly in the forest, and the Upanishads, were compiled in the upper Gangetic plain during 1000–600 BCE.

Post-Vedic

During the post-Vedic period, the Rig Vedic gods such as Varuna, Indra, Agni, Surya and Usha lost their importance. New gods like Siva, Vishnu and Brahma appeared on the religious firmament. Aryans developed the ideas of tapas (virtuous living) and brahmacharya (celibacy). Rites and rituals insisted on by Brahman priests overshadowed the true spirit of the religion. The sacrificial cult, supported by the wealthy and the elite, practised in accordance with the formulae prescribed in Brahmanas, were opposed by Buddha and Mahavira, who revolted against the existing practices and proposed their ethical teachings.

Jainism and Buddhism

In the Gangetic plain, iron plough agriculture required the use of bullocks. But the indiscriminate killing of cattle for Vedic rituals and sacrifices caused resentment. The founders of Jainism and Buddhism did not prescribe killing as a religious rite. They secured

their livelihood mostly by alms. Celibacy and abstinence from holding property made the new teachers much more acceptable than the Brahman priests. The people's resentment about the expensive and elaborate Vedic rituals, animal sacrifice and the desire for wealth eventually took them towards Jainism and Buddhism.

Mahavira and Buddha lived a life of purity and exemplified simplicity and self-denial. They lived in the times of Bimbisara and Ajatashatru, the famous kings of Magadha. The commercial development of the northern cities like Kaushambi, Kushinagara, Benaras, Vaishali and Rajgir added importance to the Vaishyas who turned to Buddhism and Jainism in their eagerness to improve their social status.

Jainism

Mahavira: Birth and Life:

Vardhamana Mahavira was born in 599 BCE at Kundagrama near Vaishali. His mother was Trishala, a Lichchavi princess. He spent his early life as a prince and was married to a princess named Yashoda. The couple had a daughter. At the age of thirty, he left his home and became an ascetic. For over twelve years, Mahavira wandered from place to place, subjecting himself to severe penance and self-mortification. In the thirteenth year of his asceticism, he acquired the highest knowledge and came to be known as Jaina (the conqueror) and Mahavira (great hero). Jains believe that Mahavira came in a long line of Tirthankaras and he was the twenty fourth and the last of them. Rishabha was the first Tirthankara and Parshvanath the penultimate or the twenty third. Mahavira travelled extensively as a preacher in the kingdoms of Magadha, Videha and Anga. Magadha rulers Bimbisara and Ajatashatru were influenced by his teachings. Thousands of people became his followers. After 30 years of preaching, Mahavira died at Pawapuri in 527 BCE at the age of seventy two.

Teachings of Mahavira

The three principles of Jainism, also known as Tri-ratnas, are the following:

1. **Right faith** : Belief in the teachings and wisdom of Mahavira.
2. **Right knowledge** : Acceptance of the theory that there is no God and that the world existed without a creator.
3. **Right action** : It refers to the Mahavira's observance of the five great vows: (a) ahimsa, (b) honesty, (c) kindness, (d) truthfulness and (e) not coveting or desiring things belonging to others.

Spread of Jainism

In order to spread his new faith, Mahavira founded monasteries and engaged munis (Jaina monks) who led a very austere life. In North India, this new faith was patronised by rulers such as Dhana Nanda, Chandragupta Maurya and Kharavela. There was a notable following for Jainism in Karnataka and western India during the 4th century BCE. Jainism

encouraged the public spirit among all who embraced it. Varna system practiced by Brahmans was challenged. People were spared from the costly and elaborate rituals and sacrifices. Mahavira believed that all objects, both animate and inanimate, have souls and various degrees of consciousness. They possess life and feel pain when they are injured.

Split in Jainism

In course of time, Jainism split into two branches, namely the Digambaras (sky-clad) and the Svetambaras (white-clad). The Digambaras were the orthodox followers of Mahavira. The Digambara rejected clothes altogether. Svetambara wore a white dress from head to toe.

Decline of Jainism

The lack of royal patronage, its severity factionalism and spread of Buddhism led to the decline of Jainism in India.

Buddhism

Gautama Buddha: Birth and Life:

Gautama Buddha was the son of Suddhodana, the chief of a Kshatriya clan of the Sakyas of Kapilavastu in present-day Nepal. His given name was Siddhartha. As he belonged to the Sakya clan, he was also known as 'Sakya Muni'. He was born in 567 BCE in Lumbini Garden, near Kapilavastu. His mother, Mayadevi (Mahamaya), died after a few days of his birth and he was brought up by his step - towards worldly affairs, his father got him married at the age of sixteen to a princess called Yashodhara. He led a happy married life for some time and had a son by name Rahula.

One evening, while Siddhartha was passing through the city, he came across an old man who had been abandoned by his relatives, a sick man crying with pain and a dead body surrounded by weeping relatives. Siddhartha was deeply moved by these sights. He also saw an ascetic who had renounced the world and found no sign of sorrows. These 'Four Great Sights' prompted him to renounce the world and search for the cause of suffering. In 537 BCE, he left his palace and went into the forest in search of truth. In the course of his wanderings, he sat under a peepal tree for several days until he attained enlightenment. The place where he attained enlightenment, the Mahabodhi temple, still exists in Bodh Gaya (Bihar). After his enlightenment, Buddha decided to impart his knowledge to the people. He went to Varanasi and gave his first sermon at Saranath. He preached in the kingdoms of Magadha and Kosala. A large number of people became his followers including his own family. After forty five years of preaching, he breathed his last in 487 BCE at Kushinagar (near Gorakhpur in Uttar Pradesh) at the age of eighty.

Teachings of Buddhism

- i. **Four Great Truths:** 1. there is suffering and sorrow in this world. 2. The cause of human suffering is desire and craving. 3. This pain or sorrow can be removed by

suppressing desire and craving. 4. This is to be achieved by leading a disciplined life or by following what Buddha called the 'Noble Eight-fold Path'.

- ii. **Attainment of Nirvana:** According to Buddha, a person should aim at attainment of nirvana or the highest bliss, and it could be achieved by any person by leading a virtuous life and by following the Noble Eight-fold Path.
- iii. **The Noble Eight-fold Path:** Buddha preached a new path to attain the purest state of mind: **1. right views, 2. right aspirations, 3. right speech, 4. right action, 5. right livelihood, 6. right effort, 7. right mindfulness and 8. right contemplations or meditation.** Buddha preached that he who practices the eight-fold path can attain the highest and purest state of mind.
- iv. **Middle Path and Salvation:** Buddha advised his followers neither to indulge in material pleasures and luxuries nor to practice austere penances. He said that by following the 'Middle Path', people could attain moksha or salvation, that is freedom from the cycle of birth, death and rebirth.
- v. **Ahimsa or Non-violence** was another fundamental belief of Buddha. He condemned bloody sacrifices in the yajnas. According to him, love for all living beings was an essential disposition for a good practitioner of Buddhism.
- vi. **Emphasis on Morality:** Buddha advised his followers to do good deeds and lead a moral and disciplined life. He appealed to them to refrain from lying, from killing living beings, from taking intoxicants, from stealing and from leading a sensual life.

Spread of Buddhism

Buddha, in order to carry his message to different parts of India, established the Buddhist sangha or the Holy Order of Monks. The bikshus (monks) and the bikshunis (nuns) were enlisted for spreading the faith and they were required to lead a life of purity and poverty. Buddhism spread to Central Asia, Sri Lanka, Tibet, Southeast Asia, as well as the eastern countries of China, Mongolia, Korea, Japan and Vietnam.

The Split in Buddhism

During the reign of Kanishka, the Buddhist monk Nagarjuna initiated reforms in the way Buddhism was being followed. As a result, Buddhism was split into two as Hinayana and Mahayana.

- i. The *Hinayana* (Lesser Vehicle) was the original creed preached by Buddha. The followers of this form regarded Buddha as their guru and did not worship him as God. They denied idol worship and continued with the people's language, Pali.
- ii. In *Mahayana* (Greater Vehicle), Buddha was worshipped as God and Bodhisattva as his previous avatar. The followers made images and statues of Buddha and

Bodhisattava and offered prayers, and recited hymns (mantras) in their praise. Later, they wrote their religious books in Sanskrit. This form of Buddhism was patronised by Kanishka.

Decline of Buddhism

Buddhism declined in India due to the following reasons:

1. Buddhism was popular in the beginning because it was preached in people's language (Pali). The later texts were written in Sanskrit, which was difficult for the common people to understand.
2. The split in Buddhism into Hinayana and Mahayana was another vital reason. Image worship in Mahayana made no difference between Hinduism and Buddhism.
3. Buddhism lost its royal patronage during the reign of Guptas.
4. Further, the invasions of Huns and Turks almost wiped out Buddhism.

Other Heterodox Sect

Ajivika

The period that produced Buddhism and Jainism also witnessed the birth of a sect known as Ajivika. Its founder was Gosala (Maskariputra Gosala), a friend of Mahavira. For some time, they were together. Later, Gosala moved away and founded the Ajivika sect. As an atheistic sect, Ajivikas rejected the karma theory, which postulated that the condition of men is determined by their past actions. Gosala argued that acts of charity and piety can, in no way, influence this finality. Ajivikas had a small presence in southern India. Under the Cholas, a special tax was levied on them. Three Tamil texts, the Mani mekalai of Buddhists, the Nilakesi of Jains and the Sivajnanasiddhiyar of Saivites, contain the outlines of Ajivika doctrine.

Political Organisation: Pre-Mauryan

The spread of Aryans in the east led to the establishment of new settlements in the Gangetic region. One important result of introduction of iron tools was the easy removal of dense forest cover from the banks of the Ganges. Sedentary agriculture had resulted in a permanent settlement of a clan in a particular area, thereby giving it a geographical identity. Retaining their acquired land required political organisation. The emergence of gana-sangha, chiefdom, has to be seen in this context. The clusters where particular clansmen were dominant came to be known as janapadas.

Gana-sanghas

There were two distinct forms of government at the time of Mahavira and Buddha: monarchical kingdom and clan oligarchies or Gana-sanghas. The Gana-sanghas provided a polity alternative to the kingdoms. Vedic rituals and the rules of varna were not followed.

The Gana-sanghas consisted of either a single clan, such as the Shakyas, Koliyas and Mallas, or a confederacy of clans, such as the Vrijjis and the Vrishnis (a confederacy located at Vaisali). The Gana-sanghas had only two strata: the Kshatriya rajakula, ruling families, and the dasa-karmakara, the slaves and labourers. The dasa-karmakaras had no representation in the Assembly. The presence of various other popular religious cults in Gana-sanghas is in contrast to the socio-cultural system prevailing in kingdoms.

In Gana-sanghas, the head of the clan presided over the Assembly, comprising the heads of families. The clan's head was not chosen following heredity. This Assembly discussed the matters relating to the affairs of the Gana-sanghas and if a unanimous decision was not possible, it was put to vote. There were advisers to the head of the clan. In later days, elaborate judicial procedures also evolved. The income of the Gana-sanghas was drawn from agriculture and cattle rearing, which was confined only to the Punjab and the doab, and to some extent from trade. For the chieftains of the north-west, the income primarily came from trade. Land was owned in common by the clan. They were cultivated by dasa-karmakara. There was only domestic slavery. The use of slaves in production was absent.

Rise of Kingdoms

The 6th century BCE witnessed the establishment of kingdoms, oligarchies and chiefdoms as well as the emergence of towns. From the largest of the chiefdoms emerged kingdoms. Many tribes of Rig Vedic period such as Bharatas, Pasus, Tritsus and Turvasas passed into oblivion and new tribes such as the Kurus and Panchalas rose into prominence. Sixteen mahajanapadas are listed in the Buddhist texts. Linguistic and cultural commonality prevailed in the janapadas, whereas in the mahajanapadas, different social and cultural groups lived. With the emergence of kingdoms, the struggle for supremacy among different states occurred frequently. Sacrifices such as Rajasuya and Asvamedha were performed to signify the imperial sway of monarchs over their rivals. The Rig Vedic title of 'Rajan' was replaced by impressive titles such as Samrat, Ekkrat, Virat or Bhoja.

Growth of Royal Power

The king enjoyed absolute power. The sabha of the Rig Vedic period ceased to exist. The king sought the aid and support of the samiti on matters like war, peace and fiscal policies. However, in spite of the existence of the assemblies, the power of the king kept increasing. The Satapatha Brahmana describes the king as infallible and immune from all punishments. The growth of royal power was reflected in the enlarged administrative structure. The king was now assisted by a group of officers such as Bhugadugha (collector of taxes), Suta (charioteer), the Aksharapa (superintendent of gambling), Kshattri (chamberlain), Gorikartana (king's companion in the chase), Palogola (courtier), Takshan (carpenter) and Rathakara (chariotmaker). In addition, there were the ecclesiastical and military officials like the Purohita (chaplain), the Senani (army general) and the Gramani (leader of the village). In the later Vedic period, Gramani, who acted both a civil and military officer, was the link through which the royal authority was enforced in the village. The king administered justice and occasionally delegated his judicial power to Adhyakshas (royal

officials). In the villages, Gramyavadin (village judge) and Sabha (court) decided the cases. Punishments for crimes were severe.

The Rise of Magadha Kingdom

The polity followed in kingdoms was different from that of gana-sanghas. Kingdoms operated with a centralised government. Political power was concentrated in the ruling family, which had become a dynasty, with succession becoming hereditary. There were advisory bodies such as parishad (ministers) and sabha (advisory council). The sabha collected the revenue and remitted it to the treasury in the capital of the kingdom, from where it was redistributed for the public expenses, such as maintenance of army and salaries to state officials. Of the kingdoms mentioned in the literature of the period, Kashi, Kosala and Magadha are considered to be powerful. The only republic that rivalled these kingdoms was the Vrijiis, whose capital was Vaisali. In the struggle for control for the Gangetic Plain, which had strategic and economic advantages, the Magadha kingdom emerged victorious.

Bimbisara was the first important king of Magadha. Through matrimonial alliances with the high-status Lichchavi clan of Vaishali and the ruling family in Kosala, Bimbisara went on to conquer Anga (in West Bengal now), thereby gaining access to the Ganges delta. Bimbisara succeeded in establishing a comprehensive structure of administration. Village was the basic unit of his administrative system. Apart from villages (gramas), there were fields and pastures as well as wasteland and the forests (aranya, khetra and vana). Each village was brought under a gramani (headman), who was responsible for collecting taxes and remitting them to the state treasury. Officers appointed to measure the land under cultivation and assess the value of crop were to assist the gramani in his task. Land tax (bali) was the main source of revenue to the kingdom and the share of the produce (bhaga) was determined proportionate to the extent of land cultivated.

The term shadbhagin - one who is entitled to a share of one-sixth - referred to the king. Thus, a peasant economy came into being at Magadha. Ajatashatru, the son of Bimbisara, is said to have murdered his father and ascended the throne in 493 BCE. He continued his father's policy of expansion through military conquests. The capital city of Magadha was Rajagriha, which was surrounded by five hills, providing protection to the kingdom from external threats. Ajatashatru strengthened the Rajagriha fort and also built another fort at Pataligrama on the Ganges. It served as the exchange centre for the local produce and later became the Mauryan capital of Pataliputra. Ajatashatru died in 461 BCE and he was succeeded by five kings. All of them followed the example of Ajatashatru by ascending the throne by killing their parent. Fed up with such recurring instances, people of Magadha appointed the last ruler's viceroy Shishunaga as the king.

After ruling nearly for half a century, the Shishunaga dynasty lost the kingdom to Mahapadma Nanda who founded the Nanda dynasty. The Nandas were the first of non-kshatriya dynasties to rule in northern India. Nandas extended the Magadhan Empire still further. Nandas gave importance to irrigation, with the canals they built touching even the Kalinga (Odisha) kingdom. During their period, officials were regularly appointed to collect

the taxes which became a part of the administrative system. Nandas' attempt to build an imperial structure was cut short by Chandragupta Maurya who founded the Mauryan kingdom in 321 BCE.

North-West India and Alexander

Historically, the north-west part of India remained a region under varying suzerainties such as north India, Afghanistan and Persia (Iran). During 6th century BCE, it was part of the Achaemenid empire founded by Cyrus II of Persia. The Indian region had since been providing mercenaries for the Persian armies in their fight against the Greeks. Takshashila or Taxila, as the Greeks called it, was a prominent city in the northwest. It turned out to be a centre for intermixing of Iranian and Indian culture and learning. The ascendancy of Achaemenid empire in north-west ended with the conquest of that empire by Alexander of Macedonia. While marching on the territories of the Achaemenid Emperor Darius III. Alexander, the Greek Emperor entered the Indian provinces in 326 BCE. His campaign in northern India lasted for two years.

The king of Jhelum region, Porus, fought him heroically in the battle of the Hydaspes (Jhelum). Though Porus lost the battle, he was restored to the throne only to be killed by one of Alexander's generals after Alexander's death. Alexander had left his governors in India. But his sudden death at the age of thirty three prompted his governors to leave north-west India to seek their fortune in West Asia. Alexander was a great general and a world conqueror. After his death, his great empire fell to pieces. Ptolemy took Egypt with its capital Alexandria, while Seleucus had Persia and Mesopotamia and part of Asia Minor as his share. Alexander's death, however, cleared the way for the founding of a great empire, the Mauryan empire in India.

Mauryan Empire: State and Society **Mauryan Kings**

Vishnugupta, who was later known as Chanakya or Kautilya, fell out with the Nanda king and vowed to dethrone him. Chandragupta perhaps inspired by Alexander of Macedonia, was raising an army and looking for opportunities to establish a kingdom of his own. On hearing the news of Alexander's death, Chandragupta stirred up the people and with their help drove away the Greek garrison that Alexander had left at Taxila. Then he and his allies marched to Pataliputra and defeated the Nanda king in 321 BCE. Thus began the reign of the Mauryan dynasty. During Chandragupta's reign, Seleucus, the general of Alexander, who had control over countries from Asia Minor to India, crossed the Indus only to be defeated by Chandragupta. Seleucus's envoy, Megasthenes, is said to have remained in India and his account titled Indica is a useful record about Mauryan polity and society.

After gaining control over the Gangetic plain, Chandragupta turned his attention to north-west to take advantage of the void created by Alexander's demise. These areas comprising the present-day Afghanistan, Baluchistan and Makran surrendered without any resistance. Thereupon Chandragupta moved to Central India. According to Jaina tradition,

towards the end of his life, Chandragupta, who had by now become an ardent follower of Jainism, abdicated his throne in favour of his son Bindusara. Bindusara, during his rule, succeeded in extending the Mauryan Empire upto Karnataka. At the time of his death, a large part of the subcontinent had come under Mauryan suzerainty.

Ashoka succeeded Bindusara in 268 BCE. Desirous of bringing the remaining parts of South India into his empire, Ashoka waged a war against Kalinga in the eighth year of his reign. The people of Kalinga fought bravely, but they were defeated after a large-scale slaughter. This war and slaughter affected Ashoka so much that he decided to give up war. Ashoka became an ardent Buddhist after meeting the Buddhist monk Upagupta and propounded his Dharma. The only true conquest, he proclaimed, is the conquest of self and the conquest of men's hearts by the dhamma (Pali) or dharma (Sanskrit). He issued edicts, which were carved out in the rock.

In one of his Kalinga edicts, he tells us his horror and sorrow over the deaths which the war and conquest caused. In yet another edict, he makes it known that Ashoka would not tolerate any longer the death or captivity of even hundredth or thousandth part of the number killed and made captive in Kalinga. Ashoka's passion for protecting life extended to animals as well. Hospitals were constructed for them and animal sacrifice was forbidden. Ashoka sent his son Mahendra and his daughter Sanghamitra to Ceylon to spread his message of Dharma there. Ashoka died after ruling for 38 years.

Mauryan Administration

The Mauryan state in its early years undertook some measures that were positive for the development of society. The state raised taxes to finance a huge standing army and a vast bureaucracy. The Mauryans had evolved a very efficient system of governance. The king, as the head of the administration, was assisted by a council of ministers. There were mahamatriyas, who functioned as secretaries to the ministers. The person in charge of revenue and expenditure was samaharta. The empire was divided into four provinces and these provinces were administered by governors, who were usually princes or from the royal family.

The district was under a sthanika, while gopas were in charge of five to ten villages. The urban administration was under a nagaraka. Six committees with five members each carried on their duties under him. They were to take care of the foreigners, to register the birth and death of the citizens, to look after trade and commerce, to supervise different manufactures and to collect excise duties and custom duties respectively. Like the city or town administration, the military department was also managed by a board of 30 members, split into six committees, with five members in each of them. At the village level, there was gramani, whose responsibility was maintaining the boundaries, keeping the records of land and a census of population and livestock. In order to keep a vigil over the entire administration, including the conduct of officers, a well-knit spy system was evolved and put in place. Justice was administered through well-established courts in all major towns and cities. Punishment for crimes was severe.

The state used the surplus appropriated for the development of the rural economy by founding new settlements, granting land and encouraging the people to settle as farmers. It also organised irrigation projects and controlled the distribution of water. There was state control of agriculture, mining, industry and trade. The state discouraged the emergence of private property in land and banned its sale. The Mauryan state gave further boost to urban development. It secured land trade routes to Iran and Mesopotamia, as well as to the kingdoms of northern China. Arthashastra refers to Kasi (Benares), Vanga (Bengal), Kamarupa (Assam) and Madurai as textile centres. The distribution of black polished ware of northern India as far as South India is indicative of the extent of trade during the Mauryan rule. Trade contributed to urbanisation in a big way. New cities such as Kaushambi, Bhita, Vaishali and Rajagriha had sprung up in the doab region.

Educational Centres

Monasteries and temples served the purpose of imparting education. Nalanda was a great monastery built by the Magadha Empire. Educational centres offered Buddhist and Vedic literature, logic, grammar, medicine, philosophy and astronomy. Even the science of war was taught. Nalanda became the most renowned seat of learning in course of time. It was supported by the revenues of 100 villages. No fees were charged to the students and they were provided free board and lodging.

11th Volume (I)

Lesson III

Rise of Territorial Kingdoms and New religious Sects

Introduction

Aryans began migrating eastwards from about 1000 BCE. As they moved eastwards, they encountered thick forests. Iron played a significant role in the clearing of the forest. The fertile soil of the Gangetic valley and the use of iron ploughs improved agricultural productivity. Iron also played a big role in improving craft production such as pottery, carpentry and metal working. This in turn paved the way for urbanization. In the meantime, a spirit of scepticism began to pervade questioning every custom and orthodoxy in the belief system in the society leading to the rise of new ideas and faiths. Of these several competing alternate beliefs, only Jainism and Buddhism touched the ears of the people. In this lesson we focus on the territorial identities and the new heterodox religious sects that emerged during this period.

Impact of Iron Technology: Differing Views

The movement of the Indo-Aryans towards the east was aimed at accessing the iron ore of south Bihar and gaining a near monopoly over it. The iron ore was responsible for the political dominance attained by the state of Magadha. -D.D. Kosambi.

Iron axes and iron ploughs led to the expansion of area under cultivation in the Ganges valley. -R.S. Sharma.

That the use of iron axe and iron plough facilitated clearing of forests and generation of agricultural surplus is a myth because even as late as 16th and 17th centuries the Gangetic plain was heavily forested. -Makkhan Lal.

The forests of Ganges region could have been cleared by means of fire. -A. Ghosh and Nihar Ranjan Ray.

Sources

The epics Mahabharata and Ramayana, the dharmasastras, Buddhist texts such as the Tripitakas and Jatakas, Jaina texts and Greek accounts such as that of Arrian constitute literary sources for the period. Archaeological excavations have corroborated the literary evidences.

- i. Iron objects such as hoes, sickles, knives, hooks, nails, arrowheads, vessels and mirrors confirm the widespread use of iron technology.
- ii. Textiles, beads, pottery, ivory objects, ceramics and glassware and artefacts of other metals are found.
- iii. A large number of terracotta artefacts have also been found. Some of the urban features revealed by excavation of the various cities are as follows:

- iv. Northern Black Polished Ware (NBPW), considered luxury-ware and “urban hallmark” have been excavated.
- v. The towns were enclosed by a moat and sometimes they were fortified.
- vi. Houses were built with mud bricks and in some cases with burnt bricks.
- vii. Facilities such as drains, ring wells and soak-pits are found, confirming the second urbanisation in the Gangetic plains.

Developments in Gangetic plain

Agriculture improved during this phase of development in the middle Gangetic plains. Wet rice cultivation began to yield more produce of rice than other crops, thus creating the necessary agrarian surplus. Protected irrigation alone was not responsible for the surplus production of rice. Iron technology also played a crucial role. While it is debated whether iron axes aided clearing of the forests or whether iron ploughshares increased agricultural yield, there can be no two opinions that it played a critical role in improving the production of artefacts. The impact of iron technology is better understood if one considers “the technical changes which the introduction of iron implements would have brought about in various craft activities”. Leisure time provided by agricultural surplus and technology led to growth of crafts, which in turn aided vibrant trade.

Second Urbanisation

Agricultural surplus, the growth of crafts and trade, and the growing population led to the emergence of towns in the Gangetic plains. This is called the second urbanisation in Indian history after the first urbanisation evident in the Harappan Civilization. Different types of towns came into being:

- i. Political and administrative centres such as Rajgriha, Shravasti, Kaushambi and Champa
- ii. Centres of trade and commerce such as Ujjain and Taxila
- iii. Holy centres such as Vaishali.

Janapadas to Mahajanapadas

The Later Vedic period (900–600 BCE) witnessed the transition from a tribal polity based on lineage to a territorial state. The janas who migrated eastwards began to settle down in various regions. The loyalty of the people shifted from jana (tribe or clan) to janapada (territory). Janapada literally meant ‘the place where the tribe sets its foot upon.’ The janapadas fought with one another for resources and political dominance. Some janapadas extended their territories and brought various janas within their jurisdiction. Such janapadas grew into mahajanapadas.

Territory, people, government and sovereignty are important elements of a state. All these elements were found in some of the mahajanapadas. The mahajanapadas represented the emergence of territorial kingdoms that ruled over people (jana). The king headed the government aided by a centralised administration. The king was also the sovereign ruler. The king levied taxes out

of agricultural surplus and redistributed it and ensured maintenance of law and order in a hierarchical society by force and coercion. These features marked the formation of state in the Gangetic plains.

Sixteen Mahajanapadas

According to Puranic, Buddhist and Jain traditions, there were sixteen mahajanapadas.

1. Gandhara
2. Kamboja
3. Assaka
4. Vatsa
5. Avanti
6. Shurasena
7. Chedi
8. Malla
9. Kuru
10. Panchala
11. Matsya
12. Vajji (Vrijji)
13. Anga
14. Kasi
15. Kosala
16. Magadha

The mahajanapadas are classified as gana-sanghas and chiefdoms based on the nature of their polity.

Gana-Sanghas

The proto-states of the Gangetic region were known as janapadas and comprised chiefdoms, republics and small kingdoms. Sixteen mahajanapadas find mention in the early texts. There were also gana-sanghas or oligarchies, which were centred on clans. The Vrijjis were one of the best known of the gana-sanghas, and Vaishali was their capital in the Mithila region. These kingdoms did not come under the single decision-making authority of a king but decisions were taken on a collective basis by the heads of the different clans together. There were also smaller kingdoms such as Kosala and Kasi. It is interesting to note that the names of the clans, such as Ikshvaku and Vrishni, as well as these early kingdoms, are all mentioned in the two epics, Ramayana and Mahabharata.

Monarchies or Kingdoms

The mahajanapadas on the Gangetic plains were all monarchies. Vedic orthodoxy was an established practice in these kingdoms. The priestly class enjoyed a preeminent status in the mahajanapadas unlike in the gana-sanghas. The kingdoms were governed by kings and the administration was centralised. The brahman priests provided legitimacy to the king

through various rituals. The kingship was hereditary and the succession was in most cases based on the law of primogeniture. The king was assisted by councils called parishad and sabha. The councils were advisory in nature. The king appropriated the agricultural surplus through land revenue apart from a few other taxes. Bali was a tax imposed based on the area of cultivable land. Bhaga was obtained as a share of the produce. Kara and Shulka were some of the other taxes collected during this period. Thus the king raised revenue through taxes to maintain an elaborate administrative structure and an army.

The richer landowners were called grihapatis. These landowners employed labourers called dasas or karmakaras. The smaller landowners were known as saskas or krishakas. The society was stratified on the basis of varna. It emerged as a marker of status. Cultivators and artisans were identified as the shudras. A new social category that emerged during this period was placed below the shudras in the social hierarchy and considered untouchables. They were forced to live on the fringes of the settlements and subsisted on hunting and gathering their food. They were marginalised and given only menial jobs as urbanisation was on the rise. They had their own language, which was different from that spoken by the Indo-Aryans.

Emergence of Heterodox Thinkers

In the sixth and fifth centuries before the Common Era, north India underwent a remarkable intellectual awakening that profoundly impacted India and influenced its culture in subsequent millennia as well. The impact also swept across South Asia. This awakening was the outcome of questioning the existing philosophy by a host of heterodox thinkers. Gosala, Gautama Buddha, Mahavira, Ajita Kesakambalin and other thinkers renounced the world and wandered across the Gangetic plains, contemplating and reflecting on the social and cultural scenario of their times. It was not uncommon to see ascetics crisscrossing the Gangetic plains, propounding new ideas. The teachings of these ascetics addressed the needs of a rapidly changing society, which saw the emergence of new polity, the coming into being of urban centres, development of crafts, and an increase in long-distance trade. These thinkers questioned the Vedic ideas of soul, mind and body, thereby paving the way for the rise of new religious sects. Even though all of them questioned the Vedic religion, there was rivalry among them. Eventually Buddhism and Jainism emerged as popular faiths.

Causes of Intellectual Awakening

Sixth century BCE was a period of intense intellectual ferment. There are several reasons for the emergence of this ferment.

1. State formation and the rigidity of the Vedic religion constrained the liberty of thought and action. A revolt against religious practice of following dogmas found its articulation in heterodox sects.

“When attempts are made to smother the intellectual curiosity of people, the mind of man rebels against it, and the inevitable reaction shows itself in an impatience of all formal authority and a wild outbreak of the emotional life long repressed by the discipline of the ceremonial religion”. -Dr. S. Radhakrishnan, the philosopher

President of India.

2. The emergence of territorial identities accelerated the process of socio-political and economic changes. The elite class, disillusioned with the system in place, began to move in protest towards the heterodox religions blossoming in Magadha or middle Ganges plains.
3. As the Vedic religion was not fully organised, its reach did not permeate into the society and hence people did not find it difficult to follow the newly emerging religious sects.
4. With urbanisation and expansion of trade, new classes of merchants and bankers such as the shis sought higher social status appropriate to their economic status.
5. The grievance of Kshatriyas was that they were denied a staged life of ashramas, a privilege permitted only to Brahmins in the Vedic texts.

Heterodox Sects

The ascetic wanderers and teachers attracted groups of followers and established various sects. Their philosophies encompassed antinomian (belief that divine grace takes away the necessity of obeying moral law), materialist and fatalist elements. They were heterodox sects that rivalled the orthodox Vedic religion and many of them came into existence during this time. A Buddhist text, Samannaphala Sutta, while making a reference to Ajatashatru of Magadha meeting Gautama Buddha, mentions that before his meeting, the former had a philosophical discourse with the leaders of the various sects such as Purana Kassapa, Makkhali Gosala, Ajita Kesakambalin, Pakudha Kachchayana, Sanjaya Belatthiputta and Nigantha Nataputta (Mahavira). They are described as "homeless wanderers" of long standing (chira-pabbajito), founders of sects (tithakaro) and leaders of their orders (ganachariyo). These sects were the key rivals of Buddhism. Their doctrines were shown unsatisfactory while that of Buddha was acceptable to Ajatashatru.

Ajivikas

The Ajivikas are believed to have evolved from one of the many ascetic groups of the times. According to Buddhist records, Nanda Vaccha was considered the founder of the Ajivika sect. He was succeeded by Kisa Samkicca, followed by Makkhali Gosala, who was the third and the greatest of the Ajivikas. Gosala met Mahavira for the first time in Nalanda and their friendship lasted for six years. They separated due to doctrinal differences. Gosala then went to Sravasti, where he was patronised by a rich potter woman called Halahala. He believed in the doctrine of reanimation, and criticised and ridiculed the severe austerities of the Vedic ascetics. Being rival sects, both the Buddhist and Jaina accounts portray Gosala as a person of vicious character. Sravasti was the headquarters of the Ajivika sect. The Ajivikas were naked ascetics. The basic principle of the Ajivikas was niyati or fate: they believed that nothing in this world could be changed as everything was predetermined. Everyone has to pass through a series of transmigrations to put an end to pain. According to Ajivikas, there were six inevitable factors in life, viz. gain and loss, joy and sorrow, and life and death. Two other preachers, Purana Kassapa and Pakudha Kachchayana, joined the Ajivikas after the death of Gosala and infused new life to it.

Purana Kassapa held the view that actions did not have any merit or demerit. No evil is caused by torture, hurting and killing others. Similarly, no merit is acquired by generosity, self-control and truthful speech. Humans cannot change anything by action as everything is predetermined. According to him, nonaction is the way out of life. Pakudha Kacchayana believed that the world was made of seven substances that were “unmade, irreducible, uncreated, barren, stable as a mountain peak, standing firm like a pillar – that do not alter, do not change, do not interfere with one another, are incapable of causing one another pleasure, pain or both pleasure and pain”.

The Ajivikas had rich lay disciples such as potters and bankers. The Ajivika sect spread across the length and breadth of the country, though their influence was much less compared to that of Buddhism and Jainism.

Ajivikas in Tamil Land Manimekalai, Nilakesi and Sivagnanasiddhiyar have references to Ajivika doctrine. Nilakesi’s quest for truth takes her to Buddha and Puranan. Puranan was the leader of the Ajivika sect. The Cholas are known to have levied a tax on the Ajivikas.

Ajita Kesakambalin (Ajita of the Hair Blanket) was a materialist. He believed that every human was made of four primary elements: fire, water, wind and sense. After death, these elements return to the earth. There is no life after death. He said, “Generosity is taught by idiots. The words of those who speak of existence after death are false, empty chatter. With the breakup of the body, the wise and the foolish alike are annihilated, destroyed. They do not exist after death.”

Lokayata and Carvaka

The term “lokyata” signifies materialist thought. Indian materialism has also been named Carvaka after one of the two founders of the school. Carvaka and Ajita Kesakambalin are said to have established Indian materialism as a formal philosophical system. Carvakas developed the concept of scepticism and believed in the pursuit of knowledge through experience. They questioned the authority of Vedas.

Rivalry among Heterodox Sects

There was intense rivalry among the various heterodox sects. This is evident from the various religious accounts of the period. Buddhist and Jaina texts not only mention other heterodox sects but also belittle them. For example, Bhagavatisutra, a Jaina text, provides a poor account of Makkhali Gosala. He is described as born to a poor mendicant in a cowshed. It accuses Gosala becoming a disciple of Mahavira for material comfort as the latter had many wealthy patrons. It describes “the greatest Ajivika teacher as a person of most contemptible character, a man of low parentage, and (sic) of low profession”. Buddhagosa also ridicules Gosala in his commentaries. He describes Gosala as a servant fleeing naked from his master on committing a mistake even disregarding the fact that his garment had fallen. A Buddhist Jataka story “compares the heretics with the fire-flies, whose faint light faded before the rising glory of the sun, i.e., the Buddha”.

Jainism

Among the various sects, the sect led by Vardhamana Mahavira (referred to as Nigantha Nataputta by Buddhist texts) bloomed into a religion called Jainism. It was earlier known as Nirgranthas (free from bonds). Mahavira was known as Jina (conqueror) of the soul and hence his sect came to be known as Jainism. According to Jain tradition, Mahavira was not the founder of Jainism, but the last of the 24 Tirthankaras or 'maker of fords' (ford means a shallow place in river or stream to allow one to walk across). According to Jain tradition, Risabha was the founder of the sect. He is considered the first Tirthankara. Yajur Veda mentions three of the Tirthankaras, viz., Risabha, Ajitanatha and Aristanemi. Mahavira organised his members into monastic and lay followers.

Life of Mahavira

Vardhamana was born around 540 BCE in Kundagrama, a suburb of Vaishali. He was a member of the ruling family of agana-sangha and his father Siddhartha was the chief of the Jnatrika clan. His mother Trishala was a Lichchavi princess and sister of its chief Chetaka. Mahavira was closely connected to rulers of Magadha, Anga and Videha through his mother. From his childhood, he was attracted to spiritual life. After the death of his parents, he left his home at the age of 30 and wandered about as a mendicant for 12 years in search of true knowledge. He practiced severe austerities and discarded his garments. During the course of his wanderings, he met Gosala and spent six years with him before they parted due to differences. In the 13th year of his wandering, at the age of 42, Vardhamana attained enlightenment or Nirvana. He then became a Tirthankara and came to be called a Jina or Mahavira (the Great conqueror). He preached for 30 years and was patronised by the rich and the elite. He died about 468 BCE at the age of 72 in Pavapuri near Rajgriha. He fasted unto death according to Jain ideals. His death or final liberation was a joyous event for the Jains.

Mahavira had a huge following. In the early stages, his followers were drawn from different sections of the society. However, in course of time, Jainism was confined to the trading and money-lending community. Jainism's insistence on non-violence closed other occupations, including agriculture, as it prescribed refraining from intended or unintended killing. About 500 years after Mahavira's death, in about 79 or 82 CE, a schism occurred in Jainism. Magadha was affected by severe famine and some of the Jain monks under Bhadrabahu went south to maintain their strict discipline. They remained without garments and were known as Digambaras (space-clad or naked). Others stayed back under the leadership of Sthulabhadra and adopted a white garment and were known as Svetambaras (white-clad). The schism weakened Jainism in Magadha, but it found ardent followers in Gujarat, Rajasthan, Madhya Pradesh, Orissa and Karnataka. On the death of Bhadrabahu, Sthulabhadra held a Great Council at Pataliputra, which compiled the Jain canon. It consisted of 12 angas (limbs). Another council was held in Valabhi, Gujarat, in the 5th century CE. It added 12 upangas (minor sections). The Jain monks not only wrote religious treatises but also promoted secular literature. Acharrangasutra, Sutakritanga, and Kalpasutra are the earliest Jain texts. Most of the early Jain texts were written in Ardha-Magadhi, the language of the common people.

Tenets of Jainism

The central tenet of Jainism is non-violence. No other religion lays as much emphasis on non-violence as does Jainism. It also criticises human emotions. Jainism denies the existence of God. In its early stages, deity was not worshipped in Jainism. It emphasises that salvation cannot be attained by worshipping god or by sacrifices. It stipulates that one can escape misery only by performing austerities.

Mahavira rejected Vedic authority. Hence, Jainism is an unorthodox religion. According to Jainism, the world has no beginning or end. It goes through a series of progress and decline according to an eternal law. Jainism advocated dualism: the world is made of soul (jiva) and matter (ajiva), which are eternal. The coming together of jiva and ajiva creates karma (action), which leads to an endless cycle of birth and rebirth. To free oneself from karma, one has to practice severe austerities and self-mortification. Therefore, in Jainism, only monks could achieve liberation from the cycle of birth and rebirth.

Triratnas

Jain discipline requires adherence to certain rigorous rules. The Jains are required to follow three principles called Triratnas or Three Gems.

- (1) Right faith (samyag-darshana);
- (2) Right knowledge (samyag-jnana);
- (3) Right conduct (samyag-mahavrat)

Five Great Vows

The monks have to undertake the five great vows (pancha-mahavrat):

- (1) Not to kill or injure (ahimsa);
- (2) Not to steal (asteya);
- (3) Not to lie (satya);
- (4) Celibacy (brahmacharya);
- (5) Not to possess property (aparigraha)

Non-Violence

The five vows are common to both the monks and lay followers. The monks were to observe the vows more rigorously than the lay followers. As Jainism placed great emphasis on non-violence, strict observers of the faith wear a muslin cloth around their mouth and nose so that they would not inhale small insects even by mistake. To avoid trampling on ants and other insects, Jain monks used feathers to sweep the path before walking. Jains could not practice agriculture or other crafts that involve killing or injury to living organisms. Hence they took to trading and money-lending and excelled in it. As a result, they were closely associated with urbanisation.

Jainism is an egalitarian religion. It does not sanction any inequality based on birth. It is one's deeds that determine one's status in society and not birth. Jainism believes that "by one's action one becomes a Brahmin, a Kshatriya, or a Vaishya, or a Sudra." Pride based on birth is considered as sin. Women were admitted into the monastic order. However, as a woman one cannot attain salvation. By accumulating merit by good deeds, a woman could be reborn as a man and then strive to attain salvation.

Jainism in Tamilnadu

Jainism spread to Tamil Nadu from about the third century CE. Jain rock shelters are found in large numbers around Madurai and other places. The mention of death of Kopperuncholan by fasting in cholPurananuru is considered by some to be similar to Jain practice of sallekhana. Jain influence is strong in early Tamil literature. Naladiyar, Palamoli, Jivaka Chinthamani, Yapperunkalam Karikai, Neelakesi are some of the prominent Jain works in Tamil. As early as c. 470 CE a Jain Dravida Sangha was established in Madurai by Vajranandi, a disciple of Boojya Padha. Jainism has survived in Tamil Nadu and there are several Jain temples. One of the Jain temples is at Tiruparuthikunram near Kanchipuram with beautiful ceiling paintings. This part of Kanchipuram was known as Jain Kanchi.

Decline of Jainism in India

Absence of royal patronage, split amongst Jains as Digambaras and Svetambaras, lack of missionary zeal, factionalism and the severity of practices, and spread of Buddhism as a rival faith led to the decline of Jainism in India.

Buddhism

Among the heterodox sects, Buddhism was the most popular. It went on to emerge as a powerful religion patronised by various rulers. It was so influential that its ideas were adopted by Asoka as a state policy. Though it virtually disappeared from India for nearly a millennium, it spread far and wide and is widely followed even today in the South-east and East Asian countries. In the mid-twentieth century it was revived in India by Dr. B.R. Ambedkar.

Life of Buddha

Gautama Buddha was born as Siddhartha in the Sakya clan to its king Suddhodhana and his chief queen Mahamaya. His mother Mahamaya dreamt of a white elephant with six tusks entering her womb when she was pregnant. Learned men prophesied that the child would either become 'a Universal Emperor or a Universal Teacher'. While Mahamaya was going to her parents' home, Siddhartha was born in a park in Lumbini near Kapilavastu. Siddhartha grew in luxury as a royal prince. He married Yashodhara and had a son named Rahula. When he was riding on his chariot with his charioteer one day outside the palace, he saw an old man, a sick man, a corpse and finally a religious mendicant.

Overcome by remorse at the misery of people, he left his palace in the dead of night in search of eternal truth. Herod in his chariot pulled by his favourite horse Kanthaka and driven by his charioteer Channa far away from the city. He cut his hair and sent it along with his discarded garments and jewellery to his father. This is known as Mahabhiraskramana or the Great Going Forth.

Siddhartha wandered about and joined Alara Kalama as a disciple for a brief period. He also sought guidance from a hermit Uddaka Ramaputta. Siddhartha was not satisfied with their path and practised severe austerities, which left him nearly dead. One day, he ate rice boiled in milk given by a milkmaid named Sujata and began meditation under a pipal tree in Bodhgaya. After 49 days of meditation, he attained enlightenment, at the age of 35. Thereafter, he came to be called Buddha or the Enlightened. He then delivered his first sermon in a deer park in Sarnath near Varanasi. This event is described as Dharmachakra-parivartana or 'wheel of the great law'. He spoke about the Four Noble Truths and the Middle Path. He established Sangha and spread his ideas far and wide. Buddha and his followers travelled for eight months of the year and stayed at a place for four months of the rainy season. At the age of 80, he passed away in Kusinagara. This is known as Parinirvana. The prominent disciples of Buddha were Sariputta, Mahamoggallana, Mahakaccayana and Ananda. Buddha had a huge following among both the royalty and lay persons.

Buddhist Councils

After the death of Buddha, the tenets and other aspects of Buddhism were decided upon in the councils of Buddhist monks. Over a period of time, four Buddhist councils were held. The First Buddhist Council was held at Rajgriha after Buddha's death. It was headed by Upali. In this council, Upali recited the Vinaya Pitaka. Ananda recited Sutta Pitaka. The Second Buddhist Council met at Vaishali a century after Buddha's death. The Buddhist Order split into two later. One was called the Sthaviravadins or 'Believers in the Teachings of the Elders' and the other known as Mahasanghikas or 'Members of the Great Community'. The Third Buddhist Council was held at Pataliputra. It was convened by Asoka. The Sthaviravadins established themselves strongly and expelled the heretics. The last section called "Kathavatthu" was added to Abhidhamma Pitaka. The Fourth Buddhist Council was held at Kashmir during the reign of Kanishka. Sarvastivadins were an important sect of Buddhism. Its doctrines were compiled in Mahavibhassa.

Buddhist Sects

In course of time, Sthaviravadins, Mahasanghikas and Sarvastivadins emerged as major sects of Buddhism. New ideas emerged among the Sarvastivadins and Mahasanghikas. It led to the emergence of Mahayana and Hinayana (the Great and Lesser Vehicles) in Buddhism. Mahayana or the Great Vehicle became popular and influential in India. Nalanda University was an important centre of Buddhist learning and was patronised by the Palas. It spread to China and Japan. Hinayana or the Lesser Vehicle became popular in Sri Lanka, Burma, Thailand and other South-east Asian countries. By the end of the Gupta period, Vajrayana or the Vehicle of the Thunderbolt emerged. It was popular in Bengal and

Bihar. It was influenced by primitive local cults and spread to Tibet in the 11th century CE. The Vikramasila University in Bihar was an important centre of Vajrayana Buddhism. Buddhism in India began to decline with the onset of the Bhakti movement. Slowly Buddhism came to be influenced by Hindu practices. Soon, Buddhism was incorporated into Hinduism, and Buddha came to be considered as an avatar of Vishnu in some traditions.

Buddhist Literature

The Buddhist texts were compiled in Pali. The Pali canons are called as the Tripitakas (Three Baskets). They are Vinaya Pitaka, Sutta Pitaka and Abhidhamma Pitaka. Vinaya Pitaka deals with monastic rules and moral disciplines. Sutta Pitaka dwells upon discourses and teachings of Buddha. Abhidhamma Pitaka expounds Buddhist philosophy. The Sutta Pitaka, which contains the teachings of Buddha, is divided into five groups or Nikayas. They contain popular works such as Theragatha and Therigatha (Hymns of the Elder Monks and Nuns) and Jataka tales (Buddha's deeds in previous births as Bodhisattva). Other important Buddhist works include Milinda Panha, a discussion

between Greco-Bactrian king Menander and Buddhist monk Nagasena, and Ceylonese chronicles Dipavamsa (Island Chronicles), Mahavamsa (Great Chronicle) and Culavamsa (Lesser Chronicle).

The Starving Tigress:

A Jataka Tale Born in a family renowned for purity of conduct and great spiritual devotion, the Bodhisattva became a great scholar and teacher. With no desire for wealth, he went to a forest and led a life of an ascetic. It was in this forest he encountered a starving tigress, which after giving birth to cubs was about to eat her own new born cubs for survival. With no food in sight, the Bodhisattva offered his body as food to the tigress out of compassion

Four Noble Truths of Buddha

The four noble truths prescribed by Buddha are as follows:

1. The Noble Truth of Suffering: Birth, age, death, unpleasantness, separation, unfulfilled wish.
2. The Noble Truth of the Origin of Suffering: thirst for pleasure, power, long life, etc. are the causes for sorrow.
3. The Noble Truth of the Cessation of Suffering (Nirvana): complete stopping or release from sorrow.
4. The Noble Truth of the Path Leading to Cessation of Suffering: the Noble Eight fold Path or the Middle Path.

Buddhism believed in karma and the doctrine of rebirth. Past actions determine one's condition in this birth. To be free from karma or the cycle of rebirth is to attain nirvana. It can be attained by following the Middle Path.

Buddha's Middle or Eightfold Path

(1) Right Views; (2) Right Resolve; (3) Right Speech; (4) Right Conduct; (5) Right Livelihood; (6) Right Effort; (7) Right Recollection; (8) Right Meditation.

Hence Buddha did not mention or talk about God. He neither accepted nor denied the existence of God. Buddhism advocated equality. It preached non-violence or ahimsa and love towards all. However, it was a moderate religion compared to Jainism's insistence on ahimsa. It promoted trade and capitalism as it was against waste and advocated frugality. Jobs involving any form of killing were forbidden. Trade in weapons, living beings, meat, liquor and poison were not permitted.

Buddhism in Tamilnadu

Buddhism spread to Tamizhagam from about third century BCE. Asokan inscriptions found in the Deccan region vouch for the spread of Buddhism to southern parts of India. Archaeological evidences also reveal the existence of a Buddhist complex of the fourth century CE in Kaveripattinam. Quoting Pattinapalai, Naboru Karashima refers to merchants in Kaveripattinam who as vegetarians were opposed to animal sacrifice. From this one could presume the influence of Buddhism in Tamil country. Manimekalai by Sattanarone of the twin epics of the post-Sangam age is a Buddhist literature. Similarly the now extinct Kundalakesi is a Buddhist epic. Kanchipuram in the early Christian era was a flourishing Buddhist centre. Dinnaga and Dhammapala who headed the famous Nalanda University were renowned Buddhist scholars from Kanchipuram. Hiuen Tsang who visited Tamil country mentions in his travel accounts about several Buddhist Stupas built by Asoka in Kanchipuram.

A Buddhist temple was built in Nagapattinam at the request of a Chinese ruler during the reign of Pallava king Narasimhavarman II (CE 695-722). Chinese monk Wu-hing visited the monastery. In CE 1006, during the reign of Rajaraja I, Srivijaya King Mara-wijayottungavarman built a Buddhist temple in Nagapattinam. It is called the Soolamani-varma-vihara.

Decline of Buddhism in India

Buddhism faced divisions from time to time. Division into various splinter groups like 'Hinayana', 'Mahayana', 'Vajrayana', 'Tantrayana' and 'Sahajayana' led Buddhism to lose its originality. Pali and Prakrit were the spoken languages of people of north India and it was through these languages the message of Buddhism was spread. But ever since the times of Fourth Buddhist Council held during the reign of Kanishka, Sanskrit had come to be adopted. Buddhism thereupon became unintelligible to common people.

Buddhism also lost its royal patronage after Harshavardhana. In contrast, the Vedic religion got royal patronage first from Pushyamitra Sunga and later from imperial Guptas. The role of the exponents of Bhakti movement like Ramanuja, Ramananda also helped to restore the glory of Vedic religion.

The invasion of Huns gave a deathblow to Buddhism. Toramana and Mihirakula, the two Hun chiefs had a deep-seated hatred for the Buddhists and they almost liquidated the Buddhists living in the north-west India. To make matters worse, the Rajput rulers who could not reconcile to the Buddhist concept of nonviolence, and as ardent advocates of Vedic religion started persecuting the Buddhists. Finally the invading Arabs and Turks forced the Buddhist monks to flee from India and seek asylum in Nepal, Tibet and Ceylon. In consequence Buddhism faded away in India.



7th term – II
Unit II
The Mughal Empire

Introduction

A new empire began in India with the arrival of the Mughal king Babur. Except for the brief reign of Sher Shah of Sur dynasty, the Mughal rule lasted from A.D.(CE) 1526 to 1707. These were the years when the fame of the Great Mughals of India spread all over Asia and Europe. After six Great Mughal Emperors, the empire began to disintegrate.

Babur (1526–1530)

Ancestry and His Early Career

Zahir-ud-din Muhammad Babur, popularly known as Babur, was the founder of the Mughal Empire in India. The term 'Mughal' can be traced to Babur's ancestors. Babur was the great grandson of Timur (on his father's side). On his mother's side, his grandfather was Yunus Khan of Tashkent, who was known as the Great Khan of the Mongols and the thirteenth in the direct line of descent of Chengiz Khan. Babur was born on 14 February 1483. He was named Zahir-ud-din (Defender of Faith) Muhammad. He inherited Farghana, a small kingdom in Central Asia, when he was 12 years old. But he was soon driven out from there by Uzbeks. After 10 years of adversity, Babur established himself as the ruler of Kabul.

Foundation of the Mughal Empire

In Kabul, Babur set his sights eastward, reminded by the memory of Timur's Indian invasion. In 1505, the very year after he took Kabul, Babur led his first expedition towards India. Yet he was preoccupied with the Central Asian affairs. He did not have any ambition beyond Punjab till 1524. Then a greater opportunity came knocking. Dilawar Khan, who was Daulat Khan Lodi's son, and Alam Khan, who was the uncle of Sultan of Delhi, arrived in Kabul to seek Babur's help in removing Ibrahim Lodi from power. Babur defeated Ibrahim Lodi in the famous Battle of Panipat in 1526 and occupied Delhi and Agra. Following Babur's victory in this battle, Mughal dynasty came to be established in India with Agra as its capital.

Babur's Military Conquests

Babur defeated Rana Sanga and his allies at Khanwa in 1527. He won the war against the chief of Chanderi in 1528 and prevailed over the Afghan chiefs of Bengal and Bihar in 1529. Babur died in 1530 before he could consolidate his victories. Babur was a scholar in Turkish and Persian languages. He recorded his impressions about Hindustan, its animals, plants and trees, flowers and fruits in his autobiography Tuzuki- Baburi.

Following the tradition set by Chengiz Khan, who nominated the most deserving among his sons as his heir, Babur chose his favourite and eldest son, Humayun, as his heir.

Humayun (1530–1540 and 1555–1556)

Humayun, on his accession to the throne, divided his inheritance as per his father's will and accordingly his brothers, Kamran, Hindal and Askari, got a province each. Yet each of the brothers aspired for the throne of Delhi. Humayun also had other rivals and notable among them was the Afghan Sher Shah Sur, the ruler of Bihar and Bengal. Sher Shah defeated Humayun at Chausa (1539) and again at Kanauj (1540). Humayun, defeated and overthrown, had to flee to Iran. With the help of the Persian ruler Shah Tahmasp of the Safavid dynasty, Humayun succeeded in recapturing Delhi in 1555. But he died in 1556 when he fell down the stairs of his library in Delhi.

Sher Shah (1540–1545)

Sher Shah was the son of the Afghan noble Hasan Suri, ruler of Sasaram in Bihar. After overthrowing Humayun, Sher Shah started the rule of Sur dynasty at Agra. During his brief reign, he built an empire stretching from Bengal to the Indus, excluding Kashmir. He also introduced an efficient land revenue system. He built many roads, and standardised coins, weights and measures.

Akbar (1556–1605)

Accession to Throne

After the death of Humayun in 1556, his 14-year-old son Akbar was crowned the King. Humayun's trusted general Bairam Khan became the regent and ruled on behalf of Akbar, as the latter was a minor.

Hemu, a general of Sur dynasty, soon captured Agra and Delhi in 1556. In the same year, Bairam Khan defeated and killed Hemu in the battle at Panipat (Second Battle of Panipat, 1556). As Bairam Khan was murdered in Gujarat, allegedly at the instance of Akbar who could not tolerate his dominance in day-to-day governance of the kingdom, Akbar assumed full control of the government. Akbar brought most of India under his control through conquests and alliances.

Conquests of Women Rulers

Akbar conquered Malwa and parts of Central India. His defeat of Rani Durgavati, a ruler in the Central Province, is not appreciated, since the brave Rani did him no harm. Yet urged by his ambition to build an empire, Akbar had no consideration for the good nature of the ruler. Similarly, another woman ruler Akbar had to confront in South India was the famous Rani Chand Bibi, regent of Ahmednagar. The fight this woman put up impressed the Mughal army so much that they gave her favourable terms of peace.

Battle of Haldighati

Akbar defeated Rana Uday Singh of Mewar and captured the fort of Chittoor in 1568 and then Ranthambore in 1569. In 1576, he won over Uday Singh's son Rana Pratap at the

Battle of Haldighati. Though defeated, Rana Pratap escaped on his horse, Chetak, and continued his fight, leading a life in the jungle. The memory of this gallant Rajput is treasured in Rajputana, and many a legend has grown around him.

Commercial Access to Arabia, Southeast Asia and China

Akbar's conquest of Gujarat helped him to establish control over Gujarat's overseas trade with the Arabs and the Europeans. Akbar's military campaigns in East Bihar and Odisha and victory over Bengal facilitated access to Southeast Asia and China.

Military Campaigns in the North-West (1585-1605)

Among other conquests of Akbar, the important were the campaigns he launched in the North-West of India. Akbar added Kandahar, Kashmir and Kabul to the Mughal Empire. His battles in the Deccan led to the annexation of Berar, Khandesh and parts of Ahmednagar. Under Akbar, the Mughal Empire extended from Kashmir in the north to Godavari in the south, and from Kandahar in the west to Bengal in the east.

Akbar died in 1605 and his mortal remains were buried at Sikandra near Agra.

Akbar's Religious Policy

Akbar, realising that the gains of affection would be more enduring than the gains of the sword, made all out efforts to win the goodwill of the Hindu nobles and the Hindu masses. He abolished the jizya (poll tax) on non-Muslims and the tax on Hindu pilgrims. He also married a girl of a noble Rajput family. Later, he married off his son to a Rajput girl as well. He appointed Rajput nobles to important and top positions in his Empire. Raja Man Singh of Jaipur was sent as governor of Kabul once.

Akbar treated all the religious groups fairly with generosity of spirit. The Sufi saint Salim Chishti and the Sikh Guru Ramdas received Akbar's utmost respect and regard. Guru Ramdas was gifted a plot of land in Amritsar, where the Sikh shrine Harmandir Sahib was later built. In Ibadat Khana, a hall in the new Fatehpur Sikri city, constructed by Akbar, scholars of all religions met for a discourse.

Contributions to culture

Akbar was a great patron of learning. His personal library had more than four thousand manuscripts. He patronised scholars of all beliefs and all shades of opinions. He extended his benevolence to authors such as Abul Fazl, Abul Faizi and Abdur Rahim Khan-i-Khanan, the great storyteller Birbal, competent officials like Raja Todar Mal, Raja Bhagwan Das and Raja Man Singh. The great composer and musician Tansen and artist Daswant adorned Akbar's court as well.

Jahangir (1605-1627)

Akbar was succeeded by Prince Salim, his son through a Rajput wife, who was also named Nur-ud-din Muhammad Jahangir (Conqueror of the World). Jahangir was more interested in art and painting and gardens and flowers, than in running the government. So Jahangir's wife, Mehr-un-nisa, known as Nur Jahan, was the real power behind the throne. Jahangir carried on to some extent his father's traditions. The toleration of religions of Akbar's time continued in Jahangir's time.

But Jahangir ordered the execution of Sikh leader Guru Arjun (or Arjan) for helping his rebellious son Khusrau, who contested for the throne. This resulted in a prolonged fight between the Sikhs and the Mughals. As a result of this confrontation, the Mughals had to lose control over the trade routes to Afghanistan, Persia and Central Asia. The loss of Kandahar exposed India to invasions from the North-West. Ahmednagar, though conquered by Jahangir, remained a source of trouble throughout his reign.

Jahangir granted trading rights to the Portuguese and later to the English. Thomas Roe, a representative of King James I of England, visited Jahangir's court and this agreement paved the way for the British establishing their first factory in Surat.

Shah Jahan (1627-1658)

Prince Khurram, after a struggle for power, succeeded Jahangir as Shah Jahan (King of the World). Shah Jahan ruled for thirty years.

He led a campaign against Ahmednagar and annexed it in 1632. Bijapur and Golconda were also conquered later. Some Maratha warriors, notably Shahji Bhonsle (Shivaji's father), entered the services of the Deccan kingdoms and trained bands of Maratha soldiers to fight against the Mughals. So there was a sustained resistance in the Deccan to the Mughals from the Marathas too. Shah Jahan was intolerant towards other religions than Islam. In his reign came the climax of Mughal splendour, which is detailed in the next part of this lesson.

Shah Jahan fell ill in 1657 and a war of succession broke out among his four sons. Aurangzeb emerged successful after killing his three brothers, Dara, Shuja and Murad. Shah Jahan passed the last eight years of his life as a prisoner in the Shah Burj of the Agra Fort.

Aurangzeb (1658-1707)

Aurangzeb, the last of the Great Mughals, started off his reign by imprisoning his old father. He assumed the title Alamgir (the Conqueror of the World). He reigned for 48 years. He was no lover of art like his grandfather Jahangir and architecture like his father Shah Jahan.

He tolerated no religion excepting Islam. He re-imposed the jizya tax on Hindus and excluded them from office as far as possible. Between 1658 and 1681, Aurangzeb remained in the North and suppressed the revolt of Bundelas, Jats, Satnamis and Sikhs. Aurangzeb's expansion in the North-East resulted in a war with the Ahoms of Kamarupa (Assam). The kingdom came under repeated attacks of the Mughals, but it could not be subdued totally.

Relationship with Rajputs and Marathas

Aurangzeb's hostility towards Rajputs led to prolonged wars with them. To make matters worse, his rebellious son, Prince Akbar, joined the forces of Rajputs and created troubles to him. Prince Akbar entered into a pact with Shivaji's son Shambuji in the Deccan. So Aurangzeb had to march to the Deccan in 1689.

In the Deccan, Aurangzeb brought Bijapur and Golconda into submission. Shivaji had carved out a kingdom, proclaiming himself the Emperor of Maratha State (1674). Aurangzeb could not stop the rise of Shivaji in the southwest. But he vanquished Shivaji's son and successor Shambuji, who was captured and executed by him. Aurangzeb remained in the Deccan until his death in 1707, at the age of nearly 90.

By the end of Aurangzeb's rule, the British had firmly established their trade centres at Madras (Chennai), Calcutta (Kolkata) and Bombay (Mumbai). The French had their main trade centre in Pondicherry (Puducherry).

The Mughal Administration Central Administration

The Mughals provided a stable administration in larger parts of India. The Emperor was the supreme head of the Mughal administrative system. He was the law maker, the chief executive, the commander-in-chief of the army and the final dispenser of justice. He was assisted by a council of ministers. The most important officials were the Wakil (Prime Minister) and Wazir or diwan (in charge of the revenue and expenditure). Mir Bhakshi was in charge of the army. The Mir Saman looked after the royal household. The Qazi was the Chief Judge. Sadr-us-Sudr was minister for enforcing Islamic law (Sharia).

Provincial Administration

The empire was divided into several Subhas (provinces). Each Subha was under the control of an officer called Subedar. The Subhas were further divided into districts called Sarkars. The Sarkars were subdivided into Parganas. A group of villages (Gramas) formed a Pargana.

Local Administration

The towns and cities were administered by Kotwals. Kotwals maintained law and order. The administration of villages was left in the hands of local village panchayats (informal institution of justice in villages). The Panchayatdars (jury) dispensed justice.

Army

The Mughal army comprised infantry, cavalry, war elephants and artillery. The Emperor maintained a large number of trained and well-armed bodyguards and palace guards

Mansabdari System

Akbar introduced the Mansabdari system. According to this system, the nobles, civil and military officials were combined to form one single service. Everyone in the service was given a mansab, meaning a position or rank. A Mansabdar was a holder of such a rank.

Mansabdar rank was dependent on Zat and Sawar. The former indicated one's status. Sawar was the number of horses and horsemen he had to maintain. His salary was fixed on the basis of the number of soldiers each Mansabdar received ranging from 10 to 10,000. The Mansabdars were paid high salary by the Emperor. Before receiving the salary, a Mansabdar had to present his horsemen for inspection. Their horses were branded to prevent theft. The Emperor could use the troops maintained by a Mansabdar whenever he wished. The rank of Mansabdar was not hereditary during Akbar's time. After him, it became hereditary.

Land Revenue Administration

Land revenue administration was toned up during the reign of Akbar. Raja Todar Mal, Revenue Minister of Akbar, adopted and refined the system introduced by Sher Shah. Todar Mal's zabt system was put in place in the north and north-western provinces. According to this system, after a survey, lands were classified according to the nature and fertility of the soil. The share of the state was fixed at one-third of the average produce for 10 years. During the reign of Shah Jahan, the zabt or zabti system was extended to the Deccan provinces.

The Mughal emperors enforced the old iqta system, renaming it jagir. It is a land tenure system developed during the period of Delhi Sultanate. Under the system, the collection of the revenue of an area and the power of governing it were bestowed upon a military or civil official now named Jagirdar. Every Mansabdar was a Jagirdar if he was not paid in cash. The Jagirdar collected the revenue through his own officials. The Amal Guzar or the revenue collector of the district was assisted by subordinate officers like the Potdar, the Qanungo, the Patwari and the Muqaddams.

Those appointed to collect the revenue from the landholders were called zamindars. Zamindars collected taxes and maintained law and order with the help of Mughal officials and soldiers. The local chieftains and little kings were also called zamindars. But at the end of the sixteenth century, the zamindars were conferred hereditary rights over their zamin. The zamindar was empowered to maintain troops for the purpose of collecting revenue. The emperor granted lands to scholars, holy men and religious institutions. These lands called suyurghal were tax-free.

Religious Policy

The Mughal emperors were the followers of Islam. Akbar was very liberal in his religious policy. In Akbar's court, the Portuguese missionaries were great favourites. Akbar tried to include the good principles in all religions and formulated them into one single faith called Din-I-Ilahi (divine faith). Jahangir and Shah Jahan also followed the policy of Akbar. Aurangzeb rejected the liberal views of his predecessors. As we pointed out earlier, he re-imposed the jizya and pilgrim tax on the Hindus. His intolerance towards other religions made him unpopular among the people.

Art and Architecture

Babur introduced the Persian style of architecture to India by building many structures at Agra, Biana, Dholpur, Gwalior and Kiul (Aligarh), but only a few of them exist today. Humayun's palace in Delhi, Din-i-Panah, was probably destroyed by Sher Shah Sur who built the Purana Qila in its place. The most prominent monument of Sher Shah's reign was his mausoleum built at Sasaram in Bihar.

The Diwan-i-Khas, Diwan-i-Am, Panch Mahal (pyramidal structure in five stories), Rang Mahal, Salim Chishti's Tomb and Buland Darwaza were built during Akbar's time. Jahangir completed Akbar's tomb at Sikandara and the beautiful building containing the tomb of Itmad-ud-daula, father of Nur Jahan, at Agra.

Shah Jahan's time witnessed the climax of Mughal splendour. The famous peacock throne, covered with expensive jewels, was made for the Emperor to sit on. Then rose the world famous Taj Mahal, by the side of the Jumna river at Agra. Besides Taj, he built the Moti Masjid, the pearl mosque at Agra, the great Jama Masjid of Delhi and the Diwan-i-Khas and Diwan-i-Am in his palace in Delhi.

During Aurangzeb's reign, architecture did not receive much patronage. The Bibi Ka Maqbara in Aurangabad, a mausoleum built by his son Prince Azam Shah as a loving tribute to his mother in the late seventeenth century, is, however, worth mentioning.

Red Fort

Red Fort, also called Lal Qila, in Delhi was the residence of the Mughal emperors. Constructed in 1639 by Emperor Shah Jahan as the palace of his fortified capital Shahjahanabad. The Red Fort is named for its massive enclosing walls of red sandstone.

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Unit14. The Mughal Empire

Introduction

India had been invaded from the west/ north-west several times over the centuries, beginning with Alexander. Various parts of north India had been ruled by foreigners like the Indo-Greeks, Sakas, Kushans and Afghans. The Mughals, descended from the Mongol Chengiz Khan and the Turk Timur, founded an empire in India which lasted for more than three centuries. But we remember them not as rulers of foreign origin, but as an indigenous, Indian dynasty. Babur was the founder of the Mughal Empire which was established in 1526 after Babur defeated Ibrahim Lodi in the battle of Panipat. Thus a new epoch and a new empire in India began, lasting for nearly three centuries beginning from 1526 to 1857. Six major rulers of this dynasty, Babur, Humayun, Akbar, Jahangir, Shah Jahan and Aurangzeb, known as the “Great Mughals”, left their mark on Indian history. The empire declined after the death of Aurangzeb in 1707. The empire formally ended a century and a half later, when power passed to the British crown after the great revolt of 1857.

At the height of its power the Mughal Empire stretched from Afghanistan to Bengal and from Kashmir down to the Tamil region in the south. Mughal rule created a uniform, centralized administration over the entire country. The Mughals, especially Akbar, created a polity integrating Hindus and Muslims into a unified nation, forging a composite national identity. In addition, the Mughals left behind a heritage of great architecture, literature and art which has enriched India.

Zahiruddin Muhammad Babur (1526–1530)

The race for political supremacy in Central Asia amongst the Uzbeks (Turkic ethnic group), the Safavids (the members of the dynasty that ruled Iran patronising Shia Islam) and the Ottomans (Turkish people practicing Sunni Islam) forced Zahiruddin Muhammad Babur, the ruler of Samarkand, to seek his career prospects elsewhere. Historically the trade conducted by countries of Central Asia through the Silk Route with India had provided the required knowledge about the country (India) they were interested in. Babur who dreamed of repeating what Timur had done a century and a quarter earlier, succeeded in founding the Mughal kingdom with Delhi as its capital in 1526 in the wake of the political disintegration of the Delhi Sultanate.

Babur, a boy of eleven, inherited the throne of Samarkand (now a city in Uzbekistan) from his father. As there were enemies all round him, he lost his throne but soon reclaimed it. But soon he realized that, with the powerful Safavid dynasty in Iran and the Uzbeks in Central Asia, he should rather turn to the southeast towards India to build an empire of his own. As a Timurid, Bābur had an eye on the Punjab, part of which had been Timur’s possession. Between 1519 and 1524 when he invaded Bhera, Sialkot and Lahore, he showed his definite intention to conquer Hindustan, where the political scene also favoured his adventure. After conquering Kabul and Ghazni, Babur crossed the Indus to India and established a small kingdom. The time for invading India was also ripe as there was discontent among the Afghans and the Rajputs, as Sultan Ibrahim Lodi of the Lodi dynasty was trying to expand his territory. Babur received an embassy from Daulat Khan Lodi, a

principal opponent of Ibrahim Lodi, and Rana Sangha, ruler of Mewar and the chief of Rajput Confederacy, with a plea to invade India. When Babur marched to India he first defeated the forces of Daulat Khan Lodi at Lahore as he had gone back on his promise to help Babur.

First Battle of Panipat, 21 April 1526

Babur then turned towards the Lodi-governed Punjab. After several invasions, he defeated the formidable forces of Ibrahim Lodi with a numerically inferior army at Panipat. Babur won this battle with the help of strategic positioning of his forces and the effective use of artillery. Babur's victory provided hopes for him to settle in India permanently. Babur had conquered Delhi and Agra, but he still had to suppress the Rajputs and the Afghans.

Artillery is an army unit that uses large cannon-like weapons, transportable and usually operated by more than one person. Gun powder was first invented by the Chinese and found its way to Europe in the 13th century A.D. (CE). It was used in guns and cannons from the mid-fourteenth century onwards. In India we have no instances of artillery being used in war before Babur.

Battle of Khanwa, 1527

Babur decided to take on Rana Sanga of Chittor, who as ruler of Mewar, had a strong influence over Rajasthan and Malwa. Babur selected Khanwa, near Agra, as a favourable site for this inevitable encounter. The ferocious march of Rana Sanga with a formidable force strengthened by Afghan Muslims, Mahmud Lodi, brother of Ibrahim Lodi, and Hasan Khan Mewati, ruler of Mewar, confronted the forces of Babur. With strategic positioning of forces and effective use of artillery, Babur defeated Rana Sanga's forces. This victory was followed by the capture of forts at Gwalior and Dholpur which further strengthened Babur's position.

Battle of Chanderi, 1528

The next significant battle that ensured Babur's supremacy over the Malwa region was fought against Medini Rai at Chanderi. Following this victory Babur turned towards the growing rebellious activities of Afghans.

Battle of Ghagra, 1529

This was the last battle Babar fought against the Afghans. Sultan Ibrahim Lodi's Brother Mahmud Lodi and Sultan Nusrat Shah, son-in-law of Ibrahim Lodi, conspired against Babur. Realising the danger Babar marched against them. In the battle that ensued along the banks of Ghagra, a tributary of Ganges, Babur defeated the Afghans. But he died on his way from Agra to Lahore in 1530

There is a story about Babur's death. His son Humayun was ill and Babur in his love for him is said to have prayed, offering his own life if his son got well. Humayun recovered.

Estimate of Babur

Babur, the founder of Mughal Empire, was a scholar of Persian and Arabic. Babur's memoirs *Tuziuk-i-Baburi* (*Baburnama*) is considered a world classic. Babur found nothing admirable either in the Afghans who ruled India for some time or in the majority of the people they governed. But his description of India is delightful.

What Hindustan possessed, in Babur's view, is described as follows: 'The chief excellence of Hindustan is that it is a large country and has abundance of gold and silver? Another convenience of Hindustan is that the workmen of every profession and trade are innumerable and without end.'

Babur's dominions were now secure from Kandahar to the borders of Bengal. However, in the great area that marked the Rajput desert and the forts of Ranthambhor, Gwalior and Chanderi, there was no settled administration, as the Rajput chiefs were quarrelling among themselves. So Babur left a difficult task for his son Humayun.

Humayun (1530-1540 & 1555-1556)

Humayun, a cultured and learned person, was not a soldier like his father. He was faced with the problems of a weak financial system and the predatory Afghans. Bahadur Shah, the ruler of Gujarat, also posed a great threat. Humayun's brother Kamran who was in-charge of Kabul and Kandahar extended his authority up to Punjab. Humayun remembering the promise he had made to his father on the eve of his death that he would treat his brothers kindly, agreed to Kamran's suzerainty over Punjab to avoid a civil war.

The growth of Afghan power in the regions around Bihar and Uttar Pradesh under the leadership of Sher Khan (later Sher Shah) made Humayun to initiate action. Defeating the Afghans at Daurah in 1532 Humayun besieged the powerful fort of Chunar. After a period of four months, Humayun, believing the word of Sher Shah that he would be loyal to the Mughals, withdrew the siege. This turned out to be a great mistake.

Humayun spent the succeeding years of his life in constructing a new city in Delhi, Dinpanah, while his enemies were strengthening themselves. Realising the ensuing danger from Bahadur Shah who had annexed Rajasthan and instigated and provided refuge to all anti-Mughal elements, Humayun marched against him. He captured Gujarat and Malwa and left them under the control of his brother Askari. Unable to put down the rebellions of the Gujarati people, Askari decided to proceed to Agra. This alarmed Humayun stationed at Mandu, for he was afraid that Askari would take Agra for himself. Hence, abandoning Gujarat and Malwa Humayun pursued his brother. Both the brothers reconciled after a meeting at Rajasthan.

When Humayun was deeply engrossed in the affairs of Bahadur Shah, Sher Khan had strengthened himself by defeating the ruler of Bengal. Sher Khan captured the fort of Rohtas and Bengal.

After capturing Chunar Humayun marched to Bengal to confront Sher Khan. When Humayun reached Gaur or Gauda he received information on the rebellion of Hindal, his younger brother. Humayun proceeded to Agra to quell the rebellion. Sher Khan who had been quiet all this time started attacking the army of Humayun. When Humayun reached Chausa with great difficulty there was a full-fledged battle.

Battle of Chausa (1539)

This battle was won by Sher Khan due to his superior political and military skills. Humayun suffered a defeat in which 7000 Mughal nobles and soldiers were killed and Humayun himself had to flee for his life by swimming across the Ganga. Humayun who had arrived at Agra assembled his army with the support of his brothers Askari and Hindal to counter Sher Khan. The final encounter took place at Kanauj.

Battle of Kanauj (1540)

This battle was won by Sher Khan and Humayun's army was completely routed, and he became a prince without a kingdom.

Sher Shah and Sur Dynasty

From the time Humayun abandoned the throne in the Battle of Kanauj to his regaining of power in 1555 Delhi was ruled by Sher Shah of the Sur Dynasty. Born in the family of a Jagirdar and named as Farid, he received the title of Sher Khan after killing a tiger (sher in Hindi). When he ascended the throne, he was called Sher Shah. Through his ability and efficiency, he emerged as the chief of Afghans in India. His military capability and diplomacy made him victorious over Humayun and many other Rajput rulers. Malwa fell without a fight. Rana Uday Singh of Mewar surrendered without resistance. Sher Shah's next venture to capture Kalinjar failed as a gunshot caused his death in 1545. Sher Shah was succeeded by his second son Islam Shah who ruled till 1553. His death at a young age led to a state of confusion about succession. Humayun used this opportunity to regain Delhi and Agra from the Sur rulers.

Sher Shah's Reforms

When Sher Shah was pursuing Humayun, he had left Khizr Khan as the Governor of Bengal. Khizr Khan married the daughter of the former ruler of Bengal, Sultan Mahmud, and started behaving like a king. On his return Sher Shah ordered him to be put in chains. As one familiar with the problem of provincial insubordination, he thought that the real solution to the problem would be to setup a strong administrative system. So he made his government highly centralised. The local administrative structure of the Delhi Sultanate was followed with certain changes. The village headmen who were made responsible for the goods stolen within the area under their control became vigilant. The welfare of the

peasants was a prime concern. When the peasant is ruined, Sher Shah believed, the king is ruined. Sher Shah took great care that the movements of the army did not damage crops. He followed a flexible revenue system. Land was surveyed and revenue settled according to the fertility of the soil. In some areas, the jagirdari and zamindari systems were allowed to continue. In yet other places he arranged to collect only a portion of the gross produce. Sher Shah showed the same concern while dealing with traders. In order to encourage trade, he simplified trade

Jagirdari

It is a land tenure system developed during the Delhi Sultanate. Under the system the collection of the revenue of an estate and the power of governing it were bestowed upon an official of the state.

Zamindari

The term refers to another land tenure system. The word zamindar means landowner in Persian. In Mughal times the zamindars were drawn from the class of nobles. Akbar granted land to the nobles as well as to the descendents of old ruling families and allowed them to enjoy it hereditarily. Zamindars collected revenue from the tenants and cultivators and remitted a fixed amount to the state.

Imposts, collecting taxes only at the point of entry and the point of sale. The standardization of the metal content of gold, silver and copper coins also facilitated trade. His currency system continued through the entire Mughal period and became the basis of the coinage under the British.

For enhancement of trade and commerce Sher Shah maintained a robust highway system by repairing old roads and laying down new roads. Apart from repairing the Grand Trunk road from the Indus in the west to Sonargaon in Bengal, he also built a road connecting Gujarat's seaports with Agra and Jodhpur. A road was laid connecting Lahore with Multan. The highways were endowed with a large network of sarais, rest houses, where the traders were provided with food and accommodation, ensuring brisk commerce. Some of the sarais constructed by Sher Shah still survive. These sarais also ensured the growth of towns in their vicinity.

Sher Shah practiced charity on a large scale. He gave stipends from the treasury to destitute people. Sher Shah was an orthodox and devout Sunni. He is said to have dispensed justice without bias, punishing the oppressors even if they were nobles or his relatives. Through stern punishments to rebellious zamindars and nobles and to thieves and robbers he ensured effective maintenance of law and order in the empire.

The fiscal administration for which Akbar and Todar Mal have been so highly praised was largely based on the methods of Sher Shah. During his short rule, Sher Shah did not have much time for building new cities and palaces. He started building a new walled

city in Delhi, which later came to be known as Purana Qila (Old Fort). He built his own mausoleum in

Humayun's Return from Exile

After Sher Shah's death in 1545 his weak successors ruled for ten years. Humayun, who had fled after his defeat at Kanauj, had taken asylum in Persia. Humayun then went to Afghanistan with Persian troops. He succeeded in capturing Kandahar and Kabul. But his brother Kamran did not allow him to hold them in peace. The struggle between the brothers intensified, and yet in the end Kamran had to seek a compromise with Humayun. Meanwhile the Sur Empire had fragmented, and so Humayun's invasion became easy. The Afghan forces in Punjab, on the approach of Mughals, began to flee. Humayun became the Emperor once again. He died very soon after regaining Delhi when he slipped down the stairs of the library in the fort at Delhi. In the colourful words of Lane Poole, "Humayun stumbled out of his life, as he has stumbled through it."

Emperor Akbar (1556-1605)

During Humayun's wanderings in the Rajputana desert, his wife gave birth to a son, Jalaluddin, known as Akbar, in 1542. Akbar was crowned at the age of fourteen. At the time of Akbar's ascension, the Afghans and Rajputs were still powerful and posed a great challenge. Yet he had a guardian and protector in Bairam Khan.

Second Battle of Panipat

Hemu, the Hindu general of the displaced Afghan king Adil Shah, successor of Sher Shah, induced the king to permit him to lead the Afghan army against the Mughals. Encouraged by the king, Hemu first took Gwalior, expelling the Mughal governor. Then he marched on Agra and captured it without any resistance. Hemu's generosity helped him to overcome potential enemies when he took Delhi. In November 1556 Akbar marched towards Delhi to meet the forces of Hemu in the Second Battle of Panipat. An arrow struck the eye of Hemu when the battle was likely to end in his favour. The leaderless Afghan army became demoralised and the Mughal forces emerged victorious. Hemu was captured and executed. This victory made Akbar the sovereign of Agra and Delhi and re-establishes the Mughal Empire.

Akbar and Bairam Khan

Akbar's rule saw the expansion of the Mughal empire from Kabul to Jaunpur, including Gwalior and Ajmer, under his regent Bairam Khan. Soon Bairam Khan began to behave haughtily towards his fellow nobles. Akbar, enraged by his behaviour issued a farman dismissing Bairam Khan. This led to Bairam Khan's revolt which was ably dealt with by Akbar. Bairam Khan, finally agreeing to submit himself to Akbar, proceeded to Mecca. But on his way he was murdered by an Afghan. The family of Bairam Khan was brought to Delhi and his son Abdur Rahim became one of the luminaries of Akbar's court with the title Khan-e-Khanan.

Akbar's Military Conquests

Akbar laid the foundation for a great empire through his vast conquests. Malwa was conquered in 1562 from Baz Bahadur who was made a mansabdar in Akbar's court. The Gondwana region of central India was annexed after a fierce battle with Rani Durgavati and her son Vir Narayan in 1564. The ruler of Mewar, Rana Uday Singh, put up a great fight before losing Chittor, which was conquered by Akbar after a siege of six months. Rana Uday Singh retreated to the hills. Yet his generals Jaimal and Patta carried on their fight. Finally, the generals, along with 30,000 Rajputs were killed. Out of admiration for the gallant Jaimal and Patta, Akbar honoured them by erecting statues to their memory outside the chief gate of Agra fort. The capture of Chittor was followed by the surrender of Rajput states like Ranthambhor, Kalinjar, Bikaner, Jodhpur and Jaisalmer.

After subordinating the regions of central India, Akbar turned his attention to Gujarat, a wealthy province renowned for its maritime commerce. Akbar conquered Gujarat from Muzaffar Shah in 1573. Gujarat became a launch pad for the annexation of Deccan. After defeating Daud Khan, the Afghan ruler of Bihar and Bengal, both the provinces were annexed to the Mughal Empire in 1576.

Akbar defeated Mirza Hakim of Kabul with the help of Raja Man Singh and Bhagwan Das. His conquest of Kashmir (1586) and Sindh (1591) consolidated the political integration of North India. Akbar turned his attention to the Deccan. Akbar's forces had occupied the Khandesh region in 1591. In 1596 Berar was acquired from Chand Bibi, who, as the regent of her nephew Muzaffar Shah, the Nizam Shahi ruler of Ahmednagar, valiantly defended Ahmednagar against the Mughal forces of Akbar. By 1600 parts of Ahmednagar had fallen into the hands of Mughal forces. Akbar fell sick in September 1604 and died on 27 October 1605.

Rajput Policy

Akbar took earnest efforts to win the goodwill of the Hindus. He abolished the jizya (poll tax) on non-Muslims and the tax on Hindu pilgrims. The practice of sati by Hindu widows was also abolished. The practice of making slaves of war prisoners was also discontinued. His conciliatory Rajput policy included matrimonial alliances with Rajput princely families, and according Rajput nobles high positions in the Mughal court. A tolerant religious policy ensured the cultural and emotional integration of the people. Even before Akbar, many Muslim kings had married Rajput princesses. But Akbar with his broadminded nature was instrumental in these matrimonial alliances becoming a synthesising force between two different cultures as he maintained close relations with the families.

Akbar had married Harkha Bai (also referred to as Jodha in popular accounts), the daughter of Raja Bharmal (also known as Bihari Mal) of Amber. He also married the Rajput princesses of Bikaner and Jaisalmer. Prince Salim who was born of Harkha Bai married the daughter of Raja Bhagwan Das. Raja Man Singh, son of Bhagwan Das, became the trusted

general of Akbar. Even the Rajputs who chose not to have any matrimonial alliances were bestowed great honours in Akbar's court. His Rajput policy secured the services of great warriors and administrators for the empire. Raja Todar Mal, an expert in revenue affairs, rose to the position of Diwan. Birbal was a favourite companion of Akbar.

Mewar and Marwar were the two Rajput kingdoms that defied the Mughal Empire. After the death of Rana Udai Singh, his son Rana Pratap Singh refused to acknowledge Akbar's suzerainty and continued to fight the Mughals till his death in 1597. The Battle of Haldighati in 1576 was the last pitched battle between the Mughal forces and Rana Pratap Singh. In Marwar (Jodhpur), the ruler Chandra Sen, son of Maldeo Rathore, resisted the Mughals till his death in 1581, though his brothers fought on the side of the Mughals. Udai Singh, the brother of Chandra Sen was made the ruler of Jodhpur by Akbar. Akbar's capital was at Agra in the beginning. Later he built a new city at Fatehpur Sikri. Though a deserted city now, it still stands with its beautiful mosque and great Buland Darwaza and many other buildings.

Mansabdari System

Akbar provided a systematic and centralised system of administration which contributed to the success of the empire. He introduced the Mansabdari system. The nobles, civil and military officials combined into one single service with each officer receiving the title of Mansabdar. Mansabdar rank was divided into Zat and Sawar. The former determined the number of soldiers each Mansabdar received ranging from 10 to 10,000. The latter determined the number of horses under a Mansabdar. Each officer could rise from the lowest to the highest ranks. Promotions and demotions were made through additions or reductions of Mansabs. The Mansabdari system diversified the ethnic base of his nobility. During Akbar's early years the nobles were drawn exclusively from Central Asians or Persians. But after the introduction of the Mansabdari system, the nobility encompassed Rajputs and Shaikhzadas (Indian Muslims). The salary of a Mansabdar was fixed in cash but was paid by assigning him a jagir (an estate from which he could collect money in lieu of his salary), which was subjected to regular transfers. The rank of Mansabdar was not hereditary and immediately after the death of a Mansabdar, the jagir was resumed by the state.

Akbar's Religious Policy

Akbar began his life as an orthodox Muslim but adopted an accommodative approach under the influence of Sufism. Akbar was interested to learn about the doctrines of all religions, and propagated a philosophy of Sulh-i-Kul (peace to all). Badauni, a contemporary author, who did not like Akbar's inter-religious interests, accused him of forsaking Islam. Akbar had established an Ibadat Khana, a hall of worship in which initially Muslim clerics gathered to discuss spiritual issues. Later he invited Christians, Zoroastrians, Hindus, Jains and even atheists to discussions.

In 1582, he discontinued the debates in the Ibadat Khana as it led to bitterness among different religions. However, he did not give up his attempt to know the Truth. Akbar discussed personally with the leading lights of different religions like Purushotam and Devi (Hinduism), Meherji Rana (Zoroastrianism), the Portuguese Aquaviva and Monserrate

(Christianity) and Hira Vijaya Suri (Jainism) to ascertain the Truth. Because of the discussions he felt that behind the multiplicity of names there was but one God. The exact word used by Akbar and Badauni to illustrate the philosophy of Akbar is Tauhid-i-Ilahi namely Din Ilahi. Tauhid-i-Ilahi literally meant divine monotheism.

It can be considered a sufistic order but not a new religion. He had become a Pir (Sufi Guru) who enrolled Murids (Sufi disciples) who would follow a set pattern of rules ascribed by the Guru. Thousands of disciples enrolled as his disciples. Akbar's intention was to establish a state based on the concept of secular principles, equal toleration, and respect to all sections irrespective of their religious beliefs. He set up a big translation department for translating works in Sanskrit, Arabic, Greek, etc, into Persian. The Ramayana, Mahabharata, the Atharva Veda, the Bible and the Quran were translated into Persian. The Din Ilahi ceased to exist after Akbar.

Jahangir (1605–1627)

Akbar was succeeded by his son Salim with the title Nur-ud-din Jahangir. He was Akbar's son by a Rajput wife. His ascension was challenged by his eldest son Prince Khusrau who staged a revolt with the blessings of Sikh Guru Arjun Dev. Prince Khusrau was defeated, captured and blinded, while Guru Arjun Dev was executed. Jahangir also tamed the rebel Afghan Usman Khan in Bengal. Mewar, which had defied Akbar under Rana Udai Singh and his son Rana Pratap Singh, was brought to terms by

Jahangir after a military campaign led by his son Prince Khurram (later to become Emperor Shah Jahan) against Rana Amar Singh, the grandson of Rana Udai Singh. They concluded a treaty whereby Rana Amar Singh could rule his kingdom after accepting the suzerainty of Jahangir. In 1608 Ahmad Nagar in the Deccan had declared independence under Malik Ambar.

Several attempts by prince Khurram to conquer Ahmad Nagar ended in failure. Prince Khurram had conquered the fort of Kangra after a siege of 14 months. Kandahar, conquered by Akbar from the Persians in 1595, was retaken by the Persian King Shah Abbas in 1622. Jahangir wanted to recapture it. But he could not achieve it due to the rebellion of Prince Khurram. Jahangir's reign witnessed the visit of two Englishmen - William Hawkins and Sir Thomas Roe. While the former could not get the consent of the Emperor for establishing an English factory in India, the latter, sent as ambassador by King James I, succeeded in securing permission to establish a British factory at Surat.

Jahangir was more interested in art and painting and gardens and flowers, than in government. His Persian wife Mehrunnisa, renamed as Nur-Jahan by Jahangir, became the real power behind the throne. The political intrigues that prevailed because of Nur-Jahan, led Prince Khurram to rebel against his father but due to the efforts of Mahabat Khan, a loyal general of Jahangir, the rebellion could not be fruitful. Prince Khurram had to retreat to the Deccan. The intrigues of Nur-Jahan also made Mahabat Khan to rise in revolt which was effectively handled by Nur-Jahan. Mahabat Khan also retreated to Deccan to join Prince Khurram. Immediately after the death of Jahangir, Nur-Jahan wanted to crown her son-in-

law Shahryar Khan but due to the efforts of Nur-Jahan's brother and Prince Khurram's father-in-law Asaf Khan, Prince Khurram succeeded as the next Mughal emperor with the title Shah-Jahan. Nur-Jahan, who ruled the empire for ten years, lost her power and influence after Jahangir's death in December 1645.

Shah Jahan (1627-1658)

When Shah Jahan ascended the throne in Agra his position was secure and unchallenged. Yet the affairs of the empire needed attention. The Afghan Pir Lodi, with the title Khanjahan, who had been governor of the southern provinces of the empire, was hostile. Despite Shah Jahan's order transferring him from the government of the Deccan, he aligned with Murtaza Nizam Shah II, the Sultan of Ahmed-Nagar, and conspired against Shah Jahan. As the situation turned serious, Shah Jahan proceeded to the Deccan in person. The newly appointed governor of the Deccan, Iradat Khan, who received the title Azam Khan led the imperial army and invaded the Balaghat. Seeing the devastation caused by the imperial troops, Murtaza changed his attitude towards Khanjahan. Khanjahan thereupon fled from Daulatabad into Malwa, but was pursued and finally slain. Peace thus having been restored in the Deccan, Shah Jahan left the Deccan after dividing it into four provinces: Ahmednagar with Daulatabad; Khandesh; Berar; and Telengana. The viceroyalty of the four provinces was conferred by Shah Jahan on his son Aurangzeb, then eighteen years of age.

Deccan Sultanates

After flourishing for over a hundred years the Bahmani kingdom, that covered much of Maharashtra and Andhra along with a portion of Karnataka, disintegrated and powerful nobles carved out new dominions at Golkonda (Qutb Shahs), Bijapur (Adil Shahs), Berar (Imad Shahs), Bidar (Barid Shahs) and Ahmad Nagar (Nizam Shahs), which go by the collective name of Deccan Sultanates or Southern Sultanates.

Thus the Deccan was brought under the effective control of the Mughal Empire during the reign of Shah Jahan. Ahmad Nagar, which offered resistance to the Mughals, was annexed despite the efforts of Malik Ambar. Shah Jahan, with the help of Mahabat Khan, subdued the Nizam Shahi rulers of Ahmad Nagar in 1636. When the Shi'ite Qutub Shahi ruler of Golkonda imprisoned his own minister Mir Jumla it was used as a pretext by Aurangzeb to invade Golkonda. A treaty made the Qutub Shahi ruler a vassal of the Mughal Empire.

European Factories/Settlements during Mughal Rule

Portuguese

In 1510, Albuquerque captured Goa from the ruler of Bijapur and made it the capital of the Portuguese Empire in the East. Subsequently Daman, Salsette and Bombay on the west coast and at Santhome near Madras and Hugli in Bengal on the east coast had become Portuguese settlements.

Dutch

The Dutch set up factories at Masulipatam (1605), Pulicat (1610), Surat (1616), Bimilipatam (1641), Karaikal (1645), Chinsura (1653), Kasimbazar, Baranagore, Patna, Balasore, Nagapattinam (all in 1658) and Cochin (1663).

Danes

Denmark also established trade settlements in India and their settlements were at Tranquebar in TamilNadu (1620) and Serampore, their headquarters in Bengal.

French

Surat (1668), Masulipatnam (1669), Pondicherry, a small village then (1673), Chandernagore in Bengal (1690). Later they acquired Mahe in the Malabar, Yanam in Coromandal (both in 1725) and Karaikal (1739).

English

The Company first created a trading post in Surat (where a factory was built in 1612), and then secured Madras (1639), Bombay (1668), and Calcutta (1690). Though the Company had many factories, Fort William in Bengal, Fort St George in Madras, and the Bombay Castle were the three major trade settlements of the English.

In 1638 Shah Jahan made use of the political intrigues in the Persian empire and annexed Kandahar, conquered by Akbar and lost by Jahangir.

The Portuguese had authority over Goa under their viceroy. In Bengal they had their chief settlements in faraway Hugli. Shah Jahan ordered the Mughal Governor of Bengal, to drive out the Portuguese from their settlement at Hugli. About 200 Portuguese at Hugli owned nearly 600 Indian slaves. They had forced many of them to be baptised into the Christian faith. Moreover Portuguese gunners from Goa had assisted the Bijapur forces against the Mughals. Though the Portuguese defended themselves valiantly, they were easily defeated.

In 1641, Shah Jahan's minister and father-in-law Asaf Khan died. Asaf Khan's sister and Shah Jahan's old enemy Nur Jahan, survived until December 1645, but lived in retirement and never caused him trouble again.

Taj Mahal:

The Taj Mahal, is the epitome of Mughal architecture, a blend of Indian, Persian and Islamic styles. It was built by the Shah Jahan to immortalize his wife Mumtaz Mahal.

Mumtaz Mahal died in childbirth in 1631, after having been the emperor's inseparable companion since their marriage in 1612. The plans for the complex have been attributed to various architects of the period, though the chief architect was Ustad Ahmad Lahawri, an Indian of Persian descent. The complex - main gateway, garden, mosque and mausoleum (including its four minarets)- were conceived and designed as a unified entity. Building commenced in about 1632. More than 20,000 workers were employed from India, Persia, the Ottoman Empire and Europe to complete the mausoleum by about 1638-39; the adjunct buildings were finished by 1643, and decoration work continued until at least 1647.

A contemporary of Louis XIV of France, Shah Jahan ruled for thirty years. In his reign the famous Peacock Throne was made for the King. He built the Taj Mahal by the side of the Yamuna at Agra. Europeans like Bernier (French physician and traveller), Tavernier (French gem merchant and traveller), Mandelslo (German adventurer and traveller), Peter Mundy (English Trader) and Manucci (Italian writer and traveller) visited India during the reign of Shah Jahan and left behind detailed accounts of India.

During the last days of Shah Jahan, there was a contest for the throne amongst his four sons. Dara Shukoh, the eldest, was the favourite of his father. He had been nominated as heir apparent, a fact resented by his brothers. Aurangzeb, the third son, was astute, determined and unscrupulous. Dara, professed the Sunni religion, but was deeply interested in Sufism. A war of succession broke out between the four sons of Shah Jahan in which Aurangzeb emerged victorious.

Aurangzeb imprisoned Shah Jahan and crowned himself as the Mughal emperor. Shah Jahan died broken hearted as a royal prisoner in January 1666 and was buried in the Taj Mahal next to his wife.

Dara Shukoh, who lost the battle for the throne of Delhi to his brother Aurangzeb, was known as the Philosopher Prince. He brought different cultures into dialogue and found a close connection between Hinduism and Islam. He translated the Upanishads from Sanskrit to Persian.

Aurangzeb (1658-1707)

Aurangzeb Alamgir ("World Conqueror") ascended the throne in 1658 after getting rid of all the competitors for the throne, Dara Shukoh, Shuja and Murad, in a war of succession. His reign of fifty years falls into two equal parts. During the first twenty-five years he resided in the north, chiefly at Delhi, and personally occupied himself with the affairs of northern India, leaving the Deccan in the hands of his viceroys. Around 1681 he was prompted by the rebellion of one of his sons, Prince Akbar, to go to the Deccan. He never returned to Delhi, dying disappointed at Ahmad Nagar in 1707.

Aurangzeb conducted several military campaigns to extend the frontiers of the Mughal empire. His wars in the northwest and northeast drained the treasury. Already under his father, the revenue of the crops had been raised from a third to a half, and the extensive and the prolonged military campaigns he waged required him to keep the peasantry heavily taxed. Aurangzeb retained Shah Jahanabad as his capital, but after some two decades the capital was shifted to wherever Aurangzeb would set up camp during his long military campaigns.

In the north there were three major uprisings against Aurangzeb. The Jats (Mathura district), the Satnamis (Haryana region), and the Sikhs rebelled against Aurangzeb. The Jat rebellion (1669), a constant feature even during the reign of Jahangir and Shah Jahan, was crushed temporarily but they remained restive even after the death of Aurangzeb. The Satnamis revolt was crushed with the help local Hindu zamindars. The Sikh (The Punjab) rebellion erupted due to the political intrigues of Ram Rai, a claimant for the position of Sikh Guru, against the incumbent Guru Tegh Bahadur.

This finally ended with the execution of Guru Tegh Bahadur, the ninth Sikh Guru.

Aurangzeb's decision that the jizya (poll tax) should be levied on Hindus of all classes agitated the chiefs of Rajasthan, who had until then served the empire faithfully. The death of Jaswant Singh of Marwar brought about a succession issue. The Rajput queen Rani Hadi, wife of Raja Jaswant Singh, resented the move of Aurangzeb to install Indra Singh, a grandnephew of Jaswant Singh, a titular chief of the state. This led to a revolt with the help of Rathor Rajputs, but was effectively put down. The Rana of Mewar, Rana Raj Singh, resenting the interference of Aurangzeb in the affairs of Marwar rose in revolt and he was supported by Prince Akbar, the rebellious son of Aurangzeb. However, the Rana could not match the Mughal forces and fought a guerrilla warfare till his death in 1680. In 1681 Rana Jai Singh, the new Rana of Mewar, signed a peace treaty with Aurangzeb.

Aurangzeb's Deccan Policy

The Deccan policy of Aurangzeb was motivated by the policy of containing the growing influence of the Marathas, the rebellious attitude of the Shia kingdoms of Deccan like Golkonda and Bijapur and to curtail the rebellious activities of his son Akbar who had taken refuge in the Deccan. Aurangzeb came to the Deccan in 1682 and remained in the Deccan till his death in 1707. The Adil Shahi ruler Sikkandar Adil Shah of Bijapur resisted the different forces sent by Aurangzeb. Aurangzeb first sent his son Azam Shah (1685) but to no avail. Then he sent another son, Shah Alam to capture Bijapur. Though Bijapur Sultan, a Shia Muslim, ably defended the fort, he lost in the end, because Aurangzeb himself entered the battlefield and inspired his forces to fight to the finish. Golkonda was captured in 1687 after defeating the ruler Abul Hasan.

Against Marathas

The Marathas under Shivaji were a threat to Aurangzeb. Aurangzeb sent two of his great generals Shaista Khan and Jai Singh one after the other to capture Shivaji. Jai Singh captured Shivaji and took him to Delhi but Shivaji managed to escape to the Deccan. Shivaji,

employing guerrilla tactics, defied the Mughal forces till his death at the age of 53 in 1680. Aurangzeb was severely tested by the Marathas till his death in 1707 as the sons of Shivaji continued the rebellion. The death of Aurangzeb in 1707 marked a watershed in Indian history as the Mughal Empire virtually came to end even though the weak successors of Aurangzeb held the throne the next 150 years.

Aurangzeb nursed a grudge against the Sikhs for having supported his brother and principal rival to the throne, Dara Shukoh. Guru Tegh Bahadur, was killed at Aurangzeb's command. In 1680 Aurangzeb sent a formidable army under his son Akbar to subdue the rebellious Rajput kings, but the emperor had not reckoned with his son's traitorous conduct. Akbar, had declared he the emperor, but was compelled to flee to the Deccan, where he enlisted the help of Shivaji's son, Sambhaji. Aurangzeb decided to take to the field himself, and eventually drove his own son into exile in Persia. Sambhaji was captured in 1689 and executed. The Sultanates of Bijapur and Golkonda were also reduced to utter submission.

Towards the end of his reign, Aurangzeb's empire began to disintegrate and this process was accelerated in the years after his death, when "successor states" came into existence. The empire had become too large and unwieldy. Aurangzeb did not have enough trustworthy men at his command to manage the more far-flung parts of the empire. Many of his political appointees broke loose and declared them independent. Aurangzeb's preoccupation with affairs in the Deccan prevented him from meeting political challenges emanating from other parts of the empire. Shortly after the death of Aurangzeb, the Mughal Empire ceased to be an effective force in the political life of India.

Aurangzeb re-imposed jizya. He also issued orders that new temples should not be constructed; but the repair of old long-standing temples was permitted. These measures were rooted not only in his religious faith but also due to political compulsions. Jizya had been levied for a long time in India. As a staunch Muslim, Aurangzeb had discontinued the practise of levying *abwab*, a tax levied on the lands over and above the original rent, not sanctioned by Shariah. Likewise, the order on temples was also an older one which in practice applied to places where he had political adversaries. In areas where there was no political insubordination, Aurangzeb provided endowments to build temples. It should be noted that during the reign of Aurangzeb the number of Hindu officials increased when compared to the reign of Shah Jahan.

Mughal Society

The population of India is estimated to have been around 15 crores in the 16th century and 20 crores in the 18th century. Large areas of land were under forest cover and the area under cultivation would have been much less. As agriculture was the prime occupation of the society the village community was the chief institution of social organisation. Though the nature, composition and governance of village differed from place to place there were certain similarities in the village administration. The *Muqaddam*, privileged headman of the village, formed the *Panch* (Panchayat), an administrative organ of the village. The *Panch* was responsible for collection and maintenance of accounts at the village level. The *Panch*

allotted the unoccupied lands of the village to artisans, menials and servants for their service to the village.

The middle class consisted of small Mansabdars, petty shopkeepers, hakims (doctors), musicians, artists, petty officials of Mughal administration. There was a salaried class, and received grants called Madad-i-Mash from the Mughal emperor, local rulers and zamindars. This section often became part of the rural gentry and a link between the village and the town. Delhi, Agra, Fatehpur Sikri, Lahore, Ahmadabad, Dacca and Multan were important cities of the empire which could be ranked along with contemporary European cities like London and Paris.

The inequality in the standard of life amongst the privileged and the underprivileged classes was clear. Among the lower strata of society, the men wore just a langota and the women a sari. Footwear was not common. The poor lived in houses made of mud and their diet consisted of wheat chapatis with pulses and vegetables. On the contrary the Mughal privileged class consisting of zamindars and nobles led an ostentatious life. The nobles were Mansabdars who received jagirs or land grants as payment according to their ranks. The jagirdars were exploitative and oppressive in nature. The nobles maintained a large train of servants, large stables of horses, elephants, etc. The nobles lived in fine houses containing gardens with fruit trees and running water. They wore the finest of clothing.

The Zamindars, members of dominant clans and castes with armed retainers, were a dominant class with privilege over lands of the peasants. Abul Fazal in his Ain-i-Akbari enlists the castes that were entitled to be zamindars. While mostly upper caste Hindus and Rajputs were zamindars, in certain localities Muslim zamindars existed. The zamindars had the right to evict the peasants, in default of payment of rent.

In Mughal social structure, the nobles came mostly from Central Asia and Iran. Afghans, Indian Muslims (shaikhzadas), Rajputs and Marathas also obtained the status of nobility. It is estimated that during the reign of Akbar over 15% of the nobility consisted of Rajputs. Raja Man Singh, Raja Todar Mal and Raja Birbal were Rajput nobles of repute during Akbar. The Rajputs appointed Kayasths and Khattris for various positions in government administration. Jahangir, Shah Jahan and Aurangzeb employed Marathas in their nobility. For example, Shaji, father of Shivaji, served Shah Jahan for some time.

There were continuous migrations from Central Asia as there were better career prospects in India. These migrations led to the enrichment of culture through assimilation of diversity. Though the nobility was divided on ethnic lines they formed a composite class promoting a syncretic culture by patronising painters, musicians and singers of both Persian and Indian origin.

The caste system was a dominant institution in the society. Castes at lower levels were subject to much repression. Despite the popular Bhakti movement raising the banner of revolt against discrimination, the deprived and disadvantaged classes, who were landless peasants, were subject to forced labour.

The Hindu women had only limited right of inheritance. Widow Remarriage was not permitted among upper caste women. Along with household activities the women were involved in spinning yarn and helped in agricultural operations. Mughal administration

discouraged the practise of sati that was prevalent among communities of the higher caste. Muslim brides were entitled to receive mehr (money mandatorily paid by the groom) at the time of marriage, and also had the right to inherit property, though it was not equal to the share of the male members of the family.

Economy

The Mughal economy was a forest-based agricultural economy. The forests provided the raw materials for the craftsmen. Timber went to carpenters, wood carvers and shipwrights, lacquerware makers; wild silk to reelers and weavers; charcoal to iron miners and metal smiths. Hence the relationship between manufacturing and the forest was very close.

Different classes of the rural population were involved in agriculture. Agriculture was the chief activity in the economy. Landless agricultural labourers without right to property formed almost a quarter of the population. Zamindars and village headmen possessed large tracts of land in which they employed labourers and paid them in cash and kind. Well irrigation was the dominant mode of irrigation.

The Ain-i-Akbari lists the various crops cultivated during the Rabi and Kharif seasons. Tobacco and maize were introduced in the seventeenth century. Chilli and groundnut came later. Pineapple was introduced in the sixteenth century. Grafted varieties of mango came to be developed by the Portuguese. Potato, tomato and guava came later. Indigo was another important commercial crop during the Mughal period. Sericulture underwent spectacular growth in Bengal to the extent that it became the chief supplier of silk to world trade.

As the farmers were compelled to pay land tax they had to sell the surplus in the market. The land tax was a share of the actual produce and was a major source of revenue for the Mughal ruling class. The administration determined the productivity of the land and assessed the tax based on the total measurement. Akbar promulgated the Zabt System (introduced by Todal Mal): money revenue rates were now fixed on each unit of area according to the crops cultivated. The schedules containing these rates for different localities applicable year after year were called dasturs.

The urban economy was based on craft industry. Cotton textile industry employed large numbers of people as cotton carders, spinners, dyers, printers and washers. Iron, copper, diamond mining and gun making were other chief occupations. Kharkhanas were workshops where expensive craft products were produced. The royal kharkhanas manufactured articles for the use of the royal family and nobility. The excess production of the artisans was diverted to the merchants and traders for local and distant markets.

Trade and Commerce

The political integration of the country with efficient maintenance of law and order ensured brisk trade and commerce. The surplus was carried to different parts of the country

through rivers, and through the roads on ox and camel drawn carts. Banjaras were specialised traders who carried goods in a large bulk over long distances. Bengal was the chief exporting centre of rice, sugar, muslin, silk and food for its textile production grains. The Coromandel Coast was reputed for Kashmiri shawls and carpets were distributed from Lahore which was an important centre of handicraft production. The movement of goods was facilitated by letters of credit called hundi. The network of sarais enabled the traders and merchants to travel to various places. The traders came from all religious communities: Hindus, Muslims and Jains. The Bohra Muslims of Gujarat, Marwaris of Rajasthan, Chettians on Coromandel Coast, and Muslims of Malabar were prominent trading communities.

Europeans controlled trade with the West Asia and European countries, and restricted the involvement of Indian traders. Moreover, the Mughal Empire, despite its vast resources and a huge army, was not a naval power. They did not realise that they were living in an era of expanding maritime trade.

Europeans imported spices, indigo, Bengal silk, muslin, calico and chintz. In return, India obtained large quantities of silver and gold. Mughal silver coinage fuelled the demand for silver.

Religion

The Mughal period witnessed a continuing assertion of all the basic elements in puranic traditions. Though it was difficult to speak of Hinduism as a single body of doctrine, in view of the countless faiths and innumerable customs and practices, having developed in mutual interaction and expressed in a large part in the same language (Sanskrit), the different sects of Hinduism yet shared the same idiom and the same or similar deities. The sixteenth and seventeenth centuries were the centuries of Vaishnavism. Tulsidas (Ramcharitmanas) a great proponent of Rama cult in his popular verses of devotion portrayed Rama as a god incarnate. The expression of bhakti was deeply emotional as the object of bhakti (devotion) was Krishna, an incarnation of Vishnu.

The Bhakti movement made great strides during this period. Poets and saints emerged from various parts of the country. They were critical of rituals, and criticised the caste system. Rather than using Sanskrit for expressing their devotion, they employed the language of the common people. The radical ideas, and the easy but catchy language often set to music made them popular among the masses. Some of the major religious figures like Vallabhacharya and his son Vitthalnath propagated a religion of grace; and Surdas, an adherent to this sect, wrote Sur-Saravali in the local language. Eknath and Tukaram were Bhakti poets from Maharashtra. The Dasakuta movement, a bhakti movement in Karnataka, popularised by Vyasaraya, turned out to be a lower class movement.

The most important figure of the Bhakti movement was Kabir. Said to be a weaver, Kabir propounded absolute monotheism, condemned image worship and rituals, and the caste system. His popular poetry written in a simple language was spread orally across large parts of north India.

An interesting aspect of the Bhakti poets was that they came from lower castes practising craft and service occupations. Kabir was a weaver, Ravidas, a worker in hides, Sain, was a barber, and Dadu, a cotton carder. The Satnami sect in Haryana credited its origin to Kabir and his teachings. While Sanskrit and Persian were the languages of administration and intellectual activity, the vernacular languages demonstrated their literary vitality.

Sikhism

Sikhism originated as a popular monotheistic movement, and evolved into one of the recognised religions of the world. Guru Granth Sahib, the holy book of Sikhs, contained the sayings of Muslim saint Shaikh Farid and of Bhakti poets such as Namdev, Kabir, Sain and Ravidas. Guru Nanak believed in one God who was formless and omnipresent. He condemned image worship and religious rituals. He stressed ethical conduct, kindness to all human beings and condemned caste system.

Sufism

India was a fertile soil for the prevalence of Sufism or Muslim mysticism that had its origin in Iran. It was accepted by the orthodox theologians as long as it fulfilled the obligations of the shariah. Sufism played a key role in creating religious harmony.

Christianity

Along with the European traders came the Christian missionaries like Roberto De Nobili, Francis Xavier. The early missionaries were Catholics. The first Lutheran missionaries under Danish patronage arrived in 1706 at Tranquebar and Ziegenbalg translated the New Testament of the Bible into Tamil in 1714, and soon the Old Testament as well. This was the earliest translation of the Bible in any Indian language.

Science and Technology

The Madrasas continued to be concerned principally with Muslim theology and its vast literature. In great learning centres like Varanasi, astrology was taught and there was no institution in India, as noted by the French traveller Bernier, to the standards of colleges and universities in Europe. This made the imparting of scientific subjects almost impossible. Attention was, however, given to mathematics and astronomy. Akbar's court poet Faizi translated Bhaskaracharya's famous work on mathematics, Lilavati. Despite the presence of Europeans, there was no influence of them on the Indian society during the Mughal period.

The method of water-lift based on pin-drum gearing known as Persian wheel had been introduced during Babur's time. A complicated system of water lift by a series of gear-wheels had been installed in Fatehpur Sikri. Akbar was also credited with popularizing the device of cooling water using saltpetre. He is also the first known person in the world to have devised the 'ship's camel', a barge on which the ship is built to make it easier for the

ship to be carried to the sea. Some mechanical devices like the screw for tightening, manually driven belt-drill for cutting diamonds were in use. Agricultural tools continued to be the same, made entirely of wood. In metallurgy, the inability to produce cast iron remained an obvious drawback. As Irfan Habib observed, 'India's backwardness in technology was obvious when the matchlock remained the most common weapon in Indian armies. In Europe the flintlock had long come into use. Indians continued to use the expensive bronze cannon, long after these had become obsolete in Europe. This was because of India's inability to make cast iron even in the seventeenth century.'

Architecture

Architectural progress during the Mughals is a landmark in world art. Mughal buildings were noted for the massive structures decorated with bulbous domes, splendid minarets, cupolas in the four corners, elaborate designs, and pietra dura (pictorial mosaic work). The mosques built during the time of Babur and Humayun are not of much architectural significance. The Sur dynasty left behind a few spectacular specimens in the form of the Purana Qila at Delhi, and the tombs of Sher Shah and Islam Shah at Sasaram in Bihar. The Purana Qila with a raised citadel and the tombs on a terraced platform surrounded by large tanks were novel features.

During Akbar's reign, Humayun's tomb was enclosed with gardens and placed on a raised platform. Built by Indian artisans and designed by Persian architects it set a pattern to be followed in the future. The Agra fort built with red sandstone is a specimen where Rajput architectural styles were also incorporated. The new capital city of Akbar Fatehpur Sikri enclosed within its walls several inspiring buildings. The magnificent gateway to Fatehpur Sikri, the Buland Darwaza, built by Akbar with red sandstone and marble is considered to be a perfect architectural achievement. The mausoleum of Akbarat Sikandra near Agra started by Akbar and completed by Jahangir includes some Buddhist architectural elements. The tomb of Itimad-ud-daula, father of Nurjahan, built by Jahangir was the first Mughal building built completely with white marble.

Mughal architecture reached its apex during the reign of Shah Jahan. The Taj Mahal is a marble structure on an elevated platform, the bulbous dome in the centre rising on a recessed gateway with four cupolas around the dome and with four free-standing minarets at each of its corners is a monument of universal fame. The Red Fort in Delhi, encompassed by magnificent buildings like Diwan-I Aam, Diwan-i-Khas, Moti Mahal and Hira Mahal reflect the architectural skills of the times of Shah Jahan. The Moti Masjid inside the Agra Fort made exclusively of marble, the Jama Masjid in Delhi, with its lofty gateway, series of domes and tall and slender minarets are the two significant mosques built by Shah Jahan. He also established a new township, Shah jahanabad (present-day Old Delhi) where Red Fort and Jama Masjid are located. Aurangzeb's reign witnessed the construction of Badshahi mosque in Lahore and the marble tomb of Rabia ud daurani, known as Bibi-ka-maqbara (Tomb of the Lady) at Aurangabad.

The Shalimar Gardens of Jahangir and Shah Jahan are showpieces of Indian horticulture. Apart from the many massive structures, the Mughals contributed many civil works of public utility, the greatest of them being the bridge over the Gomati River at

Jaunpur. The most impressive feat is the West Yamuna Canal which provided water to Delhi.

Mughal architecture influenced even temple construction in different parts of the country. The temple of Govind Dev at Vrindavan near Mathura and Bir Singh's temple of Chaturbhuj at Orchha (Madhya Pradesh) display Mughal influence.

Paintings

The Mughals achieved international recognition in the field of painting. Mughal miniatures are an important part of the museums of the world. Ancient Indian painting traditions kept alive in provinces like Malwa and Gujarat along with the central Asian influences created a deep impact in the world of painting. The masters of miniature painting, Abdu's Samad and Mir Sayyid Ali, who had come to India from Central Asia along with Humayun inspired Indian painters. The primary objective of painting was to illustrate literary works. The Persian text of Mahabharata and Akbar Nama were illustrated with paintings by various painters. Daswant and Basawan were famous painters of Akbar's court. European painting was introduced in Akbar's court by Portuguese priests. During Jahangir's time portrait painting and the painting of animals had developed. Mansur was a great name in this field. The great Dutch painter Rembrandt was influenced by Mughal miniatures. While Shah Jahan continued the tradition of painting, Aurangzeb's indifference to painting led to dispersal of the painters to different parts of the country and thereby led to promotion of painting in the provinces.

Music and Dance

According to Ain-i-Akbari, Tansen of Gwalior, credited with composing of many ragas, was patronised by Akbar along with 35 other musicians. Jahangir and Shah Jahan were patrons of music. Though there is a popular misconception that Aurangzeb was against music, a large number of books on Indian classical music were written during his regime. His queens, princes and nobles continued to patronise music. The later Mughal Muhammad Shah was instrumental in inspiring important developments in the field of music. Paintings in Babur Nama and Padshah Nama depict woman dancing to the accompaniment of musical instruments.

Literature

Persian, Sanskrit and regional languages developed during the Mughal rule. Persian was the language of administration in Mughal Empire and the Deccan states. It influenced even the Rajput states where Persian words were used in administration. Abul Fazal patronised by Akbar compiled the history of Akbar in Akbar Nama and described Mughal administration in his work Ain-i-Akbari. The Ain-i-Akbari is commendable for its interest in science, statistics, geography and culture. Akbar Nama was emulated by Abdul Hamid Lahori and Muhammad Waris in their joint work Padshah Nama, a biography of Shah Jahan. Later Muhammad Kazim in his Alamgir Nama, a work on the reign of the first decade of Aurangzeb, followed the same pattern. Babur's autobiography written in Chagatai Turkish was translated into Persian by Abdur Rahim Khan-e-Khanan. Dabistan is

an impartial account of the beliefs and works of different religions. Persian literature was enriched by translations of Sanskrit works. The Mahabharata was translated under the supervision of Abul Faizi, brother of Abul Fazal and a court poet of Akbar. The translation of Upanishads by Dara Shukoh, entitled Surr-I-Akbar (the Great Secret), is a landmark. The Masnawis of Abul Faizi, Utbi and Naziri enriched Persian Poetry in India.

The Sanskrit works produced during the Mughal rule are impressive. Sanskrit literature of this period is noted for the kavyas and historical poetry. Rajavalipataka, a kavya, written by Prajna bhatta which completed the history of Kashmir belonged to reign of Akbar. Graeco-Arabic learning was transmitted to India through Persian works in the form of Sanskrit translations. Akbar's astronomer Nilakantha wrote the Tajika Neelakanthi, an astrological treatise. Shah Jahan's court poet Jaganatha Panditha wrote the monumental Rasagangadhara.

The greatest contribution in the field of literature during the Mughal rule was the development of Urdu as a common language of communication for people speaking different dialects. Regional languages acquired stability and maturity and some of the finest lyrical poetry was produced during this period. Abdur Rahim Khan-e-Khanan composed Bhakti poetry with a blend of Persian ideas of life and human relations in the Brij form of Hindi. Tulsidas who wrote in Awadhi, the Hindi dialect spoken in the eastern Uttar Pradesh, was very popular for his devotional ideals. Marathi literature had an upsurge due to the literary contribution of Eknath, Tukaram, Ramdas and Mukteshwar during this period. Eknath questioned the superiority of Sanskrit over other languages. The verses of Tukaram kindled monotheism. Mukteshwar composed Ramayana and Mahabharata in literary Marathi.

Krishnadevaraya, the Vijayanagar ruler, through his Amuktamalyada (an epic poem on the Tamil woman poet, Andal) and his court Poet Allasani Peddana with his Manu Charitra were the leading beacons of Telugu literature during this period. Malayalam which had separated from Tamil as a language received a separate literary identity during this period. Ramayana and Mahabharata were composed in Malayalam. In Assamese language the tradition of Bhakti poetry was emulated by Shankara Deva who initiated a new literary tradition. Assamese literary works were produced in the fields of astronomy, arithmetic, and treatment of elephants and horses. Ramayana and Mahabharata were also retold in the Assamese language. The Chaitanya cult which portrayed the love of Krishna and Radha in poetic verses promoted Bengali literature. The Guru Granth Sahib, the holy book of the Sikhs compiled by Guru Arjun in which the verses of the Sikh Gurus as well as Shaikh Farid and other monotheists are a landmark in the evolution of Punjabi language.

During this period Tamil literature was dominated by Saivite and Vaishnavite literature. Kumaraguruparar, a great Saiva poet, is said to have visited Varanasi in the late seventeenth century. He composed important literary works such as Meenakshiammai Pillai Tamil and Neethineri Vilakkam. Thayumanavar wrote highly devotional verses with compassion for all humanity and he formulated a sanmargathat tried to bridge differences between the various Saivite sects. The Christian missionaries like Roberto de Nobili and Constantine Joseph Beschi contributed much too Tamil language.

The empire the Mughals built at the national level made an everlasting impact on India as they knit the fragments into a single political unit, well aided by an effective central administration. Multiple identities also got synthesized in the process leading to the evolution of a unique culture that is Indian.



Socio - Religious Movement

8th history

UNIT - 8 Status of Women in India through the ages

Introduction

Generally human society is constantly changing with additions, assimilations and omissions from within and outside. Women constitute half of the population. It is imperative to have a historical understanding of the status of women through ages.

The position of women was not uniform in all periods, differed with regional variations. In ancient India particularly early Vedic period women enjoyed equal rights. But with the passage of time their status in the society found deteriorated as a result of frequent foreign invasions. They were subjected to subjugation and subordination. New social practices, customs and systems which crept into the society in turn put limitations and restrictions on the liberty of women.

During the British Raj, many socio-religious reformers like Raja Rammohan Roy, Dayananda Saraswati, Keshab Chandra Sen, Iswara Chandra VidyaSagar, Pandita Ramabai, Dr. Muthulakshmi Ammaiyar, Jyotirao Phule, Periyar E.V.R, Dr. Dharmambal were the prominent leaders who fought for the upliftment of women. Raja Rammohan Roy's efforts led to the abolition of sati in 1829. VidyaSagar's crusade for the improvement in the condition of widows, led to the passing of Widow Remarriage Act in 1856. The reformers rightly realized that female education as an emancipating agent in eradicating social evils. So they started girls' schools in various parts of the country, which brought significant changes in the lives of women.

Women played an important part in Indian Freedom struggle. Until independence, there was no radical changes in the status of women. In independent India, last few decades have witnessed the all round development of women. Women are now making their presence felt in every walk of life.

The position of women

a) Ancient Period

In the ancient Indus civilization of India, evidences show the worship of the mother goddess. Hence, the adoration for the mother is evident during that period. During the Rig Vedic period, it is believed that the position of wife was honoured and women's position was acknowledged, especially in the performance of religious ceremonies.

During later Vedic age witnessed a transitional development in the status of women restricting her role in the social life except in the performance of religious sacrifices. Her social and political freedom was restricted. Sati became popular during the later Vedic period where the widows either chose for themselves or were forced to jump into the pyre of their husbands. The patriarchal system became rigid. Women were denied to study Vedic scriptures.

b) Medieval Period

The position of women in the society further deteriorated during the medieval period and they suffered from many social evils such as sati, child marriages, female infanticide, and slavery. Normally monogamy was in practice but among the rich polygamy was prevalent. 'Sati' was in practice particularly among the royal and upper strata of the society. Widow re-marriage was rare. Devadasi system was in practice in some parts of India. Among the Rajputs of Rajasthan, the Jauhar was practiced. The condition of widow became miserable during the medieval period. But we don't ignore the fact that the Mughal ruler Akbar attempted to abolish sati. In fact very little attention was paid to female education.

Jauhar refers to the practice of collective voluntary immolation by wives and daughters of defeated Rajput warriors, in order to avoid capture and dishonour.

In spite of general determination, we can find some exceptions Razia sultana, Queen Durgavati, Chand bibi, Nurjahan, Jahannara, Jijabai and Mira bai.

During medieval times Women's education was not completely ignored, though no regular separate school seems to have existed. Female education was informal. Girls usually had their lessons from their parents in their childhood. The rich appointed tutors to teach their daughters at home. The daughters of Rajput chiefs and Zamindars studied literature and philosophy.

c) British Period

For centuries women in India had been subordinated to men and socially oppressed. The major effect of national awakening in the nineteenth century was seen in the field of social reform. The enlightened persons increasingly revolted against rigid social evils and outdated customs. Numerous individuals, reform societies and religious organisations worked hard to spread education among women, to encourage widow remarriage, to improve the living conditions of widows, to prevent marriage of young children, to enforce monogamy and to enable middle-class women to take up professions or public employment.

In the beginning of nineteenth century female literacy was extremely low when compared to male literacy. The Christian missionaries were the first to set up the Calcutta Female Juvenile Society in 1819. The Bethune school was founded in 1849 by J.E.D. Bethune, who was the president of the council of education in Calcutta.

Charles Wood's despatch on education in 1854 laid a great stress on the need for female education. Indian Education Commission (Hunter) of 1882 recommended to start primary schools for girls and teacher-training institution and suggested special scholarships and prizes for girls. In 1880's Indian women began to enter universities. They were also

trained to become doctors and teachers. They began to write books and magazines. In 1914 the women's medical service did a lot of work in training mid-wives. In the 1890s D.K. Karve established a number of female schools in Poona. Prof D.K. Karve, Pandita Rama bai, made sincere effort to emancipate women through education was really remarkable. The Indian women's university was started by Prof. D.K. Karve in 1916. It was an outstanding institution imparting education to women. In the same year Lady Harding Medical College was started in Delhi.

Major Social Evils

a) Female infanticide

Female infanticide was another inhuman practice afflicting the nineteenth century Indian society. It was particularly in vogue in Rajputana, Punjab and the North Western Provinces. It was mainly to avoid economic burden.

Factors such as family pride, the fear of not finding a suitable match for the girl child were some of the major reasons responsible for this practice. Therefore, immediately after birth, the female infants were being killed.

The company administration in India took steps to ban this practice by passing the Bengal Regulatory Act XXI of 1795, the Regulating Act of 1802 and the Female Infanticide Act of 1870.

b) Female Foeticide

Female foeticide is also an inhuman practice which cuts across the caste, creed, class and regional boundaries. Whether it is female infanticide or female foeticide the prime motive remained the same. In order to ban the female foeticide and sex-determination the central Government passed various Acts.

c) Child marriage

The practice of child marriage was another social disgrace for the women. In 1846, the minimum marriageable age for a girl was only 10 years. The native marriage Act was passed in 1872. It fixed the minimum marriageable age of girls at 14 and boys at 18. In 1930, the Central Legislative Assembly passed Rai Saheb Harbilas Sarada's child Marriage Bill fixing the minimum marriageable age for boys at 18 and 14 for girls. It was later amended to 18 for girls and 21 for boys according to Hindu Marriage Act 1955.

Akbar prohibited child marriage and made it obligatory for the parents to obtain the approval of both the bride and the bridegroom before the marriage. He prescribed 14 years as the age of constant for girls and 16 years for boys

d) Sati

Sati was social evil that prevailed in Indian society especially among the Rajputs. Earlier it was a voluntary act but later by the relatives forced the widow to sit on the funeral pyre. The Italian traveler, Niccolo Conti, who visited Vijayanagar about the year A.D. (C.E) 1420, notes that 'the inhabitants of this region marry as many wives as they please, who are burnt with their dead husbands'.

In the early years of 19th century, sati was in practice in various Parts of Bengal, western India and southern India. In 1811, Jagan Mohan Roy, brother of Rammohan Roy, passed away and his wife was burnt along with him. Rammohan Roy was moved to the extreme at the sight of it and took an oath that he would have the cruel practice abolished by law. He carried on a continuous agitation through press and platform for the abolition of Sati.

Raja Rammohan Roy published his tracts in 1818-20, making the point that the rite of Sati was not enjoined by the Sastras. This material was used by the Serampore missionaries to shatter the generally accepted view that Sati was an integral part of the Hindu religion. Orthodox Hindu opinion against the abolition was advocated by Radhakanta Deb, and BhawaniCharanBanerji.

When Lord William Bentinck took up the question of Sati, he found that the abolition had been recommended by the judges of the criminal courts. He passed Regulation XVII on December 4, 1829 'declaring the practice of Sati or burning or burying alive the widow of Hindus, illegal and punishable by Criminal Courts'. Similar legislative measures were enacted soon after in Bombay and Madras.

e) Devadasi System

The word Devadasi (Sanskrit) or Devaradiyal (Tamil) means "servant of God" dancing girl dedicated to the service of god in a temple. Devadasi system was a social evil. There was also tradition of dedicating one daughter to the temple. In addition to taking care of the temple, they learnt and practiced BharathaNatiyam and other classical traditional Indian arts.

Later on they were ill treated and humiliated. The Devadasis lost their dignity, sense of pride, self-respect and honour.

Dr.MuthulakshmiAmmaiyar who was the first woman doctor in India, dedicated herself for the cause of abolishing the cruel practice of Devadasi system from Tamil Nadu. Appreciating her role in the agitation against Devadasi system she was nominated to the Tamil Nadu legislative council in 1929. Periyar E.V. Ramasamy was instrumental in passing the "Devadasi abolition bill". Dr.MuthulakshmiAmmaiyar proposed the bill to the Madras legislative council in 1930.

MoovalurRamamirdham was yet another woman who fought for the emancipation of the Devadasi. With the continuous moral support rendered by Rajaji, Periyar and Thiru.Vi.Ka, she raised slogan against this cruel practice. As a result the government passed the "Devadasi Abolition Act".

The Madras Devadasi Act was a law that was enacted on 9th October 1947. The law was passed in the Madras presidency and gave Devadasis the legal right to marry and made it illegal to dedicated girls to Indian temples.

Role of Social Reformers

From the second half of the nineteenth century, a number of social reformers and social reform movements sought to promote the upliftment of women by giving them education, raising their marriageable age and taking care of widows, as well as to remove the rigidity of caste and raise the suppressed class to a status of equality. The reformers who led the movements were the forerunners of modern India.

a) Raja Rammohan Roy

There were some enlightened Indians who supported the British attempt to reform the oppressive social order of India. The first was the abolition of sati by law, on humanitarian grounds. Raja Rammohan Roy, the pioneer of Indian social reform movement was a casteless crusader of sati after having seen this practice in the case of his own sister-in-law. He started his campaign against this inhuman evil practice. Influenced by the ruthless attack of the movement led by Rammohan Roy the British government declared this act as "culpable Homicide". Raja Rammohan Roy is most remembered for helping Lord William Bentinck to declare the practice of Sati a punishable offence in 1829. He also protested against the child marriage and female infanticide. He favoured the remarriage of widows, female education and women's right to property. Thus the evil practice of sati on any scale was wiped out.

b) Ishwar Chandra Vidhyasagar

Ishwar Chandra Vidhyasagar carried on the movement for female education, widow remarriage and abolition of polygamy in Bengal. He submitted petitions to this effect to the Indian Legislative Council and to the passing of the Hindu Widow Remarriage Act in 1856. His son Narayanachandra set an example to others by marrying a widow of his choice. To promote female education, Vidhyasagar founded several girls' schools in the districts of Nadia, Midnapur, Hugli and Burdwan in Bengal.

c) Kandukuri Veeresalingam

Kandukuri Veeresalingam Pantulu was the earliest champion in South India of women's emancipation. He published a journal vivekavardhani. He opened his first girls' school in 1874 and made widow remarriage and female education the key points of his programme for social reform.

d) M.G. Ranade and B.M. Malabari

In Bombay presidency, M.G. Ranade and B.M. Malabari carried on the movement for the upliftment of women. In 1869, Ranade joined the Widow Remarriage Association and encouraged widow remarriage and female education and opposed child marriage. In 1887, he started the National Social Conference, which became a pre-eminent institution for social reform. In 1884, B.M. Malabari, a journalist, started a movement for the abolition of child marriage. He published pamphlets on this subject and appealed to the government to take action.

e) Gopal Krishna Gokhale

In 1905, Gopal Krishna Gokhale started the Servants of India Society which took up such social reform measures as primary education, female education and depressed classes' upliftment. The spread of female education further led to the participation of women in the freedom struggle.

f) Periyar E.V.R.

Periyar E.V.R. was one of the greatest social reformers of Tamil Nadu. He advocated women education, widow remarriage and inter-caste marriages and opposed child marriages.

g) Women Reformers

Most of the reform movements like Brahma Samaj (1828), PrarthanaSamaj (1867) and AryaSamaj (1875) were led by male reformers who set the limit of the freedom and development of women. Women reformers like PanditaRamabai, Rukhmabai and TarabaiShinde tried to extent further. In 1889, PanditaRamabai opened SaradaSadan (Home of Learning) for Hindu widows in Bombay. It was later shifted to Poona. Her greatest legacy was her effort, the first in India, to educate widows. Theosophical society was established at Chennai and Dr. Annie Besant who came from Europe and joined it. It also developed general social reform programme.

Dr. S. Dharmambal was another reformer who was very much influenced by the ideas of Periyar. She showed great interest in implementing widow remarriage and women education. Among 'MoovalurRamamirdhamAmmaiyar' raised her voice against Devadasi system along with Dr.MuthulakshmiAmmaiyar. In her memory, the government of Tamil Nadu has instituted the "MoovalurRamamirdhaAmmalNinaivu Marriage assistance scheme", a social welfare scheme to provide financial assistance to poor women as poverty was the root cause for all these evils. Thus women reformers also contributed a lot for winning their own rights.

Leading women realized the need of forming their own associations in order to safeguard their interests. As a result three major national women's organizations - Women's India Association, National Council of Women in India and the All India Women's Conference were founded.

Women in the freedom movement

In the early anti-colonial struggle women played major roles in various capacities. Velunachiyar of Sivaganga fought violently against the British and restored her rule in Sivaganga. Begum Hazrat Mahal, Rani Lakshmi Bai of Jhansi led an armed revolt of 1857 against the British.

In the freedom struggle thousands of women came out of their homes, boycotted foreign goods, marched in processions, defied laws, received lathi charges and Courted jails. Their participation in the struggle added a new dimension of mass character.

Impact of reform movement

- ❖ Significant advances were made in the field of emancipation of women.
- ❖ It created of national awakening among the masses.
- ❖ It created the feeling of sacrifice, service and rationalism.
- ❖ The practice of sati and infanticide were made illegal.
- ❖ It permitted widow remarriage.

Women in Independent India

Women in India now participate in all activities such as education, politics, medical, culture, service sectors, science and technology.

The constitution of India guarantees (Article 14) equal opportunity and equal pay for equal work.

The National policy for empowerment of women was passed under the National Policy on Education (1986), new programme was launched called Mahila Samakhya, its main focus was on empower of women. Reservation of 33 percent to women envisaged an improvement in the socio-political status of women.

The National Commission for women was set up January 1992. Its main functions is to review women related legislation and intervene in specific individual complaints of atrocities and denial of rights.

The following legislations have enhanced the status of women in matters of marriage adoption and inheritance.

legislation	Provisions
Bengal regulation of XXI, 1804	Female infanticide was declared illegal
Regulation of XVII, 1829	Practice of sati was declared illegal
Hindus Widow's Remarriage Act, 1856	It permitted widow remarriage
The Native Marriage Act, 1872	The Child Marriage was prohibited
The Sharda Act, 1930	The age of marriage was raised for boys girls
Devadasi abolition Act, 1947	It abolished Devadasi system

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5- Social and Religious Reform Movements in the 19th Century

English education, introduced with the object of producing clerks, also produced a new English-educated middle class. This class came under the influence of western ideas and thoughts. Christianity also had its effect on the newly emerging middle class. Though small in number, the educated middle class began to take a lead in political as well as in reform movements. The Indian reformers were, however, quite hesitant to subject their old notions and habits to critical scrutiny. Instead they attempted to harmonize both Indian and Western cultures. Their ideas and their actions helped to mitigate social evils such as sati, female infanticide, and child marriage and various superstitious beliefs.

The reform movements of nineteenth century in the realm of religion fall under two broad categories: reformist movements like the Brahmo Samaj, the Prarthana Samaj and the Aligarh Movement; and the revivalist movements such as the Arya Samaj, the Ramakrishna Mission and the Deoband Movement. There were also attempts to challenge the oppressive social structure by Jyotiba Phule in Pune, Narayana Guru and Ayyankali in Kerala and Ramalinga Adigal, Vaikunda Swamikal and Iyothee Thassar of Tamil Nadu.

Raja Rammohan Roy and Brahmo Samaj

Rammohan Roy (1772–1833) was one of the earlier reformers influenced by the Western ideas to initiate reforms. He was a great scholar, well-versed in Sanskrit, Arabic, Persian, and English apart from his knowledge in his mother tongue, Bengali. Rammohan Roy was opposed to meaningless religious ceremonies and all forms of pernicious social customs. Yet he wanted to preserve continuity with the past. In his religio-philosophical social outlook, he was deeply influenced by monotheism and anti-idolatry. Based on his interpretation of the Upanishads, he argued that all the ancient texts of the Hindus preached monotheism or worship of one God.

Deeply concerned with the prevailing customs of sati, child marriage, and polygamy he published tracts against them and petitioned the government to legislate against them. He advocated the rights of widows to marry. He wanted polygamy to end. His opinions were resisted fiercely by orthodox Hindus. He appealed to reason and humanity and compassion of the people. He visited the crematorium of Calcutta to try and persuade the relatives of widows to give up their plan of self-immolation. His campaign played a key role in forcing the Governor-General William Bentinck's legislation abolishing sati in 1829.

Ram Mohan Roy condemned the subjugation of women and opposed the prevailing ideas that women were inferior to men. He strongly advocated education for women. He gave his full support for the introduction of English language and western sciences in schools and colleges. Rammohan found in the Upanishads a new revelation of one infinite, divine Being, the eternal Brahman, while Hinduism as he saw in the daily life around him was a perversion of their teaching.

Ram Mohan Roy founded the Brahmo Samaj in 1828. On 20 August 1828 he opened a temple in Calcutta, where there was no image. There he laid down that 'no religion should be reviled or slightly or contemptuously spoken of or alluded to.' The Samaj forbade idol-worship and condemned meaningless religious rites and ceremonies. However, from the beginning, the appeal of the Brahmo Samaj remained limited to the intellectuals and enlightened Bengalis. Though the Samaj failed to attract the people from the lower sections of society, its impact on the culture of modern Bengal and its middle class was quite significant.

Maharishi Debendranath Tagore

After the death of Ram Mohan Roy (1833), Maharishi Debendranath Tagore (1817-1905), the poet Rabindranath Tagore's father, carried on the work. He laid down four articles of faith:

1. In the beginning there was nothing. The one Supreme Being alone existed who created the Universe.
2. He alone is the God of Truth, Infinite Wisdom, Goodness, and Power, eternal, omnipresent, the One without second.
3. Our salvation depends on belief in Him and in His worship in this world and the next.
4. Belief consists in loving Him and doing His will.

Keshab Chandra Sen & Brahmo Samaj of India

Debendranath was a moderate reformer. But his younger colleagues in the Sabha were for rapid changes. The greatest of these, Keshab Chandra Sen, (1838-84) joined the movement in 1857. He was greatly influenced by Christianity, believing in its spirit but not in the person of its founder. But in 1866 a split occurred in the ranks of Brahmo Samaj. Keshab left the Samaj and founded a new organization. Debendranath's organization, thereafter, came to be known as Adi Brahmo Samaj. After Keshab had his fourteen-year-old daughter married to an Indian prince, in contravention of the Samaj's condemnation of child marriages, the opponents of child marriage left the Brahmo Samaj of India and started the Sadharan Samaj, which developed anti-Christian tendencies.

Ishwar Chandra Vidyasagar

Another outstanding reformer in Bengal was Ishwar Chandra Vidyasagar (1820-1891). While Ram Mohan Roy and others looked to western rationalist ideas to reform society, Vidyasagar argued that the Hindu scriptures were progressive. He provided evidence from scriptures that there was no sanction for burning of widows or for the prohibition on the remarriage of widows. He wrote a number of polemical tracts, and was the pioneer of modern Bengali prose. He played a leading role in promoting education of girls and helped them in setting up a number of schools. He dedicated his whole life for the betterment of the child widows of the Hindu society. The movement led by Vidyasagar, resulted in the Widows' Remarriage Reform Act of 1856. This Act was intended to improve the lot of child widows and save them from perpetual widowhood.

Prarthana Samaj

The Maharashtra region was another region where reform activities gained Iswar Chandra Vidyasagar steam. A movement similar to the Brahmo Samaj, but founded in Bombay in 1867, was Prarthana Samaj. Its founder was Dr. Atma Ram Pandurang (1825–1898). The two distinguished members of this Samaj were R.C. Bhandarkar and Justice Mahadev Govind Ranade. They devoted themselves to activities such as intercaste dining, inter-caste marriage, widow remarriage and improvement of women and depressed classes. Ranade (1842–1901) was the founder of the Widow Marriage Association (1861), the Poona Sarvajanic Sabha (1870) and the Deccan Education Society (1884).

While the above reformers worked among the upper castes, during the same time Jyotiba Phule worked for the uplift of depressed castes and the cause of women. His book Gulamgiri ('Slavery') is an important work that condemned the inequities of caste.

Swami Dayanand Saraswati and Arya Samaj, 1875

In the Punjab, the reform movement was spearheaded by the Arya Samaj. It was founded (1875) by a wandering ascetic in the western Gangetic plain, Swami Dayanand Saraswati (1824–83). Swami Dayanand later settled in the Punjab to preach his ideas. His book, Satyarthprakash, enjoyed wide circulation. He declared the practices such as child marriage, the prohibition of widow remarriage, and the alleged polluting effects of foreign travel had no scriptural sanction. The positive principles enunciated by Dayanand were: strict monotheism, condemnation of idolatry, and rejection of Brahman domination of ritual and social practices. He also rejected superstitious beliefs in Hinduism, especially Puranic literature and his cry was "go back to Vedas."

Arya Samaj attempted to check the incidence of religious conversion in British India. One of its main objectives was counter-conversion, prescribing a purificatory ceremony called suddhi, directed at Hindus who had converted to Islam and Christianity. The late nineteenth and early twentieth centuries were a period of great turmoil in undivided Punjab with intense debates between Hinduism, Islam and Christianity. The primary achievements of the Arya Samaj were in the field of social reform and spread of education. The Samaj started a number of Dayananda Anglo-Vedic schools and colleges.

Ramakrishna

As we saw earlier, the Brahmo Samaj, as a response to Christian and rationalist criticism had criticised idolatry and other orthodox Hindu practices. The popularity that Ramakrishna (1836–86), a simple priest of Dakshineswar near Kolkata, gained in the latter half of the nineteenth century was a response to this. He emphasised the spiritual union with god through ecstatic practices such as singing bhajans. An ardent worshipper of goddess Kali, the sacred mother, he declared that the manifestations of the divine mother were infinite. In his view, all religions contain the universal elements which, if practised, would lead to salvation. He said, "Jiva is Siva" (all living beings are God). Why then talk of showing mercy to them? Not mercy, but service, service for man, must be regarded as God.'

Ramakrishna Mission

Ramakrishna's primary achievement was his ability to attract educated youth who were dissatisfied with the rational orientation of religious reform organizations such as the

Brahmo Samaj. After his death in 1886, his disciples organised themselves as a religious community and undertook the task of making his life and teaching known in India and abroad. The chief spirit behind this task was Vivekananda. Following the organizational structure of Christian missionaries, Vivekananda established the Ramakrishna Mission which did not restrict itself to religious activities but was actively involved in social causes such as education, health care and relief in times of calamities.

Swami Vivekananda

Narendra Nath Datta (1863–1902), later known as Swami Vivekananda, was the prime follower of Ramakrishna Paramahansa. An educated youth, he was drawn to Ramakrishna's message. Dissatisfied with conventional philosophical positions and practices, he advocated the practical Vedanta of service to humanity and attacked the tendency to defend every institution simply because it was connected with religion. He emphasized a cultural nationalism and made a call to Indian youth to regenerate Hindu society.

His ideas bred a sense of self confidence among Indians who felt inferior in relation to the materialist achievements of the West. He became famous for his address on Hinduism at the 1893 World Congress of Religions in Chicago. Despite his fame, he was condemned by orthodox Hindus for suggesting that the lower castes should be allowed to engage in the Hindu rituals from which they were traditionally excluded. Vivekananda's activist ideology rekindled the desire for political change among many western-education young Bengalis. Many of the youths who were involved in the militant nationalist struggle during the Swadeshi movement following the Partition of Bengal were inspired by Vivekananda.

Theosophical Movement

During the nineteenth century, Hindu religion and culture were being discredited in the West, especially due to missionary propaganda. However, some Western intellectuals looked to the East for spiritual salvation as a remedy to the materialistic orientation of the West. The Theosophical Society, founded by Madame H.P. Blavatsky (1831–1891) and Colonel H.S. Olcott (1832–1907) played a key role in this. Founded in the USA in 1875, it later shifted to India at Adyar, Chennai in 1886. Theosophical Society stimulated a study of the Hindu classics, especially the Upanishads and the Bhagavad Gita. The Theosophical Society also played an important role in the revival of Buddhism in India. Western interest in Hindu scriptures gave educated Hindus great pride in their tradition and culture.

Contribution of Annie Besant

In India the movement became further popular with the election of Annie Besant (1847–1933) as its president after the death of Olcott. She played a role in Indian nationalist politics, and formed the Home Rule League demanding home rule to India on the lines of Ireland. Annie Besant spread Theosophical ideas through her newspapers called New India and Commonweal.

Jyotiba Phule

Jyotiba Govindrao Phule was born in 1827 in Maharashtra. Phule is chiefly known as Jyotiba Phule and Savitribai Phule as the earliest leader of the non-Brahman movement. He opened the first school for “untouchables” in 1852 in Poona. He launched the Satyashodak Samaj (Truth-Seekers Society) in 1870 to stir the non-Brahman masses to self-respect and ambition. Phule opposed child marriage and supported widow remarriage, which was prohibited particularly among high-caste Hindus. Jyotiba and his wife Savitribai Phule devoted their lives for the uplift of the depressed classes and women. Jyotiba opened orphanages and homes for widows. Unlike many contemporary nationalists he welcomed British rule and missionary activities on the ground that British rule enabled lower castes to challenge the supremacy of Brahmins. His work, *Gulamgiri* (Slavery) is an important text that summarized many of his radical ideas.

Narayana Guru

Born to poor parents in Kerala, Narayana Guru (1854– 1928) evolved into a poet and scholar in Malayalam, Tamil and Sanskrit. In his days the people of depressed classes had no access to temples, streets, public tanks and wells and educational institutions. Men and women belonging to lower castes were not allowed to wear the upper garments. Disturbed by the terrible caste tyranny, that the lower caste people suffered, he dedicated his whole life for the betterment of the oppressed. He set up the Sri Narayana Dharma Paripalana Yogam, an organization to work for the uplift of the “depressed classes”. He established a grand temple at Aruvipuram and dedicated it to all. His movement inspired a radical transformation of Kerala society, especially among the Ezhavas. Thinkers and writers such as Kumaran Asan and Dr Palpu were influenced by his ideas and carried forward the movement.

Ayyankali

Nineteenth - century Kerala region was plagued by caste discriminations of worst kind. Certain social groups were not only considered untouchable but also un-seeable. However, the strident campaigns by thinkers such as Narayana Guru and Ayyankali (1863– 1941) in the context of larger political and economic changes ushered in tremendous social changes, especially in the caste structure. Ayyankali was born in 1863 at Venganoor in Thiruvananthapuram then in the princely state of Travancore.

The discrimination he faced as a child turned him into a leader of an anti-caste movement and who later fought for basic rights including access to public spaces and entry to schools. Ayyankali challenged many caste conventions such as clothing style; he wore clothes associated with upper castes that were prohibited for lower castes. He rode on an ox-cart challenging the ‘ban’ on untouchables from accessing public roads used by caste Hindus. Inspired by Sree Narayana Guru, Ayyankali founded the Sadhu Jana Paripalana Sangam (Association for the Protection of the Poor) in 1907 which campaigned and raised funds to educate the lower caste Pulaya people.

Islamic Reforms

After the suppression of great revolt of 1857 Indian Muslims looked to Western culture with suspicion. The community feared that Western education, Western culture and Western ideas would endanger their religion. Therefore only a small section of Muslims

accepted the new avenues for modern education. Consequently, Indian Muslims as a community lagged behind in comparison to the Hindu elite of various parts of India.

Sir Sayyid Ahmed Khan

As Indian Muslims steadily lost ground in education, in the public services and in general leadership in India, there was a realization that there was no alternative but to accept modern education if the community was to go on the path of progress. The man who gave life and soul to it was Sir Sayyid Ahmed Khan (1817-1898). Born in Delhi into a noble Muslim family, Sayyid Ahmed Khan thought that lack of education, especially modern education, had harmed the Muslims greatly and kept them backward. He exhorted the Muslims to accept Western science and take up government services. He founded a scientific society and translated many English books, especially science books into Urdu. He believed that the interest of the Muslims would be best served if they bonded with the British Government rather than pitch in with the rising nationalist movement. So he advised the Muslims to take to English education and to concentrate on it.

Aligarh Movement

Say id Ahmed Khan's movement, the "Aligarh movement," is so called because it was centred around the Aligarh Mohammedan Anglo-Oriental college founded by him in 1875, which is a landmark in the history of Indian Muslim education. The college was raised to the status of a university in 1920. Aligarh produced a huge body of intelligentsia over successive generations who played a key role in public life.

Deoband Movement

Deoband was a revivalist movement organized by the orthodox Muslim Ulema with the twin objectives of propagating the pure teachings of the Quran and the Hadith as well as encouraging the spirit of Jihad against the foreign and un-Islamic elements. The Ulema under the leadership of Muhammad Qasim Wanotavi (1832-80) and Rashid Ahmad Gangotri (1828-1905) founded the school at Deoband in the Saharanpur district of the U.P in 1866. The school curricula shut out English education and western culture. The instruction imparted was in original Islamic religion and the aim was moral and religious regeneration of the Muslim community. The Deoband School did not prepare its students for government jobs but for the preaching of Islamic faith.

In politics, the Deoband School welcomed the formation of the Indian National Congress in 1885. In 1888 the Deoband Ulema issued a religious decree (fatwa) against Syed Ahmed Khan's Organisation called "The United Patriotic Association" and "The Muhammeden Anglo - Oriental Association." It is said the Deoband Ulema were mainly influenced by their determination to oppose Sir Syed Ahmed's activities. Maulana Mahmud-ul-Hassan became the new Deoband leader. The Jamait-Ul-Ulema (council of theologians) led by him gave a concrete shape to Hassan's ideas of protection of the religious and political rights of the Muslims in the overall context of Indian unity.

In the middle of the nineteenth century the reform activities of the educated Parsis (the Zoroastrians who had fled from Iran in the tenth century in the face of religious persecution) began in Mumbai. Furdunji Naoroji founded the Rahnumai Mazdayasnan

Sabha (Parsis' Reform Society) in 1851. Rast Goftar (The Truth Teller) was the main voice of the movement. The leaders of the Sabha criticized elaborate ceremonies at betrothals, marriages and funerals. They opposed both infant marriage and the use of astrology. Behrramji Malabari organized a campaign for legislation against the practice of child marriage. The community produced many leaders such as Pheroza Shah Mehta and Dinshaw Wacha who played a big role in the early Congress.

Sikh Reforms Movement (Nirankaris and Namdharis)

The wave of reform movements did not leave any community untouched. Among the Sikhs of Punjab too there were attempts to reform. Baba Dayal Das, founder of the Nirankari Movement, stressed the worship of God as Nirankar (formless). Rejection of idols, rejection of rituals associated with idolatry, reverence for the authority of Guru Nanak and of the Adi Granth formed the essence of his teachings. He reiterated the prohibition on meat-eating, and liquor consumption. The Namdhari Movement, founded by Baba Ram Singh, was another socio-religious movement among the Sikhs.

The Namdharis insisted on wearing the symbols of Sikhism except the kirpan (sword). Instead Baba Ram Singh wanted his followers to carry a lathi. It considered both men and women equal and accepted widow remarriage. It prohibited the dowry system and child marriage. In the wake of the gathering influence of Arya Samaj and the Christian missionaries, the Singh Sabha of Amritsar was established. Its main objective was to restore the purity of Sikhism. With the support of British, it established Khalsa College for the Sikhs in Amritsar. Singh Sabha was a forerunner of Akali Movement.

Ramalinga Swamikal

Popularly known as Vallalar, Ramalinga Swamikal or Ramalinga Adigal (1823–1874), was born in Marudhur, a village near Chidambaram. After his father's death, his family moved to his brother's house at Chennai. Despite having no formal education he gained immense scholarship. Ramalinga emphasised the bonds of responsibility and compassion between living beings. He expressed the view that 'those who lack compassion for suffering beings are hardhearted, their wisdom clouded'. He showed his compassion and mercy on all living beings including plants. This he called jeevakarunya.

He established the Samarasa Vedha Sanmarga Sangam in 1865 and it was renamed "Samarasa Suddha Sanmarga Satya Sanga" which means "Society for Pure Truth in Universal self-hood". Ramalinga also established a free feeding house for everyone irrespective of caste at Vadalur (1867), in the wake of a terrible famine in south India in 1866. His voluminous songs were compiled and published under the title Thiruvartuppa (Songs of Grace). His radical views deeply disturbed Saiva orthodoxy, who condemned his writings as Marutpa (songs of ignorance).

Vaikunda Swamikal

Vaikunda Swami (1809–1851), one of the earliest crusaders for social justice in south India was born at Sasthan Koil Vilai, the present Samithoppu, a village near Kanyakumari. His original name Mudichudum Perumal was changed to Muthukutty by his parents due to

objection raised by the upper caste Hindus. Muthukutt had no opportunity to have any systematic schooleducation but acquired knowledge of variousreligious texts. He preached the ideas of equalityand advocated the rights of depressed classpeople in the face of stiff opposition from uppercastes as well as the princely state of Travancore.Vaikunda Swamikal criticised therule of the British and the rule of Rajah ofTravancore as the rule of White devils andBlack devils respectively.

He visited Tiruchendur temple andexperienced a new vision. Calling himselfVaikundar, he requested the people to give up allthe irrelevant rites and rituals in their worship.His preaching's against the prevailing religiousorder brought about a considerable changein the attitude of the lower caste people. In1833, Vaikundar commenced his meditation atSamithoppu for the abolition of caste differencesand social integration of the society. During thisperiod, he led a life of a hermit.In south Travancore, there were manyrestrictions on lower caste people such as whatthey could wear and not wear. At a time whenthere was prohibition on certain sections onwearing headgear he advocated the wearing ofa turban in protest. It gave a sense of honourto the oppressed people and offered a spirit ofself-respect.

A new confidence was installedin the minds of his followers. Like the other contemporary reform movements of India in the 19th century, Vaikunda Swamigal condemned the worship of idols. Thelow caste people had no temples for their gods,they erected small pyramids of mud or bricks in their honor, plastered and white-washed. He considered this kind of worship as an uncivilized custom. The people sacrificed goats, cocks and hens. He condemned these religious customs and campaigned against animal sacrifice.

Vaikunda Swamigal founded Samathuva Samajam to unite all the people of variouscastes. He organized inter-dining to accomplish it. Even though he was imprisoned by theMaharajah of Travancore, he never gave up his principles. His followers called him respectfullyas Ayya (father). His cult was also known asAyya Vazhi (The Path of Ayya). His messageemancipated the people from the unjust socialcustoms and superstitious beliefs. His ideas arecollected into a text called Akila Thirattu.

C. Iyothee Thassar

Pandithar Iyothee Thassar (1845-1914) was a radical Tamil scholar, writer, siddha medicine practitioner, journalist and socio-political activist. Born in Chennai, he was fluent in Tamil, English, Sanskrit and Pali languages. He initiated a new knowledgepractice by using journalism as a tool to make inroads into the print public sphere, which, was hitherto an upper caste domain. He campaigned for social justice and worked for the emancipation of the "untouchables" from the caste clutches.

He worked for the construction of a casteless identity and castigated caste hegemony and untouchability. He considered education as an important tool for empowerment and became the driving force behind the establishment of several schools for the "untouchables" in Tamil Nadu. Pandithar Iyothee Thassar founded theAdvaidananda Sabha to raise the voice for the temple entry of the "untouchables". In 1882,John Rathinam and Iyothee Thassar establisheda movement called, Dravida Kazhagam andlaunched a magazine called Dravida

Pandian in 1885. He founded the Dravida Mahajana Sabhain 1891 and organised the First Conference of the association at Nilgiris.

He started a weekly journal, Oru Paisa Tamilan, in 1907 and published it until his demise in 1914. Pandithar Iyothay Thassar was disappointed with the Hindu dharma, which served as the basis for propagating and validating caste in Hindu society. Influenced by the Theosophist organizer, Colonel H.S. Olcott, he went to Sri Lanka in 1898 and converted to Buddhism. In the same year, he founded the Sakya Buddhist Society at Madras to construct the rational religious philosophy through Buddhist religion. He argued that the so-called untouchables were originally Buddhists who were stigmatized by Brahminism.

He further constructed an alternative history through the interpretation of Tamil literature and folk traditions of Tamil from a Buddhist standpoint. In addition, he stated that the revival of Buddhism could liberate the people from the evil of caste that afflicted the Hindu society. He called the "untouchables" Sathi Petham Atra Dravidar (Casteless Dravidians) and urged them to register as casteless Dravidians in the Census.



19. Towards Modernity

Introduction

By the first quarter of the nineteenth century, India had produced a small English-educated intelligentsia, closely associated with British administration or British trade. The ideas and the work of the Christian missionaries had already begun to have its impact. Bengal was the first province to be affected by the British influence and so it was here that several ideas of reform originated. British administration, English education, and European literature brought to India a new wave of thoughts that challenged traditional knowledge. Rationalism as the basis for ethical thinking, the idea of human progress and evolution, the concept of natural rights associated with the Enlightenment, were the new ideas which led to what has been termed as Indian Renaissance. The spread of printing technology played a crucial role in the diffusion of ideas.

Emergence of Reform Movements

The British characterized Indian society in the nineteenth century as being caught in a vicious circle of superstitions and obscurantism. In their view idolatry and polytheism reinforced orthodoxy impelling the people to follow them blindly. The social conditions were equally depressing. And the condition of women was deplorable. The practice of sati came in for particular condemnation. The division of society according to birth resulting in the caste system was also criticized. Most importantly, the British argued that without their intervention there was no possibility of deliverance from these evils for Indians. Needless to say, this was a self-serving argument, articulated by missionaries and Utilitarians to justify British rule.

Utilitarians: believers in the doctrine of greatest happiness of the greatest number

India was a much bigger, more complex and diverse country in the early nineteenth century. Conditions varied vastly across it. The social and cultural evils had been fought by Indian reformers through the ages. But the advent of the British with their Enlightenment ideas undoubtedly posed a new challenge. This chapter looks at how social reform movements emerged in various parts of the country.

The development of the Western culture and ideology forced the traditional institutions to revitalize themselves. During the second half of the nineteenth century, the expression of protest and desire for change were articulated through various reform movements. These movements aimed at reforming and democratizing the social institutions and religious outlook of the Indian people. The emergence of new economic forces, spread of education, growth of nationalist sentiment, influence of modern Western thoughts, ideas and culture, and awareness of the changes taking place in Europe strengthened the resolve to reform.

What gave these reform movements an ideological unity were rationalism, religious universalism and humanism. This perspective enabled them to adopt a rational approach to

tradition and evaluate the contemporary socio-religious practices from the standpoint of social utility. For example, Raja Rammohun Roy repudiated the infallibility of the Vedas and during the Aligarh Movement, Syed Ahmed Khan emphasized that religious tenets were not immutable. As Keshab Chandra Sen said, 'Our position is not that truths are to be in all religions, but that all established religions of the World are true.'

These movements enveloping the entire cultural stream of Indian society brought about significant practices in the realms of language, religion, art and philosophy. These reform movements can be broadly classified into two categories:

1. Reformist Movements
2. Revivalist Movements

Both the movements depended in varying degrees on an appeal to the lost purity of religion. The primary difference between them lay in the degree to which they relied on tradition or on reason and conscience. The social reform movements formed an integral part of the religious reforms primarily because all the efforts towards social ills like caste- and gender- based inequality derived legitimacy from religion. Initially, the social reform movement had a narrow social base – they were limited to the upper and middle strata of the society that tried to adjust their modernized views to the existing social reality. From then on, the social reform movements began to percolate to the lower strata of society to reconstruct the social fabric. Heated debates among the intellectuals expressed in the form of public arguments, tracts and journals played a big role in taking new ideas to large sections of the people, as well as to reformulate older ideas in a new form.

At the start, organizations such as the Social Conference, Servants of India and the Christian missionaries were instrumental in giving an impetus to the social reform movements along with many enlightened individuals about whom we dwell on in the following pages. In later years, especially by the twentieth century, the national movement provided the leadership and organization for social reform.

Brahmo Samaj (1828)

Raja Rammohun Roy was a man of versatile genius. He established the Brahmo Samaj in August, 1828. The Brahmo Samaj was committed to "the worship and adoration of the eternal, unsearchable, immutable Being who is the Author and Preserver of the Universe". His long term agenda was to purify Hinduism and to preach monotheism for which he drew authority from the Vedas. He emphasized human dignity, opposed idolatry and social evils such as sati. A retired servant of the East India Company, he was conversant in many languages including Persian and Sanskrit. His ideas and activities were aimed at the political uplift of society through social reform. He was a determined crusader against the inhuman practice of Sati. His tract written in 1818, A Conference Between an Advocate for and an Opponent of the Practice of Burning Widows cited sacred texts to prove that no religion sanctioned the burning alive of widows. His efforts fructified and the Company through an enactment of law (1829) declared the practice of sati a crime.

The overall contribution of Brahmo Samaj can be summed up as follows

1. It denounced polytheism, idol worship, and the faith in divine avatars (incarnations)

2. It condemned the caste system, dogmas and superstitions.
3. It wanted the abolition of child marriage, purdah system and the practice of sati
4. It supported widow remarriage

Inspired by the ideals of the French Revolution, Rammohun Roy left for Europe and died in Bristol. After his death there was a steady decline but for the new lease of life given to it by Devendranath Tagore (father of Rabindranath Tagore). After him the organization was taken forward by Keshab Chandra Sen from 1857. The strength of the organization is known from the number of branches it had in 1865, 54 Samajas (fifty in Bengal, two in North West Province, one each in Punjab and Madras). In course of time, the Brahmo Samaj broke into two namely Devendranath Tagore's, 'Brahmo Samaj of India' and Keshub Chandra Sen's 'Sadharan Brahmo Samaj'.

In Tamilnadu, Kasi Viswanatha Mudaliar was an adherent of the Samaj and he wrote a play titled Brahmo Samaja Natakam to expound the ideas of the Samaj. He also wrote a tract in support of widow remarriage. In 1864, a Tamil journal titled Tathuva Bodhini was started for the cause of the Brahmo Samaja.

The Brahmo Samaj met with great opposition from orthodox elements in Bengal society such as the Hindu Dharma Sabha. However, there were also reformers such as Ishwarchandra Vidyasagar, who advocated the same ideas but drew on Hindu scriptures as authority.

Even though the Brahmo Samaj did not win many adherents, it had a big impact on the intellectuals. In the early stages, many young men seized of the radical ideas avidly propagated them. Tagore's family was a Brahmo family and its influence can be seen in his writings and ideas.

The Prarthana Samaj (1867)

An off-shoot of the Brahmo Samaj, the Prarthana Samaj, was founded in 1867 in Bombay by Atmaram Pandurang (1823- 98). The Prarthana Samaj as an organization never had any great influence but its members, like M. G. Ranade (1852-1901), R. G. Bhandarkar, and K.T. Telang, were among the great leaders of nineteenth-century Maharashtra and they became the founders of the social reform movement in later years.

Prarthana Samaj was similar to Brahmo Samaj, but it was consciously linked with the bhakti tradition of the Maharashtrian saints. The Prarthana Samaj continued its work mainly through educational work directed at women and workers at the lower level. It concentrated on social reforms like inter-dining, inter-marriage, remarriage of widows, and uplift of women and depressed classes.

The National Social Conference organized at the initiative of M.G. Ranade met each year immediately after the Indian National Congress (1885) annual sessions. Justice Ranade was an erudite scholar with a keen intellect and under his able guidance the Prarthana Samaj became the active centre of a new social reformation in western India. He was one of the founders of the Widow Marriage Association and was an ardent promoter of the famous

Deccan Education Society. Its object was to impart such education to the young as would fit them for the unselfish service of the country. When Ranade died in 1901, his leadership was taken over by Chandavarkar.

Arya Samaj (1875)

The founder of the Arya Samaj was Dayananda Saraswati (1824–83). Dayananda, a Gujarati, left home in his youth to become an ascetic. For seventeen years he wandered around India. In 1863 he became a wandering preacher, and five years later he added the establishment of schools to his activities. In 1872 he met the Brahmins in Calcutta. In 1875 he founded the Arya Samaj and published his major work the *Satyarth Prakash*. In his view, contemporary Hinduism had become degenerate. Therefore he rejected puranas, polytheism, and idolatry, the role of Brahmin priests, pilgrimages, many rituals and the prohibition on widow marriage. As a good Sanskrit scholar, he made a call to “Back to the Vedas”. He wanted to shape society on the basis of the Vedas. He disregarded the puranas. Like the other social reformers, he encouraged female education and remarriage of widows.

Swami Dayananda’s sphere of influence was largely in the Punjab region where the trading community of Khatri experienced great mobility in colonial times. However, in the Punjab region, there was much communal conflict among Hindus, Muslims and Sikhs. Dayananda’s Shuddhi (purification) movement i.e., conversion of non-Hindus to Hindus was controversial and provoked controversies especially with the Ahmadiya movement.

Arya Samaj is considered to be a revivalist movement. Dayananda’s influence continued into the twentieth century through the establishment of Dayananda Anglo Vedic (DAV) schools and colleges.

Ramakrishna Mission (1897)

As we saw above, the early reform movements in Bengal were radical, questioning and criticising tradition very strongly. In response to this emerged the Ramakrishna Mission as an important religious movement. Ramakrishna Paramahansa (1836–1886), a poor priest in a temple at Dakshineswar near Kolkata, had no formal education but led an intense spiritual life. He had a deep faith in the inherent truth of all religions and tested his belief by performing religious service in accordance with the practices of different religions. According to him ‘all the religious views are but different ways to lead to the same goal.’ In a backlash, the later generation of Western educated intellectuals were drawn to Ramakrishna’s broad view, mysticism and spiritual fervour. He expounded his views in short stories and admirable parables which were compiled by an admirer as *Ramakrishna Kathamrita* (The Gospel of Sri Ramakrishna).

The most famous among his disciples was a young graduate of the Calcutta University named Narendranath Dutta, afterwards famously called Swami Vivekananda (1863–1902). Emphasising practical work over philosophizing he established the modern institution of the Ramakrishna Mission. He carried Ramakrishna’s message all over India and the world. His learning, eloquence, spiritual fervour and personality gathered round

him a band of followers across the country, many of whom also joined the national movement. He attended in 1893 the famous, 'Parliament of Religions' at Chicago, and made a deep impact on those congregated there. The Mission opened schools, dispensaries and orphanages and helped people during their time of distress caused by calamities.

Theosophical Society (1886)

Even as Indian intellectuals felt challenged by western Enlightenment and rationalistic movements, there was a strain of thinking in the West which looked to the East for spiritual salvation. From this idea emerged the Theosophical Society, founded by Madam H.P. Blavatsky and Colonel H.S. Olcott in the United States of America in 1875. They came to India in 1879 and established their headquarters at Adyar in 1886. Under the leadership of Annie Besant, who came to India in 1893, the Theosophical Society gathered strength and won many adherents. The Theosophical Society started associations across south India. Though involved in many controversies, the Society played an important role in the revival of Buddhism in India. Iyothethoss Pandithar, the radical Dalit thinker, was introduced to modern Buddhism through his interaction with Colonel Olcott who took him to Sri Lanka. There he met many Buddhist monks including the renowned revivalist Anagarika Dharmapala and Acharya Sumangala.

Swami Vivekananda was a personification of youth and boldness and referred to as the Morning Star of the Modern India. In the words of Valentine Chirol, 'the first Hindu whose personality won demonstrative recognition abroad for India's ancient civilization and for her newborn claim to nationhood.'

Satya Shodhak Samaj (1873)

While the movements discussed above were largely focussed on upper castes there were some exceptional movements which mobilized lower castes and articulated their perspective. The most important among them was Jyotiba Phule, who belonged to the Mali (gardener) community. Born in 1827, he received initial education in a mission school but had to discontinue it in 1833. Jyotiba Phule waged a life-long struggle against upper caste tyranny. In his quest for the truth, Phule read the Vedas, the Manu Samhita, the Puranas, and the thought of Buddha, Mahavira and the medieval Bhakti saints extensively. He also acquainted himself with Western thought, and Christian and Islamic religions. Phule judged the whole culture and tradition through the spirit of rationality and equality. While the principle of equality called for a total rejection of caste system, authoritarian family structure and subordination of women, the principle of rationality demanded the removal of superstitions and ritualism.

Phule held radical views on social, religious, political and economic issues. He considered the caste system as an antithesis of the principle of human equality. He sought to raise the morale of the non-Brahmins and united them to revolt against the centuries old inequality and social degradation. Towards this end Phule founded the Satya Shodhak Samaj (Society for Seeking Truth) in 1875. His most important book is Gulamgiri (Slavery).

Phule looked upon education of the masses as a liberating and revolutionary factor.

Since women and deprived and downtrodden were the worst sufferers in the society, Phule argued that women's liberation was linked with the liberation of other classes in society. Equality between classes as also between men and women was stressed by Phule. During marriages he asked the bridegroom to promise the right of education to his bride.

Phule also tried to translate his ideas into actual struggles. He urged the British Government to impart compulsory primary education to the masses through teachers drawn from the cultivating classes. He started a school for girls in Poona in 1851 and one for depressed classes with the assistance of his wife Savitri. He also started schools for the "untouchables" and founded a home for widow's children.

In his work we find the beginnings of the later day non-Brahman movement of Maharashtra.

Pandita Ramabai (1858–1922)

Pandita Ramabai was foremost among the Indian leaders who worked for the emancipation of women. She came from a learned family and was a great scholar of Sanskrit and addressed many learned groups in different parts of the country. She was given the title of "Pandita" and "Saraswati" for her deep knowledge of Sanskrit. After the death of her parents she and her brother travelled to different parts of the country. They went to Calcutta in 1878. Two years later her brother also died. A little later in 1880 she married a Bengali belonging to a family of lower social status. Thus, even at that time she was bold enough to marry a man of a different caste and different language. After the death of her husband two years later she returned to Poona and started the Arya Mahila Samaj with the help of leaders like Ranade and Bhandarkar. 300 women were educated in the Samaj in 1882.

Ramabai started the Sharada Sadan (shelter for homeless) for the destitute widows with the help of Ranade and Bhandarkar. But soon she was accused of converting Hindu women to Christianity and hence had to shift her activities to Khedgoan near Poona. She established a Mukti Sadan (freedom house) there. Soon there were 2000 children and women in the house. Vocational training was given make them self-reliant.

Sri Narayana Guru

This movement emerged in Kerala and was born out of conflict between the depressed classes and the upper castes. It was started by Sri Narayana Guru (1854- 1928) spearheading a social movement of the Ezhavas of Kerala, a community of toddy tappers. The Ezhavas were the single largest group in Kerala constituting 26% of population. A great scholar in Malayalam, Tamil and Sanskrit, Sri Narayana Guru established the Sri Narayana Guru Dharma Paripalana (SNDP) Yogam in 1902. The SNDP Yogam took up several issues such as (i) right of admission to public schools. (ii) recruitment to government services. (iii) access to roads and entry to temples; and (iv) political representation. The movement as a whole brought transformative structural changes such as upward social mobility, shift in

traditional distribution of power and a federation of 'backward classes' into a large conglomeration. As a response to the prohibition on Ezhavas into temples, Sri Narayana Guru established new temples, and empowered the community to modernize itself. Great personalities such as the poet Kumaran Asan Dr. Palpu and Sahodaran Ayyappan emerged from the movement, and made a lasting impact in the democratization of Kerala Society. Even though the Guru himself was not directly involved in the movement, the Vaikom Satyagraha, organized to protest against the ban on the entry of Ezhavas on the templestreets of Vaikom made a deep impact on subsequent temple entry movements.

Islamic Reform Movements

The Revolt of 1857 and its brutal suppression by the British had an adverse impact on the Muslims of South Asia. While they were viewed with suspicion by the British for the 1857 insurgency, the Muslims themselves withdrew into a shell and did not use the opportunities opened up by colonial modernity. Consequently, they lagged behind in education and attendant employment opportunities. In this context, a few decades later some reform movements emerged among the Muslims.

Aligarh Movement (1875)

Aligarh Movement was started by Syed Ahmad Khan in 1875. He wanted to reconcile Western scientific education with the teachings of the Quran. The Aligarh movement aimed at spreading (i) Modern education among Indian Muslims without weakening their allegiance to Islam, and (ii) Social reforms among Muslims relating to purdah, polygamy, and divorce.

Syed's progressive social ideas were propagated through his magazine Tahdhib-ul-Akhluq (Improvement of Manners and Morals). Syed Ahmad Khan's educational programme emphasized from the outset the advantages of the use of English as the medium of instruction. In 1864 he founded a Scientific Society of Aligarh for the introduction of Western sciences through translations into Urdu of works on physical sciences. The same year he founded a modern school at Ghazipur. In 1868 he promoted the formation of education committees in several districts, to initiate modern education among the Muslims.

During his visit to Europe in 1869-70 he developed the plans of his life-work, a major educational institution for Indian Muslims. In order to promote English education among the Muslims, he founded in 1875 a modern school at Aligarh, which soon developed into the Muhammdan Anglo-Oriental College (1877). This college was to become the Muslim University after his death. It became the nursery of Muslim political and intellectual leaders.

In 1886 Syed Ahmad Khan founded the Muhammedan Anglo Oriental Educational Conference as a general forum for spreading liberal ideas among the Indian Muslims. He rejected blind adherence to religious law and asked for a reinterpretation of the Quran in the light of reason to suit the new trends of the time. He attempted to liberalize Indian Islam and made it amenable to new ideas and new interpretations. In this mission he had to face the brunt of vehement attacks of orthodox theologians.

Ahmadiya Movement (1889)

The Ahmadiya movement founded by Mirza Ghulam Ahmed (1835–1908) in 1889 established a different trend. While emphasizing the return to the original principles enunciated in the Quran, Ghulam Ahmed became controversial when he claimed to be a Messiah, which was considered heretical by mainstream Islam. But he won many converts. His primary work was to defend Islam against the polemics of the Arya Samaj and the Christian missionaries. In social morals the Ahmadiya movement was conservative, adhering to polygamy, veiling of women, and the classical rules of divorce.

The Deoband Movement (1866)

The Deoband movement was organised by the orthodox section among the Muslim ulemas as a revivalist movement with the twin objective of propagating the pure teachings of the Quran and Hadis among Muslims. The movement was established in Deoband in Saranpur district (by Mohammad Qasim Nanotavi (1833-1877) and Rashid Ahmed Gangohi (1828–1905) to train religious leaders for the Muslim community. In contrast to the Aligarh Movement, which aimed at the welfare of Muslims through Western education and support of the British Government, the aim of the Deoband Movement was religious regeneration of the Muslim community. The instruction imparted at Deoband adhered to classical Islamic tradition.

The seminary at Deoband was founded in 1867 by theologians of the School of Wali-Allah. Muhammad Qasim Nanotavi took a prominent part in counter-polemics against the Christian missionaries and the Arya Samajists. The principal objectives of the seminary at Deoband were to re-establish contact between the theologians and the educated Muslim middle classes, and to revive the study of Muslim religious and scholastic sciences. As a religious university Deoband soon became an honoured institution, not only in Muslim India but also in the world of Islam at large.

Nadwat al-'ulama

A school less conservative than Deoband and more responsive to the demands of the modern age was the Nadwat al-'ulama,' founded in 1894 at Lucknow by the historian Shibli Nu'mani and other scholars. The school aimed to offer an enlightened interpretation of religion in order to fight the trends of agnosticism and atheism which had followed the advent of modern Western education.

Farangi Mahal

The third famous traditional school is the much older one at Farangi Mahal in Lucknow. Farangi Mahal accepted Sufism as a valid experience and a valid field of study. Another traditionalist movement was the ahl-i-hadith or of the followers of the dicta of the Prophet.

Parsi Reform Movements

Zoroastrians, persecuted in their Persian homeland, migrated in large numbers to the west coast of India in the tenth century. As a trading community they flourished over the centuries. A close-knit community it too was not left untouched by the reform movements of the nineteenth century.

The Rahnumai Madayasan Sabha (Religious Reform Association) was founded in 1851 by a group of English educated Parsis for the “regeneration of the social conditions of the Parsis and the restoration of the Zoroastrian religion to its pristine purity”. The movement had Naoroji Furdonji, Dadabhai Naoroji, K. R. Cama and S.S. Bengalee as its leaders. The message of reform was spread by the newspaper Rast-Goftar (Truth Teller). Parsi religious rituals and practices were reformed and the Parsi creed redefined. In the social sphere, attempts were made to uplift the status of Parsi women through education, removal of the purdah, raising the age of marriage and the like. Gradually, the Parsis emerged as the most westernised section of the Indian society. They played a key role in the nationalist movement and in the industrialization of India.

Sikh Reform Movement

The Sikh community could not remain untouched by the rising tide of rationalist and progressive ideas of the nineteenth century. The Singh Sabha Movement was formed in 1873, with a two-fold objective (i) to make available modern western education to the Sikhs (ii) to counter the proselytizing activities of Christian missionaries as well as Hindu revivalists. A network of Khalsa Schools was established throughout Punjab. The Akali movement was an offshoot of the Singh Sabha Movement. The Akali movement aimed at liberating the Sikh Gurudwara from the corrupt control of the Udasi Mahants (priests). The Government passed the Sikh Gurudwara Act in 1922 (amended in 1925), which gave control to Shiromani Gurudwara Prabandhak Committee (SGPC) as the main body.

Reform Movements in Tamilnadu

As we saw earlier, the reform movements of the north India had its own impact on Tamilnadu. Brahmo Samaj and Arya Samaj had their branches. Keshab Chandra Sen visited Madras and lectured here. But Tamilnadu also saw its own reform movements.

Vaikunda Swamigal (1809-1851)

The Sri Vaikunda Swamigal’s cult, which survives to this day, was organized in the 1830s. Born in a poor family (1809) at Sastankoil Vilai (now known as Swamithoppu), a village then in south Travancore (the present day Kanyakumari district), Muthukutti, spent his childhood in the village pial school, learning religious and moral texts. He also learnt the Bible and became well-versed in Christian theology. At the age of twenty two, Muthukutti, cured of a skin disease, after a holy bath in the sea during his visit to the Murugan temple at Tiruchendur (Thoothukudi district), claimed that Lord Vishnu had given him a rebirth as

his son. On his return from Tiruchendur, assuming the new name of Sri Vaikundar, he practised austerities for two years. Soon his fame spread far and wide.

In his preaching Vaikundar attacked the traditional caste-ridden Travancore society and its ruler for collecting excessive taxes from the lower caste people. He was arrested and jailed by the Raja of Travancore for his “seditious speeches”. When he was released from jail (1838) he became more popular among the people. His followers called him Aiya (father) and his cult came to be known as Aiya Vazhi (path of the father). His teachings were compiled as a text called Akila Thirattu which is recited religiously to this day. Vaikunda Swamy instructed his followers to give up worship of pudams. He also exhorted them not to offer animal sacrifices to their deities. He advocated vegetarianism.

As a symbol of protest, Vaikunda Swamy urged his followers to wear a turban, a right which was permitted only to upper castes in those days. As a part of his effort to practice equality, Vaikunda Swamy regularly organized inter-dining through his Samathuva Sangam, among different castes. In his feeding centres called NilalTangals, caste-based restrictions were broken down. The Vaikunda Swamy cult posed a serious challenge to the spread of Christianity in south Travancore even after his death in 1851.

Vallalar Ramalinga Swamigal (1823-1874)

Ramalinga Swamigal was born in a modest family near Chidambaram and spent his early life in Madras. He never had formal schooling, but exhibited great scholarship. Inspired by the Saiva Thevaram and Thiruvagasam hymns, he began to compose moving poems on his own. In his time, Saiva religion was in the grip of Saiva monasteries such as those at Thiruvaduthurai, Dharumapuram and Thiruppanandal. Ramalinga Swamigal’s poems expressed radical ideas and condemned bigotry and irrationality. He underwent certain mystical experiences which he expressed in his poems. This was resented by the orthodox elements in Saiva religion. He established the Sathya Dharma Salai at Vadalur where he began to feed poor people, especially in the context of the 1860s famine and pestilence, irrespective of caste and creed. He founded the Sathya Gnana Sabhai to organize his followers. This brought him into conflict with established Saivite orders, and matters came to a head when his followers published his poems under the title of Thiruvartuppa (Songs of Grace) in 1867. Orthodox Saivites under the Sri Lankan reformer Arumuga Navalarcriticized this as blasphemous and launched a tract war. But ultimately, Ramalinga Swamigal’s contribution was recognized and his writings inspired universal ideas, and undermined sectarianism in Saiva religion.

Buddhist Revivalism and Iyothethoss Pandithar (1845-1914)

As we saw in an earlier lesson, Buddhism had been practically wiped out in the Tamil country by the beginning of the second millennium. Towards the end of the nineteenth century, there was a revival of Buddhism. The publication of the complete edition of Jeevaka Chintamani (1887) and Manimekalai (1898) were landmarks in the recovery of heterodox traditions.

But the most important figure was Iyothethoss Pandithar (1845– 1914). A native doctor by profession, he was an erudite scholar. He also came under the influence of Colonel Olcott of the Theosophical Society. In the 1890s he began a movement among the Adi Dravidars arguing that they were the original Buddhists who had been consigned to ‘untouchability’ due to their opposition to Vedic Brahminism. He re-read classical Tamil and other texts to make his case. He also encouraged the conversion to Buddhism. He found the greatest following in north Tamilnadu and among the working classes of the Kolar Gold Fields. In this movement, M. Singavelu and Prof P. Lakshmi Narasu also played an important role. Pandithar ran a weekly journal called Oru Paisa Tamilan (later Tamilan) from 1908 until his death.

Christian Missionaries

The official religious policy of the East India Company was one of neutrality towards the native religions. Their reason for continuing this policy was the belief that the earlier Portuguese rule had come to an end because of their attempts to forcibly convert people to Christianity. As a result of this concern, the Company government prohibited the entry of missionaries into the territories under their control.

In 1793 two English missionaries, William Carey and John Thomas, both Baptists, set out to India with the intention of starting a mission. In view of the ban on missionary activity they settled down in the Danish Colony of Serampore, north of Calcutta. Carey, along with two other missionaries, Joshua Marshman and William Ward established the Serampore Mission in 1799.

The Serampore missionaries were the first evangelical Baptist missionaries in India. They were followed later by other missionary groups belonging to different Protestant denominations. Before the arrival of the Serampore missionaries, several centuries earlier, there were Christian missions in the Portuguese territory of Goa, and also on the Malabar Coast and the Coromandel Coast. The work of the earlier missionaries was limited both geographically and in terms of the number of conversions to Christianity. Thus major attempts at proselytization began during the nineteenth century.

The missionaries organised schools for the socially and economically and pleaded for their economic improvement through employment in the state service. They also fought for their ‘civil rights’ that included access to public roads, and permission for the women of these groups to wear upper garments.

The missionaries gave shelter to orphaned children and other destitute widows in their missions and provided education for them in their boarding schools. Particularly after the famines which were quite common during the nineteenth century, about which we discussed in the previous lesson, the missionaries organized relief. Providing shelter and succour gave these an opportunity to convert people to Christianity. In Tirunelveli district many villages took to Christianity during famines, especially in the last quarter of nineteenth century. The same phenomenon was witnessed in Andhra where Malas and Madigas embraced Christianity in a big way.

The Company government did little to provide modern education for the native population. For a long time, the provision of elementary school facilities to the native population, especially in the interiors for the disprivileged and the poor people, was a responsibility willingly accepted by the Christian missionaries. It must be noted that the Christian Missionaries took the initiative of establishing Hospitals and Dispensaries.

Significance of the Reform Movements

The orthodox sections of the society could not accept the scientific and ideological onslaught of the socio-religious reformers. As a result of this, the reformers were subjected to abuse, persecution, issuing of fatwas and even assassination attempts by the reactionaries. However, in spite of opposition, these movements contributed towards liberation of the individual from the conformity born out of fear. The translation of religious texts into vernacular languages, emphasis on an individual's right to interpret the scriptures, and simplification of rituals made worship a more personal experience. The movements emphasised the human intellect's capacity to reason and think. By weeding out corrupt elements in religious practices, the reformers enabled their followers to counter the official taunt that their religions and society were decadent and inferior. It gave the rising middle classes the much needed cultural roots to cling to.

NATURE OF INDIAN ECONOMIC Planning, commission & Niti Ayog & NDC

6th Economics

Unit 1 – Economics an Introduction

Consumers Goods:

The finished goods which are bought from the market to fulfill the daily needs of the consumers is called consumer goods. Example: rice, clothes, bicycles, etc

- We had a system of exchanging goods for other goods, called barter system. For example, exchange a bag of rice for enough clothes”.
- “A person who has rice in surplus and a person who has cloth in surplus, will exchange on the basis of their needs. But, here the problem is that the person who has clothes should have the willingness to buy rice. Only then, the exchange through barter system will take place”.
- The exchange commodities, they may lead to certain problems, when comparing the differences in the value of commodity. To solve this problem, people invented a tool called money”.

The amount from the income which is left for future needs after consumption is called savings.

- Early man, who hunted and gathered food, later learnt to cultivate crops. When they found rivers which provided them water, settled down permanently near the rivers. These permanent settlements were called villages. Agriculture remains to be the root of our economy even today. Man has no limits for his demand and desire. Based on this, man started to learn new occupations. Those who are involved in farming and grazing are called farmers or cultivators”.
- “Agriculture and industries are helpful in the economic development of our country. Our country’s economy is based on three economic activities”.

PRIMARY ACTIVITIES

They are concerned with the production of raw materials for food stuff and industrial use. Primary activities include

Agriculture

Cattle rearing

Fishing

Mining

Collection of fruits, nuts, honey, rubber, resin and medicinal herbs, lumbering.

- “Agriculture is the primary occupation. There won’t be any kind of facilities like our cities. At the same time, they get their basic needs fulfilled easily. There are small shops. Vegetables are grown in abundance, just like rice and pulses. Though the sugar that is added in our milk, coffee and tea is produced in sugar mills, the raw material sugarcane is cultivated in villages. From chilies to mustard, all those provisions used for food are grown in villages.”
- “Even Gandhiji has said that the villages are the backbone of our country”.
- More than 50 percentage of the world’s populations live in cities. In our state Tamil Nadu, 47 percentage of the people are in cities.

SECONDARY ACTIVITIES

The raw materials obtained from the primary activities are converted into finished products through machinery on a large scale. These activities are called secondary activities.

Industries are classified on the basis of the availability of raw materials, capital and ownership.

On the basis of raw materials, industries are classified as

Agro based industries – Cotton textiles, Sugar mills and Food processing.

Forest based industries – Paper mills, Furniture making, Building Materials.

Mineral based industries – Cement, Iron, Aluminium Industries.

Marine based industries – Sea food processing.

TERTIARY ACTIVITIES

“I already told you that industries produce goods and distribute them to the people. For this purpose, some services are required. These services are called tertiary activities or service sectors. The service sector serves the people to fulfill their daily needs like:

Transport – roadways, railways, waterways, airways

Communication – Post, Telephone, Information Technology etc

Trade – Procurement of goods, selling

Banking – Money transactions, banking services

7th Term - I

Unit 1: Production

- There are two main activities in an economy, production and consumption. Similarly there are two kinds of people, producers and consumers. Well-being is made possible by efficient production and by the interaction between producers and consumers. In the interaction, consumers can be identified in two roles both of which generate well-being. Consumers can be both customers of the producers and suppliers to the producers. The customers' well-being arises from the commodities they are buying and the suppliers' well-being is related to the income they receive as compensation for the production inputs they have delivered to the producers.

Meaning of Production

- Production is a process of combining various material inputs and immaterial inputs in order to make something for consumption (the output). It is the act of creating an output, a good or service which has value and contributes to the utility of individuals.
- Production in economics refers to the creation of those goods and services which have exchange value. It means the creation of utilities. Utility means want satisfying power of a product. Utilities are in the nature of form utility, time utility and place utility.

Types of Utility

Form utility

If the physical form of a commodity is changed, its utility may increase.

Eg. Cotton increases, if it is converted into clothes.

Place utility

If a commodity is transported from one place to another, its utility may increase.

Eg. If rice transported to Tamilnadu to Kerala, its utility will be more.

Time utility

If the commodity is stored for future usage, its utility may increase.

Eg. Agricultural commodities like Paddy, Wheat, etc. are stored for the regular uses of consumers throughout the year.

Indian Economy is a Mixed Economy. Private and Public Sector are existing together.

Types of Production

- ❖ There are three types of production
- ❖ Primary production
- ❖ Secondary Production

❖ Tertiary or Service Production

Primary Production

- Primary production is carried out by 'extractive' industries like agriculture, forestry, fishing, mining and oil extraction. These industries are engaged in such activities as extracting the gifts of nature from the earth's surface, from beneath the earth's surface and from the oceans.

Secondary Production

- This includes production in manufacturing industry, turning out semi-finished and finished goods from raw materials and intermediate goods, conversion of flour into bread or iron ore into finished steel. They are generally described as manufacturing and construction industries, such as the manufacture of cars, furnishing, clothing and chemicals, as also engineering and building.

Example: Primary sector and Secondary sector Production

Cotton (Primary sector) – Cotton Industry (Secondary Sector) = Cloth Production

Iron ore (Primary sector) – Iron Industry (Secondary sector) = Material Production

Wheat flour (Primary sector) – Bread Factory (Secondary Sector) = Food Production

Tertiary Production

- Industries in the tertiary sector produce all those services which enable the finished goods to be put in the hands of consumers. In fact, these services are supplied to the firms in all types of industry and directly to consumers. Examples cover distributive traders, banking, insurance, transport and communications. Government services, such as law, administration, education, health and defence, are also included.

The most to the Gross Domestic Product of our country is contributed by the tertiary sector

Factors of Production

- Human activity can be broken down into two components, production and consumption. When there is production, a process of transformation takes place. Inputs are converted into an output. The inputs are classified and referred to as land, labour, and capital. Collectively the inputs are called factors of production.
- When the factors of production are combined in order to produce something, a fourth factor is required. Goods and services do not produce themselves but need some conscious thought process in order to plan and implement manufacture. This thought process is often called Entrepreneurship and Organization.

Factors of production

- ❖ Primary Factors and
 - ❖ Derived Factors.
- Primary factors are land and labour. These are naturally given and without them no goods can be produced.
 - Derived factors are Capital and Organization. These derived factors, when combined with the primary factors of production, raise total production.

Land

- Land as a factor of production refers to all those natural resources or gifts of nature which are provided free to man. It includes within itself several things such as land surface, air, water, minerals, forests, rivers, lakes, seas, mountain, climate, and weather. Thus, land includes all things that are not made by man.

Land : Land can take on various forms, from agricultural land to commercial real estate to the resources available from a particular piece of Land

Characteristics of Land

Land is a Free Gift of Nature

- Man has to make efforts in order to acquire other factors of production. But to acquire land no human efforts are needed. Land is not the outcome of human labour. Rather, it existed even long before the evolution of man.

Land is fixed in supply

- The total quantity of land does not undergo any change. It is limited and cannot be increased or decreased with human efforts. No alteration can be made in the surface area of land.

Land is imperishable

- All man-made things are perishable and these may even go out of existence. But land is indestructible. Thus it cannot go out of existence. It is not destructible.

Land is a Primary Factor of Production:

- In any kind of production process, we have to start with land. For example, in industries, it helps to provide raw materials, and in agriculture, crops are produced on land.

Land is Immovable:

- It cannot be transported from one place to another. For instance, no portion of India's surface can be transported to some other country.

Land has some Original Indestructible Powers

- There are some original and indestructible powers of land, which a man cannot destroy. Its fertility may be varied but it cannot be destroyed completely.

Land Differs in Fertility

- Fertility of land differs on different pieces of land. One piece of land may produce more and the other less.
- As a gift of nature, the initial supply price of land is zero. However, when used in production, it becomes scarce. Therefore, it fetches a price accordingly.

Labour

- Labour is the human input into the production process. Alfred Marshall defines labour as, 'the use of body or mind, partly or wholly, with a view to secure an income apart from the pleasure derived from the work'.

Adam Smith is known as Father of Economics and his Economics is wealth Economics. He wrote two classic works, "The Theory of Moral sentiments (1759)", and "An inquiry into the nature and causes of the wealth of Nations (1776)".

Characteristics of Labour

- Labour is more perishable than other factors of production. It means labour cannot be stored. The labour of an unemployed worker is lost forever for that day when he does not work. Labour can neither be postponed nor accumulated for the next day. It will perish. Once time is lost, it is lost forever.
- Labour is an active factor of production. Neither land nor capital can yield much without labour.
- Labour is not homogeneous. Skill and dexterity vary from person to person. Labour cannot be separated from the labourer.
- Labour is mobile. Man moves from one place to another from a low paid occupation to a high paid occupation.
- Individual labour has only limited bargaining power. He cannot fight with his employer for a rise in wages or improvement in work-place conditions. However, when workers combine to form trade unions, the bargaining power of labour increases.

Division of Labour

- The concept 'Division of Labour' was introduced by the Adam Smith in his book 'An enquiry into the nature and causes of wealth of nations'.
- Division of labour means dividing the process of production into distinct and several component processes and assigning each component in the hands of a labour or a set of labourers, who are specialists in that particular process.

Example: A Tailor stitches a shirt in full. In the case of Garments exporters, cutting of cloth, stitching of hands, body, collars, holes for buttons, stitching of buttons etc., are done independently by different workers. Therefore, they are combining the parts into a whole shirt.

Merits of division of labour

- It improves efficiency of labour when labour repeats doing the same tasks. Facilities the use of machinery in production, resulting in inventions. Ex. More's Telegraphic Codes. Time and Materials are put to the best and most efficient use.

Demerits of division of labour

- Repetition of the same task makes labour to feel that the work is monotonous and stale. It kills the humanity in him. Narrow specialization reduces the possibility of labour to find alternative avenues of employment. This results in increased unemployment. Reduce the growth of handicrafts and the worker loses the satisfaction of having made a commodity in full.

Capital

- Capital is the man made physical goods used to produce other goods and services. In the ordinary language, capital means money. In economics, capital refers to that part of man-made wealth which is used for the further production of wealth. All wealth is not capital but all capital is wealth.
- According to Marshall, 'Capital consists of those kinds of wealth other than free gifts of nature, which yield income'.

Forms of capital

- Physical Capital or Material Resources Ex. Machinery, tools, buildings, etc. Money capital or Monetary resources Ex. Bank deposits, shares and securities, etc. Human capital or Human Resources Ex. Investments in education, training and health

- ❖ Characteristics of Capital
- ❖ Capital is a passive factor of production
- ❖ Capital is man-made
- ❖ Capital is not an indispensable factor of production
- ❖ Capital has the highest mobility
- ❖ Capital is productive
- ❖ Capital lasts over time
- ❖ Capital involves present sacrifice to get future benefits.

Entrepreneur

- An entrepreneur is a person who combines the different factors of production (land, labour and capital), in the right proportion and initiates the process of production and also bears the risk involved in it.
 - The entrepreneur is also called 'Organizer'. In, modern times, an entrepreneur is called 'the changing agent of the society'. He is not only responsible for producing the socially desirable output but also to increase the social welfare.
- ❖ Characteristics of Entrepreneur
 - ❖ Identifying profitable investible opportunities
 - ❖ Deciding the location of the production unit
 - ❖ Making innovations
 - ❖ Deciding the reward payment
 - ❖ Taking risks and facing uncertainties.

11th STD Economics

Unit - 1

Introduction to Micro-Economic

Introduction

- A subject should have a name or a title that facilitates a clear and correct understanding of its contents. In a subject like Economics, there are many books available with titles such as 'Introductory Economics', 'Economics: An Introduction', 'Basic Economics', 'Elements of Economics', 'Elementary Economics', 'Fundamentals of Economics' etc. But these books have the same contents, though each is intended to serve readers of a different levels of interest and capacity.
- A good introduction to a subject, besides containing the meaning of its title, should have an explanation of the nature and scope of the subject, i.e., whether the subject is traditional or modern, static or dynamic. The readers should be in a position to clearly classify the subject as belonging to either arts alone, or to science alone or to both. The significance of all the branches of the subject should find a place in it. As they go through the introduction, the readers should be able to understand the relationships of the subject with other subjects. Newer areas incorporated into the subject and the newer ways of comprehending its contents are to be highlighted in the introduction. The methodologies applied in the derivation of its laws are to be stated in such an introduction.

Economics: Meaning

- The term or word 'Economics' comes from the Ancient Greek oikonomikos (oikos means "households"; and, nomos means "management", "custom" or "law"). Thus, the term 'Economics' means 'management of households'. The subject was earlier known as 'Political Economy', is renamed as 'Economics', in the late 19th century by Alfred Marshall.

Economics: Its Nature

- The nature of a subject refers to its contents and how and why they find a place in the subject. This nature is understood by studying the various definitions given by the notable economists. The existence of multiplicity of the definitions makes some scholars comment that a search for a clear definition of Economics is an exercise in futility. J. M. Keynes, for example, observes that "Political Economy is said to have strangled itself with definitions". Their presence makes studying a subject interesting, exciting, enjoyable, or worthwhile. In fact, their presence in a social science subject is a clear sign of the growth of the science. It indicates that there exists freedom for people associated with such as science to formulate fresh definitions. These associates appreciate and make use of the opportunity afforded to them and come up with a plethora of

definitions saying: 'The more, the merrier'. Each definition represents a unique generalisation. A wide variety of definitions paves the way to arrive a near-complete agreement on the subject-matter of Economics.

- A science grows stage by stage, and at every stage, its newer definition emerges and a concept associated with it receives some special emphasis. However, the study of a subject is made possible when it possesses its clear cut definition and boundary.
 - A science grows stage by stage, and at every stage, its newer definition emerges and a concept associated with it receives some special emphasis. However, the study of a subject is made possible when it possesses its clear cut definition and boundary.
1. Smith's Wealth Definition, representing the Classical era;
 2. Marshall's Welfare Definition, representing the Neo-Classical era;
 3. Robbins' Scarcity Definition, representing the New Age; and,
 4. Samuelson's Growth Definition, representing the Modern Age.

Wealth Definition: Adam Smith

- Adam Smith (1723- 1790), in his book "An Inquiry into Nature and Causes of Wealth of Nations" (1776) defines "Economics as the science of wealth". He explains how a nation's wealth is created and increased. He considers that the individual in the society wants to promote his own gain and in this process, he is guided and led by an "invisible hand". He states that every man is motivated by his self interest. This means that each person works for his own good.
- Smith favours the introduction of "division of labour" to increase the quantum of output. Severe competition in factories and society helps in bettering the product. Supply force is very active and a commodity is made available to the consumers at the lowest price.

The publication of Adam Smith's "The Wealth of Nations" in 1776, has been described as "the effective birth of economics as a separate discipline".

Criticism

- For Smith, Economics consists of 'wealth-getting' activities and 'wealth-spending' activities. An undue emphasis is given to material wealth. Wealth is treated to be an end in itself. This view leads him to ignore human welfare as an essential part of Economics. Smith gives his definition when religious and spiritual values are held high. Ruskin and Carlyle regard Economics as a 'dismal science', "pig science" etc. as it teaches selfishness which is against ethics.

Welfare Definition: Alfred Marshall

- Alfred Marshall (1842-1924) in his book “Principles of Economics” (1890) defines Economics thus: “Political Economy” or Economics is a study of mankind in the ordinary business of life; it examines that part of individual and social action which is most closely connected with the attainment and with the use of the material requisites of well-being. Thus, it is on one side a study of wealth; and on the other, and more important side, a part of the study of man.”

The important features of Marshall’s definition are:

- ❖ Economics does not treat wealth as the be-all and end-all of economic activities. Man promotes primarily welfare and not wealth.
- ❖ The science of Economics contains the concerns of ordinary people who are moved by love and not merely guided or directed by the desire to get maximum monetary benefit.
- ❖ Economics is a social science. It studies people in the society who influence one another.

Criticism

- Marshall regards only material things. He does not consider immaterial things, such as the services of a doctor, a teacher and so on. They also promote people’s welfare.
- In the theory of wages, Marshall ignores the amount of money that goes as reward for the services of ‘immaterial’ services.
- Marshall’s definition is based on the concept of welfare. But it is not clearly defined. Welfare varies from person to person, country to country and one period to another. Marshall clearly distinguishes between those things that are capable of promoting welfare of people and those things that are not. Things like liquor that are not capable of promoting welfare but command a price, come under the purview of Economics
- However, welfare means happiness or comfortable living conditions of an individual or group of people. The welfare of an individual or nation is dependent not only on the stock of wealth possessed but also on political, social and cultural activities of the nation.

Scarcity Definition: Lionel Robbins

- Lionel Robbins published a book “An Essay on the Nature and Significance of Economic Science” in 1932. According to him, “Economics is a science which studies human behaviour as a relationship between ends and scarce means which have alternative uses”.

The major features of Robbins' definition are:

- Ends refer to human wants. Human beings have unlimited number of wants.
- On the other hand, resources or means that go to satisfy the unlimited human wants are limited or scarce in supply. The scarcity of a commodity is to be considered only in relation to its demand.
- Further, the scarce means are capable of having alternative uses. Hence, an individual grades his wants and satisfies first his most urgent want. Thus, Economics, according to Robbins, is a science of choice.

Criticism

- Robbins does not make any distinction between goods conducive to human welfare and goods that are not. In the production of rice and alcoholic drink, scarce resources are used. But the production of rice promotes human welfare, while that of alcoholic drinks does not. However, Robbins concludes that Economics is neutral between ends.
- Economics deals not only with the micro-economic aspects of resource allocation and the determination of the price of a commodity, but also with the macro-economic aspects like how national income is generated. But, Robbins reduces Economics merely to theory of resource allocation.
- Robbins' definition does not cover the theory of economic growth and development.

Growth Definition: Samuelson

- Paul Samuelson defines Economics as "the study of how men and society choose, with or without the use of money, to employ scarce productive resources which could have alternative uses, to produce various commodities over time, and distribute them for consumption, now and in the future among various people and groups of society".

The major implications of this definition are as follows:

- Like Robbins, Samuelson states that the means are scarce in relation to unlimited ends and that such means could be put to alternative uses.
- Samuelson makes his definition dynamic by including the element of time in it. Therefore, his definition covers the theory of economic growth.
- Samuelson's definition is applicable also in a barter economy, where money is not used.

- His definition covers various aspects like production, distribution and consumption.
- Samuelson treats Economics as a social science, whereas Robbins regards it as a science of individual behaviour.
- Of all the definitions discussed above, the 'growth' definition stated by Samuelson appears to be the most satisfactory.

Scope of Economics

- The scope of the subject of Economics refers to on the subject-matter of Economics. It throws light on whether it is an art or a science and if science, whether it is a positive science or a normative science.

Economics: Its subject-Matter

- Economics focuses on the behaviour and interactions among economic agents, individuals and groups belonging to an economic system. It deals with the activities such as the consumption and production of goods and services and the distribution of income among the factors of production. The activities of the rational human beings in the ordinary business of life under the existing social, legal and institutional arrangement are included in the Science of Economics; the abnormal persons and the socially unacceptable and unethical activities are excluded.
- Economics studies the ways in which people use the available resources to satisfy their multiplicity of wants. Scarcity is a problem indicating the gap between what people want and what they are able to get. This scarcity can be eliminated either by limiting the human wants or by increasing the supply of the goods that satisfy the human wants. The method of getting more is resorted to, rather than the method of wanting less.
- Economics is concerned with activities of human being only. Human beings are related to one another and the actions of one member affect those of the other members in the society. Hence, Economics is called a Human Science or Social Science.
- The activities of rational or normal human beings are the subject-matter of Economics.
- All human activities related to wealth constitute the subject-matter of Economics. Thus, human activities not related to wealth (non-economic activities) are not treated in Economics. For example, playing cricket for pleasure, mother's child care.
- It is customary to clarify whether Economics is an art or a science; and if it is a science, to observe its specific features.

Economics is an Art and a Science Economics as an Art

- Art is the practical application of knowledge for achieving particular goals. Economics provides guidance to the solutions to all the economic problems.
- C. Pigou, Alfred Marshall and others regard Economics as an art.

Economics as a Science

- Science is a systematic study of knowledge. All its relevant facts are collected, classified and analyzed with its scale of measurement. Using these facts, science develops the co-relationship between cause and effect. Scientific laws derived are tested through experiments; and future predictions are made. These laws are universally applicable and accepted. Economists like Robbins, Jordon and Robertson argue that Economics is a science like Physics, Chemistry etc., since, it has several similar characteristics. Economics examines the relationships between the causes and the effects of the problems. Hence, it is rightly considered as both an art and a science. In fact, art and science are complementary to each other.

Economics: Positive science Normative science

- Positive science deals with what it is, means, it analyses a problem on the basis of facts and examines its causes. For example, at the time of a price increase, its causes are analysed.
- On the other hand, normative science responds to a question like what ought to be. Here, the conclusions and results are not based on facts, but on different considerations belonging to social, cultural, political, religious realms. They are basically subjective in nature.
- In short, positive science is concerned with 'how? and why?' and normative science with 'what ought to be'. The distinction between the two can be explained. An increase in the rate of interest, under positive science, would be looked into as to why and how can it be reduced, whereas under normative science, it would be seen as to whether it is good or bad.

Three statements about each type are given below:

Positive Economics

- ❖ An increase in money supply implies a price-rise in an economy.
- ❖ As the irrigation facilities and application of chemical fertilizers expand, the production of food-grains increases.
- ❖ An increase in the birth rate and a decrease in the death rate reflect the rate of growth of population.

Normative Economics

- ❖ Inflation is better than deflation.
- ❖ More production of luxury goods is not good for a less-developed country.
- ❖ Inequalities in the distribution of wealth and incomes should be reduced.

Basic Concepts in Economics

- Like other sciences, Economics also has concepts to explain its theories. A complete and clear grasp of their meaning is necessary when the theories associated with them are studied. Only a preliminary acquaintance is now attempted here.

Goods and Services

- Both goods and services satisfy human wants. In Economics, the term 'goods' implies the term 'services' also, unless specified otherwise. Goods (also called 'products', 'commodities', 'things' etc)
 - ❖ as material things, they are tangible;
 - ❖ have physical dimensions, i.e., their physical attributes can be preserved over time;
 - ❖ exist independently of their owner;
 - ❖ are owned by some persons;
 - ❖ are transferable;
 - ❖ have value-in exchange;

Kinds of Goods (and Services)

Free and Economic goods

- Free goods are available in nature and in abundance. Man does not need to incur any expenditure to own or use them. For example air, and sun shine. Water was also an example in the past, but at present it has exchange value. So it is not a free good.
- Milton Friedman, a Nobel laureate, popularises a saying: "There is no such thing as a free lunch". He means that it is impossible to get something for nothing. Even those offered 'free' always costs a person or the society as a whole. Its cost, however, is hidden. It is an externality. Someone can benefit from an externality or from a public good, but someone-else has to pay the cost of producing these benefits. In Economics, it refers to 'opportunity cost'.

- On the other hand, economic goods are not available in plenty. They are scarce in supply. Man has to spend money to own or use them.

Consumer goods and Capital goods:

- Consumer goods directly satisfy human wants, TV, Furniture, Automobile etc.
- Capital-goods (also called producer's goods) don't directly satisfy the consumer wants. They help to produce consumer goods. For example, machines do not directly satisfy the consumers, but in factories, the manufacturers need them.

Perishable goods and Durable goods:

- Perishable goods are short-lived. Their life-span is limited. For example fish, fruits, flower etc do not have a long life.
- Durable goods and semi-durable goods have a little longer life-time than the Perishable goods. For example, a table, a chair etc.

Services

- Along with goods, services are produced and consumed. They are generally, possess the following:

Intangible:

- Intangible things are not physical objects but exist in connection to other things, for example, brand image, goodwill etc. But today, the intangible things are converted and stored into tangible items such as recording a music piece into a pen-drive. They are marketed as a good.

Heterogeneous:

- Services vary across regions or cultural backgrounds. They can be grouped on the basis of quality standards. A single type service yields multiple experiences. For example, music, consulting physicians etc.

Inseparable from their makers:

- Services are inextricably connected to their makers. For example, labour and labourer are inseparable; and,

Perishable:

- Services cannot be stored as inventories like assets. For example, it is useless to possess a ticket for a cricket-match once the match is over. It cannot be stored and it has no value in exchange.

Utility

Meaning

- 'Utility' means 'usefulness'. In Economics, utility is the want-satisfying power of a commodity or a service. It is in the goods and services for an individual consumer at a particular time and at a particular place.

Characteristics of Utility

- Utility is psychological. It depends on the consumer's mental attitude. For example, a vegetarian derives no utility from mutton;
- Utility is not equivalent to usefulness. For example, a smoker derives utility from a cigarette; but, his health gets affected;
- Utility is not the same as pleasure. A sick person derives utility from taking a medicine, but definitely, it is not providing pleasure;
- Utility is personal and relative. An individual obtains varied utility from one and the same good in different situations and places;
- Utility is the function of the intensity of human want. An individual consumer faces a tendency of diminishing utility;
- Utility is a subjective concept it cannot be measured objectively and it cannot be measured numerically;
- Utility has no ethical or moral significance. For example, a cook derives utility from a knife using which he cuts some vegetables; and, a killer wants to stab his enemy by that knife. In Economics, a commodity has utility, if it satisfies a human want;

Types of Utility

- The following are the types of utility

Form Utility:

- An individual consumer obtains utility from a good or service only when it is available in a particular form. Raw materials in their original form may not possess utility for a consumer. But in their changed forms as they become finished products, they provide utility to him. For example, cotton as a raw material may not possess utility for a consumer; but as it gets a new form as a cloth, it yields the consumer utility.

Time Utility:

- A sick man derives time utility from blood not at the time of its donation, but only at the operation-time, i.e., when it is used.

Place Utility:

- A student derives place utility from a book not at the place of its publication (production centre) but only at the place of his education (consumption centre).

Service Utility:

- An individual consumer derives service utility from a service made available at the time when he most needs it. For example, clients obtain service utility from their lawyers, patients derive service utility from the doctors and so on.

Possession Utility:

- When a student buys a book or dictionary from a book seller, then only it gives utility.

Knowledge Utility:

- It is the utility derived by having knowledge of a particular thing. Advertisement serves as a source of information on an object.

Measurability of Utility

- Wants of a person are satisfied by the act of consumption. The consumer derives utility, measured in terms of 'Utils'. An 'Util' is a unit of measurement of utility. An individual pays a price for the unit of the good, equal to the utility derived. Marshall states that utility can be measured indirectly using the 'measuring rod of money'.

Price

- Price is the value of the good expressed in terms of money. Price of a good is fixed by the forces of demand for and supply of the good. Price determines what goods are to be produced and in what quantities. It also decides how the goods are to be produced.

Market

- Generally, market means a place where commodities are bought and sold. But, in Economics, it represents
- where buyers and sellers enter into an exchange of goods and services over a price.

Cost

- Cost refers to the expenses incurred to produce or acquire a given quantum of a good. Together with revenue, it determines the profit gained or the loss incurred by a firm.

Revenue

- Revenue is income obtained from the sale of goods and services. Total Revenue (TR) represents the money obtained from the sale of all the units of a good. Thus, $TR = P \times Q$, where TR is Total Revenue; P is the price per unit of the good; and Q is the Total Quantity of the goods sold.

Equilibrium Diagram

Stable Equilibrium

- Prof. Stigler states that “equilibrium is a position from which there is no net tendency to move”. Its absence is referred to as disequilibrium. Consumer’s equilibrium occurs when he gets maximum satisfaction. The equilibrium of the Producer occurs when he gets maximum profit. A resource is in equilibrium when it gets fully employed and gets its maximum payment. Thus, static equilibrium is based on given and constant prices, quantities, income, technology, population etc.

Particular Equilibrium and General Equilibrium

- An equilibrium, when it pertains to a single variable, may be called particular equilibrium.
- An equilibrium, on the other hand, when it relates to numerous variables or even the economy as a whole, may be called general equilibrium.

Income

- Income represents the amount of monetary or other returns, either earned or unearned small or big, accruing over a period of time to an economic unit. Nominal income refers to income, expressed in terms of money. It is termed as the money income. Real income

is the amount of goods that can be purchased with money as income. It is the purchasing power of income which is based on the rate of inflation.

Methods of Economics, Facts, Theories and Laws

Methods of Economics Deduction and Induction

- Like any other science, Economics also has its laws or generalisations. These laws govern the activities in the various divisions of Economics such as Consumption, Production, Exchange and Distribution. The logical process of arriving at a law or generalization in a science is called its method.

Economics uses two methods: deduction and induction.

Deductive Method of Economic Analysis

- It is also named as analytical or abstract method. It consists in deriving conclusions from general truths; it takes few general principles and applies them to draw conclusions. The classical and neo-classical school of economists notably, Ricardo, Senior, J S Mill, Malthus, Marshall, Pigou, applied the deductive method in their economic investigations.

Steps of Deductive Method

- The analyst must have a clear and precise idea of the problem to be inquired into.
- The analyst clearly defines the technical terms used in the analysis. Further, assumptions of the theory are to be precise.

Deduce hypothesis from the assumptions taken.

- Hypotheses should be verified through direct observation of events in the real world and through statistical methods. (eg) There exists an inverse relationship between price and quantity demanded of a good.

Inductive Method of Economic Analysis

- Inductive method, also called empirical method, is adopted by the “Historical School of Economists”. It involves the process of reasoning from particular facts to general principle.

Economic generalizations are derived in this method, on the basis of

1. Experimentations;
2. Observations; and,
3. Statistical methods.

- Data are collected about a certain economic phenomenon. These are systematically arranged and the general conclusions are drawn from them.

By observing the data, conclusions are easily drawn.

Generalization of the data and then Hypothesis Formulation

Verification of the hypothesis (eg.Engel's law)

- Economists today are of the view that both these methods are complementary. Alfred Marshall has rightly remarked: "Inductive and Deductive methods are both needed for scientific thought, as the right and left foot are both needed for walking".

Economics: Facts, Theories

- Using the methods, the economist observes facts, such as, changes in the price of a commodity. Similarly, the quantity demanded of that commodity also varies. And he observes these movements and comes up with a theory that these two movements are inversely related, i.e., when the price increases, the quantity demanded of that commodity decreases and vice versa. Thus, he formulates his theory of demand.
- He tests his theory by collecting further facts and when his theory stands the test of time and obtains universal acceptance, the theory is raised to the status of a law.

Nature of Economic Laws

- A Law expresses a causal relation between two or more than two phenomena. Marshall states that the Economic laws are statement of tendencies, and those social laws, which relate to those branches of conduct in which the strength of the motives chiefly concerned can be measured by money price.
- In natural sciences, a definite result is expected to follow from a particular cause. In Economic science, the laws function with cause and effect. The consequences predicted by the data, necessarily and invariably follow.
- However, Economic laws are not as precise and certain as the laws in the physical sciences. Marshall holds the opinion that there are no laws of economics which can be compared for precision with the law of gravitation.

Importance of Micro Economics

- ❖ To understand the operation of an economy
- ❖ To provide tools for economic policies

- ❖ To examine the condition of economic welfare
 - ❖ Efficient utilization of resources
 - ❖ Useful in international trade
 - ❖ Useful in decision making:
 - ❖ Optimal resource allocation
 - ❖ Basis for prediction
 - ❖ Price determination
- A physical scientist carrying out controlled experiments in his laboratory can test the scientific laws very easily by changing the conditions obtaining there. Changes in Economics science cannot be brought about easily. As a result, prediction regarding human behaviour is likely to go wrong. There are exceptions to the Law of Demand. Thus, economic laws are not inviolable.
 - As unpredictability is invariably associated with the economic laws. Marshall compares them to the laws of tides. Just as it cannot be predicted and said with certainty that a high tide would follow a low tide, unpredictability prevails in Economics. Human behaviour is volatile. Economic laws are not assertive but they are indicative. The Law of Demand, for example, states that other things remaining the same, the quantity demanded of a commodity increases, as its price decreases and vice versa.
 - The use of the assumption 'other things remaining the same' (ceteris paribus) in Economics makes the Economic laws hypothetical. It might be argued that the laws in other sciences can also be called hypothetical. It should be admitted however that in the case of Economics, the hypothetical elements in its laws are a little less pronounced than in the laws of physical sciences.
 - But since money is used as the measuring rod, laws in economics are more exact, precise and accurate than the other social sciences. As the value of the measuring-rod money is not constant, there is always an hypothetical element surrounding the laws of Economics.
 - Some economic laws are simply truisms. For example, saving is a function of income. Another example of truism is: human wants are unlimited.

Economics: Its sub Divisions

- Economics has been divided into some branches.

Consumption

- Human wants coming under consumption is the starting point of economic activity. In this section the characteristics of human wants based on the behaviour of the consumer, the diminishing marginal utility and consumer's surplus are dealt with.

Production

- Production is the process of transformation of inputs into output. This division covers the characteristics and role of the factors of production namely Land, Labour, Capital and Organization and also the relationship between inputs and output.

Exchange

- Exchange is concerned with price determination in different market forms. This division covers trade and commerce. Consumption is possible only if the produced commodity is placed in the hands of the consumer.

Distribution

- Production is the result of the coordination of factors of production. Since a commodity is produced with the efforts of land, labour, capital and organization, the produced wealth has to be distributed among the cooperating factors. The reward for factors of production is studied in this division under rent, wages, interest and profit. Distribution studies about the pricing of factors of production.

Economics: Its Types

- Economics is a rapidly growing subject and its horizon has been expanding. The basic thrust of the subject is that there should be efficient allocation of the available scarce resources to obtain maximum welfare to the people on a sustainable basis. Given below are some of the major branches of the subject, where such efficient resource allocation is made.

Micro-economics

- Micro Economics is the study of the economic actions of individual units say households, firms or industries. It studies how business firms operate under different market conditions and how the combined actions of buyers and sellers determine prices. Micro economics covers
 - ❖ Value theory (Product pricing and factor pricing)
 - ❖ Theory of economic welfare

Macro-economics

- Macro economics is the obverse of micro economics. It is concerned with the economy as a whole. It is the study of aggregates such as national output, inflation, unemployment and taxes. The General Theory of Employment, Interest and Money published by Keynes is the basis of modern macro economics.

Difference between Micro Economics and Macro Economics

Micro Economics	Macro Economics
It is that branch of economics which deals with the economic decisionmaking of individual economic agents such as the producer, the consumer etc.	It is that branch of economics which deals with aggregates and averages of the entire economy. E.g., aggregate output, national income, aggregate savings and investment, etc.
It takes into account small components of the whole economy.	It takes into consideration the economy of the country as a whole.
It deals with the process of price determination in case of individual products and factors of production.	It deals with general price-level in any economy.
It is known as price theory	It is also known as the income theory.
It is concerned with the optimization goals of individual consumers and producers	It is concerned with the optimization of the growth process of the entire economy.

International Economics

- In the modern world, no country can grow in isolation. Every country is having links with the other countries through foreign capital, investment (foreign direct investment) and international trade.

Public Economics

- Public finance is concerned with the income or revenue raising and expenditure incurring activities of the public authorities and with the adjustment of the one with the other. The scope of Public Finance covers Public expenditure, Public revenue, Public debt and financial administration.

Developmental Economics

- The countries have been classified into developed, developing and underdeveloped on the criteria of per capita income, Human Development Index and Happiness Index. The Development Economics deals with features of developed nations, obstacles for development, Economic and Non-economic factors influencing development, various growth models and strategies.

Health Economics

- Health Economics is an area of applied economics. It covers health indicators, preventive and curative measures, medical research and education, Rural Health Mission, Drug Price control, Neo natal care, Maternity and Child health, Budgetary allocation for health etc.

Environmental Economics

- Depletion of natural resources stock and pollution result from rapid economic development. Hence the need for the study of Environmental Economics which analyses the inter relationship between economy and environment. Environmental Economics is a study of inter disciplinary tools for the problems of ecology, economy and environment.

Basic Economic Problems

- If resources are abundant and wants are so few, then there would be no economic problem. But this situation can never exist. Resources are always scarce and our wants are numerous. Hence in every society certain choices have to be made.

The Economic problem

- ❖ Wants, desires, unlimited
- ❖ Resources Scarce not freely available
- ❖ Economic choice
- ❖ Economics
How people use resources to satisfy unlimited wants.

What and how much to produce?

- Every society must decide on what goods it will produce are and how much of these it will produce. In this process, the crucial decisions include:
 - ❖ Whether to produce more of food, clothing and housing or to have more luxury goods
 - ❖ Whether to have more agricultural goods or to have industrial goods and services
 - ❖ Whether to use more resources in education and health or to use more resources in military services

- ❖ Whether to have more consumption goods or to have investment goods
- ❖ Whether to spend more on basic education or higher education

How to Produce?

- Every society has to decide whether it will use labour-intensive technology or capital intensive technology; that is whether to use more labour and less more machines and vice versa.

For whom to produce?

- Every society must also decide how its produce be distributed among the different sections of the society. It must also decide who gets more and who gets less. It should also decide whether or not a minimum amount of consumption be ensured for everyone in the society. Due to the scarcity of resources, a society faces the compulsion of making choice among alternatives. It faces the problem of allocating the scarce resources to the production of different possible goods and services and of distributing the produced goods and services among individuals within the economy.

Production Possibility Curve

- The problem of choice between relatively scarce commodities due to limited productive resources with the society can be illustrated with the help of a geometric device, is known as production possibility curve. Production possibility curve shows the menu of choice along which a society can choose to substitute one good for another, assuming a given state of technology and given total resources.
- The explanation and analysis of production possibility curve is based upon certain assumptions, some of them are following
 - ❖ The time period does not change. It remains the same throughout the curve.
 - ❖ Techniques of production are fixed.
 - ❖ There is full employment in the economy
 - ❖ Only two goods can be produced from the given resources.
 - ❖ Resources of production are fully mobile.
 - ❖ The factors of production are given in quantity and quality
 - ❖ The law of diminishing returns operates in production.

- Every production possibility curve is based upon these assumptions. If some of these assumptions changes or neglected, then it affects the nature of production possibility curve.
- To draw this curve we take the help of production possibilities schedule, as shown below.
- This schedule suggests that if all resources are thrown into the production of food, a maximum of 500 tons of food can be produced, given the existing technology. If on the other hand, all resources are instead used for producing cars, 25 cars can be produced. In between these two extreme possibilities exist. If we are willing to give up some food, we can have some cars.
- We can obtain a production possibility curve by drawing production possibilities schedule graphically. The quantity of food is shown on x-axis and the number of cars is shown on y-axis, the different six production possibilities are being shown as point P1P2P3P4P5&P6

Food production

- If we assume that innumerable production possibilities exist between any two production possibilities schedule, we get the production possibility curve P1 to p6. This shows the locus of points of the different possibilities of production of two commodities, which a firm or an economy can produce, with the help of given resources and the techniques of production. Points outside the production possibility (e.g. point p) are unattainable as society's resources of production are not sufficient to give output beyond the curve. Points lying inside the curve like p1 are attainable by the society but at these points resources production are not fully employed. For example, if society is producing at point p7 then it can increased the production of food keeping the no of cars constant or it can increase the production of cars keeping the food grain output constant or it can increased the output of both the goods simultaneously.

The PPC shifts upward or downward due to:

1. The change in the supply of productive resources and
 2. The change in the state of technology.
- The production capacity of an economy grows overtime through increase in resource supplies and improvement of technology. This enables PPC to shift upward from AE to A1E1 as shown in figure below. This outward shift of the PPC is the basic feature of economic growth.

Uses of production possibility curve

- Through the device of PPC can be used for many analytical purposes. We shall discuss below some of its popular uses.

The problem of choice

- The problem of choice arise because of the given limited resources and unlimited wants, may relate to the allocation of resources between the goods for the higher income group and the lower income group and the goods for the defense and the civilians. Since PPC is the locus of the combination of the goods the problem of choice will not arises when we choose any point on PPC.

The Notion of Scarcity

- We can explain the notion of scarcity with the help of PPC. We know that every society possesses only a specific amount of resources, which can produce only limited amount of output even with the help of best technology, Economic scarcity of best fact of life. The production possibility curve reflects the constraints imposed by the element of economic scarcity.

Solution of central problems

- The central problems of an economy can be explained with the help of PPC. The solution of problem of what to produce involves the decision regarding the choice of location on the production possibility curves. A production combination represented by any point inside the PPC indicates that the economy is using inefficient methods of production and inefficient combination of resources.

Conclusion

- This chapter has given a broad overview of economics. Moreover the present certain common characteristics of economics definitions of Wealth, Welfare, Scarcity & Growth free essential questions an economy must solve; what to produce, how to produce and for whom to produce and also looked at division of economics, distinguishing between Micro and Macroeconomics. It has introduced some basic concepts frequently appearing throughout the lessons.
- It is perhaps both importance, the study of economics is an intellectually fascinating adventure highly relevant and it affects people's life. Every now and then after learning lesson, think of economic activities in and around you. Perhaps in this way learning of economics makes to think like an economist.

Unit -7 Indian Economy

Meaning of Growth and Development

- A country's economic growth is usually measured by National Income, indicated by Gross Domestic Product (GDP). The GDP is the total monetary value of the goods and services produced by that country over a specific period of time, usually one year.
- The level economic development is indicated not just by GDP, but by an increase in citizens' quality of life or well-being. The quality of life is being assessed by several indices such as Human Development Index (HDI), Physical Quality of Life Index (PQLI) and Gross National Happiness Index (GNHI).

Gross National Happiness Index (GNHI)

The term "Gross National Happiness" was coined by the fourth king of Bhutan, Jigme Singye Wangchuck, in 1972. It is an indicator of progress, which measures sustainable development, environmental conservation promotion of culture and good governance.

- On the basis of the level of economic development, nations are classified as developed and developing economies.
- Developed economies are those countries which are industrialised, utilise their resources efficiently and have high per capita income. The USA, Canada, U.K, France, and Japan are some of the developed economies. Developed economies are also termed as Advanced Countries. On the other hand, countries which have not fully utilized their resources like land, mines, workers, etc., and have low per capita income are termed as under developed economies. Examples of underdeveloped countries are Sub Saharan Africa, Bangla Desh, Myanmar, Pakistan, Indonesia etc. They are also termed as Undeveloped Countries or Backward Nations or Third World Nations.

Indian Economy

- Indian economy is the Seventh largest economy of the world. Being one of the top listed countries. In terms of industrialization and economic growth, India holds a robust position with an average growth rate of 7% (approximately).
- Even though the rate of growth has been sustainable and comparatively stable, there are still signs of backwardness.

Features of a Developed Economy

1. High National Income

2. High Per Capita Income
3. High Standard of Living
4. Full Employment of Resources
5. Dominance of Industrial Sector
6. High Level of Technology
7. High Industrialisation
8. High Consumption Level
9. High Level of Urbanisation
10. Smooth Economic Growth
11. Social Equity, Gender Equality and Low Levels of Poverty
12. Political Stability and Good Governance

The diametrically opposite features of Indian Economy are discussed below in detail.

Features of Indian Economy

Strengths of Indian Economy

India has a mixed economy

- Indian economy is a typical example of mixed economy. This means both private and public sectors co-exist and function smoothly. On one side, some of the fundamental and heavy industrial units are being operated under the public sector, while, due to the liberalization of the economy, the private sector has gained importance. This makes it a perfect model for public – private partnership.

Agriculture plays the key role

- Agriculture being the maximum pursued occupation in India, it plays an important role in its economy as well. Around 60% of the people in India depend upon agriculture for their livelihood. In fact, about 17% of our GDP today is contributed by the agricultural sector. Green revolution, ever green revolution and inventions in bio technology have made agriculture self sufficient and also surplus production. The export of agricultural products such as fruits, vegetables, spices, vegetable oils, tobacco, animal skin, etc. also add to foreign earning through international trading.

An emerging market

- India has emerged as vibrant economy sustaining stable GDP growth rate even in the midst of global downtrend. This has attracted significant foreign capital through FDI and FII. India has a high potential for prospective growth. This also makes it an emerging market for the world.

Emerging Economy

- Emerging as a top economic giant among the world economy, India bags the seventh position in terms of nominal Gross Domestic Product (GDP) and third in terms of Purchasing Power Parity (PPP). As a result of rapid economic growth Indian economy has a place among the G20 countries.

Fast Growing Economy

- India's economy is well known for high and sustained growth. It has emerged as the world's fastest growing economy in the year 2016-17 with the growth rate of 7.1% in GDP next to People's Republic of China.

Fast growing Service Sector

- The service sector, contributes a lion's share of the GDP in India. There has been a high rise growth in the technical sectors like Information Technology, BPO etc. These sectors have contributed to the growth of the economy. These emerging service sectors have helped the country go global and helped in spreading its branches around the world.

Large Domestic consumption

- With the faster growth rate in the economy the standard of living has improved a lot. This in turn has resulted in rapid increase in domestic consumption in the country. The standard of living has considerably improved and life style has changed.

Rapid growth of Urban areas

- Urbanization is a key ingredient of the growth of any economy. There has been a rapid growth of urban areas in India after independence. Improved connectivity in transport and communication, education and health have speeded up the pace of urbanization.

Stable macro economy

- The Indian economy has been projected and considered as one of the most stable economies of the world. The current year's Economic survey represents the Indian economy to be a "heaven of macroeconomic stability, resilience and optimism. According to the Economic Survey for the year 2014-15, 8%-plus GDP growth rate has been predicted, with actual growth turning out to be a little less (7.6%). This is a clear indication of a stable macroeconomic growth.

Demographic dividend

- The human capital of India is young. This means that India is a pride owner of the maximum percentage of youth. The young population is not only motivated but skilled and trained enough to maximize the growth. Thus human capital plays a key role in maximizing the growth prospects in the country. Also, this has invited foreign investments to the country and outsourcing opportunities too.

Weakness of Indian Economy

Large Population

- India stands second in terms of size of population next to China and our country is likely to overtake china in near future. Population growth rate of India is very high and this is always a hurdle to growth rate. The population growth rate in India is as high as 1.7 per 1000. The annual addition of population equals the total population of Australia.

Inequality and poverty

- There exists a huge economic disparity in the Indian economy. The proportion of income and assets owned by top 10% of Indians goes on increasing. This has led to an increase in the poverty level in the society and still a higher percentage of individuals are living Below Poverty Line (BPL). As a result of unequal distribution of the rich becomes richer and poor becomes poorer.

Increasing Prices of Essential Goods

- Even though there has been a constant growth in the GDP and growth opportunities in the Indian economy, there have been steady increase in the prices of essential goods. The continuous rise in prices erodes the purchasing power and adversely affects the poor people, whose income is not protected.

Weak Infrastructure

- Even though there has been a gradual improvement in the infrastructural development in the past few decades, there is still a scarcity of the basic infrastructure like power, transport, storage etc.

Inadequate Employment generation

- With growing youth population, there is a huge need of the employment opportunities. The growth in production is not accompanied by creation of job. The Indian economy is characterized by 'jobless growth'.

Outdated technology

- The level of technology in agriculture and small scale industries is still outdated and obsolete.

Demographic trends in India

- Scientific study of the characteristics of population is known as Demography. The various aspects of demographic trends in India are:
 - ❖ Size of population
 - ❖ Rate of growth
 - ❖ Birth and death rates
 - ❖ Density of population
 - ❖ Sex-ratio

- ❖ Life-expectancy at birth
- ❖ Literacy ratio

Size of Population

Census Year	Population (in crores)	Average annual growth rate
1901	23.84	-
1911	25.21	0.56
1921	25.13	-0.03
1931	27.90	1.04
1941	31.87	1.33
1951	36.11	1.25
1961	43.92	1.96
1971	54.81	2.20
1981	68.33	2.22
1991	84.33	2.16
2001	102.70	1.97
2011	121.02	1.66

- Over a period of 100 years, India has quadrupled its population size. In terms of, size of population, India ranks 2nd in the world after China. India has only about 2.4% of the world's geographical area and contributes less than 1.2% of the world's income, but accommodates about 17.5% of the world's population. In other words, every 6th person in the world is an Indian. Infact, the combined population of just two states namely, Uttar Pradesh and Maharashtra is more than the population of United States of America, the third most populous country of the world. Some of the states in India have larger population than many countries in the world.
- The negative growth during 1911-21 was due to rapid and frequent occurrence of epidemics like cholera, plague and influenza and also famines. The year 1921 is known as the 'Year of Great Divide' for India's population as population starts increasing.
- During 1951, population growth rate has come down from 1.33% to 1.25%. Hence it is known as 'Year of Small divide'.
- In 1961, population of India started increasing at the rate of 1.96% i.e, 2%. Hence 1961 is known as 'Year of Population Explosion'. In the year 2001, the Population of India crossed one billion (100 crore) mark.
- The 2011 census reveals growth of youth population which is described as 'demographic transition'.

Birth rate and death rate

Crude Birth rate:

It refers to the number of births per thousand of population.

Crude Death rate:

- It refers to the number of deaths per thousand of population
- Crude birth and death rates of India during various years.

Birth rate and death rate

Year	C.B.R	C.D.R.
1951	39.9	27.4
2001	25.4	8.4
2011	21.8	7.11

- Birth rate was 39.9 in 1951; it fell to 21.8 in 2011. Although the birth rate has declined, the decline is not so remarkable. The death rate has declined from 27.4 in 1951 to 7.1 in 2011. However, from the data it is clear that the fall in birth rates is less than that of death rates.
- Kerala has the lowest birth rate (14.7) and Uttar Pradesh has the highest birth rate (29.5). West Bengal has the lowest death rate (6.3) and Orissa (9.2) has the highest. Among States Bihar has the highest decadal (2001-11) growth rate of population, while Kerala has the lowest growth rate. The four states Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh called BIMARU states have very high population.

Density of population

- It refers to the average number of persons residing per square kilometre. It represents the man- land ratio. As the total land area remains the same, an increase in population causes density of population to rise.

Density of population

Year	Density of population (No. of persons per sq. km)
1951	117
2001	325
2011	382

- Just before Independence, the density of population was less than 100. But after independence, it has increased rapidly from 117 in 1951 to 325 in 2001. According to

2011 census, the present Density of population is 382. Thus, the pressure of population on land has been rising. Kerala, West Bengal, Bihar and Uttar Pradesh have density higher than the India's average density. Bihar is the most densely populated state in the country with 1,102 persons living per sq.km followed by West Bengal with 880. Arunachal Pradesh has low density of population of only 17 persons.

Sex ratio

- It refers to the number of females per 1,000 males. It is an important indicator to measure the extent of prevailing equity between males and females at a given point of time.

Census year	Sex ratio(Number of females per1000 males)
1951	946
2001	933
2011	940

- In India, the sex ratio is more favourable to males than to females. In Kerala, the adult sex ratio is 1084 as in 2011. The recent census (2011) shows that there has been a marginal increase in sex ratio. Haryana has the lowest sex ratio of 877 (2011) among other states, while Kerala provides better status to women as compared to other States with 1084 females per 1000 males.

Life expectancy at birth

- It refers to the mean expectation of life at birth. Life expectancy has improved over the years. Life expectancy is low when death rate is high and / or instances of early death are high. On the other hand, life expectancy is high when death rate is low and / or instances of early death are low.

Year	Male	Female	Overall
1951	32.5	31.7	32.1
1991	58.6	59.0	58.7
2001	61.6	63.3	62.5
2011	62.6	64.2	63.5

- During 1901 - 11, life expectancy was just 23 years. It increased to 63.5 years in 2011. A considerable fall in death rate is responsible for improvement in the life expectancy at birth. However the life expectancy in India is very low compared to that of developed countries.

Literacy ratio

- It refers to the number of literates as a percentage of the total population. In 1951, only one-fourth of the males and one-twelfth of the females were literates. Thus, on an average, only one-sixth of the people of the country were literates. In 2011, 82% of males and 65.5% of females were literates giving an overall literacy rate of 74.04% (2011). When compared to other developed countries and even Sri Lanka this rate is very low.

Census year	Literate persons	Males	Females
1951	18.3	27.2	8.9
2001	64.8	75.3	53.7
2011	74.04	82.1	65.5

- Kerala has the highest literacy ratio (92%) followed by Goa (82%), Himachal Pradesh (76%), Maharashtra (75%) and Tamil Nadu (74%). Bihar has the lowest literacy ratio (53%) in 2011.

Natural Resources

- Any stock or reserve that can be drawn from nature is a Natural Resource. The major natural resources are - land, forest, water, mineral and energy. India is rich in natural resources, but majority of the Indians are poor. Nature has provided with diverse climate, several rivers for irrigation and power generation, rich minerals, rich forest and diverse soil.

Types of Natural resources

- Renewable Resources: Resources that can be regenerated in a given span of time. E.g. forests, wildlife, wind, biomass, tidal, hydro energies etc.
- Non-Renewable Resources: Resources that cannot be regenerated. E.g. Fossil fuels coal, petroleum, minerals, etc.

Land Resources

- In terms of area India ranks seventh in the world with a total area of 32.8 lakh sq. km. It accounts for 2.42% of total area of the world. In absolute terms India is really a big country. However, land- man ratio is not favourable because of the huge population size.
- According to Agricultural Census, the area operated by large holdings (10 hectares and above) has declined and area operated under marginal holdings (less than one hectare) has increased. This indicates that land is being fragmented and become ineconomic.

Forest Resources

- India's forest cover in 2007 is 69.09 million hectare which constitutes 21.02 per cent of the total geographical area. Of this, 8.35 million hectare is very dense forest, 31.90 million hectare is moderately dense forest and the rest 28.84 million hectare is open forest.

Important Mineral Resources

Iron-Ore

- India possesses high quality iron-ore in abundance. The total reserves of iron-ore in the country are about 14.630 million tonnes of haematite and 10,619 million tonnes of magnetite. Hematite iron is mainly found in Chhattisgarh, Jharkhand, Odisha, Goa and Karnataka. The major deposit of magnetite iron is available at western coast of Karnataka. Some deposits of iron ore are also found in Kerala, Tamil Nadu and Andhra Pradesh.

Coal and Lignite

- Coal is the largest available mineral resource. India ranks third in the world after China and USA in coal production. The main centres of coal in India are the West Bengal, Bihar, Madhya Pradesh, Maharashtra, Odisha and Andhra Pradesh. Bulk of the coal production comes from Bengal-Jharkhand coalfields.

c. Bauxite

- Bauxite is a main source of metal like aluminium. Major reserves are concentrated in the East Coast bauxite deposits of Odisha and Andhra Pradesh.

Mica

- Mica is a heat resisting mineral which is also a bad conductor of electricity. It is used in electrical equipment's as an insulator. India stands first in sheet mica production and contributes 60% of mica trade in the world. The important mica bearing pegmatite is found in Andhra Pradesh, Jharkhand, Bihar and Rajasthan.

Crude Oil

- Oil is being explored in India at many places of Assam and Gujarat. Digboi, Badarpur, Naharkatia, Kasimpur, Palliaria, Rudrapur, Shivsagar, Mourn (All in Assam) and Hay of Khambhat, Ankaleshwar and Kalol (All in Gujarat) are the important places of oil exploration in India.

Gold

- India possesses only a limited gold reserve. There are only three main gold mine regions – Kolar Goldfield, Kolar district and Hutti Goldfield in Raichur district (both in Karnataka) and Ramgiri Goldfield in Anantpur district (Andhra Pradesh).

Diamond

- As per UNECE the total reserves of diamond is estimated at around 4582, thousand carats which are mostly available in Panna (Madhya Pradesh), Rammallakota of Kurnur district of Andhra Pradesh and also in the Basin of Krishna River.
- The new Kimberlile fields have been discovered in Raipur and Pastar districts of Chhattisgarh, Nuapada and Bargarh districts of Odisha, Narayanpet - Maddur Krishna areas of Andhra Pradesh and Raichur-Gulbarga districts of Karnataka.

Economic Infrastructure

- Infrastructural development means the development of many support facilities. These facilities may be divided into (a) economic infrastructure and (b) social infrastructure. Economic infrastructure includes - transport, communication, energy, irrigation, monetary and financial institutions. Social infrastructure includes - education, training and research, health, housing and civic amenities.

Economic Infrastructure

- Economic infrastructure is the support system which helps in facilitating production and distribution. For instance, railways, trucks, posts and telegraph offices, ports, canals, power plants, banks, insurance companies etc. are all economic infrastructure of an economy. They help in the production of goods and services.

Transport

- For the sustained economic growth of a country, a well-connected and efficient Transport system is needed. India has a good network of rail, road, coastal shipping, and air transport. The total length of roads in India being over 30 lakh km, India has one of the largest road networks in the world. In terms of railroads, India has a broad network of railroad lines, the largest in Asia and the fourth largest in the world. The total rail route length is about 63,000 km and of this 13,000 km is electrified. The major Indian ports including Calcutta, Mumbai, Chennai, Vishakhapatnam and Goa handle about 90% of sea-borne trade and are visited by cargo carriers and passenger liners from all parts of the world. A comprehensive network of air routes connects the major cities and towns of the country. The domestic air services are being looked after by Indian Airlines and private airlines. The international airport service is looked after by Air India.

Indian Railways Provide Wi-Fi Facility First in India is Bangalore Railway Station

Air India and Indian Airlines were merged on August 27, 2007 to form National Aviation Company of India Ltd. (NACIL)

The National Harbour board was set up in 1950 to advise the Central and State Governments on the management and development of ports, particularly minor ports

Energy

- Electrical energy is one of the necessary components of our life. Nowadays, without electricity, we cannot survive in this world of technology. The energy sources are classified under two heads based on the availability of the raw materials used, while generating energy.

1. Non-renewable energy sources
2. Renewable energy sources

Non-renewable energy sources

- As the name suggests, the sources of energy which cannot be renewed or re-used are called non-renewable energy sources. Basically these are the energy sources which will get exhausted over a period of time. Some of the examples of this kind of resources are coal, oil, gas etc.

Renewable energy sources

- These are the kind of energy source which can be renewed or reused again and again. These kinds of materials do not exhaust or literally speaking these are available in abundant or infinite quantity. Example for this kind include **1. Solar energy 2. Wind energy 3. Tidal energy 4. Geothermal energy 5. Biomass energy** Sometimes renewable sources are also called non-conventional sources of energy since, these kinds of materials or these ways of energy production were not used earlier or conventionally.

Social Infrastructure

- Social infrastructure refers to those structures which are improving the quality of manpower and contribute indirectly towards the growth of an economy. These structures are outside the system of production and distribution. The development of these social structures help in increasing the efficiency and productivity of manpower. For example, schools, colleges, hospitals and other civic amenities. It is a fact that one of the reasons for the low productivity of Indian workers is the lack of development of social infrastructure. The status and developments in the social infrastructure in India are discussed below.

Education

Education in India

- Imparting education on an organized basis dates back to the days of 'Gurukul' in India. Since then the Indian education system has flourished and developed with the growing needs of the economy. The Ministry & Human Resource Development (MHRD) in India formulates education policy in India and also undertakes education programs.

Education system in India

- Education in India until 1976 was the responsibility of the State governments. It was then brought under concurrent list (both Centre and State). The Centre is represented by the Ministry of Human Resource Development decides the India's education budget. The education system in India consists of primarily six levels:
 1. Nursery Class,
 2. Primary Class,
 3. Secondary Level,
 4. Higher Secondary Level,
 5. Graduation, 6. Post-Graduation

Education Institutions in India:

- Education in India follows the 10+2 pattern. For higher education, there are various State run as well as private institutions and universities providing a variety of courses and subjects. The accreditation of the universities is decided under the University Grant Commission Act. The Education Department consists of various schools, colleges and universities imparting education on fair means for all sections of the society. The budget share of the education sector is around 3% of GDP, of this largest proportion goes for school education. However, per pupil expenditure is the lowest for school students.

Health

a. Health in India

- Health in India is a state government responsibility. The Central Council Of Health and Welfare formulates the various health care projects and health department reform policies. The administration of health industry in India as well as the technical needs of the health sector are the responsibility of the Ministry Of Health And Welfare.
- Health care in India has many forms. These are the ayurvedic medicinepractice, unani or galenic herbal care, homeopathy, allopathy, yoga, and many more. Each different healthcare form has its own treatment system and practice patterns. The medical practicing in India needs a proper licensing from the Ministry of Health. All medical systems are now under one ministry viz AYUSH.

Health Care Services in India:

- The health care services in India are mainly the responsibility of the Ministry of Health. State wise, health status is better in Kerala as compared to other States. Compared to other developed countries, India's health status is not satisfactory. India's health status is poor compared to Sri Lanka.

Contributions of Indian Economic Thinkers

Tiruvalluvar

- The economic ideas of Tiruvalluvar are found in his immortal work, Thirukkural, a book of ethics. Even though scholars differ widely over the estimation of the period of Tiruvalluvar, it is generally believed that, he belongs to the Sangam age in Tamil Nadu around third century A.D. Tiruvalluvar's work is marked by pragmatic idealism.
- A large part of Valluvar's economic ideas are found in the second part of Tirukkural, the porutpal. It deals with wealth. Tiruvalluvar is a fundamental thinker. He believes that rains are the basic support of life. Since rain provides food, it forms the basis for stable economic life. Agriculture which is the most fundamental economic activity depends on rain, "It is rain that both ruins and aids the ruined to rise".

Factors of Production

- Tiruvalluvar has made many passing references about the factors of production viz., Land, Labour, Capital, Organisation, Time, Technology etc. He says, "Unfailing harvest, competent body of men, group of men, whose wealth knows no diminution, are the components of an economy". (Kural 61)

Agriculture

- According to Tiruvalluvar, agriculture is the most fundamental economic activity. They are the axle-pin of the world, for on their prosperity revolves prosperity of other sectors of the economy, "The ploughmen alone", he says "live as the freemen of the soil; the rest are mere slaves that follow on their toil" (Kural 1032). Valluvar believes that agriculture is superior to all other occupation.

Public Finance

- Tiruvalluvar has elaborately explained Public Finance under the headings Public Revenue, Financial Administration and Public expenditure. He has stated these as 1) Creation of revenue, 2) Collection of revenue, 3) Management of revenue 4) Public expenditure

Public Expenditure

- Valluvar has recommended a balanced budget. "It is not a great misfortune for a state if its revenues are limited, provided the expenditure is kept within bounds." He has given

certain guidelines for a budgetary policy. "Budget for a surplus, if possible, balances the budget at other times, but never budget for a deficit." Valluvar advocates the following main items of public expenditure: 1) Defence 2) Public Works and 3) Social Services.



External Assistance

- Valluvar was against seeking external assistance. According to Kural No. 739, countries taking external assistance are not to be considered as countries at all. In other words, he advocated a self-sufficient economy.

Poverty and Begging

- Valluvar considers freedom from hunger as one of the fundamental freedoms that should be enjoyed by every citizen. According to him 'poverty' is the root cause of all other evils which would lead to ever-lasting sufferings. It is to be noted that the number of people living below poverty line, begging, sleeping on the roadsides and rag picking in India has been increasing.

Wealth

- Valluvar has regarded wealth as only a means and not an end. He said, "Acquire a great fortune by noble and honourable means." He condemned hoarding and described hoarded wealth as profitless richness. To him industry is real wealth and labour is the greatest resource.

Welfare State

- Tiruvalluvar is for a welfare state. In a welfare state there will be no poverty illiteracy, disease and industry. The important elements of a welfare state are 1) perfect health of the people without disease 2) abundant wealth, 3) good crop 4) prosperity and happiness and 5) full security for the people.

Mahatma Gandhi

- Gandhian Economics is based on ethical foundations. In 1921, Gandhi wrote, "Economics that hurts the moral well-being of an individual or a nation is immoral, and therefore, sinful." Again in 1924, he repeated the same belief: "that economy is untrue which ignores or disregards moral values".

Salient Features of Gandhian Economic Thought

1. Village Republics:

- To Gandhi, India lives in villages. He was interested in developing the villages as self-sufficient units. He opposed extensive use of machinery, urbanization and industrialization.

2. On Machinery:

- Gandhi described machinery as 'Great sin'. He said that "Books could be written to demonstrate its evils... it is necessary to realize that machinery is bad. Instead of welcoming machinery as a boon, we should look upon it as an evil. It would ultimately cease.

3. Industrialism:

- Gandhi considered industrialism as a curse on mankind. He thought industrialism depended entirely on a country's capacity to exploit.

4. Decentralization:

- He advocated a decentralized economy, i.e., production at a large number of places on a small scale or production in the people's homes.

5. Village Sarvodaya:

- According to Gandhi, "Real India was to be found in villages and not in towns or cities." So he suggested the development of self-sufficient, self-dependent villages.

6. Bread Labour:

- Gandhi realized the dignity of human labour. He believed that God created man to eat his bread by the sweat of his brow. Bread labour or body labour was the expression that Gandhi used to mean manual labour.

7. The Doctrine of Trusteeship:

- Trusteeship provides a means of transforming the present capitalist order of society into an egalitarian one. It gives no quarter to capitalism. However, now India experiences both casino capitalism and crony capitalis

8. On the Food Problem:

- Gandhi was against any sort of food controls. He thought such controls only created artificial scarcity. Once India was begging for food grain, but India tops the world with very large production of foodgrains, fruits, vegetables, milk, egg, meat etc.,

9. On Population:

- Gandhi opposed the method of population control through contraceptives. He was, however, in favour of birth control through Brahmacharya or self-control. He considered self-control as a sovereign remedy to the problem of over-population.

10. On Prohibition:

- Gandhi advocated cent per cent prohibition. He regarded the use of liquor as a disease rather than a vice. He felt that it was better for India to be poor than to have thousands of drunkards. But ,now many states depend on revenue from liquor sales.

Jawaharlal Nehru

- Jawaharlal Nehru, one of the chief builders of Modern India, was the first Prime Minister of Independent India and he was there in that post till his death in 1964. He was a great patriot, thinker and statesman. His views on economics and social problems are found in the innumerable speeches he made and in the books he wrote.

Democracy and Secularism

- Jawaharlal Nehru was a firm believer in democracy. He believed in free speech civil liberty, adult franchise and the Rule of Law and Parliamentary democracy. Secularism, is another signal contribution of Nehru to India. In our country, there are many religions - Hinduism, Islam, Christianity, Buddhism, Jainism, Zoroastrianism, Sikhism and so on. But there is no domination by religious majority. Secularism means equal respect for all religions.

Planning

- Jawaharlal Nehru was responsible for the introduction of planning in our country. To Jawaharlal Nehru, the Plan was essentially an integrated approach for development. Initiating the debate on the Second Plan in the Lok Sabha in May 1956, Nehru spoke on the theme of planning. He said, "the essence of planning is to find the best way to utilize all resources of manpower, of money and so on." Planning for Nehru was essentially linked up with industrialization and eventual self-reliance for the country's economic growth on a self-accelerating growth. Nehru carried through this basic strategy of planned development. Nehru's contribution to the advancement of science, research, technology and industrial development cannot be forgotten. It was during his period, many IITs and Research Institutions were established. He always insisted on "scientific temper".

Democratic Socialism

- Socialism is another contribution of Nehru to India. He put the country on the road towards a socialistic pattern of society. But Nehru's socialism is democratic socialism.

B. R. Ambedkar

- B.R. Ambedkar (1891-1956) was a versatile personality. He was the architect of the Indian Constitution, a custodian of social justice and a champion of socialism and state planning. Ambedkar's writings included "Ancient Indian Commerce" (a thesis submitted to the Columbia University for the award of the Master of Arts Degree in 1915), 'National Dividend of India: A Historical and Analytical Study (a thesis for which he was awarded Ph.D). His thesis was published as 'The Evolution of Provincial Finance in British India: A Study of the Provincial Decentralization of Imperial Finance'.

- Ambedkar's thesis on "Provincial Decentralization of Imperial Finance in British India" was accepted for the M. Sc degree in 1921. And his thesis "The Problem of the Rupee" was accepted for the award of the D.Sc degree by the London School of Economics in 1923. It is a miracle that RBI was conceptualized as per the guidelines presented by Ambedkar in his book, "The Problem of the Rupee;Its origin and its solution". The main economic ideas of Ambedkar may be studied under four broad headings:



Financial Economics

- Much of the work done by Ambedkar during his stay abroad mostly during the period 1913-1923, was in the field of Finance Economics. Ambedkar divided the evolution of provisional finance into three stages: (i). Budget by Assignment (1871-72 to 1876-77); (ii) Budget by Assigned Revenue (1877-78 to 1881-82); and (iii) Budget by Shared Revenues (1882-83 to 1920-1921).

Agricultural Economics

- In 1918, Ambedkar published a paper “Small Holding in India and their Remedies”. Citing Adam Smith’s ‘Wealth of Nations’, he made a fine distinction between “Consolidation of Holdings” and “Enlargement of Holdings”.

Economics of Caste

- Ambedkar believed that caste was an obstacle to social mobility. It resulted in social stratification. He was of the firm view that individuals must be free to change their occupations. Moreover, the caste system caused social tensions. The caste system has resulted in the absence of social democracy in India as distinct from political democracy.

Economics of Socialism

- Ambedkar was a socialist. He was a champion of state socialism. He advocated the nationalization of all key industries and suggested state ownership of land and collective farming. He was for state monopoly of insurance business. Not only that, he advocated compulsory insurance for every citizen.
- There is no doubt that Ambedkar was a great economist. But his academic work as an economist was eclipsed by his greater contributions in the field of law and politics. Above all he was a great social reformer.

J. C. Kumarappa

- Joseph ChelladuraiKumarappa was born on 4 January 1892 in Tanjavur, Tamil Nadu. A pioneer of rural economic development theories, Kumarappa is credited for developing economic theories based on Gandhism – a school of economic thought he coined “Gandhian Economics”.

Gandhian Economics

- J.C.Kumarappa strongly supported Gandhi’s notion of village industries and promoted Village Industries Associations. Kumarappa worked to combine Christian and Gandhian values of “trusteeship”, nonviolence and a focus on human dignity and development in place of materialism as the basis of his economic theories. While rejecting socialism’s emphasis on class war and force in implementation, he also rejected the emphasis on materialdevelopment, competition and efficiency in free-market economies. Gandhi and Kumarappa envisioned an economy focused on satisfying human needs and challenges while rooting out socio-economic conflict, unemployment, poverty and deprivation.
- Kumarappa worked as a Professor of economics at the Gujarat Vidyapith in Ahmedabad, while serving as the editor of Young India during the Salt Satyagraha. He founded the All India Village Industries Association in 1935; and was imprisoned for more than a year during the Quit India movement. He wrote during his imprisonment, Economy of Permanence: The Practice and Precepts of Jesus (1945) and Christianity: Its Economy and Way of Life (1945).
- Several of Gandhi’s followers developed a theory of environmentalism. Kumarappa took the lead in a number of relevant books in the 1930s and 1940s. Historian RamachandraGuha calls Kumarappa, “The Green Gandhian,” portraying him as the founder of modern environmentalism in India.
- Kumarappa worked for the Planning Commission of India and the Indian National Congress to develop national policies for agriculture and rural development. He also travelled to China, Eastern Europe and Japan on diplomatic assignments and to study their rural economic systems.

V.K.R.V. Rao

- According to P.R. Brahmananda, “ the great trinity of pre- independent and post independent Indian economists consisted of D.R.Gadgill, C.N.Vakil and V.K.RV. Rao. These scholars were imbued with a missionary zeal and analysed the Indian economic problems with a view to designing and propagating economic policies/programmes and plans to India’s national advantage.” V.K.R.V: Rao was a prolific writer.

V.K.R.V: Rao was deeply interested in three large themes. They were:

- ❖ National Income,
- ❖ Food, nutrition and the distribution of good; and
- ❖ Employment and occupational distributions.

National Income Methodology

- As an applied economist, Rao's name is remembered for his pioneering work on the enumeration of national income of India. Rao was a pupil of J.M. Keynes and he worked with Colin Clark. H.W Singer considered V.K.R.V Rao as "the best equipped of all Keynes' pupils. He attempted (i) to develop the national income concepts suited to India and developing countries generally; (ii) to analyse the concepts of investment, saving and the multipliers in an underdeveloped economy; and (iii) to study the compatibility of the national incomes of industrialized and underdeveloped countries. Rao's paper on "Full Employment and Economic Development" was one of the earliest contributions in the field of development towards employment.

International Food Aid

- Rao was influential in creating ideas and shaping policy in the international attack on world poverty, not only through his contributions to the question of international aid and improved flows of external resources, but also through his activities in the field of food aid.

Support for Socialism

- During the early phases of planning in India, Rao supported the case of a socialist India, where the state would control the commanding heights of the economy and the public sector would play a dominant role in economic development.

Rao's Views on Industrialization

- In his pamphlet "what is wrong with Indian Economic Life?" (1938), Rao gave the following reasons for low per capita income and low levels of per capita nutrition in India.
 - ❖ Uneconomic holdings with subdivisions and fragmentation;
 - ❖ Low levels of water availability for crops;
 - ❖ Excess population pressure on agriculture due to the absence of a large industrial sector;
 - ❖ Absence of capital;

- ❖ Absence of autonomy in currency policy, and in general in monetary matters encouraging holding of gold.

Village Clusters

- Rao felt that rural communities had to be given a viable base. Therefore he suggested that a cluster of villages should form a unit for rural development, so that both social and economic interactions between villages could develop, and they could effectively generate and fashion their own development with a more meaningful participation by people.

Investment, Income and Multiplier

- Rao's examination of the "interrelation between investment, income and multiplier in an under developed economy" (1952) was his major contribution to macroeconomic theory. As a thinker, teacher, economic adviser and direct policy maker, V.K.R.V. Rao followed the footsteps of his great teacher, John Maynard Keynes.

Institution Builder

- He founded three national level research institutes namely Delhi School of Economics, Institute of Economic Growth (both at Delhi) and Institute for Social and Economic Change (Bangalore)

Amartya Kumar Sen

- The Nobel citation refers to Sen's contributions to social choice theory, development economics, study on poverty and famines and concept of entitlements and capability development (1998).

Poverty and Famines

- Sen's "Poverty and Famines: An Essay on Entitlement and Deprivation" (1981) is both a theoretical and an applied work. In the book, several famines have been studied in the working of a general theoretical framework from an original angle. He examined various meanings of poverty and drew attention to the incidence of absolute and relative deprivation.

Poverty and Inequality

- Sen has carried out massive work on poverty and inequality in India. Sen's major point has been that the distribution of income/ consumption among the persons below the poverty line is to be taken into account.

The Concept of Capability

- The concept of capabilities developed by Sen has been cited as a better index of wellbeing than commodities or utilities. Capability, as defined by Sen, is the ability to transform Rawlsian primary goods to the achievement of wellbeing.

Entitlement

- Sen has included the concept of entitlement items like nutrition, food, medical and health care, employment, security of food supply in times of famine etc. He considered famine as arising out of the failure of establishing a system of entitlements.

Choice of Technique

- Sen's 'Choice of Technique ' was a research work where he argued that in a labour surplus economy, generation of employment cannot be increased at the initial stage by the adaptation of capital- intensive technique.
- Conclusively, AmartyaSen, more than just an economist, is an ethical philosopher. He is a lover of freedom and a humanist. He has focused on the poor, viewing them not as objects of pity requiring charitable hand-outs, but as disempowered folk needing empowerment, education, health, nutrition, gender equality, safety net in times of distress; all are needed to empower people.

Conclusion

- This lesson mainly focused on some of the aspects of the Indian Economy and its resources, infrastructure facilities and energy, It also discussed the principles of Indian Economic thinkers to motivate the students to read good books on Economics Written by the great economists.

8. Indian Economy Before and After Independence

Introduction

- This chapter discusses the major events that took place in India before and after Independence. India was a colony for long. Colonialism refers to a system of political and social relations between two countries, of which one is the ruler and the other is its colony. The ruling country not only has political control over the colony but it also determines the economic policies of the subjugated country. Thus, the people living in a colony cannot take independent decisions in respect of utilisation of the country's resources and Important economic activities. India had the bitter experience of colonialism.

Indian Economy during the British Period

- Indian's sea route trade to Europe started only after the arrival of Vasco da Gama in Calicut, India on May 20, 1498. The Portuguese had traded in Goa as early as 1510. In 1601 the East India Company was chartered, and the English began their first inroads into the Indian Ocean. In 1614 Sir Thomas Roe was successful in getting permission from Jahangir for setting up factories and slowly moved all parts of India.

History of British Period

During the British period

Before the advent of the British, Indian practically lived in village. Thus the economy of the village was self-sufficient. But under the British rule only industries were allowed to develop. These economic and organization change brought down the economic condition of Indians. All the problems are chiefly related with health, housing, child and woman welfare and labour, recreation, crime and social disorganization. Due to these problems, the need for organized social work was realised.

- Hundred years after Battle of Plessey the rule of the East India Company finally did come to an end. In 1858, British Parliament passed a law through which the power for governance of India was transferred from the East India Company (EIC) to the British crown. Even the transfer of power from the East India Company to the British Crown did not materially alter the situation.

Britain had exploited India over a period of two centuries of its colonial rule. On the basis of the form of colonial exploitation, economic historians have divided the whole period into three phases: namely the period of merchant capital, the period of industrial capital, the period of finance capital.

Period of Merchant Capital

- The period of merchant capital was from 1757 to 1813.

- The only aim of the East India Company was to earn profit by establishing monopoly trade in the goods with India and the East India's.
- During this period, India had been considered as the best hunting ground for capital by the East Indian company to develop industrial capitalism in Britain.
- When Bengal and South India came under political shake of the East India Company in 1750s and 1760s, the objective of monopoly trade was fulfilled.
- The company administration succeeded in generating huge surpluses which were repatriated to England, and the Indian leaders linked this problem of land revenue with that of the drain.
- Above all, the officers of the company were unscrupulous and corrupt.

Period of Industrial Capital

- The period of Industrial capital was from 1813 to 1858.
- During this period, India had become a market for British textiles.
- India's raw materials were exported to England at low price and imported finished textile commodities to India at high price. In this way, Indians were exploited.
- India's traditional handicrafts were thrown out of gear.

Period of Finance Capital

- The third phase was the period of finance capital starting from the closing years of the 19th century and continuing till independence. During this period, finance imperialism began to entrench itself through the managing agency firms, export - import firms, exchange banks and some export of capital.
- Britain decided to make massive investments in various fields (rail, road, postal system irrigation, European banking system, and a limited field of education etc.) in India by plundering Indian capital.
- Railway construction policy of the British led to unimaginable as well as uneconomic. The poor Indian taxpayers had been compelled to finance for the construction of

railways. The political power was handed over to the British Government by the East India Company in 1858.

Decline of Indian Handicrafts

- The Indian handicrafts products had a worldwide market. Indian exports consisted chiefly of hand weaved cotton and silk fabrics, calicoes, artistic wares, wood carving etc.
- Through discriminatory tariff policy, the British Government purposefully destroyed the handicrafts.
- With the disappearance of nawabs and kings, there was no one to protect Indian handicrafts.
- Indian handicraft products could not compete with machine-made products.
- The introduction of railways in India increased the domestic market for the British goods.

The Land Tenure Systems in India

- Land Tenure refers to the system of land ownership and management. The features that distinguish a land tenure system from the others relate to the following:
 - Who owns the land;
 - Who cultivates the land;
 - Who is responsible for paying the land revenue to the government.
- Based on these questions, three different types of land tenure existed in India before Independence. They were Zamindari system, Mahalwari system and Ryotwari system.

Zamindari System or the Land lord-Tenant System

- This system was created by the British East India Company, when in 1793, Lord Cornwallis introduced 'Permanent Settlement Act'. Under this system the landlords or the Zamindari were declared as the owners of the land and they were responsible to pay the land revenue to the government. The share of the government in total rent collected was fixed at 10/11th, the balance going to the Zamindars as remuneration.

Mahalwari System or Communal System of Farming

- After introduction of this system, it was later extended to Madhya Pradesh and Punjab. The ownership of the land was maintained by the collective body usually the villagers which served as a unit of management. They distributed land among the peasants and collected revenue from them and pay it to the state.

Ryotwari System or the Owner-Cultivator System

- This system was initially introduced in Tamil Nadu and later extended to Maharashtra, Gujarat, Assam, Coorg, East Punjab and Madhya Pradesh. Under this system the ownership rights of use and control of land were held by the tiller himself. There was the direct relationship between owners. This system was the least oppressive system before Independence.

Process of Industrial Transition and Colonial Capitalism

- This process of industrial transition in India during the British period can be broadly classified into two as given below:

Industrial growth during the 19th century

- During the 19th century, British investors started to pioneer industrial enterprises in India as they had experiences of running industries at home. British enterprises also received maximum state support. Although the Britishers initiated industrialisation process in the 19th century, they were primarily interested in making profit and not in accelerating the economic growth in India. At the end of 19th century, there were about 36 jute mills, 194 cotton mills and a good number of plantation industries. The production of coal had risen to over 6 million tonnes per annum.

Industrial progress during the 20th century

- During the first part of 20th century, Swadeshi movement stimulated the industrialisation process in India. The existing industries and new industries had maintained a slow but steady growth till the outbreak of the First World War in 1914. By this time more than 70 cotton mills and 30 jute mills were set up. Coal production was doubled. The foundation of iron and steel industry was laid. Railway network was extended.
- During the period 1924-39, various major industries like iron and steel, cotton textiles, jute, matches, sugar, paper and pulp industry etc. were brought under protection scheme. This led to rapid expansion of protected industries in India. These protected industries captured the entire Indian market and eliminated foreign competition totally.

- Thus in the early part, British rule tried to transform the Indian economy as the producer of industrial raw materials and tried to capture Indian market for their industrial finished goods and thus started exploiting Indian economy in a different way. Later on, British capitalists gradually developed various industries like, jute, tea, coffee, cotton and textiles, paper and paper pulp, sugar etc, in India for locational advantages and exploited Indian labourers extensively.

Problems of British Rule

1. The British rule stunted the growth of Indian enterprise.
2. The economic policies of British checked and retarded capital formation in India.
3. The drain of wealth financed capital development in Britain.
4. Indian agricultural sector became stagnant and deteriorated even when a large section of Indian population was dependent on agriculture for subsistence.
5. The British rule in India led the collapse of handicraft industries without making any significant contribution to development of any modern industrial base.
6. Some efforts by the colonial British regime in developing the plantations, mines, jute mills, banking and shipping, mainly promoted a system of capitalist forms that were managed by foreigners. These profit motives led to further drain of resources from India.

Important Industrial Policies Prior to 1991

- India is the Asia's third largest economy. The 70 years of Independence have brought a remarkable change in the socio - economic landscape of India.

Industrial Policy of India 1948, 1956, 1977, 1980, 1990 & 1991

- Economic development of a country particularly depends on the process of industrialisation. At the time of Independence, India inherited a weak and shallow industrial base. Therefore during the post-Independence period, the Government of India took special emphasis on the development of a solid industrial base. The Industrial Policy Resolutions of 1948 and 1956 clearly stated the need for developing both small scale industries and large scale industries.

Industrial Policy Resolutions 1948

- The Government of India recognized the significant contribution of industrialization. Therefore the Government of India declared its first Industrial Policy on 6th April 1948. The main importance of this policy was that it ushered in India the system of mixed economy.

Industrial Policies

Industrial Policy 1948 –

Center's Monopoly: Government of India's Monopoly shall include Railways. Arms and ammunition, Atomic Energy, Postal Department.

State's Monopoly: State Monopoly shall include natural resources like coal, steel, manufacture of aircraft, cement, rubber automobile, wireless apparatus (Radio Receiving Sets) and mineral oil.

Unregulated Private Enterprises: It was kept open to private enterprises of individuals and co-operative societies to also involve.

1. Industries were classified into four groups such as public sector (strategic industries), public-cum-private Sector (key industries), and controlled private sector, private and co-operative sectors.
2. This policy endeavoured to protect cottage and small scale industries.
3. The central and state governments had a virtual monopoly in rail roads and exclusive rights to develop minerals, iron ore etc.
4. The Government encouraged the significance of foreign capital for industrialization but the government decided that the control should remain with Indian hands.

Industrial Policy Resolution 1956

1. The Industrial Policy of 1956 sought to give a dominant role to public sector. At the same time, it assured a fair treatment to the private sector.
2. The Government would support and encourage cottage and small scale enterprises by restricting volume of production in the large scale sector by differential taxation or by direct subsidies.
3. This industrial policy emphasized the necessity of reducing the regional disparities in levels of development.
4. The Government recognized the need for foreign capital for progressive Indenisation of foreign concerns.

Industrial Resolution Policy – 1956

Shaped by the Mahalanobis Model of growth which suggested that emphasis on heavy industries would lead the economic towards a long term higher growth path. The Industrial Policy Resolution – 1956 classified industries into three categories;

17 Industries:

Exclusively under the domain of the Government. These included inter alia, railway, air transport, arms and ammunition, iron and steel and atomic energy.

12 Industries:

Which were envisaged to be progressively State owned by Private Sector was expected to

supplement the efforts of the State. The third category contained all the remaining industries and it was expected that private sector would initiate development of these industries but they would remain open for the state as well.

Green Revolution

- The term Green Revolution refers to the technological breakthrough in of agricultural practices. During 1960s the traditional agricultural practices were gradually replaced by modern technology and agricultural practices in India. Initially the new technology was tried in 1960-61 as a pilot project in seven districts. It was called as the High Yielding Varieties Programme (HYVP).

Achievement of Green Revolution

1. The major achievement of the new strategy was to boost the production of major cereals viz., wheat and rice. India was depending on the US for the food grain. The US by using Public Law 480 (PL480) exported wheat to India. Indians were waiting for the ships to sip their food. On the other hand, India lost lots of minerals. The US could strategically exploit Indian mineral resources at cheapest price for manufacturing missiles and weapons, which gave job opportunity for larger US youth and largely contributed to US GDP. But now India is food surplus, exporting food grains to the European countries.
2. The Green revolution was confined only to High Yielding Varieties (HYV) cereals, mainly rice, wheat, maize and jowar.
3. This Strategy was mainly directed to increase the production of commercial crops or cash crops such as sugarcane, cotton, jute, oilseeds and potatoes.
4. Per hectare productivity of all crops had increased due to better seeds.
5. Green Revolution had positive effect on development of industries, which manufactured agricultural tools like tractors, engines, threshers and pumping sets.
6. Green Revolution had brought prosperity to rural people. Increased production had generated employment opportunities for rural masses. Due to this, their standard of living had increased.
7. Due to multiple cropping and more use of chemical fertilizers, the demand for labour increased.
8. Financial resources were provided by banks and co-operative societies. These banks provided loans to farmer on easy terms.

The New Agricultural strategy was also called by various names. Modern agricultural technology, seed - fertilizer - water technology, or simply green revolution.

Weaknesses of Green Revolution

1. Indian Agriculture was still a gamble of the monsoons.
2. This strategy needed heavy investment in seeds, fertilizers, pesticides and water.
3. The income gap between large, marginal and small farmers had increased. Gap between irrigated and rain fed areas had widened.
4. Except in Punjab, and to some extent in Haryana, farm mechanization had created widespread unemployment among agricultural labourers in the rural areas.
5. Larger chemical use and inorganic materials reduced the soil fertility and spoiled human health. Now organic farming is encouraged.

Rainbow Revolution	
1. Green revolution - Agriculture (Food grains productions)	7. White Revolution - Milk
2. Blue Revolution - Fish	8. Yellow Revolution - Oilseeds
3. Golden Revolution - Fruits / Apple	9. Black Revolution - Petroleum
4. Silver Revolution - Egg	10. Round Revolution - Potato
5. Red Revolution- Meat/ Tomato	11. Grey Revolution - Fertilizers
6. Pink Revolution - Shrimp	12. Brown Revolution - Leather

Second Green Revolution

- The Government of India had implemented 'Second Green revolution' to achieve higher agricultural growth. The target of Second Green Revolution was to increase 400 million tons of food grain production as against about 214 million tons in 2006-07. This is to be achieved by 2020. In agricultural sector, the growth rate of 5% to 6% has to be maintained over next 15 years. There may be changes in these statistics.

Requirements of Second Green revolution:

- Introduction of Genetically Modified (GM) seeds which double the per acreage production.
- Contribution of private sector to market the usage of GM foods.
- Government can play a key role in expediting irrigation schemes and managing water resources.
- Linking of rivers to transfer surplus water to deficient areas.

Large Scale Industries

- The term “Large scale industries” refers to those industries which require huge infrastructure, man-power and a have influx of capital assets. The term ‘large scale industries’ is a generic one including various types of industries in its purview. All the heavy industries of India like the iron and steel industry textile industry automobile manufacturing industry fall under the large scale industrial arena. However in recent years due to the IT boom and the huge amount of revenue generated by it the IT industry can also be included within the jurisdiction of the large scale industrial sector. Indian economy is heavily dependent on these large industries for its economic growth, generation of foreign currency and for providing job opportunities to millions of Indians. The following are the major large scale industries in India.

Iron and steel industry

- First steel industry at Kulti, Near Jharia, West Bengal - Bengal iron works company in 1870.
- First large scale steel plant TISCO at Jamshedpur in 1907 followed by IISCO at Burnpur in 1919. Both belonged to private sector.
- The first public sector unit was “Vishveshvaraya Iron and Steel works” at Bhadrawati.
- All these are managed by SAIL (at present all important steel plants except TISCO, are under public sector)
- Steel Authority of India Ltd (SAIL) was established in 1974 and was made responsible for the development of the steel industry.
- Presently India is the eighth largest steel producing country in the world.

Public sector steel plants

Location	Assistance
Rourkela (Odissa)	Germany
Bhilai (MP)	Russia
Durgapur (WB)	UK
Bokaro (Jharkhand)	Russia
Burnpur (WB)	Acquired from private sector in 1976
Vishakhapatnam (AP)	Russia
Salem (Tamil Nadu)	Government of India (No external assistance)
Vijai Nagar Karnataka)	Government of India
Bhadrawati (Karnataka)	Nationalisation of Vishveshvarayya Iron and Steel Ltd (owned by Centre and State government)

Jute industry

- Jute industry is an important industry for a country like India, because not only it earns foreign exchange but also provides substantial employment opportunities in agriculture and industrial sectors.
- Its first modernised industrial unit was established at Reshra in West Bengal in 1855.
- The jute industry in the country is traditionally export oriented. India ranks number one in the raw jute and jute goods production and number two in export of jute goods in the world.

Cotton and textile industry

- Oldest industry of India, and employs largest number of workers.
- It is the largest organised and broad-based industry which accounts for 4% of GDP, 20% of manufacturing value-added and one third of total export earnings.
- The first Indian modernised cotton cloth mill was established in 1818 at Fort Gloaster near Calcutta. But this mill was not successful. The second mill named “Mumbai’s Spinning and Weaving Co.” was established in 1854 at Bombay by KGN Daber.

Sugar industry

- Sugar industry is the second largest industry among agriculture-based industries in India.
- India is now the largest producer and consumer of sugar in the world. Maharashtra contributes over one third of the Indian total sugar output, followed closely by Uttar Pradesh.

Fertiliser industry

- India is the third largest producer of nitrogenous fertilisers in the world.

Paper industry

- The first mechanised paper mill was set up in 1812 at Serampur in West Bengal.
- The paper industry in India is ranked among the 15 top global paper industries.

Silk industry

- India is the second-largest (first being China) country in the world in producing natural silk. At present, India produces about 16% silk of the world.

- India enjoys the distinction of being the only country producing all the five known commercial varieties of silk viz Mulberry, Tropical Tussar, Oak Tussar, Eri and Muga.

Petroleum and natural gas

- First successful Oil well was dug in India in 1889 at Digboi, Assam.
- At present a number of regions with oil reserves have been identified and oil is being extracted in these regions
- For exploration purpose, Oil and Natural Gas Commission (ONGC) was established in 1956 at Dehradun, Uttarakhand

Small Scale Industries

- Small scale industries play an important role for the development of Indian economy in many ways. About 60 to 70 percent of the total innovations in India comes from the SSIs. Many of the big businesses today were all started small and then nurtured into big businesses. The role of SSIs in economic development of the country is briefly explained in forthcoming paragraphs.

Role of SSIs in Economic Development

Provide Employment

- SSIs use labour intensive techniques. Hence, they provide employment opportunities to a large number of people. Thus, they reduce the unemployment problem to a great extent.
- SSIs provide employment to artisans, technically qualified persons and professionals, people engaged in traditional arts, people in villages and unorganized sectors.
- The employment-capital ratio is high for the SSIs.

Bring Balanced Regional Development

- SSIs promote decentralized development of industries as most of the SSIs are set up in backward and rural areas.
- They remove regional disparities by industrializing rural and backward areas and bring balanced regional development.

- They help to reduce the problems of congestion, slums, sanitation and pollution in cities. They are mostly found in outside city limits.
- They help in improving the standard of living of people residing in suburban and rural areas in India.
- The entrepreneurial talent is tapped in different regions and the income is also distributed instead of being concentrated in the hands of a few individuals or business families.

Help in Mobilization of Local Resources

- SSIs help to mobilize and utilize local resources like small savings, entrepreneurial talent etc., of the entrepreneurs, which might otherwise remain idle and unutilized.
- They pave way for promoting traditional family skills and handicrafts. There is a great demand for handicraft goods in developed countries.
- They help to improve the growth of local entrepreneurs and self-employed professionals in small towns and villages in India.

Pave for Optimisation of Capital

- SSIs require less capital per unit of output. They provide quick return on investment due to shorter gestation period. The payback period is quite short in SSIs.
- SSIs function as a stabilizing force by providing high output-capital ratio as well as high employment-capital ratio.
- They encourage the people living in rural areas and small towns to mobilize savings and channelize them into industrial activities.

Promote Exports

- SSIs do not require sophisticated machinery. Hence, import the machines from abroad is not necessary. On the other hand, there is a great demand for goods produced by SSIs. Thus they reduce the pressure on the country's balance of payments. However, with recent past large scale industries are able to borrow large funds with low interest rate and spend large sums on advertisements. Hence SSSs are gradually vanishing.
- SSIs earn valuable foreign exchange through exports from India.

Complement Large Scale Industries

- SSIs play a complementary role to large scale sector and support the large scale industries.

- SSIs provide parts, components, accessories to large scale industries and meet the requirements of large scale industries through setting up units near the large scale units.
- SSIs serve as ancillaries to large scale units.

Meet Consumer Demands

- SIs produce wide range of products required by consumers in India.
- Hence, they serves as an anti-inflationary force by providing goods of daily use.

Develop Entrepreneurship

- SSIs help to develop a class of entrepreneurs in the society. Tey help the job seekers to become job givers.
- They promote self-employment and spirit of self-reliance in the society.
- SSIs help to increase the per capita income of India in various ways.
- They facilitate development of backward areas and weaker sections of the society
- SSIs are adept in distributing national income in more efficient and equitable manner among the various participants of the society.

Micro, Small and Medium Enterprises (MSMEs)

- As on now, the following monetary limits have been used for defining different kinds of industrial service units. However, these limits are subject to changes over time.

Manufacturing Enterprises

- Micro Manufacturing Enterprises:**The investment in plant and machinery does not exceed Rs.25 lakhs.
- Small Manufacturing Enterprises:**The investment in plant and machinery is more than twenty five lakh rupees but does not exceed Rs.5crores.
- Medium Manufacturing Enterprises:**The investment in plant and machinery is more than Rs.5crores but not exceeding Rs.10crores.

Service Enterprises

- Micro Service Enterprises:** Theinvestment in equipment does not exceed Rs. 10 lakh
- Small Service Industries:**Theinvestment in equipment is more than Rs.10 lakhs but does not exceed Rs. 2 crores.

- c. **Medium Service Enterprises:** The investment in equipment is more than Rs.2crores but does not exceed Rs.5crores.

Public Sector and Private sector banks

Public Sector Banks

- Public sector bank is a bank in which the government holds a major portion of the shares. Say for example, SBI is public sector bank; the government holding in this bank is 58.60%. Similarly PNB is a public sector bank; the government holds a stake of 58.87%. Usually, in public sector banks, government holdings are more than 50 percent. Public sector banks are classified into two categories: 1. Nationalised Banks 2. State Bank and its Associates.
- In case of nationalized banks, the government controls and regulates the functioning of the banking entity. Some examples are SBI, PNB, BOB, OBC, Allahabad Bank etc. However, the government keeps reducing the stake in PSU banks as and when they sell shares. So, to that extent they can also become minority shareholders in these banks. This is in accordance with the privatization policy.

Private Sector Banks

- In these banks, most of the equity is owned by private bodies, corporations, institutions or individuals rather than government. These banks are managed and controlled by private promoters. Of the total banking industry in India, public sector banks constitute 72.9% share while the rest is covered by private players. In terms of the number of banks, there are 27 public sector banks and 22 private sector banks. As part of its differentiated banking regime, RBI, the apex banking body, has given license to Payments Bank and Small Finance Banks (SFBs). This is an attempt to boost the government's Financial Inclusion drive. (But, there may be other problems).
- As a result, Airtel Payments Bank and Paytm Payments Bank Limited have come up. How far these banks would help the poor people is not known.

Nationalisation of Banks

- After Independence, the Government of India adopted planned economic development. For this purpose, Five Year Plans came into existence since 1951. The main objective of the economic planning aimed at social welfare. Before Independence commercial banks were in the private sector. These commercial banks failed in helping the Government to achieve social objectives of planning. Therefore, the government decided to nationalize 14 major commercial banks on 19 July 1969. In 1980, again the government took over another 6 commercial banks.

Nationalization

<p>1969 14 banks with deposits above Rs.50crores were nationalized. 19 July 1969</p> <ol style="list-style-type: none"> 1. Allahabad Bank 2. Bank of Baroda 3. Bank of Maharashtra 4. Canara Bank 5. Central Bank of India 6. Dena Bank 7. Indian Bank 8. Indian Overseas Bank 9. Punjab National Bank 10. Syndicate Bank 11. Union Bank 12. United Bank of India 13. UCO Bank 14. Bank of India 	<p>1980 6 banks with deposits above Rs. 200 crores were Nationalized</p> <p>15 April 1980</p> <ol style="list-style-type: none"> 1. Andhra Bank 2. Corporation Bank 3. New Bank of India 4. Oriental Bank of Commerce 5. Punjab & Sindh Bank 6. Vijaya Bank
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Objectives of Nationalization

- The Government of India nationalized the commercial banks to achieve the following objectives.
 1. The main objective of nationalization was to attain social welfare. Sectors such as agriculture, small and village industries were in need of funds for their expansion and further economic development.
 2. Nationalisation of banks helped to curb private monopolies in order to ensure a smooth supply of credit to socially desirable sections.
 3. In India, nearly 70% of population lived in rural areas. Therefore it was needed to encourage the banking habit among the rural population.
 4. Nationalisation of banks was required to reduce the regional imbalances where the banking facilities were not available.
 5. Before Independence, the numbers of banks were certainly inadequate. After nationalization, new bank branches were opened in both rural and urban areas.
 6. Banks created credit facilities mainly to the agriculture sector and its allied activities after nationalization.
- After New Economic Policy 1991, the Indian banking industry has been facing the new horizons of competitions, efficiency and productivity. With all these developments people in villages and slums depend largely on local money lenders for their credit need. This is unfortunate.

Performance of India's Five Year Plans

- Economic planning is the process in which the limited natural resources are used skillfully so as to achieve the desired goals. The concept of economic planning in India or five year plan is derived from Russia (then USSR). India has launched 12 five year plans so far. Twelfth five year plan will be the last one. The government of India has decided to stop the launching of five year plans and it was replaced by NITI Aayog.

First Five Year Plan (1951-1956)

- It was based on the Harrod-Domar Model.
- Its main focus was on the agricultural development of the country.
- This plan was successful and achieved the GDP growth rate of 3.6% (more than its target)

Second Five Year Plan (1956-1961)

- It was based on the P.C. Mahalanobis Model.
- Its main focus was on the industrial development of the country.
- This plan was successful and achieved the growth rate of 4.1%

Third Five Year Plan (1961-1966)

- This plan was called 'Gadgil Yojana' also.
- The main target of this plan was to make the economy independent and to reach self-propelled position or take off.
- Due to Indo-China war, this plan could not achieve its growth target of 5.6%

Plan Holiday (1966-1969)

- The main reason behind the plan holiday was the Indo-Pakistan war & failure of third plan.
- During this plan, annual plans were made and equal priority was given to agriculture, its allied sectors and the industry sector.

Fourth Five Year Plan (1969-1974)

- There are two main objectives of this plan i.e. growth with stability and progressive achievement of self reliance.
- This plan failed and could achieve growth rate of 3.3% only, against the target of 5.7%.

Fifth Five Year Plan (1974-1979)

- In this plan top priority was given to agriculture, next came industry and mines.
- Overall this plan was successful, which achieved the growth rate of 4.8% against the target of 4.4%.
- The draft of this plan was prepared and launched by D.P. Dhar. This plan was terminated in 1978.

Rolling Plan

- This plan was started with an annual plan for 1978-79 and as a continuation of the terminated fifth year plan.

Sixth Five Year Plan (1980-1985)

- The basic objective of this plan was poverty eradication and technological self-reliance. Garibi-Hatao was the motto.
- It was based on investment yojana.
- Its growth target was 5.2% but it achieved 5.7%.

Seventh Five Year Plan (1985-1990)

- Objectives of this plan included the establishment of the self-sufficient economy and opportunities for productive employment.
- For the first time, due to the pressure from private sector the private sector got the priority over public sector.
- Its growth target was 5.0% but it achieved 6.0%.

Annual Plans

- Eighth five year Plan could not take place due to volatile political situation at the centre. So two annual programmes are formed in 1990-91 & 1991-92.

Eighth Five Year Plan (1992-1997)

- In this plan the top priority was given to development of the human resources i.e. employment, education and public health.
- During this plan, New Economic Policy of India was introduced.
- This plan was successful and got annual growth rate of 6.8% against the target of 5.6%.

Ninth Five Year Plan (1997-2002)

- The main focus of this plan was “growth with justice and equity”.
- This plan failed to achieve the growth target of 7% and Indian economy grew only at the rate of 5.6%.

Tenth Five Year Plan (2002-2007)

- This plan aimed to double the per capita income of India in the next 10 years.
- It aimed to reduce the poverty ratio to 15% by 2012.
- Its growth target was 8.0% but it achieved only 7.2%.

Eleventh Five Year Plan (2007-2012)

- Its main theme was “faster and more inclusive growth”.
- Its growth rate target was 8.1% but it achieved only 7.9%

Twelfth Five Year Plan (2012-2017)

- Its main theme is “Faster, More Inclusive and Sustainable Growth”.
- Its growth rate target is 8%.
- Here it can be concluded that since the Indian Independence the five year plans of India played a very prominent role in the economic development of the country. These plans had guided the Government as to how it should utilise scarce resources so that maximum benefits can be gained. It is worthy to mention here that Indian Government adopted the concept of five year plans from Russia.

NITI Aayog

The Planning Commission has been replaced by the NITI Aayog on 1st January, 2015. NITI (National Institution for Transforming India) Aayog will monitor, coordinate and ensure implementation of the accepted sustainable development goals. NITI Aayog serves as a knowledge hub and monitors progress in the implementation of policies and programmes of the Government of India. It includes the matters of national and international importance on the economic front, dissemination of best practices from within the country and from other nations, the infusion of new policy ideas and specific issue-based support. In order to understand the achievements of the NITI Aayog, researches need to be done then and there.

Development Indicators

Human Development Index (HDI)

- United Nations Development Programme has been publishing Human Development Report annually since 1990. HDI helped the government to the real uplifting of standard of living of the people.

Human Development Index (HDI)

HDI was developed by the Pakistani Economist MahbubulHaq and the Indian Economist Amartya Kumar Sen in 1990 and was published by the United Nations Development Programme (UNDP). It is constructed based on Life Expectancy Index, Education Index and GDP Per Capita.

HDI is based on the following three indicators

1. Longevity is measured by life expectancy at birth,
 2. Educational attainments,
 3. Standard of living, measured by real GDP per capita (PPP\$).
- Before calculating HDI, the fixed minimum and maximum values of each indicator are chosen.
 - The performance in each dimension is expressed as a value between 0 and 1 by applying the following formula

$$\text{Dimension Index} = \frac{\text{Actual value} - \text{Minimum value}}{\text{Maximum value} - \text{Minimum value}}$$
 According to Planning Commission's National Human Development Report 2011, HDI has improved significantly between 1980 and 2011. That is, The HDI went up from 0.302 in 1981 to 0.472 score in 2011.
 - As per latest Human Development Report (2016) by the United Nations Development Programme (UNDP), India has been ranked 131st out of 188 countries. Out of 188 countries, India lies in Medium HumanDevelopment bracket. The other nations such as Bangladesh, Bhutan, Pakistan, Kenya, Myanmar and Nepal attained the medium human development. The HDR 2016 stated that regional disparities in education, health and living standards within India has caused India's downfall to 27 % on HDI score. India's HDI rank value in 2015 stood at 0.624, which had increased from 0.580 in 2010. India's rank in 2014 was 131.

Top three countries of HDI

Norway (0.949) Australia (0.939) Switzerland (0.939)

Human Development Index (HDI)		
Dimensions	Indicator	Dimensions Index
Long and Healthy Life	Life Expectancy at Brith	Life Expectancy Index
Knowledge	Adult Literacy rate	Education Index
Decent Standard of Living	Cross enthrallment ratio	GDP Index
	GDP Per capita (PPP US\$)	

- Biswajeet Guha has stated that the calculation of HDI neglected many important aspects of human development. He has created four indices of HDI as HDI₁, HDI₂, HDI₃, and HDI₄. HDI₁ is based on UNDP methodology as given in Human Development Report. He has enlarged the scope of HDI by adding three more dimensions such as quality of life, poverty eradication, and urbanization. Various countries including India are continuously making efforts to improve and enlarge the scope of available statistical information.

Physical Quality of Life Index (PQLI)

- Morris D Morris developed the Physical Quality of Life Index (PQLI). The PQLI is a measure to calculate the quality of life (well-being of a country). For this, he included three indicators such as life expectancy, infant mortality rate and literacy rate. A scale of each indicator ranges from the number 1 to 100. Number 1 represents the worst performance by any country. 100 is the best performance. For example, in case of life expectancy, the upper limit of 100. This was assigned to 77 years which was achieved by Sweden in 1973. The lower limit of 1 was assigned to 28 years which was achieved by Guinea-Bissau in 1960. The main difference between the two is the inclusion of income in HDI and exclusion of income from PQLI. HDI represents both physical and financial attributes of development and PQLI has only the physical aspects of life.

Conclusion

- To conclude, the British were more focused on the money from Indians than good governance. Some positive things happened during British Rule. They eradicated systems like 'sati', introduced railway services, English language and education, infrastructure and basic principle of capitalist economy. After Independence, the Government of India formulated many policies with the help of Five year plans to achieve the growth target in various sectors. Among the other things, the major challenges that still continue are: poor health standard, female foeticide, declining child sex ratio, open defecation, social & economic inequalities, increasing slumming, urban congestion and declining qualities of basic environmental resources namely air, land and water.

9. Development Experiences in India

Introduction

- At the time of Independence in 1947, India was a typically backward economy. Owing to poor technological and scientific capabilities, industrialization was limited and lopsided. Agricultural sector exhibited features of feudal and semi-feudal institutions, resulting into low productivity. Means of transport and communications were underdeveloped. Educational and health facilities were grossly inadequate and social security measures were virtually non-existent. In brief, the country suffered from the twin problems of rampant poverty and widespread unemployment, both resulting in low standard of living.
- The year 1991 is an important landmark in the economic history of post-independent India. The country went through a severe economic crisis in the form of serious Balance of Payments problem. Indian economy responded to the crisis by introducing a set of policies known as Structural Reforms. These policies were aimed at correcting the weaknesses and rigidities in the various sectors of the economy such as Industry, Trade, Fiscal and Agriculture.

Meaning of Liberalization, Privatization and Globalization (LPG)

- The triple pillars of New Economic Policy are Liberalization, Privatization and Globalization (LPG)

Impacts of Liberalisation	
Positive Effects	Negative Effects
Increase In Foreign investment	Increase in Unemployment
Increase In production	Decrease in Tax Receipt
Technological advancement	
Increase in GDP growth rate	

Liberalization:

- Liberalization refers to removal or relaxation of governmental restrictions in all stages in industry. Deregulation, decontrol, deregulation, subsidies (incentives) and greater role for financial institutions are the various facets of liberalization.

Privatization:

- Privatization means transfer of ownership and management of enterprises from public sector to private sector. Denationalization, disinvestment and opening exclusive public sector enterprises to private sector are the gateways to privatization.

Globalization:

Impacts of Globalisation	
Positive Effects	Negative Effects
Expansion of market	But thought Completion
Development of infrastructure	Rise in Monopoly
Higher living Standards	Discourage Domestic Forms
International Co-operations	Increase in inequality

- Globalization refers to the integration of the domestic (Indian) economy with the rest of the world. Import liberalization through reduction of tariff and non-tariff barriers, opening the doors to Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI) are some of the measures towards globalization.

Arguments in favour of LPG

1. Liberalization was necessitated because various licensing policies were said to be deterring the growth of the economy.
2. Privatization was necessitated because of the belief that the private sector was not given enough opportunities to earn more money.
3. Globalization was necessitated because today a developed country can grow without the help of the under developed countries. Natural and human resources of the developing countries are exploited by the developed countries and the developing economies are used as market for the finished goods of the developed countries. The surplus capital of the developed countries are invested in backward economies. Obsolete and out dated technologies of the developed countries can be easily sold to poor under developed countries. Ultimately, the rich countries can grow further at the cost of developing economies.

Arguments against LPG

- a. Liberalization measures, when effectively enforced, favour an unrestricted entry of foreign companies in the domestic economy. Such an entry prevents the growth of the local manufacturers.
- b. Privatization measures favour the continuance of the monopoly power. Only the powerful people can sustain in business markets. Social justice cannot be easily established and maintained. As a result, the disparities tend to widen among people and among regions.
- c. As globalization measures tend to integrate all economies of the world and bringing them all under one umbrella; they pave the way for redistribution of economic power at the world level. Only the already well-developed countries are favoured in this process

and the welfare of the less-developed countries will be neglected. The economic crises of the developed countries are easily spread to the developing economies through trade.

The following are the major changes after 1991:

1. Foreign exchange reserves started rising.
 2. There was a rapid industrialization.
 3. The pattern of consumption started improving (or deteriorating).
 4. Infrastructure facilities such as express highways, metro rails, flyovers and airports started expanding (but the local people were thrown away).
- The benefits of this growth in some sectors have not reached the marginalized sections of the community. Moreover, the process of development has generated serious social, economic, political, demographic and ecological issues and challenges. Development brings benefits, but which section gets this benefit depends on socioeconomic structure of the society.
 - Despite all these initiatives in the Indian economy, a large section of the people of India continue to face basic economic problems such as poverty, unemployment, discrimination, social exclusion, deprivation, poor healthcare, rising inflation, agricultural stagnation, food insecurity and labour migration. However, for these problems, Government policies alone cannot be blamed. As new institutional economists suggest, the values, beliefs, norms etc. of the individuals also matter.

Disinvestment

Disinvestment means selling of government securities of Public Sector Undertakings (PSUs) to other PSUs or private sectors or banks. This process has not been fully implemented.

Relative Position of on Indian Economy

- (This discussion is suitable for a particular period only, there may be changes afterwards)



- According to International Monetary Fund, World Economic Outlook (October-2016), GDP (nominal) of India in 2016 at current prices was 42,251 billion. India contributed 2.99% of total world's GDP in exchange rate basis. India shared 17.5 percent of the total world population and 2.4 percent of the world surface area. India was now 7th largest economy of the world in 2016.
- India was at 3rd position after China and Japan among Asian countries. India shared 8.50% of total Asia's GDP (nominal) in 2016.

Industrial Sector Reforms

- The Prime Minister of India announced the new industrial policy on July 24, 1991. The new policy radically liberalized the industrial policy itself and de-regulated the industrial sector substantially. The primary objectives of the industrial policy were to promote major industries from the clutches of bureaucrats, to abolish restrictions on foreign direct investment, to liberate the indigenous enterprise from the restrictions of MRTP Act, to maintain a sustained growth in productivity and employment and also to achieve international competitiveness.

Important Initiatives by the Government towards Industrial Policy

- The policy has brought changes in the following aspects of industrial regulation:
 - Industrial Delicensing
 - De reservation of the industrial sector
 - Public sector policy (dereservation and reform of PSEs)
 - Abolition of MRTP Act
 - Foreign investment policy and foreign technology policy.

Industrial De regulation	
Before 1991	After 1991
Industrial licensing for all commodities	Licensing restricted to alcohol, drugs etc.,
Private Sector not allowed in many industries	Only defence, energy, railway for public sector large scale privatization, disinvestment
Controls on price fixation and distribution	Market allowed to determine prices

- Industrial Delicensing policy:** the most important objective of the new industrial policy of 1991 was the end of the industrial licensing or the license raj or red tapism. Under the industrial licensing policies, private sector firms had to secure licenses to start an industry.
- De reservation of the industrial sector:** Previously, the public sector was given reservation especially in the capital goods and key industries. Under industrial deregulation, most of the industrial sectors were opened to the private sector as well. Under the new industrial policy, only three sectors viz., atomic energy, mining and railways will continue as reserved for public sector. All other sectors have been opened for private sector participation.
- Reforms related to the Public sector enterprises:** Reforms in the public sector were aimed at enhancing efficiency and competitiveness of the sector. The government

identified strategic and priority areas for the public sector to concentrate. Loss making PSUs were sold to the private sector.

4. **Abolition of MRTP Act:** The New Industrial Policy of 1991 has abolished the Monopoly and Restrictive Trade Practices Act 1969. In 2010, the Competition Commission has emerged as the watchdog in monitoring competitive practices in the economy. The policy caused big changes including emergence of a strong and competitive private sector and a sizable number of foreign companies in India.
5. **Foreign investment policy:** Another major feature of the economic reform was red carpet welcome to foreign investment and foreign technology. This measure has enhanced the industrial competition and improved business environment in the country. Foreign investment including FDI and FPI were allowed. In 1991, the government announced a specified list of high-technology and high-investment priority industries wherein automatic permission was granted for foreign direct investment (FDI) upto 51 % foreign equity. The limit was raised to 74 percent and subsequently to 100 percent for many of these industries. Moreover, many new industries have been added to the list over the years. Foreign Investment Promotion Board (FIPB) has been set up to negotiate with international firms and approve foreign direct investment in select areas.

Impact of LPG on Agricultural Sector Reforms

- Since the inception of economic reforms, Indian economy has achieved a remarkable rate of growth in industry and service sector. However, this growth process bypassed the agricultural sector, which showed sharp deceleration in the growth rate (3.62 % during 1984/85 - 1995/96 to 1.97 percent in 1995/96 - 2004/05). The sector has recorded wide variations in yield and productivity and there was a shift towards cash crop cultivation. Moreover, agricultural indebtedness pushed several farming households into poverty and some of them resorted to extreme measures like suicides.

Crop Insurance

- Agriculture in India is highly prone to risks like droughts and floods. It is necessary to protect the farmers from natural calamities and ensure their credit eligibility for the next season. For this purpose, the Government of India introduced many agricultural schemes throughout the country. The Pradhan Mantri Fasal Bima Yojana (Prime Minister's Crop Insurance Scheme) was launched on **18 February 2016**. It envisages a uniform premium of only 2 % to be paid by farmers for Kharif crops and 1.5 % for Rabi crops. The premium for (annual) commercial and horticultural crops will be 5 %

Cold Storage

- India is the largest producer of fruits and second largest producer of vegetables in the world. In spite of that per capita availability of fruits and vegetables is quite low because of post-harvest losses which account for about 25% to 30% of production. Besides, quality of a sizable quantity of produce also deteriorates by the time it reaches the

consumer. Most of the problems relating to the marketing of fruits and vegetables can be traced to their perishability. Perishability is responsible for high marketing costs, market gluts, price fluctuations and other similar problems. In order to overcome this constraint, the Government of India and the Ministry of Agriculture promulgated an order known as “Cold Storage Order, 1964” under Section 3 of the Essential Commodities Act, 1955. However, the cold storage facility is still very poor and highly inadequate.

Post Harvest measures

- The annual value of harvest and post-harvest losses of major agricultural produce at national level was of the order of Rs.92,651crores, calculated using production data of 2012-13 at 2014 and wholesale prices, estimated by the Indian Council of Agricultural Research (ICAR).

Food Items Waste (%)	
Crops	Cumulative wastages (%)
Cereals	5-6
Pulses	6 - 8
Oil seeds	3-10
Fruits &Vegetables	5-16
Milk	1
Fisheries (in land)	5
Fisheries (Marine)	10
Meat	3
Poultry	7

Source: Ministry of Food Processing Industries, GoI, 2016

Kisan Credit Card Scheme

A Kisan Credit Card (KCC) is a credit delivery mechanism that is aimed at enabling farmers to have quick and timely access to affordable credit. It was launched in 1998 by the Reserve Bank of India and NABARD. The scheme aims to reduce farmer dependence on the informal banking sector for credit - which can be very expensive and suck them into a debt spiral. The card is offered by cooperative banks, regional rural banks and public sector banks. Based on a review of the working of the KCC, the government has advised banks to convert the KCC into a smart card cum debit card.

- In order to reduce wastage of agricultural produce and minimize post-harvest losses, the Ministry of Food Processing Industries (MoFPI) has implemented various components of Central Sector Schemes, namely:
- Mega Food Parks; Integrated Cold Chain; Value Addition Preservation Infrastructure; Modernization of Slaughter houseScheme for Quality Assurance; Codex Standards; Research and Development and Other promotional activities.

- Further, the GoI extended support to arrest post harvest losses of horticulture and non-horticulture produce and to provide integrated cold chain and preservation infrastructure facilities from the farm gate to the consumer or from the production site to the market since 2008-09. However, the improvement is not visible for it is not substantial.

Agricultural Produce Market Committee

- Agricultural Produce Market Committee (APMC) is a statutory body constituted by state government in order to trade in agricultural or horticultural or livestock products.

Functions of APMC

1. To promote public private partnership in the ambit of agricultural markets.
2. To provide market led extension services to farmer.
3. To bring transparency in pricing system and transactions taking place in market in a transparent manner.
4. To ensure payments to the farmers for the sale of agricultural produce on the same day.
5. To promote agricultural activities.
6. To display data on arrivals and rates of agricultural produce from time to time into the market.

Agrarian Crisis after Reforms

- a. High input Costs: The biggest input for farmers is seeds. Before liberalisation, farmers across the country had access to seeds from state government institutions. The institutions produced own seeds and were responsible for their quality and price. With liberalization, India's seed market was opened up to global agribusinesses. Also, following the deregulation many state government institutions were closed down in 2003. These hit farmers doubly hard: seed prices shot up, and fake seeds made an appearance in a big way.
- b. Cutback in agricultural subsidies: Farmers were encouraged to shift from growing a mixture of traditional crops to export oriented 'cash crops' like chill, cotton and tobacco. Liberalisation policies reduced the subsidies on pesticide, fertilizer and elasticity. As a result prices have increased by 300%. However, the prices of agricultural goods have not increased to that extent.
- c. Reduction of import duties: With a view to open India's markets, the liberalization reforms also withdrew tariffs and duties on imports. By 2001, India completely removed

restrictions on imports of almost 1,500 items including food. As a result, cheap imports flooded the market, pushing prices of crops like cotton and pepper down.

- d. **Paucity of credit facilities:** After 1991 the lending pattern of commercial banks, including nationalised bank drastically changed. As a result, loan was not easily adequate. This has forced the farmers to rely on moneylenders who charge exorbitant rate of interest.

Trade Reforms:

- ❖ **Trade Policy Reforms:** The main features of the new trade policy as it has evolved over the years since 1991 are as follows:
- ❖ **Free imports and exports:** Prior to 1991, in India imports were regulated. From 1992, imports were regulated by a limited negative list. For instance, the trade policy of 1 April 1992 freed imports of almost all intermediate and capital goods. Only 71 items remained restricted. This would affect the domestic industries.
- ❖ **Rationalization of tariff structure and removal of quantitative restrictions:** The Chelliah Committees Report had suggested drastic reduction in import duties. It had suggested a peak rate of 50 percent. As a first step towards a gradual reduction in the tariffs, the 1991-92 budget had reduced the peak rate of import duty from more than 300 percent to 150 percent. The process of lowering the customs tariffs was carried further in successive budgets. This also affected the domestic industries.

Export and Import Policy

- The Government of India, Ministry of Commerce and Industry announced New Foreign Trade Policy on 01st April 2015 for the period of 2015-2020.

Salient Features of “EXIM POLICY (2015-2020)”

- The new EXIM policy has been formulated focusing on increasing in exports scenario, boosting production and supporting the concepts like Make in India and Digital India.
- Reduce export obligations by 25% and give boost to domestic manufacturing supporting the “Make in India” concept.
- As a step to Digital India concept, online procedure to upload digitally signed document by CA/CS/Cost Accountant are developed and further mobile app for filing tax, stamp duty has been developed.
- Repeated submission of physical copies of documents available on Exporter Importer Profile is not required.
- Export obligation period for export items related to defence, military store, aerospace and nuclear energy to be 24 months.

- EXIM Policy 2015-2020 is expected to double the share of India in World Trade from present level of 3% by the year 2020. This appears to be too ambitious.

Special Economic Zones

- With a view to overcome the shortcomings experienced on account of the multiplicity of controls and clearances, absence of world-class infrastructure, and an unstable fiscal regime and with a view to attract larger foreign investments in India, the Special Economic Zones (SEZs) Policy was announced in April 2000.
- As part of the economic reforms, the system of taking over land by the government for commercial and industrial purposes was introduced in the country. As per the Special Economic Zones Act of 2005, the government has so far notified about 400 such zones in the country. Since the SEZ deprives the farmers of their land and livelihood, it is harmful to agriculture. In order to promote export and industrial growth in line with globalisation the SEZ was introduced in many countries

History of SEZ in India

<p>First ever export processing zone (EPZ) in Asia was set up by government of India in Kandla in 1965.</p>	<p>Based on the success of Kandle EPZ in the beginning of eighties, seven more EPZs were set up in Bombay, Noida Surat, Madras, Falta, Visakapattinam</p>	<p>To invite larger foreign investments in India, these EPZs were converted into special Economic Zones (SEZs) in the year 2000 under a new policy announced by the Government of India.</p>
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- India was one of the first in Asia to recognize the effectiveness of the Export Processing Zone (EPZ) model in promoting exports, with Asia's first EPZ set up in Kandla in 1965. The broad range of SEZ covers free trade zones, export processing zones, industrial parks, economic and technology development zones, high-tech zones, science and innovation parks, free ports, enterprise zones, and others.

Major Objectives of SEZs

1. To enhance foreign investment, especially to attract foreign direct investment (FDI) and thereby increasing GDP.
2. To increase shares in Global Export (International Business).
3. To generate additional economic activity.
4. To create employment opportunities.
5. To develop infrastructure facilities.

6. To exchange technology in the global market.

Main Characteristics of SEZ

- a. Geographically demarked area with physical security
- b. Administrated by single body/ authority
- c. Streamlined procedures
- d. Having separate custom area
- e. Governed by more liberal economic laws.
- f. Greater freedom to the firms located in SEZs. As a result, they need not respect the Government's rules and regulations. The social and environmental impacts were disastrous.

Fiscal Reforms

- A key element in the stabilization effort was to restore fiscal discipline. It means reduction of fiscal deficit to the extent of just 3% of GDP, as suggested by Fund Bank Policies. In this way, the budget aimed at containing government expenditure and augmenting revenues; reversing the downtrend in the share of direct taxes to total tax revenues and curbing conspicuous consumption. Some of the important policy initiatives introduced for correcting the fiscal imbalance were: reduction in fertilizer subsidy, abolition of subsidy on sugar and disinvestment of a part of the government's equity holdings in select public sector undertakings. Gradually expenditures on welfare measures were reduced; taxes on corporate sectors were reduced; and taxes on poor people were increased.

Goods and Services Tax (GST)

- Goods and Services Tax (GST) is defined as the tax levied when a consumer buys a good or service. It is proposed to be a comprehensive indirect tax levied on manufacture, sale and consumption of goods as well as services. GST aims to replace all indirect taxes levied on goods and services by the Indian Central and State governments. GST would eliminate the cascading effect of taxes on the production and distribution of goods and services. It is also a "one-point tax" Unlike VAT which was a multipoint tax.
- The Goods and Service Tax Act was passed in the Parliament on 29th March 2017. The Act came into effect on 1st July 2017. Te motto is one nation, one market, one tax.

Current GST Rates in India

Advantages of GST

- Removing cascading tax effect
- Single point tax
- Higher threshold for registration
- Composition scheme for small business
- Online simpler procedure under GST
- Defined treatment for e-commerce
- Increased efficiency in logistics
- Regulating the unorganized sector

Monetary and Financial Sector Reforms

- Monetary reforms aimed at doing away with interest rate distortions and rationalizing the structure of lending rates. The new policy tried in many ways to make the banking system more efficient. Some of the measures undertaken were:
 - a. **Reserve Requirements:** Reduction in statutory liquidity ratio (SLR) and the cash reserve ratio (CRR) were recommended by the Narasimham Committee Report, 1991. It was proposed to cut down the SLR from 38.5 percent to 25 percent within a time span of three years. Similarly it was proposed that the CRR be brought down to 3 to 5% over a period of four years.
 - b. **Interest Rate Liberalisation:** Earlier, RBI controlled (i) the interest rates payable on deposits, (ii) the interest rates which could be charged for bank loans.
 - c. Greater competition among public sector, private sector and foreign banks and elimination of administrative constraints/
 - d. Liberalisation of bank branch licensing policy in order to rationalize the existing branch network.
 - e. Banks were given freedom to relocate branches and open specialized branches
 - f. Guidelines for opening new private sector banks.
 - g. New accounting norms regarding classification of assets and provisions of bad debt were introduced in tune with the Narasimham Committee Report.

Conclusion

- There is no doubt that the Indian economy recorded ample achievements in some sectors after new economic policy. If the size of an economy provides the first impression of a country's political and economic strength, then India has indeed grown since 1991. In dollar terms, India's GDP crossed the \$2-trillion mark in 2015-16. Currently, the country is ranked ninth in the world in terms of nominal GDP. Once India was rebuked for its

“Hindu rate of growth”, a term used by Rajkrishna to refer to low rate of economic growth. The GDP growth rate of India is very much appreciated. This growth is also due to changes in accounting system. That is why the increased GDP growth rate has failed to alleviate the miseries of the common people and to reduce the socio, economic and environmental imbalances. The basic problems of unemployment, poverty ill-health and inequalities remain unsolved.



12th Economy

Unit - 1

Introduction To Macro Economics

“Macroeconomics is very much about tying together facts and theories”.

- Dorn Busch, Fischer and Startz

Introduction

- The subject Economics is classified into two branches, namely, Micro Economics and Macro Economics. Ragnar Frisch, a Norwegian economist and the co-recipient of the first Nobel Prize in Economic Sciences coined the words ‘micro’ meaning small and ‘macro’ meaning large in the year 1933. However, macroeconomics in its modern form, began with John Maynard Keynes and his book “The General Theory of Employment, Interest and Money” published in 1936. Keynes offered an explanation for fallout from the Great Depression, when goods remained unsold and workers unemployed. Hence, Keynes is regarded as the ‘Father of Modern Macro Economics’.

Meaning of macro Economics

- The word ‘Macro’ is derived from the Greek word ‘Makros’ meaning ‘large’. Hence, Macro Economics is the study of the economy as a whole. In other words, macro economics deals with aggregates such as national income, employment and output. Macro Economics is also known as ‘Income Theory’.
- The subject matters covered in Macro Economics are the areas such as employment, national income, inflation, business cycle, poverty, inequality, disparity, investment and saving, capital formation, infrastructure development, international trade, balance of trade and balance of payments, exchange rate and economic growth.

Importance of Macro Economics

- The importance and the need for introducing a macro outlook of an economy are given below:
- There is a need to understand the functioning of the economy at the aggregate level to evolve suitable strategies and to solve the basic problems prevailing in an economy.
- Understanding the future problems, needs and challenges of an economy as a whole is important to evolve precautionary measures.

- Macro economics provides ample opportunities to use scientific investigation to understand the reality.
- Macro economics helps to make meaningful comparison and analysis of economic indicators
- Macro economics helps for better prediction about future and to formulate suitable policies to avoid economic crises.

Scope of Macro Economics

- The study of macro economics has wide scope and it covers the major areas as follows.
- **National Income:** Measurement of national income and its composition by sectors are the basic aspects of macroeconomic analysis. The trends in National Income and its composition provide a long term understanding of the growth process of an economy.
- **Inflation:** Inflation refers to steady increase in general price level. Estimating the general price level by constructing various price index numbers such as Wholesale Price Index, Consumer Price Index, etc, are needed.
- **Business Cycle:** Almost all economies face the problem of business fluctuations and business cycle. The cyclical movements (boom, recession, depression and recovery) in the economy need to be carefully studied based on aggregate economic variables.
- **Poverty and Unemployment:** The major problems of most resource - rich nations are poverty and unemployment. This is one of the economic paradoxes. A clear understanding about the magnitude of poverty and unemployment facilitates allocation of resources and initiating corrective measures.
- **Economic Growth:** The growth and development of an economy and the factors determining them could be understood only through macro analysis.
- **Economic Policies:** Macro Economics is significant for evolving suitable economic policies. Economic policies are necessary to solve the basic problems, to overcome the obstacles and to achieve growth.

Limitations

Macro economics suffers from certain limitations. They are:

1. There is a danger of excessive generalisation of the economy as a whole.
2. It assumes homogeneity among the individual units.

3. There is a fallacy of composition. What is good of an individual need not be good for nation and viceversa. And, what is good for a country is not good for another country and at another time.
4. Many non - economic factors determine economic activities; but they do not find place in the usual macroeconomic books.

Economy and its Types

- The term economy has been defined by A. J. Brown as, “A system by which people earn their living.” J. R. Hicks defined as, “An economy is a cooperation of producers and workers to make goods and services that satisfy the wants of the consumers.”
- In short, an economy is referred to any system or area where economic activities are carried out. Each economy has its own character. Accordingly, the functions or activities also vary. The functioning of an economy by its activities is explained in flow chart 1.
- In an economy, the fundamental economic activities are production and consumption. These two activities are supported by several other activities. The ultimate aim of these activities is to achieve growth. The ‘exchange activity’ supports the production and consumption activities. These activities are influenced by several economic and non-economic activities. The major economic activities include transportation, banking, advertising, planning, government policy and others. The major non-economic activities are environment, health, education, entertainment, governance, regulations etc. In addition to these supporting activities, external activities from other economies such as import, export, international relations, emigration, immigration, foreign investment, foreign exchange earnings, etc. also influence the entire functioning of the economy.

Economies can be classified into different types based on the

1. **Status of Development:** Developed, underdeveloped, undeveloped and developing economies.
2. **System of Activities:** Capitalistic, Socialistic and Mixed Economies.
3. **Scale of Activities:** Small and Large Economies.
4. **Nature of Functioning:** Static and Dynamic Economies.
5. **Nature of Operation:** Closed and Open Economies.
6. **Nature of Advancement:** Traditional and Modern Economies.
7. **Level of National Income:** Low Income, Middle Income and High Income Economies.

Economic Systems

- Economic System refers to the manner in which individuals and institutions are connected together to carry out economic activities in a particular area. It is the methodology of doing economic activities to meet the needs of the society. There are three major types of economic systems. They are:

1. Capitalistic Economy (Capitalism),
2. Socialistic Economy (Socialism)and
3. Mixed Economy (Mixedism)

Globalism

The term coined by Manfred D Steger (2002) to denote the new market ideology of globalisation that connects nations together through international trade and aiming at global development. This ideology is also termed as 'Extended Capitalism'.

- Capitalism and socialism are two extreme and opposite approaches. In capitalism, there is total freedom and private ownership of means of production. In socialism, there is no freedom for private and there is public ownership of means of production. Mixedism denotes the Co-existence of capitalism and socialism. The features, merits and demerits of various economic systems are discussed below.

Capitalistic Economy (Capitalism)

- Adam Smith is the 'Father of Capitalism'. Capitalistic economy is also termed as a free economy (Laissez faire, in Latin) or market economy where the role of the government is minimum and market determines the economic activities.
- The means of production in a capitalistic economy are privately owned. Manufacturers produce goods and services with profit motive. The private individual has the freedom to undertake any occupation and develop any skill. The USA, West Germany, Australia and Japan are the best examples for capitalistic economies. However, they do undertake large social welfare measures to safeguard the downtrodden people from the market forces.

Features of Capitalistic Economy

1. **Private Ownership of Property and Law of Inheritance:** The basic feature of capitalism is that all resources namely, land, capital, machines, mines etc. are owned by private individuals. The owner has the right to own, keep, sell or use these resources according to his will. The property can be transferred to heirs after death.
2. **Freedom of Choice and Enterprise:** Each individual is free to carry out any occupation or trade at any place and produce any commodity. Similarly, consumers are free to buy any commodity as per their choice

3. **Profit Motive:** Profit is the driving force behind all economic activities in a capitalistic economy. Each individual and organization produce only those goods which ensure high profit. Advance technology, division of labour, and specialisation are followed. The golden rule for a producer under capitalism is 'to maximize profit.'
4. **Free Competition:** There is free competition in both product and factor market. The government or any authority cannot prevent firms from buying or selling in the market. There is competition between buyers and sellers.
5. **Price Mechanism:** Price mechanism is the heart of any capitalistic economy. All economic activities are regulated through price mechanism i.e, market forces of demand and supply.
6. **Role of Government:** As the price mechanism regulates economic activity, the government has a limited role in a capitalistic economy. The government provides basic services such as, defense, public health, education, etc.
7. **Inequalities of Income:** A capitalist society is divided into two classes - 'haves' that is those who own property and 'have-nots' who do not own property and work for their living. The outcome of this situation is that the rich become richer and poor become poorer. Here, economic inequality goes on increasing.

Merits of Capitalism

1. **Automatic Working:** Without any government intervention, the economy works automatically.
2. **Efficient Use of Resources:** All resources are put into optimum use.
3. **Incentives for Hard work:** Hard work is encouraged and entrepreneurs get more profit for more efficiency.
4. **Economic Progress:** Production and productivity levels are very high in capitalistic economies.
5. **Consumers Sovereignty:** All production activities are aimed at satisfying the consumers.
6. **Higher Rates of Capital Formation:** Increase in saving and investment leads to higher rates of capital formation.
7. **Development of New Technology:** As profit is aimed at, producers invest on new technology and produce quality goods.

Demerits of Capitalism

1. **Concentration of Wealth and Income:** Capitalism causes concentration of wealth and income in a few hands and thereby increases inequalities of income.
2. **Wastage of Resources:** Large amount of resources are wasted on competitive advertising and duplication of products.
3. **Class Struggle:** Capitalism leads to class struggle as it divides the society into capitalists and workers.
4. **Business Cycle:** Free market system leads to frequent violent economic fluctuations and crises.
5. **Production of non essential goods:** Even the harmful goods are produced if there is possibility to make profit.

Socialistic Economy (Socialism)

- The **Father of Socialism** is Karl Marx. Socialism refers to a system of total planning, public ownership and state control on economic activities. Socialism is defined as a way of organizing a society in which major industries are owned and controlled by the government, A Socialistic economy is also known as 'Planned Economy' or 'Command Economy'.
- In a socialistic economy, all the resources are owned and operated by the government. Public welfare is the main motive behind all economic activities. It aims at equality in the distribution of income and wealth and equal opportunity for all. Russia, China, Vietnam, Poland and Cuba are the examples of socialist economies. But, now there are no absolutely socialist economies.

Features of Socialism:

1. **Public Ownership of Means of Production:** All resources are owned by the government. It means that all the factors of production are nationalized and managed by the public authority.
2. **Central Planning:** Planning is an integral part of a socialistic economy. In this system, all decisions are undertaken by the central planning authority.
3. **Maximum Social Benefit:** Social welfare is the guiding principle behind all economic activities. Investments are planned in such a way that the benefits are distributed to the society at large.
4. **Non-existence of Competition:** Under the socialist economic system there is absence of competition in the market. The state has full control over production and distribution of goods and services. The consumers will have a limited choice.

5. **Absence of Price Mechanism:** The pricing system works under the control and regulation of the central planning authority.
6. **Equality of Income:** Another essential feature of socialism is the removal and reduction of economic inequalities. Under socialism private property and the law of inheritance do not exist.
7. **Equality of Opportunity:** Socialism provides equal opportunity for all through free health, education and professional training.
8. **Classless Society:** Under socialism, there is a classless society and so no class conflicts. In a true socialist society, everyone is equal as far as economic status is concerned.

Merits of Socialism

1. **Reduction in Inequalities:** No one is allowed to own and use private property to exploit others.
2. **Rational Allocation of Resources:** The central planning authority allocates the resources in a planned manner. Wastages are minimised and investments are made in a pre planned manner.
3. **Absence of Class Conflicts:** As inequalities are minimum, there is no conflict between rich and poor class. Society functions in a harmonious manner.
4. **End of Trade Cycles:** Planning authority takes control over production and distribution of goods and services. Therefore, economic fluctuations can be avoided.
5. **Promotes Social Welfare:** Absence of exploitation, reduction in economic inequalities, avoidance of trade cycles and increase in productive efficiency help to promote social welfare.

Demerits of Socialism

1. **Red Tapism and Bureaucracy:** As decision are taken by government agencies, approval of many officials and movement of files from one table to other takes time and leads to red tapism.
2. **Absence of Incentive:** The major limitation of socialism is that this system does not provide any incentive for efficiency. Therefore, productivity also suffers.
3. **Limited Freedom of Choice:** Consumers do not enjoy freedom of choice over the consumption of goods and services.

4. **Concentration of Power:** The State takes all major decisions. The private takes no initiative in making economic decisions. Hence, the State is more powerful and misuse of power can also take place.

Mixed Economy (Mixedism):

- In a mixed economy system both private and public sectors co-exist and work together towards economic development. It is a combination of both capitalism and socialism. It tends to eliminate the evils of both capitalism and socialism. In these economies, resources are owned by individuals and the government. India, England, France and Brazil are the examples of mixed economy.

Features of Mixed Economy

1. **Ownership of Property and Means of Production:** The means of production and properties are owned by both private and public. Public and Private have the right to purchase, use or transfer their resources.
2. **Coexistence of Public and Private Sectors:** In mixed economies, both private and public sectors coexist. Private industries undertake activities primarily for profit. Public sector firms are owned by the government with a view to maximize social welfare.
3. **Economic Planning:** The central planning authority prepares the economic plans. National plans are drawn up by the Government and both private and public sectors abide. In general, all sectors of the economy function according to the objectives, priorities and targets laid down in the plan.
4. **Solution to Economic Problems:** The basic problems of what to produce, how to produce, for whom to produce and how to distribute are solved through the price mechanism as well as state intervention.
5. **Freedom and Control:** Though private has freedom to own resources, produce goods and services and distribute the same, the overall control on the economic activities rests with the government.

Merits of Mixed Economy

1. **Rapid Economic Growth:** The best advantage of mixed economy is that it promotes rapid economic growth. Thus, both public requirements and private needs are taken care of.

2. **Balanced Economic Growth:** Mixedism promotes balanced growth of the economy. It promotes balanced growth between agriculture and industry, consumer goods and capital goods, rural and urban etc.
3. **Proper Utilization of Resources:** In a mixed economy, the government can ensure proper utilization of resources. The government controls most of the important activities directly and the private sector indirectly.
4. **Economic Equality:** The government uses progressive rates of taxation for levying income tax to bring about economic equality.
5. **Special Advantages to the Society:** The government safeguards the interest of the workers and weaker sections by legislating on minimum wages, and rationing, establishing fair price shops and formulating social welfare measures.

Demerits of Mixed Economy

1. **Lack of Coordination:** The greatest drawback of mixedism is lack of coordination between public sector and private sector. As both work with divergent motives, it creates many coordination related problems.
2. **Competitive Attitude:** It is expected that both government and private should work with a complementary spirit towards the welfare of the society, but in reality they are competitive in their activities.
3. **Inefficiency:** Most of the public sector enterprises remain inefficient due to lethargic bureaucracy, red tapism and lack of motivation.
4. **Fear of Nationalization:** In a mixed economy, the fear of nationalization discourages the private entrepreneurs in their business operations and innovative initiatives.
5. **Widening Inequality:** Ownership of resources, laws of inheritance and profit motive of people widens the gap between rich and poor.

Ultimately the inequality of capitalism and inefficiency of socialism are found in mixed economies.

Comparison of Different Economic Systems

S.No.	Features	Capitalism	Socialism	Mixedism
1.	Ownership of Means of production	Private Ownership	Public Ownership	Private ownership and Public ownership

2	Economic Motive	Profit	Social Welfare	Social Welfare and Profit Motive
3.	Solution of Central Problems	Free Market System	Control Planning system	Central Planning System and Free Market System
4.	Government Role	Interanal Regulation only	Complete Involvement	Limited Role
5.	Income Distribution	Unequal	Equal	Less unequal
6.	Nature of Enterprise	Private Enterprise	Government Enterprise	Both Private and State Enterprises
7.	Economic Freedom	Complete Freedom	Lack of Freedom	Limited Freedom
8.	Major Problem	Inequality	Inefficiency	Inequality and Inefficiency

Concepts of Macro Economics

The important concepts used in macro economics are presented below:

Stock and Flow Variables

- Variables used in economic analysis are classified as stock and flow. Both stock and flow variables may increase or decrease with time.
- Stock refers to a quantity of a commodity measured at a point of time. In macro economics, money supply, unemployment level, foreign exchange reserves, capital etc are examples of stock variables.
- Flow variables are measured over a period of time. National Income, imports, exports, consumption, production, investment etc are examples of flow variables.
- Economic Models A model is a simplified representation of real situation. Economists use models to describe economic activities, their relationships and their behaviour. A model is an explanation of how the economy, or part of the economy, works. Most economic models are built with mathematics, graphs and equations, and attempt to explain relationships between economic variables. The commonly used economic models are the supply-demand models and circular flow models and Smith models.

Circular Flow of Income

- The circular flow of income is a model of an economy showing connections between different sectors of an economy. It shows flows of income, goods and services and factors of production between economic agents such as firms, households, government

and nations. The circular flow analysis is the basis of national accounts and macroeconomics.

- There are three models of circular flow of income, representing the major economic systems.
 1. Two Sector Model: It is for a simple economy with households and firms.
 2. Three Sector Model: It is for a mixed and closed economy with households, firms and government.
 3. Four Sector Model: It is for an open economy with households, firms, government and rest of the world (External sector).

Circular Flow of Income in a Two-Sector Economy:

There are only two sectors namely, household sector and firm sector.

- i. **Household Sector:** The household sector is the sole buyer of goods and services, and the sole supplier of factors of production, i.e., land, labour, capital and organisation. It spends its entire income on the purchase of goods and services produced by the business sector. The household sector receives income from firm sector by providing the factors of production owned by it.
 - ii. **Firms:** The firm sector generates its revenue by selling goods and services to the household sector. It hires the factors of production, i.e., land, labour, capital and organisation, owned by the household sector. The firm sector sells the entire output to households.
- In a two- sector economy, production and sales are equal and there will be a circular flow of Income and goods. The outer circle represents real flow (factors and goods) and the inner circle represents the monetary flow (factor price and commodity prices). Real flow indicates the factor services flow from household sector to the business sector to the household. The basic identities of the two- sector economy are as under:

$Y = C + I$

Where

Y is income; C is Consumption; I is investment

Circular Flow of Income in a Three- Sector Economy:

- In addition to household and firms, inclusion of the government sector makes this model a three-sector model. The government levies taxes on households and firms, purchases goods and services from firms, and receive factors of production from household sector.

On the other hand, the government also makes social transfers such as pension, relief, subsidies to the households. Similarly, Government pays the firms for the purchases of goods and services. The Flow Chart illustrates three- sector economy model:

- Under three sector model, national income (Y) is obtained by adding Consumption expenditure (C), Investment expenditure (I) and Government expenditure (G).

Therefore:

$$Y = C + I + G$$

Circular Flow of Income in a Four-Sector Economy:

- In a Four-sector economy, in addition to household, firms and government, a fourth sector namely, external sector is included. In real life, only four-sector economy exists. This model is composed of four sectors namely,

- (i) Households, (ii) Firms,
- (iii) Government, (iv) External sector

- The external sector comprises exports and imports. It is illustrated in the Flow Chart.
- In four-sector economy, expenditure for the entire economy include domestic expenditure (C+I+G) and net exports (X- M). Therefore,

$$Y = C + I + G + (X - M)$$

APPOLO STUDY CENTRE

Unit -11

Economics of Development and Planning

A good plan may fail due to faulty implementation. But a faulty plan cannot succeed through good implementation.

“Plan your work for today and every day, then work your plan.”

-Margaret Thatcher

Introduction

- The concept "development" refers to the structural changes towards betterment. Until the World War II, interest was rarely shown on the problems of the present day third World Countries. After the Second World War, economists started devoting their attention towards analyzing the problems of underdeveloped countries and formulating theories and models of development and growth. The Under Developed Countries (UDCs) were once the colonies of England and other European countries. After becoming free and independent, there was an awakening to march towards economic development.

Approaches to Economic Development

- There are two main approaches to the concept of development viz i) the traditional approach and ii) the new welfare oriented approach.
 1. Traditional Approach : The traditional approach defines development strictly in economic terms. The increase in GNP is accompanied by decline in share of agriculture in output and employment while those of manufacturing and service sectors increase. It emphasizes the importance of industrialization. It was assumed that growth in GNP per capita would trickle down to people at the bottom.
 2. New Welfare oriented Approach: During 1970s, economic development was redefined in terms of reduction of poverty, 'inequality' and unemployment within the context of a growing economy. In this phase, 'Redistribution with Growth' became the popular slogan.
- To quote Michael P. Todaro, "Development must, therefore, be conceived as a multidimensional process involving major changes in social structures, popular attitudes and national institutions as well as the acceleration of growth, the reduction of inequality and the eradication of absolute poverty".

Underdevelopment

- The UDCs are characterized by predominance of primary sector i.e. agriculture, low per capita income, widespread poverty, wide inequality in distribution of income and

wealth, over population, low rate of capital formation, high rate of unemployment, technological backwardness, dualism etc.

Meaning of Underdevelopment

- The term underdevelopment refers to that state of an economy where levels of living of masses are extremely low due to very low levels of Per capita income, resulting from low levels of productivity and high growth rate of population.

Economic Growth Vs Economic Development

1. State of Development

- Generally speaking, economic development refers to the problems of underdeveloped countries and economic growth to those of developed countries.

2. Nature and Level of Change

- Development is a discontinuous and spontaneous change while growth is a gradual and steady change in the long run.

3. Scope of Change

- Growth simply means more output. But development refers to efficiency in production i.e. output per unit of input. It also implies changes in composition of output and in allocation of resources, reduction of poverty, inequality and unemployment.

4. Extent of change

- Economic development (wider concept than economic growth) is taken to mean growth plus structural change.

Differences between Economic Growth and Economic Development	
Economic Growth	Economic Development
Deals with the problems of Developed countries	Deals with the problems of UDCs
Change is gradual and steady	Change is discontinuous and spontaneous
Means more output	Means not only more output but also its composition
Concerns Quantitative aspects i.e. increase in per capita income	Quantitative as well as Qualitative
Narrow	Wider concept Development = Growth + Chang

Measurement of Economic Development

Economic development is measured on the basis of four criteria

- **Gross National Product (GNP):** GNP is the total market value of all final goods and services produced within a nation in a particular year, plus income earned by its citizens (including income of those located abroad), minus income of non-residents located in that country. GNP is one measure of the economic condition of a country, under the assumption that a higher GNP leads to a higher quality of living, all other things being equal.
- **GNP per capita:** This relates to increase in the per capita real income of the economy over the long period. This indicator of economic growth emphasizes that for economic development the rate of increase in real per capita income should be higher than the growth rate of population.
- **Welfare:** Economic development is regarded as a process whereby there is an increase in the consumption of goods and services by individuals. From the welfare perspective, economic development is defined as a sustained improvement in health, literacy and standard of living.
- **Social Indicators:** Social indicators are normally referred to as basic and collective needs of the people. The direct provision of basic needs such as health, education, food, water, sanitation and housing facilities check social backwardness.

Determinants of Economic Development

- Economic development is not determined by any single factor. Economic development depends on Economic, Social, Political and Religious factors.

Economic and Non-Economic Factors

Economic Factors

1. **Natural Resource:** The principal factor affecting the development of an economy is the availability of natural resources. The existence of natural resources in abundance is essential for development. A country deficient in natural resources may not be in a position to develop rapidly. But a country like Japan lacking natural resources imports them and achieve faster rate of economic development with the help of technology. India with larger resources is poor.
2. **Capital Formation:** Capital formation is the main key to economic growth. Capital formation refers to the net addition to the existing stock of capital goods which are either tangible like plants and machinery or intangible like health, education and research. Capital formation helps to increase productivity of labour and thereby production and income. It facilitates adoption of advanced techniques of production. It

leads to better utilization of natural resources, industrialization and expansion of markets which are essential for economic progress.

3. **Size of the Market:** Large size of the market would stimulate production, increase employment and raise the National per capita income. That is why developed countries expand their market to other countries through WTO.
4. **Structural Change:** Structural change refers to change in the occupational structure of the economy. Any economy of the country is generally divided into three basic sectors: Primary sector such as agricultural, animal husbandry, forestry, etc; Secondary sector such as industrial production, constructions and Tertiary sector such as trade, banking and commerce. Any economy which is predominantly agricultural tends to remain backward.
5. **Financial System:** Financial system implies the existence of an efficient and organized banking system in the country. There should be an organized money market to facilitate easy availability of capital.
6. **Marketable Surplus:** Marketable surplus refers to the total amount of farm output cultivated by farmers over and above their family consumption needs. This is a surplus that can be sold in the market for earning income. It raises the purchasing power, employment and output in other sectors of the economy. The country as a result will develop because of increase in national income.
7. **Foreign Trade:** The country which enjoys favorable balance of trade and terms of trade is always developed. It has huge forex reserves and stable exchange rate.
8. **Economic System:** The countries which adopt free market mechanism (laissez faire) enjoy better growth rate compared to controlled economies. It may be true for some countries, but not for every country.

Non- Economic Factors

- 'Economic Development has much to do with human endowments, social attitudes, political conditions and historical accidents. Capital is a necessary but not a sufficient condition of progress.
- Ragnar Nurkse.

1. **Human Resources:** Human resource is named as human capital because of its power to increase productivity and thereby national income. There is a circular relationship between human development and economic growth. A healthy, educated and skilled labour force is the most important productive asset. Human capital formation is the process of increasing knowledge, skills and the productive capacity of people. It includes expenditure on health, education and social services. If labour is efficient and skilled, its capacity to contribute to growth will be high. For example Japan and China.

2. **Technical Know-how:** As the scientific and technological knowledge advances, more and more sophisticated techniques steadily raise the productivity levels in all sectors. Schumpeter attributed the cause for economic development to innovation.
3. **Political Freedom:** The process of development is linked with the political freedom. Dadabhai Naoroji explained in his classic work 'Poverty and Un-British Rule in India' that the drain of wealth from India under the British rule was the major cause of the increase in poverty in India.
4. **Social Organization:** People show interest in the development activity only when they feel that the fruits of development will be fairly distributed. Mass participation in development programs is a pre-condition for accelerating the development process. Whenever the defective social organization allows some groups to appropriate the benefits of growth, majority of the poor people do not participate in the process of development. This is called crony capitalism.
5. **Corruption free administration:** Corruption is a negative factor in the growth process. Unless the countries root-out corruption in their administrative system, the crony capitalists and traders will continue to exploit national resources. The tax evasion tends to breed corruption and hamper economic progress.
6. **Desire for development:** The pace of economic growth in any country depends to a great extent on people's desire for development. If in some country, the level of consciousness is low and the general mass of people has accepted poverty as its fate, then there will be little scope for development.
7. **Moral, ethical and social values:** These determine the efficiency of the market, according to Douglas C. North. If people are not honest, market cannot function.
8. **Casino Capitalism:** If People spend larger proportion of their income and time on entertainment liquor and other illegal activities, productive activities may suffer, according to Thomas Piketty.
9. **Patrimonial Capitalism:** If the assets are simply passed on to children from their parents, the children would not work hard, because the children do not know the value of the assets. Hence productivity will be low as per Thomas Piketty.

Vicious Circle of Poverty

- There are circular relationships known as the 'vicious circles of poverty' that tend to perpetuate the low level of development in Less Developed Countries (LDCs). Nurkse explains the idea in these words: "It implies a circular constellation of forces tending to act and react upon one another in such a way as to keep a poor country in a state of poverty. For example, a poor man may not have enough to eat; being underfed, his health may be weak; being physically weak, his working capacity is low, which means that he is poor, which in turn means that he will not have enough to eat and so on. A

situation of this sort relating to a country as a whole can be summed up in the proposition: "A county is poor because the country is poor".

- The vicious circle of poverty operates both on the demand side and the supply side.
- On the supply side, the low level of real income means low savings. The low level of saving leads to low investment and to deficiency of capital. The deficiency of capital, in turn, leads to low levels of productivity and back to low income. Thus the vicious circle is complete from the supply side.
- The demand-side of the vicious circle is that the low level of real income leads to a low level of demand which, in turn, leads to a low rate of investment and hence back to deficiency of capital, low productivity and low income.

Breaking the Vicious Circle of Poverty

- The vicious circle of poverty is associated with low rate of saving and investment on the supply side. In UDCs the rate of investment and capital formation can be stepped up without reduction in consumption. For this, the marginal rate of savings is to be greater than average rate of savings.
- To break the vicious circle on the demand side, Nurkse suggested the strategy of balanced growth. If investment is made in several industries simultaneously the workers employed in various industries will become consumers of each other's products and will create demand for one another. The balanced growth i.e. simultaneous investment in large number of industries creates mutual demand. Thus, through the strategy of balanced growth, vicious circle of poverty operating on the demand side of capital formation can be broken.

Planning

Meaning

- Planning is a technique, a means to an end being the realization of certain pre-determined and well-defined aims and objectives laid down by a central planning authority. The end may be to achieve economic, social, political or military objectives.

Definitions

- Economic Planning is "collective control or suppression of private activities of production and exchange".
-Robbins
- "Economic Planning in the widest sense is the deliberate direction by persons in-charge of large resources of economic activity towards chosen ends".
-Dalton

Economic Planning in India

- Consists of economic decisions, schemes formed to meet certain predetermined economic objectives and a road map of directions to achieve specific goals within specific period of time. The current thinking of economic planning is fairly new, somewhat rooted in Marxist socialism. In the 20th century, intellectuals, theorists, thinkers from Europe put forward the idea of state involvement to stop capitalism and the inequality of society.
- Soviet Union adopted economic planning for the first time in 1928 that enabled the country to turn into an industrial superpower. The idea of economic planning was strengthened during the Great Depression in 1930s. The outbreak of the World War II also required adequate and suitable planning of economic resources for the effective management after the effects of post war economy.
- After Independence, in 1948, a declaration of industrial policy was announced. The policy suggested the creation of a National Planning Commission and the elaboration of the policy of a mixed economic system. On January 26, 1950, the Constitution came into force. In logical order, the Planning Commission was created on March 15, 1950 and the plan era began on April 1, 1951 with the launch of the first five year plan (1951-56). The evolution of planning in India is stated below:
 1. **Sir M. Vishveshwarya (1934):** a prominent engineer and politician made his first attempt in laying foundation for economic planning in India in 1934 through his book, "Planned Economy of India". It was a 10 year plan.
 2. **Jawaharlal Nehru (1938):** set-up "National Planning Commission" by a committee but due to the changes in the political era and second World War, it did not materialize.
 3. **Bombay Plan (1940):** The 8 leading industrialists of Bombay presented "Bombay Plan". It was a 15 Year Investment Plan.
 4. **S. N Agarwal (1944)** gave the "Gandhian Plan" focusing on the agricultural and rural economy.
 5. **M.N. Roy (1945)** drafted 'People's Plan'. It was aiming at mechanization of agricultural production and distribution by the state only.
 6. **J.P. Narayan (1950)** advocated, "Sarvodaya Plan" which was inspired by Gandhian Plan and with the idea of Vinoba Bhave. It gave importance not only for agriculture, but encouraged small and cottage industries in the plan.
- After considering all the plans, in the same year Planning Commission was set up to formulate Five Year Plan in India by Jawaharlal Nehru. He was the first Chairman of Planning Commission, Government of India.

Case for planning

- The economic planning is justified on the following grounds.

1. To accelerate and strengthen market

mechanism: The market mechanism works imperfectly in underdeveloped countries because of the ignorance and economy comprises the non-monetized sector. The product, factor, money and capital markets are not organized properly. Therefore the planned economy will be a better substitute for free economy.

2. To remove unemployment:

Capital being scarce and labour being abundant, the problem of providing gainful employment opportunities to an ever-increasing labour force is a difficult task. The need for planning in underdeveloped countries is further stressed by the necessity of removing widespread unemployment and disguised unemployment in such economies.

3. To achieve balanced development:

In the absence of sufficient enterprise and initiative, the planning authority is the only institution for planning the balanced development of the economy. For rapid economic development, underdeveloped countries require the development of the agricultural and industrial sectors, the establishment of social and economic overheads, the expansion of the domestic and foreign trade sectors in a harmonious way.

1. **Development of Agriculture and Industrial Sectors:** The need for developing the agriculture sector along with the industrial sector arises from the fact that agriculture and industry are interdependent. Reorganization of agriculture releases surplus labour force which can be absorbed by the industrial sector. Development of agriculture is also essential to supply the raw material needs of the industrial sector.

2. **Development of Infrastructure:** The agriculture and industrial sectors cannot develop in the absence of economic and social overheads. The building of canals, roads, railways, power stations, etc., is indispensable for agricultural and industrial development. Infrastructure involves huge capital investment long gestation period and low rate of return. The state alone can provide strong infrastructural bases through planning.

3. **Development of Money and Capital Markets:** The expansion of the domestic and foreign trade requires not only the development of agricultural and industrial sectors along with social and economic overheads but also the existence of financial institutions. Money and capital markets are not adequate in underdeveloped countries. This factor acts as an obstacle to the growth of industry and trade. So planning alone can provide sound money market and capital market.

4. **To remove poverty and inequalities:** Planning is the only path open to underdeveloped countries, for raising national and per capita income, reducing inequalities and poverty and increasing employment opportunities. Has it happened in India in the last 65 years?

- Hence, Arthur Lewis says, “Planning is more necessary in backward countries to devise ways and means and to make concerted efforts to raise national income”

Case against planning

- The failure of market mechanism invited state intervention in economic activities through planning. The prime goals of economic planning are stabilization in developed countries and growth in LDCs. But the economic planning also is not free from limitations. It may retard private initiatives, hamper freedom of choice, involve huge cost of administration and stop the automatic adjustment of price mechanism. The arguments against planning are discussed below.

1. Loss of freedom

- The absence of freedom in decision making may act as an obstacle for economic growth. Regulations and restrictions are the backbone of a planned economy. The economic freedom comprises freedom of consumption, freedom of choice of occupation, freedom to produce and the freedom to fix prices for the products. Under planning, the crucial decisions are made by the Central Planning Authority. The consumers, producers and the workers enjoy no freedom of choice. Therefore, Hayek explains in his book ‘Road to Serfdom’ that centralized planning leads to loss of personal freedom and ends in economic stagnation. The decisions by the Government are not always rational.

But, freedom to private producers will be misused; profit will be given top priority, welfare will be relegated.

2. Elimination of Initiative

- Under centralized planning, there will be no incentive for initiatives and innovations. Planning follows routine procedure and may cause stagnation in growth. The absence of initiatives may affect progress in following ways.
 - a. The absence of private ownership and profit motive discourages entrepreneurs from taking bold decisions and risk taking. Attractive profit is the incentive for searching new ideas, new lines and new methods. These are missing in a planned economy.
 - b. As all enjoy equal reward under planned economy irrespective of their effort, efficiency and productivity, nobody is interested in undertaking new and risky ventures.
 - c. The bureaucracy and red tapism which are the features of planned economy, cripple the initiative as they cause procedural delay and time loss. The ease of doing business is disrupted. It is because of this, even socialist countries like Russia and China offer incentives to private enterprises.

3. High cost of Management

- No doubt the fruits of planning such as industrialization, social justice and regional balance are good. But the cost of management of the economic affairs outweighs the benefits of planning. Plan formulation and implementation involve engagement of an army of staff for data collection and administration. As Lewis remarks, "The better we try to plan, the more planners we need". Inadequate data, faulty estimations and improper implementation of plans result in wastage of resources and cause either surplus or shortages.

4. Difficulty in advance calculations

- Price mechanism provides for the automatic adjustment among price, demand and supply in a Laissez Faire economy. The producers and consumers adjust their supply and demand based on price changes. There is no such mechanism in a planned economy. Advance calculations in a precise manner are impossible to make decisions regarding the consumption and production. It is also very difficult to put the calculations into practice under planning. Excess supply and excess demand can also happen in the market oriented economy. In fact it has happened in many capitalist economies, including the US.
- The arguments against planning are mostly concerned with centralized and totalitarian planning. The democratic planning, planning by inducement and decentralized planning especially under mixed economies give equal role for private sector and public sector. Planned economy appears to be more efficient operationally than a market economy. So the question is not one of plan or no plan but one of the type of plan. The right mix of market mechanism and state intervention in right proportion will promise accelerated economic growth accompanied by stability and social justice.

Types of planning

- Economic planning is a process under which attempts are made to achieve desired targets of economic development within a specified period of time. There are different types of planning which differ in ideology and the procedure in execution

1. Democratic Vs Totalitarian:

- Democratic planning implies planning within democracy. People are associated at every step in the formulation and implementation of the plan. A democratic plan is characterized by the widest possible consultations with the various state governments and private enterprises at the stage of preparation. The plan prepared by the Planning Commission is not accepted as such. It can be accepted, rejected or modified by the Parliament of the country.
- Under totalitarian planning, there is central control and direction of all economic activities in accordance with a single plan. Consumption, production, exchange, and distribution are all controlled by the state. In authoritarian planning, the planning

authority is the supreme body. It decides about the targets, schemes, allocations, methods and procedures of implementation of the plan.

2. Centralized Vs Decentralized:

- Under centralized planning, the entire planning process in a country is under a central planning authority. This authority formulates a central plan, fixes objectives, targets and priorities for every sector of the economy. In other words, it is called 'planning from above'
- Under decentralized planning local organizations and institutions formulate, adopt, execute and supervise the plan without interference by the central authorities. In other words, it is called 'planning from below'.

3. Planning by Direction Vs Inducement:

- Under planning by direction, there is a central authority which plans, directs and orders the execution of the plan in accordance with pre-determined targets and priorities.
- Under planning by inducement, the people are induced to act in a certain way through various monetary and fiscal measures. If the planning authority wishes to encourage the production of a commodity, it can give subsidy to the firms. Thus, planning by inducement is able to achieve the same results as under planning by direction but with less sacrifice of individual liberty.

4. Indicative Vs Imperative Planning:

- Indicative planning is peculiar to the mixed economies. It has been in practice in France since the Monnet Plan of 1947-50. In a mixed economy, the private sector and the public sector work together. Under this plan, the outline of plan is prepared by the Government. Then it is discussed with the representatives of private management, trade unions, consumer groups, finance institutions and other experts. The essential function of planning is coordination of different economic units. The state provides all types of facilities to the private sector. The private sector is expected to fulfill the targets and priorities. The state does not force the private sector but just indicate the areas of operation and targets to be fulfilled. In short, the planning procedure is soft and flexible.
- Under imperative planning, the state is all powerful in preparation and implementation of the plan. Once a plan is drawn up, its implementation is a matter of enforcement. The USSR President Stalin used to say, 'Our plans are our instructions'. There is complete control over the entire resources by the state. There is no consumer sovereignty. The Government policies and procedures are rigid. China and Russia follow imperative planning.

5. Short, Medium and Long term Planning:

- Short-term plans are also known as 'controlling plans'. They encompass the period of one year, therefore, they are also known as 'annual plans'. The medium-term plans last for the period of 3 to 7 years. But normally, the medium term plan is made for the period of five years. The medium-term planning is not only related to allocation of financial resources but also physical resources.
- Long-term plans last for the period of 10 to 30 years. They are also known as 'perspective plans'. The basic philosophy behind long-term planning is to bring structural changes in the economy.

6. Financial Vs Physical Planning:

- Financial planning refers to the technique of planning in which resources are allocated in terms of money while physical planning pertains to the allocation of resources in terms of men, materials and machinery.

7. Functional Vs Structural Planning:

- Functional planning refers to that planning which seeks to remove economic difficulties by directing all the planning activities within the existing economic and social structure. The structural planning refers to a good deal of changes in the socioeconomic framework of the country. This type of planning is adopted mostly in under developed countries.

8. Comprehensive Vs Partial Planning:

- General planning which concerns itself with the major issues for the whole economy is known as comprehensive planning whereas partial planning is to consider only the few important sectors of the economy.
- 13th August, 2014. The Prime Minister is the Chairperson of NITI Aayog and Union Ministers will be Ex-officio members. The Vice- Chairman of the NITI Aayog is the functional head and the first Vice- Chairman was Arvind Panangariya.

Functions of NITI Aayog

1. **Cooperative and Competitive Federalism:** To enable the States to have active participation in the formulation of national policy.
2. **Shared National Agenda:** To evolve a shared vision of national development priorities and strategies with the active involvement of States.
3. **Decentralized Planning:** To restructure the planning process into a bottom-up model.
4. **Vision and Scenario Planning:** To design medium and long-term strategic frameworks towards India's future.

5. **Network of Expertise:** To mainstream external ideas and expertise into government policies and programmes through a collective participation.
6. **Harmonization:** To facilitate harmonization of actions across different layers of government, especially when involving cross-cutting and overlapping issues across multiple sectors; through communication, coordination, collaboration and convergence amongst all the stakeholders.
7. **Conflict Resolution:** To provide platform for mutual consensus to intersectoral, inter-departmental, inter-state as well as centre-state issues for all speedy execution of the government programmes.
8. **Coordinating Interface with the World:** It will act nodal point to harness global expertise and resources coming from International organizations for India's developmental process.
9. **Internal Consultancy:** It provides internal consultancy to Central and State governments on policy and programmes.
10. **Capacity Building:** It enables to provide capacity building and technology up-gradation across government, benchmarking with latest global trends and providing managerial and technical know-how.
11. **Monitoring and Evaluation:** It will monitor the implementation of policies and programmes and evaluate the impacts.
 - Initiatives like Atal Innovation Mission, Ayushman Bharat approach towards water conservation measures and the draft bill to establish the National Medical Commission to replace the Medical Council of India have all been conceptualized in NITI Aayog.
 - NITI Aayog is also bringing about a greater level of accountability. It has established a development monitoring and evaluation office which collects data on the performance of various ministries. Using such data, the Aayog makes performance based ranking of states to foster a spirit of competitive federalism. The success of NITI Aayog can be evaluated after a substantial period of time.

13. LOCAL GOVERNMENT

PANCHAYAT RAI

- The term Panchayati*Raj* in India signifies the system of rural local self-government. It has been established in all the states of India by the Acts of the state legislatures to build democracy at the grass root level. It is entrusted with rural development. It was constitutionalised through the **73rd Constitutional Amendment Act of 1992** and came into force on **24 April, 1993**. Eleventh schedule contains **29 functional subjects**. The subject of '**Local Government**' is mentioned in the State List under the Seventh Schedule of the Constitution.

EVOLUTION OF PANCHAYATI RAJ

Origin and Development of Panchayat Raj

- In ancient India, Kautilya's Arthshastra (Treatise) gives a comprehensive account of the system of village administration prevailing in his time.
- History of Local Self-government in Tamilnadu is evident from the Uthiramerur stone inscriptions of Paranthaka Chola I on **Kuda Olai Murai**.
- Post Independence, many Gandhians convinced the drafting committee to have a provision for the village panchayats in Part IV of the Indian Constitution.

Balwant Rai Mehta Committee

- In **January 1957**, the Government of India appointed a committee to examine the working of the Community Development Programme (**1952**) and the National Extension Service (**1953**) and to suggest measures for their better working. The chairman of this committee was Balwant Rai G Mehta. The committee submitted its report in **November 1957** and recommended the establishment of the scheme of

'**democratic decentralisation**', which ultimately came to be known as Panchayati Raj. The report is hailed as the **Magna Carta of the Panchayat Raj System**.

➤ **The specific recommendations made by it are:**

1. Establishment of a three-tier Panchayati raj system—gram panchayat at the village level, panchayat Samiti at the block level and ZilaParishad at the district level. These tiers should be organically linked through a device of indirect elections.
 2. The village panchayat should be constituted with directly elected representatives, whereas the panchayat Samiti and ZilaParishad should be constituted with indirectly elected members.
 3. The panchayat Samiti should be the executive body while the ZilaParishad should be the advisory, coordinating and supervisory body.
- **Rajasthan** was the first state to establish Panchayati Raj. The scheme was inaugurated by the prime minister **Pt. Jawaharlal Nehru** on **October 2, 1959**, in **Nagaur district**. Rajasthan was followed by Andhra Pradesh, which also adopted the system in **1959**.

Study Teams and Committees on Panchayati Raj

1. **1960** - Committee on Rationalisation of Panchayat Statistics **V.R. Rao**
2. **1961** - Working Group on Panchayats and Cooperatives **S.D. Mishra**
3. **1963** - Study Team on Panchayati Raj Finances **K. Santhanam**
4. **1965** - Committee on Panchayati Raj Elections **K. Santhanam**
5. **1969** - Study Team on Involvement of Community Development Agency and Panchayati Raj Institutions in the Implementation of Basic Land Reform Measures **V. Ramanathan**
6. **1972** - Working Group for Formulation of Fifth Five Year Plan on Community Development and Panchayati Raj **N.Ramakrishnayya**
7. **1976** - Committee on Community Development and Panchayati Raj Smt. **Daya Choubey**
8. **1978**-Dantawala committee Report on Block level Panning

Ashok Mehta Committee

- In **December 1977**, the Janata Government appointed a committee on panchayati raj institutions under the chairmanship of **Ashok Mehta**. It submitted its report in **August 1978** and made **132** recommendations to revive and strengthen the declining Panchayati raj system in the country.

- Some of its main recommendations were:
 1. The three-tier system of panchayati raj should be replaced by the two-tier system, that is, zila parishad at the district level, and below it, the mandal panchayat consisting of a group of villages with a total population of **15,000 to 20,000**.
 2. There should be an official participation of political parties at all levels of panchayat elections.
 3. A minister for panchayat raj should be appointed in the state council of ministers to look after the affairs of the panchayat raj institutions.
 4. Seats for SCs and STs should be reserved on the basis of their population
 5. The panchayat raj institutions should have compulsory powers of taxation to mobilise their own financial resources.
 6. Zila parishad should be the executive body and made responsible for planning at the district level.

- Due to the collapse of the Janata Government before the completion of its term, no action could be taken on the recommendations of the Ashok Mehta Committee at the central level. Three states of Karnataka, West Bengal and Andhra Pradesh took steps to revitalise the panchayati raj, keeping in view some of the recommendations of the Ashok Mehta Committee.

G V K Rao Committee

- The Committee on Administrative Arrangement for Rural Development and Poverty Alleviation Programmes under the chairmanship of G.V.K. Rao was appointed by the Planning Commission in 1985. The Committee came to conclusion that the developmental process was gradually bureaucratised and divorced from the Panchayat Raj. This phenomenon of bureaucratisation of development administration as against the democratisation weakened the panchayat raj institutions resulting in what are aptly called as “grass without roots”.

Recommendations

- A post of District Development Commissioner should be created. He should act as the chief executive officer of the Zila Parishad and should be in charge of all the development departments at the district level.

Hanumantha Rao committee report on District planning(1984)

- The Hanumantha Rao committee advocated separate district planning bodies under either District collector or minister.
- The committee recommended that the collector should be the coordinator, at the district level of all developmental and planning activities.

L M Singhvi Committee

- In 1986, Rajiv Gandhi government appointed a committee on ‘Revitalisation of Panchayati Raj Institutions for Democracy and Development’ under the chairmanship of L M Singhvi.

Major recommendations

1. Main recommendation was the Panchayati Raj institutions should be constitutionally recognised, protected and preserved.
2. Nyaya Panchayats should be established for a cluster of villages.
3. The Village Panchayats should have more financial resources.
4. The judicial tribunals should be established in each state to adjudicate controversies about election to the Panchayat Raj institutions, their dissolution and other matters related to their functioning.

Thungon committee

It was constituted in **1988** to examine the political and administrative structure in the district for the purpose of district planning.

Gadgil Committee

The Committee on Policy and Programmes was constituted in **1988** by the Congress Party to consider the question of “how best Panchayat Raj Institutions could be made effective.”

Rajiv Gandhi Government

- The Rajiv Gandhi Government introduced the **64th Constitutional Amendment Bill** in the Lok Sabha in **July 1989** to constitutionalise Panchayati raj institutions and make them more powerful and broad based. Although, the Lok Sabha passed the bill in August 1989, it was not approved by the Rajya Sabha. The bill was vehemently opposed by the Opposition on the ground that it sought to strengthen centralisation in the federal system.

V.P. Singh Government

- A constitutional amendment bill was introduced in the Lok Sabha by the National Front Government in September 1990. However, the fall of the government resulted in the lapse of the bill.

Narasimha Rao Government

- P V Narasimha Rao government considered the matter of the constitutionalisation of panchayat raj bodies. It introduced constitutional amendment bill in the Lok Sabha in September, 1991. This bill finally emerged as the **73rd Constitutional Amendment Act, 1992** and came into force on **24 April, 1993**. The act gives a constitutional status to the panchayat raj institutions. Hence, April 24 is celebrated as **National Panchayat Raj Day**.

73rd Amendment Act of 1992

- This act has added a new Part-IX to the Constitution of India. It is entitled as '**The Panchayats**' and consists of provisions from **Articles 243 to 243O**. In addition, the act has also added a new Eleventh Schedule to the Constitution. This schedule contains 29 functional items of the panchayats. It deals with **Article 243-G**. The act has given a practical shape to **Article 40** of the Constitution. It envisages all the states and union territories except those with population not exceeding **20 lakhs** to constitute a three tier system of Panchayat.

Salient Features

Gram Sabha (Article 243 A)

- It is a body consisting of persons registered in the electoral rolls of a village comprised within the area of Panchayat at the village level. Thus it is a village assembly consisting of all the registered voters in the area of panchayat. It may exercise such functions and powers at the village level as legislature of a state determines.

Election of Members and Chairpersons (Article 243 C)

- All the members of panchayats at the village, intermediate and district levels shall be elected directly by the people.

Reservation of Seats (Article 243D)

- Reservation of seats for scheduled castes and scheduled tribes in every panchayat and reservation of not less than one-third of the total number of seats for women. Further, not less than one-third of the total number of offices of chairpersons in the panchayats at each level shall be reserved for women.

Duration of Panchayats (Article 243 E)

- The act provides for a **five-year** term of office to the panchayat at every level.

State Election Commission (Article 243K)

- The superintendence, direction and control of the preparation of Electoral rolls and the conduct of all elections to the panchayats shall be vested in the state election commission. It consists of a state election commissioner to be appointed by the governor. Tamil Nadu state election commission was constituted in **1994**.

Finance Commission (Article 243 I)

- The governor of a state shall, after every five years, constitute a finance commission to review the financial position of the panchayats. Tamil Nadu state finance commission was constituted in 1997.

Eleventh Schedule (Article 243 G)

- It contains the following 29 functional items

1. Agriculture, including agricultural extension
2. Land improvement, implementation of land reforms, land consolidation and soil conservation
3. Minor irrigation, water management and watershed development
4. Animal husbandry, dairying and poultry
5. Fisheries
6. Social forestry and farm forestry
7. Minor forest produce
8. Small-scale industries, including food processing industries
9. Khadi, village and cottage industries
10. Rural housing
11. Drinking water
12. Fuel and fodder
13. Roads, culverts, bridges, ferries, waterways and other means of communication
14. Rural electrification, including distribution of electricity
15. Non-conventional energy sources
16. Poverty alleviation programme
17. Education, including primary and secondary schools
18. Technical training and vocational education
19. Adult and non-formal education
20. Libraries
21. Cultural activities
22. Markets and fairs
23. Health and sanitation including hospitals, primary health centres and dispensaries
24. Family welfare
25. Women and child development
26. Social welfare, including welfare of the handicapped and mentally retarded
27. Welfare of the weaker sections, and in particular, of the scheduled castes and the schedule tribes

28. Public distribution system
29. Maintenance of community assets.

PESA ACT OF 1996 (EXTENSION ACT)

- The provisions of Part IX of the constitution relating to the Panchayats are not applicable to the Fifth Schedule areas. However, the Parliament may extend these provisions to such areas, subject to such exceptions and modifications as it may specify. Under this provision, the Parliament has enacted the “**Provisions of the Panchayats (Extension to the Scheduled Areas) Act**”, 1996, popularly known as the PESA Act or the Extension Act. At present (2013), nine states have Fifth Schedule Areas. These are: Andhra Pradesh, Chhattisgarh, Gujarat, Himachal Pradesh, Jharkhand, Madhya Pradesh, Maharashtra, Odisha and Rajasthan. All the nine states have enacted requisite compliance legislations by amending the respective Panchayati Raj Acts.

Finances of Panchayat Raj

- The second administrative reforms commission of India (2005-2009) has summarized the sources of Panchayat Raj Institutions (PRIs).
 1. Grants from union government based on the recommendation of the central Finance commission as per **Article 280** of the constitution.
 2. Devolution from the state government based on the recommendations of the State Finance commission as per **Article 243-I**.
 3. Loans/grants from the state government.
 4. Programme specific allocation under centrally sponsored schemes and additional central assistance.
 5. Internal resource Generation (tax and non-tax).

Reasons for ineffective performance

1. Lack of adequate devolution
2. Excessive control by bureaucracy
3. Tied nature of funds
4. Overwhelming dependency on government funding
5. Reluctance to use fiscal powers
6. Status of the Gram Sabha
7. Creation of parallel bodies

8. Poor infrastructure

MUNICIPALITIES

- The system of urban government was constitutionalised through the **74th Constitutional Amendment Act of 1992** and came into force on **1 June 1993**.
- It comes under the following ministries
 - Ministry of Urban Development, created as a separate ministry in **1985**
 - Ministry of Defence in the case of cantonment boards
 - Ministry of Home Affairs in the case of Union Territories

EVOLUTION OF URBAN BODIES

Historical Perspective

- The institutions of urban local government originated and developed in modern India during the period of British rule. The major events in this context are as follows:
 1. In **1687-88**, the first municipal corporation in India was set up at **Madras**.
 2. In **1726**, the municipal corporations were set up in Bombay and Calcutta.
 3. **Lord Mayo's Resolution of 1870** on financial decentralisation visualised the development of local self-government institutions.
 4. **Lord Ripon's Resolution of 1882** has been hailed as the '**Magna Carta**' of local self-government. He is called as the **father of local-self-government in India**.
 5. The Royal Commission on decentralisation was appointed in **1907** and it submitted its report in **1909**. Its chairman was Hob house.
 6. Under the dyarchical scheme introduced in Provinces by the **Government of India Act of 1919**, local self-government became a transferred subject under the charge of a responsible Indian minister.
 7. In **1924**, the Cantonments Act was passed by the Central legislature.
 8. Under the provincial autonomy scheme introduced by the **Government of India Act of 1935**, local self-government was declared a provincial subject.

Major committees

Year	Commission	Head
1953-54	Taxation Enquiry Commission	John Matthai
1963-66	Rural-Urban Relationship Committee	A.P. Jain
1982	Study Group on Constitution, Powers and Laws of Urban Local Bodies and Municipal Corporations	K.N. Sahaya
1985-88	National Commission on Urbanisation	C.M. Correa

74th AMENDMENT ACT OF 1992

- This Act has added a new **Part IX-A** to the Constitution of India. It is entitled '**The Municipalities**' and consists of provisions from Articles **243-P to 243-ZG**. In addition, the act has also added a new Twelfth Schedule to the Constitution. This schedule contains eighteen functional items of municipalities. It deals with **Article 243-W**.

Composition (Article 243 R)

- All the members of a municipality shall be elected directly by the people of the municipal area.

Wards Committees (Article 243S)

- There shall be a wards committee, consisting of one or more wards, within the territorial area of a municipality having population of 3 lakh or more.

Reservation of Seats (Article 243 T)

- The act provides for the reservation of seats for the scheduled castes and the scheduled tribes in every municipality in proportion of their population to the total population in the municipal area. It provides for the reservation of not less than **one-third** of the total number of seats for women.

State Election Commission (Article 243 ZA)

- The superintendence, direction and control of the preparation of electoral rolls and the conduct of all elections to the municipalities shall be vested in the state election commission.

Finance Commission (Article 243 Y)

- The finance commission (which is constituted for the panchayats) shall also, for every **five years**, review the financial position of municipalities and make recommendation to the governor.

District Planning Committee (Article 243 ZD)

- Every state shall constitute at the district level, a district planning committee to consolidate the plans prepared by panchayats and municipalities in the district, and to prepare a draft development plan for the district as a whole. The chairman of the district panchayat shall be the chairperson of the committee and the collector shall be the vice chairman of the committee.
- District collector is the head of administration of District. His responsibility is collection of land revenue, censuses law and order, focus on development activities of district.

Metropolitan Planning Committee (Article 243 ZE)

- Every metropolitan area shall have a metropolitan planning committee to prepare a draft development plan.

Twelfth Schedule (Article 243W)

1. Urban planning including town planning
2. Regulation of land use and construction of buildings
3. Planning for economic and social development
4. Roads and bridges
5. Water supply for domestic industrial and commercial purposes
6. Public health, sanitation, conservancy and solid waste management
7. Fire services
8. Urban forestry, protection of environment and promotion of ecological aspects.
9. Safeguarding the interests of weaker sections of society, including the handicapped and mentally retarded
10. Slum improvement and upgradation
11. Urban poverty alleviation
12. Provision of urban amenities and facilities such as, parks, gardens, playgrounds.
13. Promotion of cultural, educational and aesthetic aspects.
14. Burials and burial grounds cremations and cremation grounds and electric crematoriums.
15. Cattle ponds, prevention of cruelty to animals.
16. Vital statistics including registration of births and deaths.
17. Public amenities including street lighting, parking lots, bus stops and public conveniences and
18. Regulation of slaughter houses and tanneries.

Three Types of Municipalities

- The act provides for the constitution of the following three types of municipalities in every state.
 1. A **nagar panchayat**(by whatever name called) for a transitional area, that is, an area in transition from a rural area to an urban area.
 2. A **municipal council**for a smaller urban area.
 3. A **municipal corporation**for a larger urban area

TYPES OF URBAN GOVERNMENT

- There are eight types of urban local governments in India
- 1.Municipal corporation, 2.Municipality, 3.Notified area committee, 4.Town area committee, 5.Cantonment board, 6.Township, 7.Port trust and 8.Special purpose agency.

1. Municipal Corporation

- Municipal Corporations in India are generally structured on the pattern of **Bombay Municipal Corporation**.
- Municipal corporations are created for the administration of big cities. A municipal corporation has three authorities, namely, the council, the standing committees and the commissioner. The Council is headed by a Mayor. He is the political head of corporation. He is directly elected by the people. Metropolitan area means an area having a population of **10 lakh** or more.

2. Municipality

- The municipalities are established for the administration of towns and smaller cities. Set up in the states by the acts of the concerned state legislatures and in the union territory by the acts of the Parliament of India.

Municipality Grade	Population
Class A	1 lakh or more
Class B	More than 50,000 less than 1 lakh
Class C	Less than 50,000

3. Notified Area Committee

- A notified area committee is created for the administration of two types of areas – a fast developing town due to industrialisation, and a town which does not yet fulfil all the conditions necessary for the constitution of a municipality. It is neither an elected body nor a statutory body but it is an entirely nominated body.

4. Town Area Committee

- A town area committee is set up for the administration of a small town.
- It is created by a separate act of a state legislature. It may be wholly elected or wholly nominated by the state government or partly elected and partly nominated.

5. Cantonment Board

- A cantonment board is established for municipal administration for civilian population in the cantonment area. It is set up under the provisions of the **Cantonments Act of 2006**. This Act has repealed the **Cantonments Act of 1924**. At present (2019), there are **62 cantonmentboards** in the country. A cantonment board is created as well as administered by the Central government. The executive officer of the cantonment board is appointed by the president of India. A cantonment board consists of partly elected and partly nominated members.

Classification of Cantonment Boards

<i>Category</i>	<i>Civil Population</i>
I	above 50,000
II	10,000 to 50,000
III	2,500 to 10,000
IV	Below 2,500

6. Township

- This type of urban government is established by the large public enterprises to provide civic amenities to its staff and workers who live in the housing colonies built near the plant.

7. Port Trust

- To manage and protect the ports and to provide civic amenities

8. Special Purpose Agency

- They are known as 'single purpose', 'unipurpose' or 'special purpose' agencies or 'functional local bodies'.

National level institutions providing training to the municipal personnel

1. **All-India Institute of Local Self-Government** (Mumbai) constituted in 1927; it is a private registered society
2. **Centre for Urban and Environmental Studies (New Delhi)** set up in 1967 on the recommendation of Nur-ud-din Ahmed Committee on Training of Municipal Employees(1963-1965)

3. Regional Centres for Urban and Environmental Studies (Kolkata, Lucknow, Hyderabad and Mumbai) set up in **1968** on the recommendation of Nur-ud-din Ahmed Committee on Training of Municipal Employees (**1963-1965**)
4. National Institute of Urban Affairs, established in **1976**
5. Human Settlement Management Institute, established in **1985**

Municipal Revenue

1. Tax revenue- Property tax, entertainment tax, taxes on advertisements, professional tax, tax on animals, lighting tax, pilgrim tax, market tax, toll on new bridges, Octroi.
2. Non tax revenue - fees and fines, royalty, profits and dividends, interest, sanitation charges.
3. Grants from central and state governments.
4. Devolution - Transfer of funds to local bodies from the state government. It is made based on recommendation of state finance commission.

CENTRAL COUNCIL OF LOCAL GOVERNMENT

- The Central Council of Local Government was set up in **1954**. It was constituted under **Article 263** of the Constitution of India by an order of the President of India. Till **1958**, it dealt with both urban as well as rural local governments, but after **1958** it has been dealing with matters of urban local government only. The Council is an advisory body.

Panchayat Raj in Tamilnadu

- In the post-independence era, the first enactment in democratic decentralisation in the state was the Madras village Panchayats Act, 1950 Pursuant to the white paper on the '**Reform of Local Administration**' in **1957**, the Madras Panchayats Act, 1958 and Madras District Development Council Act, 1958 were enacted.

Tamil Nadu panchayat act 1994 features

1. 3 tier system- panchayats:

- Village panchayat- Headed by President
- Panchayat Union - Headed by Chairman
- District panchayat- Headed by Chairman

2. Three tier system- Municipalities

- Town panchayat- Headed by chairman
- Municipal council- Headed by chairman
- Municipal corporation – Headed by Mayor

3. Election

The President and ward members are elected directly by the people (Age of above 18). To contest in the election, one must have attained the age of **21 years**

4. Gram Sabha

The Gram Sabha meetings must be held four times in a year i.e. January 26 (Republic Day), May 1 (May Day), August 15 (Independence Day) and October 2 (Gandhi Jayanthi)

5. Tax collected by Village panchayat:

- House tax, Vehicle tax, entertainment tax, Land tax, Water tax.

6. Strength of local bodies:

- Rural Local Bodies
 - Villages- 12564 , Panchayat Union- 388, District Panchayat- 37.
- Urban Local Bodies
 - Municipal Corporations – 21
 - Municipalities – 152
 - Town Panchayats - 561

Municipal Corporations established in 2021 are Tambaram, Kanchipuram, Karur, Kumbakonam, Cuddalore, Sivakasi.

7. Committees appointed by Tamil Nadu government related to rural local bodies:

- L.C.Jain committee(1996)
- Ko.Si.Mani committee(1997)
- M.K.Stalin committee(2007)

8. November 1st in every year celebrated as local bodies day

9. Municipal administration in Tamil Nadu:

- The municipal government was first introduced in Madras. Madras Corporation was formed in **1688**. **Nathanial Haggison** was the first mayor of Madras.

10. Reservation

- The Madras District Municipalities Act (1919-1920) were amended in 1930 to introduce reservation of seats for minorities and women. As per the Tamil Nadu Panchayats (Amendment) Act, 2016, **50% reservation for women** is being fixed in Panchayat Raj Institutions.

Important Facts

1. **Bihar** is the first state to give 50% reservation for women in Panchayat Raj Institutions.
2. **Tamilnadu** was the first state to introduce a Town Panchayat in India
3. **Walajahpet** Municipality is the first Municipality in Tamilnadu.
4. **Periyar E.V. Ramasamy** became the chairman of Erode Municipality in 1917 piped water supply scheme was implemented in 1919 by Periyar.
5. There are around **2,50,000 village panchayats** in India (2011 census)

CO-OPERATIVE SOCIETIES

- The **97th Constitutional Amendment Act** of 2011 gave a constitutional status and protection to co-operative societies. In this context, it made the following three changes in the constitution:

1. It made the right to form co-operative societies a fundamental right (**Article 19**).
2. It included a new Directive Principle of State Policy on promotion of co-operative societies (**Article 43-B**).
3. It added a new **Part IX-B** in the Constitution which is entitled "The Co-operative Societies" (**Articles 243-ZH to 243-ZT**).

