Periodic table with properties

TEST 8

9thmwptpay;
Ntjpapay;

9th STD	Unit- 12	**jdpkq;fspd; tifghl;L ml;ltid**
10th STD	Unit- 7	**mZf;fSk; %yf;$WfSk;**
	Unit- 8	**jdpkq;fspd; Mth;jjd tifgghL**
11 th vol - 1	Unit - 3	**jdpkq;fspd; Mth;jjd tifgghL**

myF 12

jdpkq;fspd; tifgghl;L ml;ltiz

mwpKfk;:

ehk ,ej cyfpy gytifj jdikAila nghUsfNshL ,Uffpw;Nwhk. ,it midjJk› jdpkqfs nttNtW Kiwapy ,izejikahy cUthdit. vyyh jdpkqfSk mtwwpd jdik kwWk gzGfspy jdpj jdik cilait. xdW Nghy kwnwhdW ,UffhJ. ,jjdpkqfisnayyhk mtwwpd gzGfspd mbggilapy thpirggLjj mwptpay mwpQhfs xU toplaj Njbf nfhzbUejdh. 1800 ,y 31 jdpkqfs klLNk mwpaggl bUejd. 1865 ,y mJ 63 jdpkqfshfpaJ. jwnghOJ 118 jdpkqfs mwpaggLssd. GJgGJ jdpkqfisf fzLgpbfFk NghJ mwpQhfs mtwwpd gzGfisf FwpjJ Gjpa Gjpa fzLgpbgGfis mwpeJ nfhss Mukgpjjdh. ,ij xOqFgLjJtJ mwptpay mwpQHfSfF fbdkhfg fhzgglJ. vdNt› ,twiw gzGfspd mbggilapy xOqFgLjj ,thfs xU jdpjJt Kiwiaj Njbdh. ,ij mbggilahff nfhzL jdpkqfis vspjpy milahsk fzL mtwiw Muhat J vspJ vdf fUjpdh. Mukg fhyk Kjy ,dWtiu gyNtW mwpQhfs vLjJiujj jdpkqfspd tifgghL gwwpa fUjJffis ,qF fhzNghk.

jdpkq;fspd; tifgghl;by; Kw;fhyf; fUj;J f;fs;:
lhgh;dhpd; Kk;ik tpjp:

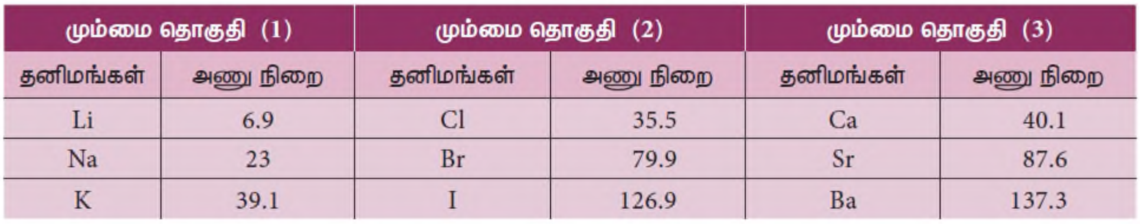
1817 ,y N[hfd Ty/gfhq lhghdh vDk n[hkhdpa Ntjpayhsh jdpkqfis mtwwpd mZ epiwapd mbggilapy tifggLjJk xU fUjij vLjJiujjhh. ,th jdpkqfis xtnthU njhFjpfFk %dW jdpkqfs nfhzl FOffshf myyJ njhFjpfshfg gphpjJ mikjjhh. ,th ,ejf FOffis "Kkik" vdW Fwpggplhh (Kkik - %dW).

lhghdh› %dW jdpkqfis mtwwpd epiwapd mbggilapy VW thpirapy mLfFk NghJ eLtpy css jdpkjjpd mZ epiw kww ,uzL jdpkqfspd mZ epiwapd ruhrhpfF Vwjjho rhpahf ,UfFk vdW $wpdhh. ,J lhghdhpd

Kkik tpjp vd mioffggLfpwJ. lhghduhy Kdnkhopaggll Kkik tpjpia vLjJiuffpwJ.

vLj;Jf;fhl;L: Kkik njhFjp (1) ,y xdwhk kwWk %dwhk jdpkqfspd mZ epiwapd $lLrruhrhp = 6.9 + 39.1 / 1 = 23. ,qF eLtpy css jdpkk Nrhbajjpd mZ epiwAk mJNt› mjhtJ

அட்டவணை 12.1 டாபர்னீரின் மும்மை விதி



மும்மை தொகுதி (1)		மும்மை தொகுதி (2)		மும்மை தொகுதி (3)	
தனிமங்கள்	அணு நிறை	தனிமங்கள்	அணு நிறை	தனிமங்கள்	அணு நிறை
Li	6.9	Cl	35.5	Ca	40.1
Na	23	Br	79.9	Sr	87.6
K	39.1	I	126.9	Ba	137.3

Fiwfs;:

- lhghduhy mffhy fllljjpy %dW njhFjpfspy fzL gpbffglll jdpkqfspy klLNk Kkikj jdpkqfisf fhz KbejJ. NkYk vyyh jdpkqfSk ,ej Kkik tpjpfF clgltpyiy.
- kpff Fiwej mZ epiw kwWk kpf mjpf mZ epiw nfhzl jdpkqfSfF ,ijg gadgLjj Kbatpyiy.

epA+yhe;j;d; vz;k tpjp:

1866 ,y› [hd epA+yheJ 56 mwpag gll jdpkqfis mtwwpd mZ epiwapd mbggilapy VW thpirapy xOqfikjjhh. mth xtnthU vllhtJ jdpKk rqfjjjpy vllhtJ RUjpAk Kjy RUjpAk (r› up› f› k› g› j› ep› r) xjjpUggJ Nghy KjyhtJ jdpkjjpd gzig xjjpUggijf fzlwpejhh. ,J 'vzk tpjp" vdW mwpaggllJ.

fhehlf rqfjjjpy vzkk vdgJ r› up› f› k› g›j›ep›r ,qF KjypYk filrpapYk r tUtijf fhzyhk. ,ijg NghyNt epA+yhejpd vllhtJ jdpkk G@hpd 'F'. ,J Kjy jdpkkhd 'H'-I jd gzGfspy xjjpUggijf fhzyhk.

epA+yhejpd vzk tpjpiag gadgLjjp jdpk Nrhbfisf fhzf.

(v.fh. Mg & Ca)

i. F, Mg, C, O, B ii. Al, Si, S, Cl, Ca

Fiwfs;:

- ,uzL NtWggll jdpkqfs xNu ,ljjpy itffggll epfoTfs eilngwwJ. v.fh. Nfhghyl kwWk epffy.
- KwwpYk khWgll gzGfis cila rpy jdpkqfs mNj njhFjpapy itffglld (Nfhghyl› epffy› gyybak› gpshlbdk kwWk ,hpbak ,it `hNyhn[d njhFjpapy mikffglld).
- vzk tpjpahdJ fhyrpajijf fhlbYk mjpf mZ epiw nfhzl jdpkqfSfF VwGilajhf ,yiy.
- epA+yheJ mllltizahdJ 56 jdpkqfSffhf klLNk Nghlgglls. gpwfhyjjpy fzLgpbffglf $ba jdpkqfSfF ,lkpyiy.

- gwfhyqfsy fzL gbffggll mha thAffs (kej thA.. eahd› Mhfhd...) xdgjhtJ jdkjjwFk Kjyhk jdkjjwFk xjj gzigf fhzgjjd. v.fh. G@hd kwWk Nrhbajjwf ,ilay itffggll eahd.

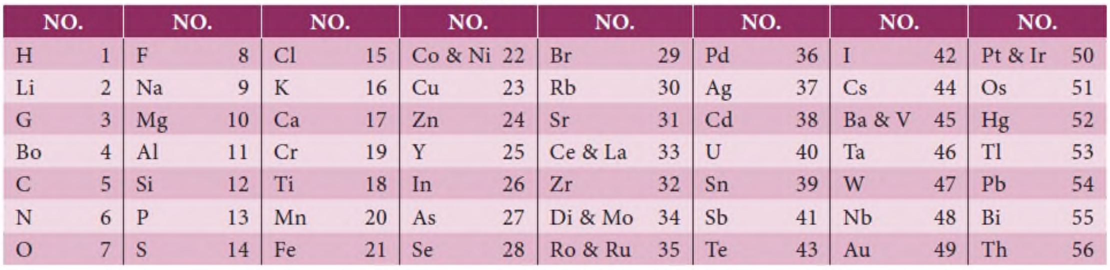
nkz nlytd jdk thir mlltiz:

1869 ,y› ,~a Ntjayhsh bklh nkz nlyt jdkqfsd gzGfs› mit mZ eiwad mbggilay mLffggLk NghJ xU Fwggll ,ilntsfFg gwF kWgbAk tUtijf fzlwejhh. ,jd mbggilay ,th jdk Mthjjd tjia cUthffdhh. ,ej tj "jdkqfsd ,awgay kwWk Ntjaay gzGfshdit mtwwd Mthjjd nrayghLfisg nghWjjJ" vdf $WfwJ. ,th mej Neujjy mwaggll 56 jdkqfis ,ej tjjad mbggilay mikjjhh. ,J jdk mlltizad RUffk vdggLfwJ.

nkz nlyt jdk thir mlltizad rwgGfs:

- ,jy vlL ezl nrqFjJf euyfSk (njhFjfs) VO gLfif myyJ fiilkll eiufSk (thir) fhzggLfdwd.
- xtnthU njhFjfFk ,uzL Jizj njhFjfs A kwWk B czL. xU njhFjay fhzggLk vyyh jdkqfSk xjj gzgidg ngwwUffk.

அட்டவணை 12.2 நியூலாந்தின் எண்ம விதி அட்டவணை



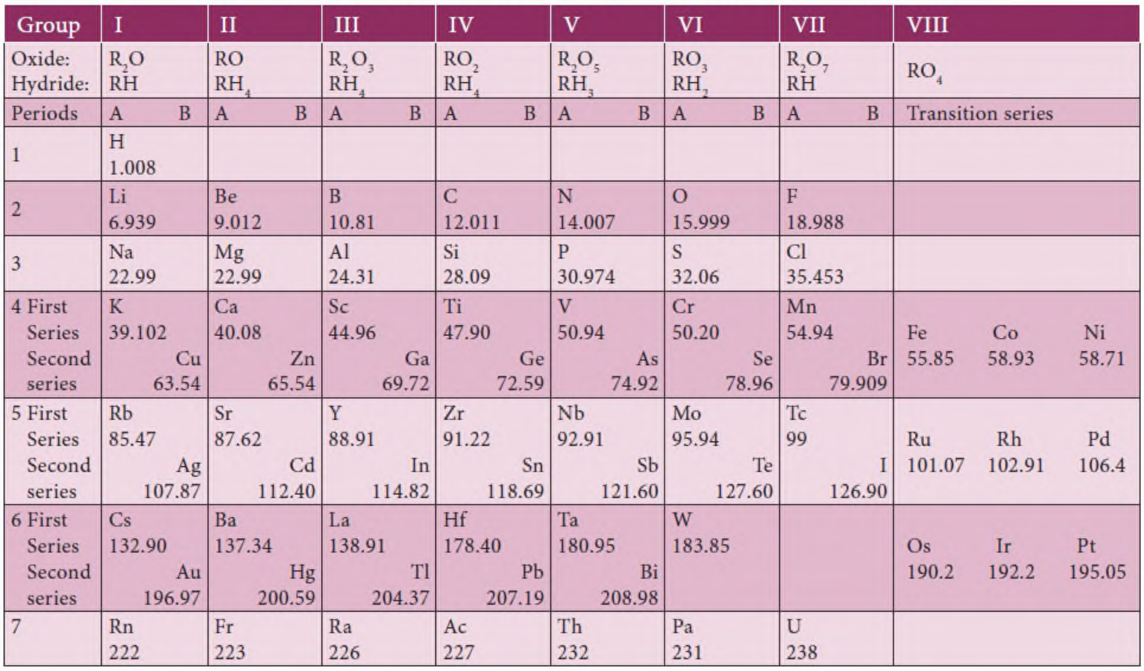
NO.		NO.		NO.		NO.		NO.		NO.		NO.		NO.	
H	1	F	8	Cl	15	Co & Ni	22	Br	29	Pd	36	I	42	Pt & Ir	50
Li	2	Na	9	K	16	Cu	23	Rb	30	Ag	37	Cs	44	Os	51
G	3	Mg	10	Ca	17	Zn	24	Sr	31	Cd	38	Ba & V	45	Hg	52
Bo	4	Al	11	Cr	19	Y	25	Ce & La	33	U	40	Ta	46	Tl	53
C	5	Si	12	Ti	18	In	26	Zr	32	Sn	39	W	47	Pb	54
N	6	P	13	Mn	20	As	27	Di & Mo	34	Sb	41	Nb	48	Bi	55
O	7	S	14	Fe	21	Se	28	Ro & Ru	35	Te	43	Au	49	Th	56

- Kjd Kiwahf jdkqfs thf rhahd Kiway tifggLjjglld. ,jdhy xjj gzGfis cila jdkqfs xNu njhFjay itffgglld. ,J Ntjaay Maitvsjhffaj.
- xjj gzGfis cila jdkqfs xNu njhFjay itffggL tifggLjjggll NghJ ry jdkqfs mtwwwfhd njhFjay itffggl Kbahky Nghd J fzlwaggllJ. Vnddwhy mtwwwnfdW jhkhdffggll mZ eiw jtW MFk. ,J fzlwagglL gd ,ej jtW rh nraaggllJ. v.fh. Kjyy nghyajjd mZ eiw 14 vd mwaggllJ. ,ij nkznlyt kWgbAk MuhaeJ mZ eiw 9 vdf fzlweJ rhahd njhFjay mij itjjhh.
- mej Neujjy fzLggbffgglhj jdkqfSfF vdW mlltizad gjjay ,lk tlgglJ. mtwwd gzGfs $l Kddwaggll jhf mikejJ. ,J Ntjaay Muharria ,dDk J}zLtjhf mikejJ. v.fh. nkznlyt› mYkdak kwWk rylfhDfFf fNo tuf$ba jdkqfSfF vfh mYkdak kwWk vfh. rylfhd vdg ngahlhh. NkYk mtwwd gzGfs ,tthWjhd ,UfFk vd Kddwtjjhh. mtuJ fhyjjNyNa gdh fzLggbffggll n[hkhdak mthd $wW rh vd ej&gjjJ.

FiwghLfs:

- gzGfsy mjf NtWghLss jdkqfSk xNu njhFjay itffgglld. v.fh. fbd cNyhfqfshfa nrkG kwWk ntssp nkd cNyhfqfshfa Nrhbak kwWk nghllhraj NjhL xNu njhFjay itffgglld.

அட்டவணை 12.3 மெண்டெலீவின் தனிம அட்டவணை



Group	I	II	III	IV	V	VI	VII	VIII
Oxide: Hydride:	R_2O RH	RO RH_4	R_2O_3 RH_4	RO_2 RH_4	R_2O_5 RH_3	RO_3 RH_2	R_2O_7 RH	RO_4
Periods	A B	A B	A B	A B	A B	A B	A B	Transition series
1	H 1.008							
2	Li 6.939	Be 9.012	B 10.81	C 12.011	N 14.007	O 15.999	F 18.988	
3	Na 22.99	Mg 22.99	Al 24.31	Si 28.09	P 30.974	S 32.06	Cl 35.453	
4 First Series Second series	K 39.102 Cu 63.54	Ca 40.08 Zn 65.54	Sc 44.96 Ga 69.72	Ti 47.90 Ge 72.59	V 50.94 As 74.92	Cr 50.20 Se 78.96	Mn 54.94 Br 79.909	Fe 55.85 Co 58.93 Ni 58.71
5 First Series Second series	Rb 85.47 Ag 107.87	Sr 87.62 Cd 112.40	Y 88.91 In 114.82	Zr 91.22 Sn 118.69	Nb 92.91 Sb 121.60	Mo 95.94 Te 127.60	Tc 99 I 126.90	Ru 101.07 Rh 102.91 Pd 106.4
6 First Series Second series	Cs 132.90 Au 196.97	Ba 137.34 Hg 200.59	La 138.91 Tl 204.37	Hf 178.40 Pb 207.19	Ta 180.95 Bi 208.98	W 183.85		Os 190.2 Ir 192.2 Pt 195.05
7	Rn 222	Fr 223	Ra 226	Ac 227	Th 232	Pa 231	U 238	

- i`lu[DfF vdW xU jd ,lk nfhLffggl Kbatyiy. mNyhfkhfa i`lu[d› yjjak› Nrhbak kwWk nghllhrak Nghdw nkd cNyhfqfNshL xNu njhFjay itffgglld.
- $bfnfhzNl nryYk mZ eiw vDk tjjia ry Ntisfsy fil gbff Kbatyiy. v.fh: Co & Ni, Te & I
- lNrhNlhgGfSfF jdahf ,lk xJffglltyiy.

n[hkhdajjd gzG:

jdkqfs	nkznlytd KddwtgG (1871)	cz ik gzG (1886)
mZ eiw	VwfFiwa 72	72.59
xgglhjj	5.5	5.47
ewk	mlh rhkgy	mlh rhkgy
Mfi]bd FwaL	Es O_2	Ge O_2
FNshiubd jdik	Es Cl_4	Ge Cl_4

etd fhy jdk thir mlltiz:

1913 y› MqfNya ,awgayhsh n`dw Nkh]Ny vdgth jdDila X– fjh rijT Nrhjid %yk jdkqfsd gzGfs mtwwd mZ vzizg nghWjJ ,UfFNk jtu mtwwd eiwiag nghWjJ ,UffhJ vdW e&gjjhh. ,jd tisthf etd fhy jdk thir mlltizahdJ mZ vzzd VW thiray mikffgglJ.

,ej etd fhy mlltiz nkzly/g mlltizad xU thT gLjjNy MFk. nkzly/g mlltiz FWk mlltiz vdWk etd mlltiz ezl mlltiz vdWk mwaggLfwJ.

etld Mthj;jd tjj:

xU jdkjjd mZ vzzhdJ (Z) mtwwYss GNuhllhdfsd (Neh kd Rik) vzzfifia klLk Fwggjyiy mtwwYss vyfluhdfsd (vjh kd Rik) vzzfifiaAk FwffwJ. jdkqfsd ,awgay kwWk Ntjaay gzGfs mtwwd GNuhllhdfsd vzzfifiar rhhejit myy; khwhf vyfluhdfsd vzzfifiaAk rhhejjhFk. vdNt etd Mthjjd tjjia ,tthW $wyhk. 'jdkqfsd ,awgay kwWk Ntjaay gzGfs mtwwd mZ vzfsd jdk thir nrayghLfshFk". ,ej etd tjjia itjJ etd jdk thir mlliz cUthffgglJ.

els thir jdk ml;ltiz mikggd; rpwgGfs;

- midjJj jdkqfSk mtwwd mjfhfFk mZ vzzwF VwwhwNghy mikffgglLssd.
- jdk mlltizay jdkqfs filkllkhf thirggLjjggll mikgG 'thirfs' vd mioffggLfwJ. nkhjjk VO thirfs cssd.
- jdkqfs mtwwd mZffsy css $Lfsd vzzfiffSfF Vwg thirfsy mikffggLk.
- jdk thir mlltizay NkyUeJ fohf nrqFjjhf css gjj njhFjfs' vdggLk. jdk mlltizay 18 njhFjfs cssd.
- xtnthU njhFjaYk css jdkqfsd gzgwF Vwg ,it gy FLkgqfshfg gfffgglLssd.

etld jdk thir njhFjfs;

FO	njhFjfs;
1	fhu cNyhfqfs
2	fhu kz cNyhfqfs
3 to 12	,ilei y cNyhfqfs
13	Nghuhd FLkgk
14	fhhgd FLkgk
15	ielu[d FLkgk
16	Mf]j[d (m) rhyNfhd FLkgk
17	`hy[dfs / cggdfs
18	mha thA / kej thA

jdkq;fis njhFjfshf thir; gLj;Jjy;

xU jdkjjy mtwwd vyfluhdfs clfUitr Rww $Lfsy itffgglLssd vdgij ehk mwNthk. xtnthU $Lk xdW myyJ mjwF Nkwgll Jizf $Lfisf nfhzLssJ. ,twwy vyfluhdfs xU Fwggll tifay eugggggLfdwd.

,ej Jizf $Lfs s, p, d kwWk f MFk. Jizf$Lfsy vyfluhdfs itffgglLss mikggd mbggilay jdkqfs s, p, d kwWk f vd ehdF Jizj njhFjfshfg gfffgglLssd.

1. s– njhFj jdkqfs: njhFj 1 kwWk 2-,y css jdkqfis ruikfFk NghJ filrp vyfluhdhdJ s Jizf $lby itffggLfwJ. vdNt ,ej

jdpkqfs s– njhFjp jdpkqfs vdW mioffggLfpdwd. i`lu[d jtpu njhFjp xdwpd jdpkqfs cNyhfqfshFk. ,it eUld tpidGhpeJ cUthfFk fiuryhdJ fhafwpfspypUeJ fpilfFk. rptgG rhajij Cjh epwjJfF khwWk. ,ejf fiuryfs mjpf fhujjdik nfhzljhff fhzggLfpdwd vdNt> ,it fhu cNyhfqfs vdW mioffggLfpdwd. njhFjp 2 ,d jdpkqfSk cNyhfqfNs. ,it Mf]p[NdhL ,izeJ Mfi]Lfis cUthfFfpdwd. KdG ,it 'Gtp' vdW mioffgglld. ,ej Mfi]Lfs ehpy fiuAk NghJ fhu fiuryfis cUthfFfpdwd. vdNt> ,it fhu kz cNyhfqfs vd mioffggLfpdwd.

2. p-njhFjp jdpkqfs: ,it mlltizapy 13 Kjy 18 njhFjpfs tiu csssd. ,twwpy Nghuhd> fhhgd> ielu[d> Mf]p[d> GShpd FLkgk kwWk kej thAffs (`ypak jtpu) mlqFk. ,it gpujpepjpjJt jdpkqfs vdW mioffggLfpdwd. p njhFjp nghpa mstpy NtWglI jdpkqfspd rqfkkhFk. ,ej xU njhFjpapy kILNk cNyhfqfs> mNyhfqfs kwWk cNyhfg Nghypfs vdw %dW tifgghLk fhzggLfpdwd.

3. d-njhFjp jdpkqfs: ,it 3 Kjy 12 njhFjp tiu css jdpkqfis csslffpaJ. ,it jdpk mlltizapd ikajjpy fhzggLfpdwd. ,twwpd gzGfs s njhFjp kwWk p njhFjp jdpkqfSfF ,ilapy fhzggLk. vdNt> ,it ,ilepiyj jdpkqfs vd mioffggLfpdwd.

4. f– njhFjp jdpkqfs: ,it yhejdjij mLjJss yhejidLfs vdggLk 14 jdpkqfisAk Mfbdjij mLjJss MfbidLfs vdggLk 14 jdpkqfisAk csslffpajhFk. ,it jdpk thpir mlltizapy mbgghfjjpy itffgglLssd. ,it cs ,ilepiyj jdpkqfs vdWk mioffggLfpdwd.

etPd jdpk thpir mlltizapd; rpwgGfs;

- ,ej mlltiz mZ tpd kpFej mbggilj jdikahd mZ vziz mbggilahff nfhzlJ.
- ,J jdpkjjpd miktpljijAk mZ mikgigAk njspthf xUqfpiz ffpwJ.
- xtnthU thpir KbtJk thjg nghUjjkhdJ. xU thpirapy mZ vz mjpfhpff mjpfhpff Mwwy $Lfs kej thA tUk tiu nkJthf epukGfpdwd.
- ,J epidtpy itjJf nfhstjwFk kWgb cUthfFtjwFk vspaJ.
- xtnthU njhFjpAk jwrhhG cilaJ. ,jdhy Jizj njhFjpfs Ntzlhk vd KbT nraagglIJ.
- xU jdpkjjpd INrhNlhgGfs xNu mZ vzizf nfhzLssjhy mtwwpwF xNu miktplk NghJk vd vLjJf nfhssgglIJ.
- vllhk njhFjpapd (nkznlyt mlltiz) miktplKk rhp vd epU&gpffgglIJ. ,ilepiyj jdpkqfspd gzGfs mtwwpd tyJ kwWk ,lJGwk css jdpkqfspd gzGfSfF ,ilggllljhf cssjhy mit eLtpy nfhzL tuggIld.

- ,ej mlltiz cNyhfqfisAk mNyhfqfisAk jdpj jdpahf gphpffpwJ. mNyhfqfs mlltizapd Nky tyJ %iyapy mikeJssd.

- nkzlyt mlltizapy ,lk khwp itffgglbUej jdpkqfs midjJk rhp nraagglL jwNghJ rhpahd ,ljjpy itffgglLssd. Vnddwhy ,it mZ vziz mbggilahff nfhzlit.

- yhejidLfSk MfbidLfSk mlltizapd mbapy itffgglljwF rhpahd fhuzk nfhLffgglIJ.

jdpk thpir ml;ltizapy; i`lu[dpd; epiygghL:

i`lu[d kpfTk Nyrhd› rpwpa kwWk jdpk thpir mlltizapy Kjy jdpkkhFk. ,jDila mZ mikgG (IS') kpfTk vsjaJ. ,J mlltizapy xU jdp

Jizf $Lfspd vyfluhdpd vzzpfif

$Lfspd vz	1(K)	2 (L)		3 (M)			4(N)			
Jizf $L	1s	2s	2p	3s	3p	3d	4s	4p	4d	4f
mjpfglr vyfluhdfs	2	2	6	2	6	10	2	6	10	14
mjpfglr vyfluhdfs	2	8		18			32			

,ljjpy cssJ. ,it fhu cNyhfk kwWk `hy[dpd gzig jdDs nfhzLssd.

1. i`lu[d jdJ xNu vyfluhid ,oeJ fhu cNyhfqfisg Nghy Neh kpd madpahf (H^+) khWk jdik cilaJ.

2. ,J N`y[dfs (cggdpfs) Nghy xU vyfuhidg ngwW i`liuLfshf (H^-) khWk jdik nfhzLssJ.

3. fhu cNyhfqfs jpzkqfs: mNj Ntisapy i`lu[d xU thA.

vdNt jdpk thpir mlltizapy i`lu[dpd epiygghL ,dDk rhrirfFhpaNj. Vnddwhy i`lu[dpd gzGfs jdpjjdik nfhzlitahFk.

ke;j thAf;fspd; epiygghL:
`ypak› epahd› Mhfhd› fphglhd› nrdhd kwWk 18 Mk njhFjpapy css Nulhd Nghdw jdpkqfs mhpa thAffs myyJ kej thAffs vd mioffg gLfpdwd. ,it XuZj jdpkqfs. kww nghUlfSld mttsT vspjpy tpid Ghpt jpyiy. vdNt› ,it kej thAffs vdW mioffggLfpdwd. NkYk› ,it kpfr rpwpa mststNyNa fhzggLfpdwd. vdNt› ,it mhpa thAffs vdWk mioffggLfpdwd.

cNyhfq;fs;› mNyhfq;fs; kwWk; cNyhfg; Nghyp;fs;:
cNyhfq;fs;:

cNyhfqfs nghJthf fbdkhd› gpufhrkhd› fkgpahf ellf$ba› jflhf mbfff$ba. cUff$ba kwWk ntggjijAk kpdrhujijAk fljjf $ba jdikAilait. ghjurjijj jtpu vyyh cNyhfqfSk miw ntgg epiyapy jpzkkhfNt ,UfFk. ,it jdpk thpir mlltizapy nghpa ,ljijf nfhzLssd. ,it foffzlthW tifggLjjggLssd.

1. fhu cNyhfqfs. v.fh: yppjjpak Kjy guhdrpak tiu.

2. fhu kz cNyhfqfs: v.fh: nguyak Kjy Nubak tiu.
3. ,ileiy cNyhfqfs: v.fh: njhFj IIIB Kjy IIA tiu
4. PnjhFj jdkqfs v.fh: Al, Ga, In, Tl, Sn, Pb kwWk Bi.

mNyhfqfs:

mNyhfkhdJ gsgsggww; nkdikahd; fkgahf ell Kbahj; jflhf mbff Kbahj; kdrhujijf fljjhj jdikAilaJ. NtWtjkhff $wdhy; cNyhfg gzG ,yyhj jdkqfs ahTNk mNyhfqfshFk v.fh: mNyhfqfs pnjhFjay klLNk mikffgglLssd. pnjhFj mNyhfqfs : C, N, O, P, S, Se, N`y[dfs (F, Cl, Br kwWk I) kwWk kej thAffs (He – Rn).

cNyhfg Nghyfs:

cNyhfk kwWk mNyhfk Mfatwwd gzGfisf nfhzlit cNyhfg NghyfshFk. v.fh. Nghuhd; Mhnrdf.

cNyhff fyit:

f.K. 3500 y kffs ntzfyk vdw xU cNyhff fyitia cgNahfjjdh. vdNt; cNyhff fyitia cUthfFtJ kwWk cgNahfggLjJtJ VwfdNt toffjjy ,UejJjhd. ,dW ehk gadgLjJk mNef cNyhfg nghUsfs cNyhff fyitfshFk. cNyhff fyit vdgJ xdwwF Nkwgll cNyhfqfsd fyitahFk. cNyhfqfs cUffgglL; edF fyffgglL cNyhff fyitfs cUthffggLfdwd. kf mhjhfNt mNyhfqfs cNyhfqfSld fyffgglL cNyhfffyitfs cUthffggLfdwd.

nghJthf cNyhff fyitfs mit cUthffggll cNyhfqfis tl mjf gaDssjhf ,Uffdwd. gjjisahdJ nrkG kwWk Jjjehff fyit MFk.

edikfs:

- ,it tiutiy JUggbggJk. mhjJg NghtJk ,yiy. mggbNa mhjjhYk rwjsNt NrjkilAk.
- ,it J}a cNyhfjij til fbdkhfTk tyikahdjhfTk ,UfFk. v.fh: jqfk nrkNghL fyffggLk NghJ J}a jqfjij til tyikahdjhf ,UfFk.
- ,it J}a cNyhfjij til fljJk jdik Fiwejit. v.fh: nrkG mjd cNyhff fyitfshfa gjjis kwWk ntzfyjij til edF ntggk kwWk kdrhujijf fljJk.
- rytwwd cUF eiy J}a cNyhfjjd cUF eiyia til FiwT. v.fh: gwwhR vdgJ <ak kwWk ntssajjd fyit. ,jd cUF eiy FiwT.

eid tiy nfhsf:

- lhghdh jdkqfis mtwwd rhhG mZ eiwad mbggilay %dW jdkqfs nfhzl FOffshfg gjjhh. (Kkik)
- [hd eAyheJ 56 njhej jdkqfis mtwwd mjfhfFk mZ eiwad mbggilay mlltizg gLjjdhh.
- bklhl nkzlyt Mthjjd mlltizia Kdnkhoejhh.

- jd▯k Mthjjd mlltiza▯y 'njhFj▯' vdggLk vlL nrqFjj gjj▯fSk 'th▯ir' vdggLk VO f▯ilkll th▯irfSk czL.

- etd jd▯k th▯ir mlltiza▯y vyyh jd▯kqfSk mtww▯d mj▯fh▯fFk mZ vz z▯d mbggila▯y mikffgglLssd.

- jd▯kqfs jd▯k th▯ir mlltiza▯y 7 th▯irfshfTk 18 njhFj▯fshfTk g▯h▯jJ mikffgglLssd.

- jd▯kqfs mtww▯d Jizf $Lfs▯d mbggila▯y njhFj▯fs▯y mikffgglLssd.

- njhFj▯a▯Yss jd▯kqfs▯d xUk▯jj gzg▯wF Vwg mit xNu FLkgkhf njhFffgglLssd.

- mj▯f glrkhf s, p, d kwWk f njhFj▯fs▯y KiwNa 2› 6› 10 kwWk 14 vyfluhdfs itffggLf▯dwd.

10th mwptpay;
myF 7
mZf;fSk; %yf;$WfSk;

mwpKfk;

ekikr RwwpAssgUngnghUsfs midjJk mZffshy Mdit vdgijehk Kd tFgGfspy gbjJsNshk. Kjd KiwahffpK. (ngh.M.K) 5k E}wwhzby fpNuffj jjJttpayhshfs mZitg gwwpajqfsJnfhsififantspapllldh. mthfsJnfhsifahdJ KwwpYk jjJtk rhhejNjadwpmjwFvejtpjmwptpay mbggilAk ,yiy.

[hd lhyld mZitg gwwpaKjy mwptpay NfhlghlbidntspapllLhh. lhyldpd rpyNfhlghLfs N[.N[. jhkrd>&jhNghhL>ey]Nghh> ~pNuhbQrh (Schrodinger) NghdwgpeijamwptpaymwpQhfspd MaTfshy jtWvdfzlwpagglIJ. mthfsJMaTKbTfspd mbggilapy lhyld NfhlghlbdFiwfs effgglL'etdmZfnfhsif'vdwNfhlghLKd nkhopaggllJ. etdmZf nfhsiffspd rpyKffpafUjJUffs gpdgtUkhW.

- mZvdgJgpsfff $baJfs (vyflUhd>GNuhllhd epA+lUhd fzLgpbgGfFg gpwF)
- xNujdpkjjpd mZffs nttNtWmZepiwfisg ngwWssd. (lNrhNlhgGfspd fzLgpbgGfSfFg gpwFv.fh. $_{17}Cl^{35}$, $_{17}Cl^{37}$)
- nttNtWjdpkqfspd mZffs xNumZepiwfisg ngwWssd. (lNrhghhfspd fzLgpbgGfSfFg gpwFv.fh. $_{18}Ar^{40}$, $_{20}Ca^{40}$)
- mZitMffNth>mopffNthKbahJ. xUjdpkjjpd mZffiskwnwhUjdpkjjpd mZffshfkhwwKbAk. (nrawifkhwWjdpkkhffy Kiw)
- mZthdJvspa KO vzfspd tpfpjjjpy ,UffNtzbamtrpakpyiy. (v.fh. FSfNfh] $C_6H_{11}O_6$ C : H : O = 6 : 12 : 6 myyJ 1 : 2 : 1 kwWk RfNuh] $C_{12}H_{22}O_{11}$ C : H : O = 12 : 22 : 11
- mZvdgJNtjptpidapy <LgLk kpfrrpwpaJfs
- xUmZtpd epiwapypUeJmjd Mwwiyfzffpl KbAk. ($E = mc^2$)

etdmZfnfhsifahdJmZffspd ,awgpay kwWk Ntjpapay gzGfSfFmbggilahJ. mZitg gwwpambggilf fUjJfiseqfs Kd tFgGfspy gbjJsshfs. jwNghJmZ itg gwwptphptthfghhgNghk.

mZkwWk; mZepiw:
vejxUnghUs epiwkwWk gUkidg ngwWssNjh>mgnghUs gUnghUs vdggLk. gUnghUsfspd mbggilj JfsfsmZffs MFk. ,ejmZffNsgUnghUsfspd epiwfFf fhuzk. etdmZfnfhsifapd gbmZthdJvyfluhd>GNuhllhd>epA+luhd Nghdw cgJfsfisj jdDs nfhzLssJ. ,twwpy GNuhllhdfSk epA+luhdfSk FwpggllJjffepiwiag ngwWssd. ,twWld xggpLk NghJvyfluhdfspd epiwkpfTk FiwT. vdNtxUmZtpd epiwfFGNuhllhdfSk epA+luhdfSNkfhuzkhfcsssd.

,jdgbGNuhllhdfs kwWk eA+luhdfsd $LjNymejmZ td "eiwvz"vdggLk.

jdjjmZ thdJkfTk rwaJ. vdNtmjd eiwiaf fzffLtJkfTk rukkhdJ. ehk ngUknghUsfsd eiwiaf fuhk kwWk fNyhfuhky fzffLNthk. mJNghymZ td eiwahdJ'mZ eiwmyfdhy'(amu) msffggLfwJ.

fhhgd lNrhNlhgGfsy 6 GNuhllhdfisAk 6 eA+luhdfisAk ngwWssC – 12mZ td eiway 12 ,y xUgFjNamZ eiwmyFMFk.

(FwggG: jwfhyjjy mZeiwiaf FwgglamuvdwFwalbwFgjy 'U'vdwFwaLgadgLjjggLfwJ. VwjjhoxUGNuhllhdd eiwmyyJeA+luhdd eiwahdJ1amuMFk).

xgGmZeiw(RAM)

mZvdgJkfrrwajhf ,Uggjhy mjDilaeiwiaNeubahff fzfflKbahJ. vdNtKwfhyjjy mZeiwiaf fzffLtjwF›mjNdhLnjhlhGilakwnwhUjdkjjd eiwNahLxgglLfzffllhhfs. mthfs xNukhjhahdeiwiaf nfhzl ,uzLmyyJmjwFNkwgllmZffisxNuNeujjy vLjJf nfhzL›mtwwy xUjdkjjd mZeiwfFFwgglllkjgigmsjJmjidjllmsthff nfhzL›mjDld xgglLkwwjdkqfsd mZeiwfisf fzffllldh. ,tthWngwggllmZeiwxgGmZeiwvdggLk. Kjyy i`lu[d mZtd eiwiajllmsthff nfhzLkwwmZffsd eiwfs fzfflgglld. i`lu[dd ($_1H^1$, $_1H^2$, $_1H^3$) lNrhNlhg gzGfshy gddh i`lu[d mZtwFg gjy Mfr[d mZthdJjllmsthfvLjJf nfhssggllJ. jwNghJ›mZeiw 12 nfhzlfhhgdd eiyjjlNrhNlhgghdC – 12lNrhNlhgghdJxgglLmZeiwiaf fzfflj llmsthfvLjJf nfhssggLfwJ.

xNuNeujjy vLjJf nfhzL›mtwwy xUjdkjjd mZeiwfFFwgglllkjgigmsjJmjidjllmsthff nfhzL›mjDld xggllkwwjdkqfsd mZeiwfisf fzfflldh. ,tthWngwggllmZeiwxgGmZeiwvdggLk. Kjyy i`lu[d mZtd eiwiajllmsthff nfhzLkwwmZffsd eiwfs fzfflgglld. i`lu[dd ($_1H^1$, $_1H^2$, $_1H^3$) lNrhNlhg gzGfshy gddh i`lu[d mZtwFg gjy Mfr[d mZthdJjllmsthfvLjJf nfhssgglJ. jwNghJ›mZeiw12nfhzlfhhgdd eiyjjlNrhNlhgghdC – 12lNrhNlhgghdJxgglLmZeiwiaf fzfflj llmsthfvLjJf nfhssggLfwJ.

xUjdkjjd xgGmZeiwvdJmjjdkjjd lNrhNlhgGfsd ruhrhmZeiwfFk C – 12mZ td eiway 1/12gqfd eiwfFk cssfjkhFk. ,J'A$_r$'vdWFwgglggLfwJ. ,jid'jllmZvil'vdTk miofFyhk.

xgGmZeiw:

$$(A_r)=\frac{\text{xU jdkjjd lNrhNlhgGfsd ruhrh mZ eiw}}{\text{xU C-12 d mZ eiway } \frac{1}{12} \text{ gqfd eiw}}$$

mZeiwiaf fzfflf$baetdKiwahd‘eiwewkhiykhd’Kiway (mass Spectrometric method) C – 12jllmsthfg gadgLjjggLfwJ. ngUkghyhd jdkqfsy xgGmZeiwahdJ KO vzfisxlbNacssjhy fzfflbwFvsjhf KO vzfshfkhwwNagadgLjJfNwhk. ryjdkqfsd xgGmZeiwfs glbaylgglLssJ.

jdkqfsd xgGmZeiw (C – 12mstL)

jdkk	FwaL	A_r
i`lu[d	H	1
fhhgd	C	12
ielu[d	N	14
Mfr[d	O	16
Nrhbak	Na	23
nkfdrak	Mg	24
rygh	S	32

XgGmZeiwvdgJxUtfjk›vdNtmjwFmyF ,yiy. xUjdkjjd mZeiwiafuhky FwggLtjhff nfhzlhy mjwF‘fuhk mZeiw”vdWngah.
i`lu[dd fuhk mZeiw= 1f
fhhgdd fuhk mZeiw= 12f
ielu[dd fuhk mZeiw= 14f
Mfr[dd fuhk mZeiw= 16f

XgGmZeiwvdgJxUtfjk›vdNtmjwFmyF ,yiy. xUjdkjjd mZeiwiafuhky FwggLtjhff nfhzlhy mjwF‘fuhk mZeiw”vdWngah.
i`lu[dd fuhk mZeiw
fhhgdd fuhk mZeiw

ruhrhm Zeiw(AAM):
xUjdkjjd mZeiwiavtthWfzffLtha? ,twiwf fzffLtJvdgJkfTk rukk. Vnddy jdkqfs ,awifay gylNrhNlhgGfsd fyitahfcssd. xtnthUlNrhNlhgGk jdjjdmZeiwiaf nfhzLssJ. jdkjjd mZeiwiaf fzffLkNghJ ,ejlNrhNlhgGfisf fzffy vLjJf nfhstJmtrak.

xUjdkjjd ruhrhm ZeiwvdgJ ,awifay filffff$bafzfflgglllNrhNlhgGfsd ruhrheiwiaf FwggjhFk.

Mdhy ,awifay midjJlNrhNlhgGfSk xNumstyy filggjyiy. mZeiwiaf fzffLk NghJmidjJlNrhNlhgGfsd eiwfs kwWk rjtjmsTfs Nghdwitfzffy vLjJf nfhssgglLfwJ. vdy›ruhrhm ZeiwvdwhyvddŽ cjhuzkhf 9 amu mZeiwcsslNrhNlhgG 50 tOffhLk 10 amu mZeiwcsslNrhNlhgG 50 tOffhLk vLjJf nfhssggllhy mjDilaruhrhm ZeiwfofzlthWfzfflggLfwJ.

ruhrhm Zeiw:

= (1 tJlNrhNlhggd eiw× 1 tJlNrhNlhggd rjtjmsT+ (2tJ lNrhNlhggd eiw× 2tJ lNrhNlhggd rjtjmsT) vdNtnfhLffgglljd;kjj;d ruhrhp

mZep;iw= $=(9\times\frac{50}{100})+(10\times\frac{50}{100})$

= 4.5 + 5 = 9.5 amu

(FwpgG: fzff;Lk NghJ tpOffhlbid>jrkkhfkhwwpf zff;lNtzLk. cjhuzkhf 50 tpOffhLvdgij50/100 (m) 0.50vdwthWfzffpy vLjJf nfhssNtzLk)

jd;kthp;irmlltiza;y FwpggplgglLssjd;kqfs;d mZep;iwvdgJruhrhpmZep;iwahFk. r;yNeuqfs;y mZvilvdgJruhrhpmZep;iwiaf FwpggjhFk. jd;kthp;irmlltiza;d ngUkghyhdjd;kqfs;d mZep;iwvdgJKO vzfshf ,Uggj;yiyvdmwpaggLfpwJ. cjhuzkhfjd;kthp;irmlltiza;y fhhgd;d mZep;iw12.00 amuvdgjwFgj;yhf12.01 amuvdWnfhLffgglLssJ. ,jwFfhuzk fhhgd;d mZep;iwiaf fzff;LkNghJC – 12kwWk C – 13 d lNrhNlhgGfs fzff;y vLjJf nfhssggLf;dwd. fhhgd - 12kwWk fhhgd - 13Mf;atwwpd ,awifgutyfs KiwNa98.90%kwWk 1.10%MFk. fhhgd;d ruhrhpmZep;iwfofffzlthWfzff;lggLfpwJ.

fhhgd;d ruhrhpmZep;iw

$$=(12\times\frac{98.9}{100})+(13\times\frac{1.1}{100})$$

= (12 × 0.989) + (13 × 0.011)

= 11.868 + 0.143 = 12.011 amu

,j;y;UeJfhhgd;d mZep;iw12 amuvdgJfhhgd lNrhNlhgGfs;d ruhrhpmZep;iwNajtp>jd;jjfhhgd;d mZep;iwmyy.

r;yjd;kq;fs;d; mZep;iwfs;:

mZvz;	ngah;	Fwpa;L	mZep;iw
1	i`lu[d	H	1.008
2	`y;ak	He	4.003
3	y;jj;ak	Li	6.941
4	ngh;y;ak	Be	9.012
5	Nghuhd	B	10.811

ruhrhpmZep;iwiaf; fzf;f;Ljy;:

v.fhfzfF 1 : G;k;a;d NkwgugGkwWk kd;jclyjy mjpfkhff fhzgglf$bajd;kk Mfr;[d. %dWtifahde;iyjjlNrhNlhgGfs;d fyitahfcssJ.

Mf;r;[d;d; lNrhNlhgGfs;

lNrhNlhg;	ep;iw	% gutyy;
$_{8}O^{16}$	15.9949	99.757
$_{8}O^{17}$	16.9991	0.038
$_{8}O^{18}$	17.9992	0.205

Mf;r;[d;d; mZep;iw

= (15.9949 × 0.99757) + (16.9991 × 0.00038)
+ (17.9992 × 0.00205)
= 15.999 amu.

v.fh. fzfF 2 : ,awifay jdkk Nghuhd vdgJ Nghuhd - 10 (5 +GNuhllhdfs 5eA+luhdfs) kwWk Nghuhd - 11 (5GNuhllhdfs 6eA+luhdfs) Mfatwwd fyitahfcssJ. B – 10 d rjtjguty 20MfTk B – 11 d rjtjguty 80 MfTk cssJ. vdy Nghuhdd ruhrheiwfofz lthWfzfflggLfwJ.

Nghuhdd mZeiw

$$=(10´\,\frac{20}{100})+(11´\,\frac{80}{100})$$

= (10 × 0.20) + (11 × 0.80)
= 2 + 8.8
= 10.8 amu

%yf;$W kwWk; %yf;$W eiw:

kejthAffisj jtungUkghyhdjdkqfsd mZffshdJmNjjdkjjd mZffSlNdhmyyJgwjdkqfsd mZffSlNdh ,izeNjfhzggLk. ,jwF %yf$W vdWngah. ,uzLmyyJmjwFNkwgllmZffs mitfSffilNaahdxUtYthdNtjffthrrtirahy (NtjggizggHy) xdwizeJcUthff $baJ›xU %yf$W MFk.

%yf;$Wfsd; tifgghLfs;:

,uzLmyyJmjwFNkwgllxNujdkjjd mZffNshmyyJnttNtWjdkqfsd mZffNshkhwhtfj tjggb›xUFwggll tfjjjy xdwizeJcUthtNj %yf$W vdggLk. MfNt %yf$W vdgJjdkkhfNthmyyJNrhkkhfNth ,Uffyhk. xU %yf$whdJxNujdkjjd mZffshy cUthffggllhy mJxjjmZ %yf$W vdmioffggLk. xU %yf$whdJnttNtWjdkqfsd mZffshy cUthffggllhy mJNtwwZ %yf$W vdmioffggLk. %yf$wy cssmZffsd vzzfifNamk%yf$wd ‘mZfflLvz”MFk.

%yf;$Wfsd; tifgghLfs;

mZf;fl;Lvz;	mZf;fsd; vz;zf;if	ngah;
1	1	XuZ
2	2	<uZ
3	3	%tZ
>3	>3	gymZ

cjhuzkhfMfr[id vLjJf nfhsNthk. Mfr[d thAMrr[d (O_2)›XNrhd (O_3)Mfa ,uzLGwNtwWiktbtqfisf nfhzlJ. xUMfr[d (O_2)%yf$wy ,uzLMfr[d mZffs cssd. MfNtMfr[dd mZfflLvz : 2›, jy ,uzLmZffSk xNukhjhahf ,Uggjhy ,J ‘xjj<uZ %yf$W’vdggLk. xjj<uZ %yf$Wfshff fhzggLk gwjdkqfshtd: i`lu[d $(H_2)$›ielu[d $(N_2)$kwWk `hy[d: (/g@hd (F_2)›FNshhd (Cl_2)›GNuhkd (Br_2)mNahbd (I_2).

xUxNrhd (O_3) %yf$wþy %dWMfrþ[d mZffs cssd. vdNtmJ'xjj %tZ %yf$W'vdmioffggLfþwJ. xU%yf$W %dWfFNkwgllmZffisf nfhzbUejhy mJ'gymZ %yf$W'vdggLk.

cjhuzkhfi`lu[d FNshiuilvLjJf nfhzlhy mJi`lu[d kwWk FNshhþd Mfþa ,uzLnttNtWjdþkqfsþd mZffshy Mdit. vdNt ,jd mZfflLvz 2. ,JNtwW<uZ %yf$W MFk. mJNghyNteh %yf$W ,U i`lu[d mZffisAk xUMfrþ[d mZitAk nfhzlJ. vdNt,jd mZfflLvz 3. ,JNtwW %tZ %yf$W MFk.

xgG %yf;$W eþiw(RMM):

%yf$Wfs midjJk mZffshy Mdit. Mjyhy mjwFeþiwczL. xUjdþkk myyJNrhkjjþd %yf$W eþiwahdJC – 12msltlbidg nghUjJmsffggLtjhy mJxgG %yf$W eþiwvdggLk.

xgG %yf$W eþiwvdgJxU %yf$wþd eþiwfFk›C – 12mZtþd eþiwaþy 1/12gqfþd eþiwfFk csstþfþjkhFk.

xU %yf$wþd xgG %yf$W eþiwahdJmk%yf$wþy cssmidjJmZffsþd xgGmZeþiwfsþd $LjYfFr rkk.

xgG %yf$W eþiwvdgJxUtþfþjk. vdNtmjwFmyF ,yiy. xUNrhkjjþd %yf$Weþiwiafþuhkþy FwþggþLtjhff nfhzlhy mjwFfþuhk %yf$Weþiwvdwngah.

ehþd fþuhk %yf$W eþiw= 18fþ

CO_2 d fþuhk %yf$Weþiw= 44fþ

NH_3 d fþuhk %yf$W eþiw= 17fþ

HCl d fþuhk %yf$Weþiw= 36.5fþ

xgG %yf;$W eþiwfsþd; fzf;fLfs;

v.fh. fzfF 1: rygA†hþf mkþyjjþd xgG %yf$W eþiwahdJfofzlthWfzffþlggLfþwJ. rygA†hþf mkþykhdJ ,uzLi`lu[d mZffshYk xUrygh mZthYk ehdFMfrþ[d mZffshYk MdJ.

MfNt›rygA†hþf mkþyjjþd xgG %yf$Weþiw

= (2 × i`lu[dþd eþiw) + (1 × ryghþd eþiw)

(4× Mfrþ[dþd eþiw)

= (2 × 1) + (1 × 32) + (4 × 16)

= 98

mjhtJxUrygA†hþf mkþyjjþd %yf$Weþiwahd J1/12gqFC –12 mZtþd eþiwiatþl98klqFmjþfkhdJ.

v.fh: fzfF 2 : ehþd xgG %yf$W eþiwfofzlthWfzffþlggLfþwJ. eh %yf$whdJ 2 i`lu[d mZitAk 1 Mfrþ[d mZitAk nfhzLsssJ.

ehþd; xgG %yf;$W eþiw

= (2 × i`lu[dþd eþiw) + (1 Mfrþ[dþd eþiw)

= (2 × 1) + (1 × 16)

= 18

xUeH %yf$wþd eþiwahdJ1/12gqFC – 12mZtþd eþiwiatþl18 klqFnghþaJ.

%yf;$WfSf;fpi lNaahdNtWghL:

mZffs› %yf$WfSilambggilj Jfsfshf ,UejNghjpYk ,itapuzLk gygzGfspy NtWgLfpdwd. mZffSfFk %yf$WfSfFkhdgyNtWNtWghLfs njhFffgglLssd.

mZf;fs; kw;Wk; %yf;$WfSf;F ,ilNaahdNtWghLfs;

mZf;fs;	%yf;$Wfs;
xUjdpkjjpd kpfrrpwpagFjpmZMFk	Jdpkk myyJNrhkjjpd kpfr rpwpagFjp %yf$W MFk.
kejthAffisj jtpu Vida mZffs jdpjjeipiyapy ,Uggjpy iy	%yf$Wfs jdpjjeipiyapy ,UfFk.
kejthAffisj jtpu Vida mZffs	%yf$Wfs tpidjjpwdFiwejit
mZffspy Ntjpg gpizgGfs ,yiy	%yf$Wfspy Ntjpg gpizgGfs cssd.

Nkhy; fUj;J:

,JtiuehkgUgnghUsfspy cssjdpjjmZffs kwWk %yf$Wfisg gwwpg gbjNjhk. mZepiwmyfhdJjdpkqfspd mZepiwfSfF ,ilNaahdxUxgglLkjpggpidtoqFfpwJ. Mdhy mZffs kpfrrpwpaepiwianfhzbUggjhy›mZepiwmyiff nfhzLngUkvz zpfiifapyhdmZffspd epiwiaf fzffpLtJvdgJrhpahdKiwayy. ehk ngUkkhjphfspd vzzpfifiamstpLgyNtWmstpLk KiwfisVwfdNttoffjjpy nfhzLsNshk. cjhuzkhfN[hb (2 cUggbfs) kwW l[d (12 cUggbfs) NghdwitmidtUfFk edFnjhpejmyFfs MFk. mJNghymjpfvzzpfifnfhzlmZffs kwWk %yf$Wfisf FwpggpLtjwFxUrpwpgGmyFNjitgglJ. vdNtNtjpapayhshfs mZffisAk %yf$WfisAk mstpLtjwF'Nkhy'vdwmyifg gadgLjJfpdwdh. ,qFNkhy vdwnrhy Jfsfspd vzzpfifiaklLNkFwpggpLfpwJ.

SImstlLKiwapy xUNkhy vdgJfhhgd - 12 (C – 12) lNrhNlhggpd 12fp (myyJ0.012fp.fp) epiwapy cssmZffspd vzzpfifffFr rkkhdmbggilJfsfis (mZffs› %yf$W kwWk gpw) nfhzlnghUspd msTMFk. 12 fpepiwnfhzl C – 12 lNrhNlhggpy cssmZffspd vzzpfifNrhjidKiwapy ephzak nraagglLssJ. ,J ,jjhypamwptpay mwpQh mtfhlNuhvdgtuhy Kdnkhopaggllljhy mtuJngahpNyNa 'mtfhlNuhvz' vdmiofffggLfpwJ. ,jd kjpgG 6.023×10^{23} MFk. MfNtxUNkhy vdgJ 6.023×10^{23} Jfsfshy (%yf$Wfshy) MdJ›cjhuzkhf5 Nkhy Mfrp[d %yf$Wfspy $5 \times 6.023 \times 10^{23}$ %yf$Wfs cssd.

Nkhy; jj;Jtk;:

Nkhy vdgjidvzzpfifmyfhfg gadgLjjp %yf$Wfspd epiwkwWk gUkidfzffpLk KiwNaNkhy jjJtk MFk.

Nkhyfspd vzzpfifahdJfpilffgngwwfofzlgyNtWtifahdjuTfspypUeJgpdtUkhWf zffplggLfpwJ.

- mZffspd Nkhyfspd vzzpfif
- %yf$Wfspd Nkhyfspd vzzpfif

- thAffsd Nkhyfsd vz zfif (jllntggmOjjeiyay (S.T.P) jllNkhyhh gUkd = 22.4yllh)
- madfsd Nkhyfsd vz zfif

(FwgG : j.nt.m–jllntggeiykwWk mOjjeiyvdgJ 273.15 KkwWk 1 tskz lymOjjjijf FwfFk)

·

xUmZ td; Nkhy;:

xUNkhy mZ vdgJ 6.023 × 10^{23} mZ ffisf FwggLtjhFk. ,JmejmZ td fuhk mZ eiwfFr rkk.

cjhuzkhf xUNkhy Mfr[d mZ vdgJ 6.023 × 10^{23} Mfr[d mZ ffisf nfhzlJmjd fuhk mZ eiw 16 f.

xUNkhy %yf$W vdgJ 6.023 × 10^{23} %yf$WfisFwggLtjhFk. ,Jmej %yf$wd fuhk %yf$Weiwf Fr rkk.

cjhuzkhf xUNkhy %yf$W Mfr[d vdgJ 6.023 × 10^{23} Mfr[d %yf$Wfisf nfhzlJ. mjd fuhk %yf$W eiw 32 f.

Nkhyhh; gUkd;:

jllntggmOjjeiyay (S.T.P) xUNkhy thAthdJ 22.4yllh myyJ 22400kygUkid MffukfFk. ,JNkhyhh gUkd vdTk mioffggLk.

Nkhy;fsd; vz;zf;ifia f; fz f;fLk; gyNtWKiwfs;:

$$\text{Nkhyfsd vz zfif} = \frac{\text{eiw}}{\text{mZ eiw}}$$

$$= \frac{\text{eiw}}{\text{\%yf\$Weiw}}$$

$$= \frac{\text{mZ ffsd vz zfif}}{6.023 \times 10^{23}}$$

$$= \frac{\text{\%yf\$Wfsd vz zfif}}{6.023 \times 10^{23}}$$

rjtj ,iaG :

ehk ,Jtiu›nfhLffggllgUgnghUsfsy cssJfsfsd vz zfifiag gwwg gbjNjhk. Mdhy ngUkghyhdNeuqfsy Nrhkqfsy cssFwgglljdkqfsd rjtj ,iaGNji tggLfwJ.

Nrhkqfsd rjtj ,iaGvdgJ 100 fNrhkjjy cssxtntnhUjdkjjd eiwiaf FwggjhFk. cjhuzkhfehy cssi`lu[d kwWk Mfr[dd rjtj ,iaigfofz lthWfz fflyhk.

jdkj;jd; eiwrjtjk;:

$$\frac{\text{Nrhkjjy css xU Fwggll jdkjjd eiw}}{\text{Nrhkjjd \%yf\$W eiw}} \times 100$$

ehd %yf$W eiw$H_2O$ = 2(1) + 16 = 18 f

i ` lu[dpd rjtj ,iaG= $\frac{2}{18} \times 100 = 11.11\%$

Mfrp[dpd rjtj ,iaG= $\frac{16}{18} \times 100 = 88.89\%$

rjtj ,iaghdJNrhkqfspd tpfpjthaghLkwWk %yf$W thaghliIf fzlwptjpy gadgLfpwJ.

rjtIj ,iaGfz fpfILfs;

v.fh. fzfF 1: kjNjdpy csssjdpkqfspy rjtj ,iaigfhzf.

CH_4 d %yf$W epiw= 12 + 4 = 16 fp

fhhgdpd rjtj ,iaG $= \frac{12}{16}$´ $100=75\%$

i ` lu[dpd rjtj ,iaG $= \frac{4}{16}$´ $100=25\%$

mtfhlNuhfUJNfhs;fs;

1811 ,y mtfhlNuhvdwmwptpay mwpQh %yf$Wfspd vzzpfifffFk mtwwpd gUkDfFk ,ilNaahdnjhlhgpidnttNtW #oepiyfspy fzlwpeJmtuJfUJNfhsfisnts;apllhh.

mtfhlNuh $wwpdgb›“khwhntggkwWk mOjjepiyapy rkgUkDssthAffs midjJk rkmsTvzzpfifapyhd %yf$Wfisf nfhzbUfFk”

mtfhlNuhfUJNfhs;fs;

1881 ,y mtfhlNuhvdwmwptpay mwpQh %yf$Wfspd vzzpfifffFk mtwwpd gUkDfFk ,ilNaahdnjhlhgpidnttNtW#oepiyfspy fzlwpeJmtuJfUJNfhsfisnts;apllhh.

mtfhlNuh $wwpdgb›“khwhntggkwWk mOjjepiyapy rkgUkDssthAffs midjJk rkmsTvzzpfifapyhd %yf$Wfisf nfhzbUfFk”.

,jdgbnfhLffggllthAffspd gUkdhdJmtthAtpd %yf$Wfspd vzzpfifffFNehtpfpjjjpy njhlhGilajhf ,UfFk. vdpy ‘V’vdgJgUkidAk ‘n’vdgJthA %yf$Wfspd vzzpfifiaAk Fwpggjhff nfhzlhy mtfhlNuhtpjpggb

$V \alpha n$

V = khwpypxn

MfNt 1 ypi ` lu[dpy css %yf$Wfspd vzzpfif 1 ypMfrp[dpy css %yf$Wfspd vzzpfifFrkkhf ,UfFk. ,jd%yk thAffspd gUkdhdJmtwwpd %yf$Wfspd vzzpfifFNehtpfpjj njhlhGnfhzlJvdgJnjspthfpwJ.

tpsf;fk;

i ` lu[d kwWk FNshhpd ,izeJi ` lu[d FNshiuLcUthFk tpidiavLjJf nfhsNthk.

$$H_{2\,(thA)} + Cl_{2\,(thA)} \rightarrow 2HCl_{(thA)}$$

1 gUkd + 1 gUkd → 2gUkd

mtfhlNuhtjjggbxUgUkDssthAffs midjJk ‘n’vz zfifayhd %yf$Wfi sngwwUfFk. vdNt

n %yf$W + n %yf$W 2n %yf$W

n = 1vdy

1 %yf$W + 1 %yf$W → 2 %yf$W

½%yf$W + ½ %yf$W → 1 %yf$W

1 %yf$W i`lu[d FNshiuLvdgJ½ %yf$W i`lu[idAk ½ %yf$W FNshhidAk nfhzlJ. ,jd%yk %yf$Wfisghffkbak vdgJnjsthfwJ. ,JlhyldD mZ fnfhsifi axjjUffwJ.

mtfhlNuhtjjayd; gadghLfs;

1. Nf-Y}rhf tjjayidttthffwJ.
2. thAffsd mZ fflLvz izf fzfflcjTfwJ.
3. mtfhlNuhtjjayidg gadgLjjthAffsd %yf$W thaghliilfz fflyhk.
4. %yf$WeiwfFk›MtmlhjjfFk cssnjhlhigtUtffcjTfwJ.
5. midjJthAffsd fuhk Nkyhh gUkid (22.4 yllh jllntggmOjjeiyay) fzffLtjy gadgLfwJ.

Mtmlhj;jf;Fk; xgG %yf;$W ei wf;Fk; ,ilNaahdnjhlhG:

1. xgG %yf$W eiw (i`lu[d mstL):
   xUthAmyyJMtad xgG %yf$W eiwvdgJxU %yf$W thAmyyJMtad eiwfFk xUi`lu[d mZtd eiwfFk ,ilNacsstfjkhFk.

2. **Mtmlhj;j(V.D):**
   khwhntggkwWk mOjjeiyay xUFwggllgUkDssthAmyyJMtad eiwfFk mNjgUkDssi`lu[d mZtd eiwfFk csstfjNkMtmlhjjvdggLk.

   Mtmlhjj(V.D) =

$$\frac{\text{jj.nt.m. eiyay Fwggll gUkDss thA (m) Mtad eiw}}{\text{mNj gUkDss i`lu[d mZtd eiw}}$$

mtfhlNuhtjjggbrkgUkDssthAffs midjJk rkmsTvz zfifayhd %yf$Wfisf nfhzbUfFk.

xUgUkDssthAty ‘n’vz zfifayhd %yf$Wfs cssjhff nfhzlhy›

$$\text{Mtmlhjj (jj.nt.m)} = \frac{\text{'n' \%yf \$W thA (m) Mtad eiw}}{\text{'n' \%yf \$W i`lu[dd eiw}}$$

‘n’ = 1vdf nfhzlhy›

$$\text{Mtmlhjj} = \frac{\text{1 \%yf \$W thA (m) Mtad eiw}}{\text{1 \%yf \$W i`lu[dd eiw}}$$

i`lu[d›uZ %yf$W Mjyhy

$$\text{Mtmlhjj} = \frac{\text{1 \%yf \$W thA (m) Mtad eiw}}{\text{1 i`lu[d mZffsd eiw}}$$

ehk Mtmlhjjia %yf$W eiwAld fofzlthWnjhlhGgLjjyhk.

$$\text{Mtmlhjj} = \frac{\text{1 \%yf\$W thA (m) Mtad eiw}}{\text{1 i ` lu[d mZffsd eiw}}$$

$$\text{xgG \%yf\$W eiw} = \frac{\text{1 \%yf\$W thA (m) Mtad eiw}}{\text{1 i ` lu[d mZ td eiw}}$$

rkdghLgjyal

$$\text{Mtmlhjj} = \frac{\text{xgG \%yf\$W thA eiw}}{2}$$

FWfNfngUff

$2 \times$ Mtmlhjj = thA (m) Mtad xgG %yf$W eiw (m)

xgG %yf$W eiw = $2 \times$ Mtmlhjj

jhffgglfz fFfs

1. %yf$W eiwfz fFfs:
   fofz ltwwd %yf$W eiwiaf fhzf.
   1. H_2O 2. CO_2 3. $Ca_3(PO_4)_2$
   jhT
   1. H_2O
      H d mZ eiw = 1, O-d mZ eiw = 16
      H_2O d %yf$W eiw = (1 × 2) + (16 × 1) = 2 + 16
      H_2O d %yf$W eiw = 18 f
   2. CO_2 d
      C d mZ eiw = 12› O-d mZ eiw = 16
      CO_2 d %yf$W eiw = (12 × 1) + (16 × 1) = 2 + 16
      = 12 + 32
      CO_2 d %yf$W eiw = 44 f
   3. $Ca_3(PO_4)_2$
      Ca d mZ eiw = 40, P– d mZ eiw = 30›
      O d mZ eiw = 16
      $Ca_3(PO_4)_2$ d %yf$W eiw
      = (40 × 3) + [30 + (16 × 4)] × 2
      = 120 + (94 × 2)
      = 120 + 188
      $Ca_3(PO_4)_2$ d %yf$W eiw = 308 f

2. eiwkwWk gUkidg gadgLjjNkhyfisf fzffLjy
   1. 46 fNrhbajjd Nkhyfisf fzffL.

   $$\text{Nkhyfsd vz zfif} \frac{\text{eiw}}{\text{mZ eiw}} = \frac{46}{23} = 2\text{Nkhy}$$

   2. S.T.P ,y 5.6 ylIh Mfr[d

   $$\text{Nkhyfsd vz zfif} \frac{\text{gUkd}}{\text{Nkhyhh gUkd}} = \frac{5.6}{22.4} = 0.25\text{Nkhy}$$

   3. 12.046×10^{23} , Ukgd Nkhyfisf fzffL.

$$\text{Nkhyfsd vz zfif} = \frac{\text{mZffsd vz zfif}}{\text{mtfhl Nuh vz}}$$

$$\frac{12.046´\ 10^{23}}{6.023´\ 10^{23}} = 2 \text{ Nkhy}$$

Nkhyfsd vz zfif ayUeJeiwiaf fz ffLjy

1. 0.3 Nkhy mYkdak (Al d mZ eiw= 27)

$$\text{Nkhyfsd vz zfif} = \frac{\text{eiw}}{\text{mZ eiw}}$$

eiw=Nkhyfsd vz zfif × mZ eiw

eiw= 0.3 × 27 = 8.1 f

2. S.T.P ,y 2.24 yllh SO_2

%yf$W eiw32 + (16 × 2) = 32 + 32 = 64 f

$$\text{Nkhyfsd vz zfif}\ \frac{\text{gUkd}}{\text{Nkhyhh gUkd}} = \frac{2.24}{22.4} = 0.1\text{Nkhy}$$

3. 1.51×10^{23} %yf$W eh

ehd %yf$W eiw= 18 f

$$\text{Nkhyfsd vz zfif} = \frac{\text{\%yf\$Wfsd vz zfif}}{\text{mtfhl Nuh vz}}$$

$$\frac{1.51\ ´\ 10^{23}}{6.023\ ´\ 10^{23}} = \frac{1}{4} = 0.25 \text{ Nkhy}$$

eiw=Nkhy × %yf$W eiw

eiw0.25 × 18 = 4.5 f

4. 5×10^{23}%yf$W FS fNfh]

FS fNfh]d %yf$W eiw= 180 f

$$\text{eiw}\ \frac{\text{\%yf\$W eiw}\ ´\ \text{\%yf\$Wfsd vz zfif}}{\text{mtfhl Nuh vz}}$$

$$\text{eiw} = \frac{(180\ ´\ 5´\ 10^{23})}{6.023\ ´\ 10^{23}} = 149.43 \text{ f}$$

%yf$Wfsd vz zfif kwWk mZ ffsd vz zfif iaf fz ffLjy

1. 11.2 yCO_2 ,y css %yf$Wfsd vz zfif iaf fz ffL.

$$\text{Nkhyfsd vz zfif} = \frac{\text{gUkd}}{\text{Nkhyhh gUkd}} = \frac{11.2}{22.4} = 0.5\text{Nkhy}$$

%yf$Wfsd vz zfif=Nkhyfsd vz zfif ×mtfhlNuhvz

= 0.5 × 6.023 × 10^{23} = 3.011 × 10^{23}%yf$Wfs

2. 1 fjqfjjy cssmZffsd vz zfif iaf fz ffL (Aud mZ eiw= 198 f)

$$\text{mZffspd vzzpfif} = \frac{\text{epiw ´ mtfhlNuh vz}}{\text{mZ epiw}}$$

$$\text{mZffspd vzzpfif} = \frac{1´\ 6.023´\ 10^{23})}{198} = 3.042 \times 10^{21}$$

3. 54fpH_2O ,y css %yf$Wfspd vzzpfifahJ?

$$\text{\%yf\$Wfspd vzzpfif} = \frac{\text{epiw ´ mtfhlNuh vz}}{\text{\%yf\$W epiw}}$$

$$\text{\%yf\$Wfspd vzzpfif} = \frac{54´\ 6.023´\ 10^{23}}{18} = 18.069 \times 10^{23}$$

4. 5 Nkhy CO_2y cssfhhgd kwWk Mfrp[d mZffspd vzzpfifiaf fhzf.

- 1 Nkhy CO_2 ,y 2Nkhy Mfrp[d mZffs cssJ.
- 5 Nkhy CO_2 ,y 10Nkhy Mrrp[d mZffs cssJ.

mZffspd vzzpfif=Nkhyfspd vzzpfif
× mtfhlNuhvz
= 10 × 6.023 × 10^{23}= 6.023 × 10^{24} Mfrp[d mZ

- 1 Nkhy CO_2 ,y 1 Nkhy fhhgd mZffs cssJ.
- 5 Nkhy CO_2 ,y 5 Nkhy fhhgd mZffs cssJ

mZffspd vzzpfif= Nkhyfspd vzzpfif
× mtfhlNuhvz
= 5 × 6.023 × 10^{23} = 3.011 × 10^{24} fhhgd mZ

Nkhyhh; gUkd; fzf;Ffs;

flof z;ltwwpd; gUkidf; fzf;fpL:

1. 2.5 Nkhy CO_2

gUkd =Nkhyfspd vzzpfif×Nkhyhh gUkd
gUkd 2.5 × 22.4 = 56ypllh

2. 12.046 ××10^{23} %yf$W mkNkhdpah

$$\text{Nkhyfspd vzzpfif} = \frac{\text{\%yf\$Wfspd vzzpfif}}{\text{mtfhlNuh vz}}$$

$$= \frac{12.046´\ 10^{23}}{6.023´\ 10^{23}} = 2 \text{ Nkhy}$$

gUkd Nkhyfspd vzzpfif ×Nkhyhh gUkd
gUkd = 2 × 22.4 = 44.8 ypllh

3. 14 fp ielu[d thA

$$\text{Nkhyfspd vzzpfif} = \frac{14}{28} = 0.5 \text{ Nkhy}$$

gUkd Nkhyfspd vzzpfif ×Nkhyhh gUkd
gUkd = 0.5 × 22.4 = 11.2 ypllh

rjtlj ,iaG fzf;Ffs;

1. H_2SO_4y cssS d rjtj ,iagpidf fhzf.

H_2SO_4 **d; %yf;$W eiw**

= (1 × 2) + (32 × 1) + (16 × 4)

= 2 + 32 + 64 = 98 fp

$$\text{ryghpd rjtj ,iaG} = \frac{\text{ryghpd eiw}}{H_2SO_4 \text{ d %yf\$W eiw}} \times 100$$

$$\text{ryghpd rjtj ,iaG} = \frac{32}{98} \times 100 = 32.65\%$$

eid tpy; nfhs;f:

- xjjmZvz izAk NtWgllepiwvz fisAk nfhz lxNujdpkjjpd nttNtWmZffs lNrhlhgGfs vdggLk. v.fh. $_{17}Cl^{35}$, $_{17}Cl^{37}$.
- xjjepiwvz izAk NtWgllmZvz fisAk nfhz lnttNtWjdpkjjpd mZffs lNrhghhfs vdggLk. v.fh. ($_{18}Ar^{40}$, $_{20}Ca^{40}$)
- epA+luhdfspd vz zpfiifiaAk›NtWgllmZvz fisAk›NtWgllepiwvz fisAk nfhz lnttNtWjdpkqfspd mZffs lNrhNlhdfs vdggLk. ($_6C^{13}$, $_7N^{14}$).
- xUjdpkjjpd xgGmZepiwvdgJmjjdpkjjpd ruhrhpmZepiwfFk C – 12mZtpd epiwapy 1/12gqfpd epiwfFk csstpfpjkhFk.
- xUjdpkjjpd ruhrhpmZepiwvdgJ ,awifapy fpilfff$bamjjdpkjjpd xtntlhU lNrhNlhgGfspd rjtjgutiymjd fZepiwahy ngUfFpffpilfFk kjpgGfspd $lLjnjhiffFr rkkhFk.
- xgG %yf$W epiwvdgJxU %yf$wpd epiwfFk›C – 12mZtpd epiwapy 1/12gqfpd epiwfFk csstpfpjkhFk.
- mtfhlNuh $wwpdgb›"khwhntggkwWk mOjjepiyapy rkgUkDssthAffs midjJk rkmsTvz zpfiifapyhd %yf$Wfisf nfhz bUfFk".
- khwhntggkwWk mOjjepiyapy xUFwpggplgUkDssthAmyyJMtpapd epiwfFk mNjgUkDssi `lu[d mZtpd epiwfFk csstpfpjNkM tpmlhjjpvdggLk.
- mZfllvz = %yf$W epiw/mZepiw
- xgG %yf$W epiw= 2 x M tpmlhjjp

10th mwpt pay;
myF– 8
jdpkq;fspd; Mthj;jd tifgghL

mwpKfk;:

tpQQhdjjpy› Ntjpapay Jiwapy 18 Mk kwWk 19 Mk E}wwhzLfspy› Jhpjkhwwqfs epfoejd. fp.gp. (ngh.M) 1860 y tpQQhdpfshy 60 jdpkqfSk mtwwpd epiwfSk fzLgpbffggIbUejd. mtwWs rpy›gzGfspy xjjpUejjhy›xNunjhFjpfspy thpirggLjjggIId. ,ffhyffIIjjpy nttNtWGjpajdpkqfs nttNtWgzGfNshLfzLgpbffggIId. xtnthUjdpkjjpd gzGfisjdpjjdpNamwptjwFgjpyhf›mtwiwj njhFjpfshTk›njhIhfshfTk xUqfpizjJ› gpd gzGfisxggpILg ghhjjy vspikahf ,UfFk vdfUjggIIJ. fhafisAk.fdpfisAk mtwwpd gzGfs nghWjJtifggLjJtJNghyjdpkqfisMthjjdg gzGfs %yk thpirggLjjyhk vdfUjpdh. vdNtmwpQhfs jfftopapy›jdpkqfisthpirggLjjgyKawrpfisNkwnfhzIdh. flejxdgjhk tFgGg ghIjjpy jdpkqfisthpirggLjjeIejKeijaKawrpfisg gwwpmwpejhfs. xdgjhk tFggpy jdpkqfistifggLjJjy ghIjjpy ngwwmwptpd njhIhrrpahf›ehk cah rpejidfNshLKd njhIheJ›jdpkqfspd gzGfisg gwwpamwpittshjJf nfhsNthk.

etdM thj;jd tpjp:

nkdIygpd MthjjdmIItizapy jhffKbahjrpyKuzghLfs ,Uejd. cjhuzkhfmZepiw(39.95 amu)nfhzIMhfhd jdpkk›KddhYk›mZepiw(39.10 amu)nfhzIngh IIhrpak jdpkk gpddhYk thpirggLjjggIId. mZepiwiaikakhff nfhzLmLfFNthkhapd›nghIIhrpajjpd ,Ijij›Mhfhd ngwwpUfFk. ypjjpak Nrhbak cssnjhFjpapy MhfhidvejxUNtjpayhsUk itffkhIIhhfs. ,it›mZepiwvdwmbggiIiatpINtWxUmbggiIg gzgpwFtoptFjjd. nkzIyg kwWk mtNuhL ,UejthfSfFmZtpy cssGNuhIIhdfspd vz zpfifmbggiIgzghf ,UffpwJvdgJmwpaf$Ihjjha ,UejJ.

1912 Mk MzLn ` dwpNkh]NyhvdwgphpIId tpQQhdpMthjjdthpirggLjjYfF›mZvz vdgJrpwejmbggiIvdwczikiaf fzIwpejhh. mZvz vdgJxUmZtpd cssGNuhIIhdpdvzzpfifiaNah›myyJvyfluhdpd vzzpfifiaNahFwpfFk›MfNtMthjjdtpjpiaf foffzIthWNkkgLjjpmwpayhk.

‘jdpkqfspd ,awgpay kwWk Ntjpapay gzGfs mtwwpd mZvzfisr rhheJmikAk’.

etdM thj;jdml;l t i z :

etdMthjjdtpjpapd gb›jdpkqfs›mZvz mjpfhpggpwFVwwhwNghy etdmIItizapy thpirggLjjggILsd. Ntjpapay jdpkqfs›jqfs gzGfisKiwNac zhjJk tifapy›njhIhfshfTk›njhFjpfshfTk›etdMthjjdmIItizapy thpirggLjjggILssd. 118 jdpkqfs nfhzletdMthjjdmIItiziaf fhILfpdwJ.

flejxdgjhk tFggpy fwwMthjjdmIItizapd rpwggkrqfspd njhIhrrpahf›njhFjpkwWk njhIhfspd rpwggkrqfismwpatpioNthk.

njhlhfsd; rwggk;rq;fs;

- jdkqfsd filklltthirfs njhlhfshFk. Mthjjdmlltizay nkhjjk 7 njhlhfs cssd.
- Kjyhk njhlh (mZvz 1 kwWk 2) ,jnjhlh krrwanjhluhFk. ,jy i`lu[d kwWk `yak vDk 2 jdkqfNs cssd.
- ,uzlhk njhlh (mZvz 3 yUeJ 10 tiu) ,J rwanjhluhFk. ,jy ‘Li’ ayUeJ ‘Ne’ tiu 8 jdkqfs cssd.
- %dwhk njhlh ,JTk xUrwanjhluhFk. (mZvz 11 yUeJ 18 tiu) ,jy ‘Na’ayUeJ ‘Ar’ tiu 8 jdkqfs cssd.
- ehdfhk njhlh (mZvz 19 yUeJ 36 tiu) ,J xUezlnjhluhFk. ,jy ‘K’ayUeJ› ‘Kr’ tiu› 18 jdkqfs cssd. ,twwy 8 rhjhuz jdkqfSk› 10 ,ileiyj jdkqfSk cssd.
- Iejhk njhlh (mZvz 37 yUeJ› 54 tiu) ,JTk xUezlnjhluhFk. ,jy RbayUeJXe tiu 18 jdkqfs cssd. ,twwy 8 rhjhuz jdkqfSk› 10 ,ileiyj jdkqfSk cssd.
- Mwhk njhlh (mZvz 55 yUeJ 86 tiu) ,J kfezlnjhluhFk. ,jy ‘Cs’yUeJ›‘Rn’ tiu32 jdkqfs cssd. ,twWs 8 rhjhuz jdkqfs› 10 ,ileiyj jdkqfs kwWk 14 cs,ileiyj jdkqfs (yhejidLfs) vdMFk.
- Vohk njhlh (mZvz 87 yUeJ› 118 tiu) Mwhk njhliug Nghy› ,JTk 32 jdkqfs nfhzlJ. rkgjjy›ehdFjdkqfs mlltizay IUPAC My clgLjjglld.

njhFjfsd; rwggk;rq;fs;

- Mthjjdmlltizay NkyUeJ fohf thirggLjjglljdkqfs›njhFjfs vdggLk. mlltizay nkhjjk 18 njhFjfs cssd.
- jdkqfsd nghJ thdrwggayGfisitjJnttNtWFLkgqfshfj njhFffgglLssd.
- njhFj 3-d mqfkhfj jfOk›yhejidLkwWk MfbizLfs cs ,ileiyj jdkqfs vdmioffgLk.
- G[[aj njhFjiaj jtu›kwwnjhFjfsy cssjdkqfsd ntsfS lby›xjjvz zfifcssvyfluhdfSk›xjj ,izjwDk ngwwUfFk. vLjJffllhf›njhFj 1y cssjdkqfs ntsMwwy klljjy xUvyfluhd klLk $1S^1$ngwwUggjhy›fhu cNyhfj jdkqfsd ,izjwd 1 MFk.

njhFj vz;	FLkgk;
1	fhu cNyhfqfs

2	fhu kz cNyhfqfs
3 - 12	,ileiy cNyhfqfs
13	Nghuhd FLkgk
14	fhhgd FLkgk
15	ielu[d FLkgk
16	Mf]][d FLkgk (m) fhyNfh[d FLkgk
17	N`y[dfs
18	kej thAffs

- xjjnjhFjay csssjdkqfs xjjvyfluhd mikgGfisg ngwW›xjjNtjgg zGfNshLjfOk.

- ,ay gzGfshd› cUFeiy›nfhjeiykwWk mlhjjMfadruhfkhWgLk.

- G[[aj njhFjj jdkqfs›eiyahdvyfluhd mikgigntsf$lby ngwwUggjhy›ti dAwhjdikiag ngwwUfFk.

Mthjjdgz Gfsy VwgLk efoTfs:

jdkqfsd vyfluhd mikgG›ruhfefOk ,ay kwWk Ntjaay gzGfistsffcjTfdwd. jdkthirmllti zay csssjdkqfsd gzGfs. Fwggllruhd ,ilntsfFg gwFkzLk xNukhjhaUfFk efoTMthjjdgzGvdggLk.

gzGfshd›mZMuk›madMuk›madahfFk Mwwy›vyfluhd›fthjdik›vyfluhd ehllk MfadMthjjdj gzigfhlLfdwd. etdmllti zahdJjdkqfsd nghJggzGfisAk›njhFjkwWk njhlhfsy VwgLk jdkqfsd ruhdkhwwqfisAk mwK fkhfhjjdkqfSfFk kfj njsthfj jUfdwJ. ,ggFjay gdtUk Mthjjdgz Gfisg gwwmwayhk.

mZMuk:

xUmZtd Muk vdgJmjd mZffUtd ikajjwFk› ,izfwvyfluhd cssntsf$lbwFk ,ilNaahd J}uk vdtiuaWffggLk. xUjdjjmZtd Mujij›NeubahfmstlKbahJ. kej thAffs jtu›toffkhfmZMuk vdgJnjhlhGilamZffSffilNacssgizggd jdikianghWjJ›rfggizgGMuk myyJcNyhfMuk vdwioffggLk. mUfUNfcss ,uzLcNyhfmZffsd clfUffSfF ,ilNacss J}ujjd ghjNacNyhfMuk vdggLk.

1. cNyhfkwwjdkqfsy›cssmZMuk rfggizgGMuk vdwioffggLk. xdiwrfggizgghy gizffgglLss ,uzLxjjmZffsd mZffUffSfF ,ilNa Md njhiytd ghjasTrfggizgGMuk vdggLk. vLjJffhllhf›H_2 %yf$wy› ,uzL \i `lu[d mZffUfSfF ,ilay css J}uk 0.74A°. ,jd rfggizgGMukhdJ. 0.74/2 = 0.37A° vdWfzffllyhk.

jdkthirmllti zay csssjdkqfsd mZMuqfisg ghhfFk NghJ› ,UNtWefoTfs njsthFk. njhlhy› ,lJGwjjyUeJtyJGwkhfnryifay. jdkqfsd mZMuqfs FiwAk. Mdhy njhFjjay NkyUeJfohf ,wqFkNghJmZMuqfs mjfhfFk. ,jd fhuzjijfoffzlthWmwayhk. njhFjjay NkyUeJfohf ,wqFkNghJ›ntsf$L vz mjfhfFk

,jdhy›ntsf▯$lbwFk Mwwy klljjwFk mZffUtwFk ,ilggll J}uk mj▯fh▯jJf thrr▯t▯irFiweJ›cUtsTngh▯jhff fhzggLk.

khwhfnjhlh▯y ,lk Gwjj▯y▯UeJtyJGwkhfnryifa▯y›Mwwy kllk khWtj▯yiy. Mdhy GNuhllhd▯d vzz▯fifmj▯fh▯jJnryYk. mj▯fh▯fFk Nehk▯d RikfFVwgvyfluhdfs kJssfthrr▯t▯irmj▯fh▯ggjhy mZt▯d cUtmsTFiwf▯wJ. mZ Mukhd Jy▯jj▯ajj▯y▯UeJNghuhDfFnryYk NghJvtthWFiwf▯wJ

madpMuk;:

xUmad▯a▯d fUikajj▯wFk›mttad▯a▯d vyfluhd j▯us Kf▯y kJmjd fUthy fthrr▯t▯irnrYjj ,aYk J}ujj▯wFk ,ilNaahdnjhiyTmad▯Muk vdtiuaWffggLk. xUmZ thdJvyfluhdfis ,oeNjh›VwNwhmad▯ahfkhWk. vyfluhd ,ofFk mZ›Nehk▯d Rik ngwW›Nehk▯d mad▯vdwioffggLk vyfluhidVwFk ‘mZ›vj▯h k▯dRikngwW›vj▯hk▯d mad▯vdwioffggLk. fiuryfs▯d ,ayGfisAk. mad▯jj▯zkqfs▯d tbtikgGfisAk›jhkhd▯ff›mad▯fs▯d cUtsTKff▯akhFk. Nehk▯d mad▯ahdJmjd njhlhGilamZ ittt▯lcUtst▯y r▯w▯jhfTk›vj▯hk▯d mad▯ahdJmjd njhlhGilamZ ittt▯lcUtst▯y ngh▯jhfTk fhzggLk.

cjhuzkhfy▯jj▯ak kwWk Nrhbak jqfsJntsMwwy klljj▯y cssXh vyfluhid ,oeJNehk▯d mad▯fshf▯dwd. ,ttad▯fs›jk njhlhGilamZffist▯lcUt▯y r▯w▯jhf ,Ufff fhuzk›clfUtwFk›kjKss cs Mwwy kllvyfluhdfSfFk ,ilNacssmj▯ffthrr▯t▯irNafhuzk MFk. g@h▯d kwWk FNshh▯d jqfsJntsf$lby xUvyfluhidVwWvj▯hk▯d RikAilamad▯fshf▯dwd. clfUthdJvj▯hk▯d RikAilamad▯fs▯y cssntsf$lLvyfluhdfs▯y fhlLk <hgGt▯irahdJmNjjd▯kjj▯d eLe▯iymZt▯y fhlLtijt▯lFiwT. MfNtmZ Muj▯y fzlJNghy›mad▯Muqf Sk njhlh▯y ,lgGwjj▯y▯UeJtygGwkhfFiweJk›njhFj▯a▯y›Nky▯UeJfohfmj▯fh▯jJk fhzggLk.

madpahfpFk; Mwwy;:

mb Mwwy e▯iya▯y csseLe▯iyj jdikcilajd▯jjhAe▯iymZxdw▯d ,izj▯wd $lby▯UeJ ,yFthfg g▯izffgglLssxUvyfluhideff▯Nehk▯d mad▯ahfkhwWtjwFNjitggLk FiwejglrMwwy›mad▯ahfFk Mwwy vdggLk. ,ijmad▯ahfFk vdjhyg▯vdWk mioffyhk. ,jd myFKJ / mol. mad▯ahfFk Mwwy mj▯fh▯fFk NghJ›vyfluhideffFtJfbdkhf▯dwJ.

njhlh▯y mZMuk ,lk Gwjj▯y▯UeJtyJGwkhfnryifa▯y Fiwtjhy›vyfluhideff›mj▯fMwwy Nji tggLk. MfNt›njhlh▯y› ,lJGwjj▯y▯UeJtyJGwk nryifa▯y›mad▯MfFk Mwwy mj▯fh▯ff▯dwJ. Mdhy njhFj▯a▯y Nky▯UeJfohf ,wqFifa▯y›mZt▯d cUtsTmj▯fh▯ggjhYk› ,izj▯wvyfluhdfs ,yFthfg▯izffgglbUggjhYk›mad▯ahfFk Mwwy k▯fr r▯w▯jsNtNjitggLk. MfNt›njhFj▯a▯y Nky▯UeJfo▯wqFifa▯y mad▯ahfFk Mwwy FiwAk jdikngww▯UfFk.

FwggG:

- Nehk▯d Rik mj▯fh▯fFk NghJNehk▯d mad▯a▯d cUtsTFiwAk.
- vj▯hk▯dRikmj▯fh▯fFk NghJvj▯hk▯d mad▯a▯d cUtsTmj▯fh▯fFk.

vyfpluhd; ehlil;k;:

xUjd▯jjeLe▯iycilathAe▯iymZxdw▯d ,izj▯wd $lby›xUvyfluhidNrhjJ›mjd vj▯h k▯d RikAilamad▯iacUthfFk

NghJntsggLk Mwwy vyfluhd ehllk vdggLk.madahfFk Mwwiyg Nghy›vyfluhd ehllKk njhlhy ,lgGwjjyUeJ›tygGwkhfmjfhjJk›njhFjay NkyUeJfohfFiweJk fhzggLk.

,jd myFKJ/mol MFk.

$A_{(g)} + e^- \rightarrow A^-_{(g)}$ + Mwwy

$Cl_{(g)} + e^- \rightarrow Cl^-_{(g)}$ +Mwwy

vyfluhd fthjdik:

rfggiz ggy gqflgglLssvyfluhd ,izaidjdidNehffftUk gzG›vyfluhd fthjwd vdggLk. cjhuzkhfHCl %yf$iwvLjJf nfhsNthk. i`lu[d kwWk FNshhd mZffs xUvyfluhidgqflLrfggizggidcUthfFk. FNshhd mZtwFvyfluhd fthjjdikmjfk. mjdhy›gqflLvyfluhdfisi`lu[d tl›FNshhd mZjdikNehff ,OjJf nfhsSk. gizgGcilAk NghJgizvyfluhd›FNshhDld nrdWH⁺kwWk Cl⁻madfs cUthFk. ,ijfoffhZk glqfsd %yk mwayhk.

i`lu[DfFk›FNshhDfFk csJsxgglLvyfluhd fthjdik:

vyfluhd fthjjdikahdJfoffhZk NrhjidKbTfshd›gizgGMwwy›madahlFk Mwwy›vyfluhd ehllk MfatwiwrhheJmikAk.

vyfluhd fthjjdikiafzffLtjy›ghyq mstLngUk gqfsffdwJ. ,jd %yk› xu %yf$wd mZffSfF ,ilay csssgizggd jdikia (madggizgGmyyJrfggizgG) mwayhk.

rjdkqfsd vyfluhd fthjjdikiaf fNofhzf.

F – 4.0, Cl – 3.0, Br – 2.8, I = 2.5, H = 2.1, Na = 1

,UmZffSfF ,ilNacssvyfluhd fthjdiktjjahrk 1.7vd ,Uejhy›mggizgG50%madjjdikAk›50%rfggizgGj jdikiaAk ngwwUfFk.

mttjjahrk 1.7 I tlFiwthad mggizgGrfggizgghFk.

tjjahrkhdJ 1.7 I tlmjfnkdy mggizgGmadggizgghFk.

njhlhy› ,lgffjjyUeJtyggffkhfnryYk NghJvyfluhd fthjdikmjfhfFk. Vnddy mZffUkdRikmjfhfFkNghJ›vyfluhd fthrrtirmjfkhFk. njhFjay NkyUeJfohf ,wqFifay vyfluhd fthjdikFiwfwJ. Vnddy›Mwwy kllj d vzzfifmjfkhfwJ.

Mthjjdg gzG	njhlhy khwwk	njhFjay khwwk
mZMuk	FiwfwJ	mjfhffwJ
MadMuk	FiwfwJ	mjfhffwJ
madahfFk Mwwy	MjfhffwJ	FiwfwJ
vyfluhd ehllk	mjfhffwJ	FiwfwJ
vyfluhd fthjjdik	MjfhffwJ	FiwfwJ.

cNyhftay:

kdj thoTntt tNtWcNyhfqfSld njhlhGilaJ. mdwhlthotayy›cNyhfqfisehk gadgLjJfNwhk. kdj clyy

Nrhbak›nghl lhrak›fhyrak› ,UkGKjyhd cNyhfqfs ,dwaikah ,lk ngwWssd. ,tTNyhfqfsd FiwghLfs tshrijkhwwqfisg ghjjJ›Nehafs cUthff fhuzkhFk. MfNt›cNyhfqfs›ekthotjy Kffagq Ftffdwd. ,ggFjay›cNyhftay %yk cNyhfqfs vtthWghjnjLffggLfdwdvdgNjtthffyhk.

cNyhfqfismtwwd jhJffsyUeJghjnjLjJ› ,ay kwWk Ntjaay gzGfSffVwwhwNghy mtwiwcNyhff fyitfshfkhwwntt NtWgadghlLfFclgLjJk mwtaNy cNyhftay vdggLk. cNyhftayd nrayghLfs %dWgbfisf nfhzlJ.

- jhJffismlhggjjy ,kKiwad %yk›jhJffsy csskhRffs effggLfdwd.
- cNyhfjijcUthffy ,kKiwayy›jhJty ,UeJcNyhfk ghjnjLffggLfwJ.
- cNyhfjijJ}aikahffy ,kKiway cNyhfkhdJ J}aiknraaggLfwJ.

cNyhftayy csfiyr nrhwfs

fdkqfs:xUfdkk vdgJjdNrhkkhfNthmyyJntt NtWNrhkqfisr NrhjJmlffa $lLf fyitahfNthGtay fhzggLk.

jhJ: vffdkjjyUeJ›cNyhfkhdJvsjy›rffdkhf›nghams ty ghjnjLffKbfwNjhmJNtjhJvdggLk.

cjhuzkhffsk zZk ($Al_2O_3.2SiO_2.2H_2O$) ghfirlLk ($Al_2O_3.2H_2O$) mYkdajjd fdkqfshFk. Mdhy›ghfirlbyUeJmYkdak ,yhgfukhfghjnjLffKbtjhy›ghfirllhdJmYkdajjd jhJvdWk›fskz mjd fdkk vdWk miofggLk.

RuqfcwgjjG:tj NjhlbyUeJ›jhJffisg ghfFk KiwNaRuqfcwgjjvdggLk.

jhJf$sk myyJfhqF: cNyhfj jhJgnghUlfNshLfyeJssk z kwWk ghiwj J}s khRffs fhqFmyyJjhJf$sk vdggLk.

,sff:jhJTld csskhRffis (fhqF) cUfLk NrhkkhfkhwwmijefflјhJTld NrhfFk nghUNs ,sffvdggLk.
v.fh›CaO(fhujjdikaJ)›SiO_2(mkyjjdikaJ)

frL:cNyhfjijg ghjjyy› ,sffjhJf $sjJld tidGheJcUthfFk tisnghUNsfrLvdggLk.

jhJf$sk + ,sff→frL

cUffgghjjy:tWjjcNyhfMfiril›cNyhfkhfcUfaeiyayy›khwWk xUxLfftidNacUffgghjjy MFk. ,kKiway fhqFvdggLk khRffs›Nrhffggll ,sffahy frlhfeffggLfdwd.

jhJffisghjnjLfFk Kiwfs myyJmlhggfFk Kiwfs

jhJffsd ,ayiggnghWjJ›mtwwyUeJcNyhfjijg ghjnjLfFk KiwahdJehdFtifggLk. cNyhfqfsd ntt NtWjhJffs glbaylggllssJ.

edF J}shffgglljhJffismlhggfFk Kiwfs fofffzlthWmikfdwd.

1. **GtahgGKiway; gphj;jy;**

jj;Jtk;jhJffSfFk›jhJf $sqfSfFk› ,ilay csssmlhjjNtWghL ,kKiwad mbggilahFk. MfirLjhJffs ,kKiwadhy J}aikahffggLfdwd. v.fh. N`kill Fe_2O_3(,Ukgd JhJ)

Kiw: edF J}shffggllljhJ›mjht ilak rha jsjjdNky nfhllggLk. gwFeh mjd Nky garrmbffggLk. ,dhy›mlhjjkFjhJ J}sfs fNojqftlNyrhdjhJf$sqfs jz zuhy fOteffggLfdwd.

2. **fhej Kiwgphg:**

jj;Jtk;jhJffsd fhejjjdik›gphjjyd mbggilahfmikfwJ. jhJNthmyyJjhJf$sNkhfhejj jdikngwwUggd› ,kKiwnraygLjjggLk. v.fh. bd]Nlhd SnO_2ntssajjd jhJ.

Kiw:edFJ}shffqggllljhJthdJ ,uzLcNyhfcUisfSfFCNlnryYk ,aqFngybd %yk nfhllggLfdwJ. ,t cUisfsy xdWfhejj jdikAld ,Uggjhy›fhejj Jfsfs›fhejjdikAsscUisahy <hffgglLfhejjdikawwJfsfs njhiytly nrwweJgphffggLk.

3. **EiukjgGKiw:**

jj;Jtk;igd Maiyd %yk jhJffisAk›ehd %yk jhJf$sqfisAk vejmstwFvsjy <uggjk VwwKbANkh›mJNt› ,kKiwad jjJtkhFk. NyrhdjhJffshd›ry igLjhJffs› ,kKiway mlhggffggLfdwd. v.fh. [qf gsdl ZnS.

Kiw:edF J}shffggllljhJthdJ›vznzAk›eUk nfhzlxUnghanjhlbay ,lgglL›mtwwd Nky edFmOjjgglfhwWnrYjjggLfdwJ. jhJthdJvznzad %yk <uggLjjgglLEiutbty›jhJf$sjjyUeJgphffggLfdwJ. jhJthdJNyrhfcssjhy mJEiutbtyy ntsgguggwFteJtLk. khRffs mbay jqftLk. v.fh. [qf gsdl (ZnS)

4. **NtjKiw:**kfJ}aeiyay csssjhJffismlhgjjYfF ,kKiwgadgLjjggLfwJ.

jhJthdJ:jFejNtjgnghUSld tidGhanraJfiuar nratjd %yk›fiuahjkhRffs tbffllyd %yk gphjnjLffggLfdwd. tbeh jFejNtjgnghUSld NrhffgglL›tidGheJjhJtogbthfkhWfdwJ. v.fh. ghfirl Al_2O_3. $2H_2O$ (mYkdajjd KffajhJ)

jkoehlby; fil f;Fk; jhJf;fs;

Rz zhkGffy : Nfhit›flY}h›jzLffy
[grk : jUrrNfhitkhtllqfs.
illNldafdkqfs : fddahFkh›ney iykwWk J}jJfFb
FNuhikl :Nfhit›Nryk khtllqfs
Nkfdill:jhkGh<NuhL›Nryk›jUtzzhkiy
lqf]ld : kJiu›jzLffy

cNyhfjjd; gz;Gfs;

,aw; gz;Gfs;

1. ,ayGeiy: vyyhcNyhfqfSk›miwntggeiyay jleiyay cssit. (nkhFhkwWk fhyak jtu)

2. gsgsgGj jdik: cNyhfqfs mjfgsgsgghdit.

3. fbdjdik: mNdfcNyhfqfs›fbdjdikiaAk tyikiaAk ngwwit (Nrhbak›nghllhrak›jtu› ,it fjjahy ntll ,aYk nkdikngwwit).

4. cUFeiykwWk nfhjeiy: toffkhf›cNyhfqfs mjcUFeiykwWk nfhjeiyiag ngwwUfFk. mjfntggeiyay mitMtahFk. (fhyak›nkhFh›Nrhbak›nghllhrak jtu)

5. mlhjj: cNyhfqfs mjfmlhjjngwwit. (Nrhbak kwWk nghllhrak jtu ,it jzzh tlmlhjjFiwejit)

6. fkgahfeSk jdik: cNyhfqfs fkgahfeSk jdikadit. mtwiwc illffhky›fkgahfellKbAk.

7. jflhFk jdik: cNyhfqfs jflhFk jdikngwwit. mjhtJ›mtwiwvejgsTk glhky›mbjjbjJjflhfkhwwKbAk.

8. ntggk kwWk kdfljJk jdik: cNyhfqfs ntggjijAk›kdrhujijAk vsjy fljJk jdikad. v.fh. ntssp›jhkuk (lqf]ld jtu)

9. fiuAk jdik: toffkhfcNyhfqfs jutfiugghdfsy fiuatjyiy.

jhJf;fsd; tiffs;

MfirLjhJ	fhhgNdl jhJ	N`iyLjhJ	ryigLjhJ
ghfirl($Al_2O_3.2H_2O$)	khhgs ($CaCO_3$)	fiuNahiyl (Na_3AlF_6)	fydh(PbS)
Fgiul (Cu_2O)	khfdirl($MgCO_3$)	/gSh]ghh(CaF_2)	,UkGigiul (FeS_2)
N`kill(Fe_2O_3)	rliul($FeCO_3$)	ghiwcgG($NaCl$)	[qf gsdl (ZnS)

cNyhfMf;irbyUe;J cNyhfj;ijg; ghj;jy; 3 tiffgLk;

mjtidgLk; cNyhfq;fs;	rhjhuz khftidgLk; cNyhfq;fs;	FiwthftidgLk; cNyhfq;fs;
Na, K, Ca, Mg, Al	Zn, Fe, pb, Cu	Ag, Hg
cNyhfMfirLcNyhfkhf kddhw gFggd %yk xLffk milfwJ	cNyhfMfirLcNyhfkh ffhhgd (CoKe) cjtAld NtjxLffk milfwJ.	nrQ#NlwwrijTWjyhy cNyhfMfirLcNyhfkh fxLffk milfwJ

Ntjaay; gzGfs;:

,izjwvyf;luhd;fs;: cNyhfmZffs nghJthf 1› 2 myyJ 3 vyfluhdfisntss$lby ngwWssd.

madcUthjy; gz;G: cNyhfqfs vyfluhdfis ,oeJNehkd madfshfkhWk jdikcilait. mjdhy mitNehkd Rik ngWk.

madkdRik ,ojjy; cNyhfqfsd Nrhkqfs kddwgFjjy tidad NghJ›cNyhfmadfs vjhkdtha tejilAk.

mZffl;Lvz; cNyhf %yf$Wfs›M teiyay›xwiwmZfflLvz izg ngwWssd.

Mf;irLfsd; jd;ik: cNyhfMfirLfs nghJthffhujjdikcilad.

mYkdac Nyhf tay;

GtjNjhlby kfr nrweJfhzggLk cNyhfk mYkdak MFk. ,jd tidgLk jwd mjfk. mjdhy Nrhejeiyay ,J fhzggLk. ,jd Kffaj jhJffs foffzlthWvOjyhk.

mYkdajhJff;s	thaggh;L
ghfirl	$Al_2O_3.2SiO_2.2H_2O$
fiuNahiyl	Al_3AlF_6
nfhuzlk	Al_2O_3

mYkdajjd Kffaj jhJghfirl MFk. ,jjhJ tyUeJmYkdak ghjnjLjjy› 2 eiyfsy eilngWfdwJ.

ghf;irl;ilmYkdhthfkhwwk; nra;jy; Ngah; Kiw:

ghfirlilmYkdhthfkhwWjy ,uzLgbfiscsslffaJ.

ghfirl jhJtid›edF J}shffryitNrhlhTld 150˚C ntggeiyay›FwggllmOjjjjy tidggLjJk NghJ›Nrhbak nkllhmYkNdl cUthfwJ.

Nrhbak nkllhmYkNdlilehdhy ehffr nratjhy›mYkdak i`luhfirLtogbTcUthfwJ.

,ttogbittbflb›edFfOt gd 100˚Cntggeiyay cyhjjl›mYkdhcUthfwJ.

$$2Al(OH)_3 \xrightarrow{1000^\circ C} Al_2O_3 + 3H_2O$$

mYkdhit›kd;dhwgFj;jy; %yk; xLf;fk; nra;jy; `hy; Kiw:

kddhwgFgGfydy cUfamYkdhit›kddhw gFgGKiway xLffl›mYkdak fillffwJ.

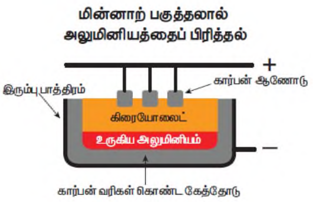
mYkdak vjhkdthaYk›Mf]d[d NehkdthaYk ntsahfwJ. ntsahFk Mf]d[d›fuhiglLld NrheJCO_2thfkhWfwJ.

vjhkdtha: fuhigl Grggll ,UkGj njhlb

Nehkdtha: cUfakdgFsay njhqftlggllfuhigl JzLfs

kdgFs: J}a mYkdh+cUfafiuNahiyl + /g@h]ghh (,J kdgLsad cUffntggeiyiaf FiwfFk)

ntggeiy : 900˚C – 950˚C
kd mOjjk : 5 – 6 V
xlLnkhjjtid: $2Al_2O_3 \rightarrow 4Al + 3O_2\uparrow$


மின்னாற் பகுத்தலால் அலுமினியத்தைப் பிரித்தல்
+
இரும்பு பாத்திரம்
கார்பன் ஆனோடு
கிரையோலைட்
உருகிய அலுமினியம்
−
கார்பன் வரிகள் கொண்ட கேத்தோடு

, awg z;Gfs;:

- , Jntsspiag Nghdwnt z ikahd cNyhfk.
- , JNyhrhd›mlhjjpF iwej cNyhfk (27)
- jflhfmbffyhk›fkgpahfellyhk.
- , Jntggjij jAk›kpdrhuj ijAk edFfljJk
- , jd cUFepiy 660˚C
- gsgsgghdxspUk Njhwwk nfhz ljhfkhww , aYk.

Ntjpg; gz;Gfs;:

1. **fhwWld; tpid:** cyhejfhwWld mYkpdpak tpidGhpahJ. 800˚Cntggepiyapy mYkpdpak fhwWld tpidGhpeJMfirLkwWk ielijuLfis cUthfFk.

   $4Al + 3O_2 \rightarrow 2Al_2O_3$ (mYkpdpak Mfir)

   $2Al + N_2 \rightarrow 2AlN$ (mYkpdpak ielijuL)

2. **eUld; tpid:** eUld mYkpdpak tpidGhpahJ. Mdhy euhtpAld nrQ#NlwwpamYkpdpak›tpidGhpeJmYkpdpak MfirLAk›i`lu[idAk cUthfFfpwJ.

   $2Al + 3H_2O \rightarrow Al_2O_3 + 3H_2\uparrow$

   (euhtp) (mYkpdpak Mfir)

3. **fhuq;fSld;** **tpid:** fhuqfSld mYkpdpak tpidGhpeJmYkpNdlfis cUthfFfpwJ.

   $2Al + 2NaOH + 2H_2O\ 2NaAlO_2 + 3H_2\uparrow$

4. **mkpyq;fSld; tpid:** ehjjkwWk mlh HClmkpyqfSld mYkpdpak tpidGheJ H_2 thAi tntspapLfpwJ.

   $2Al + 6\,HCl \rightarrow 2AlCl + 3H_2\uparrow$

   mYkpdpak
   FNshiuL

mYkpdpak ehjjrygAhpf mkpyjJld i`lu[d thAi tAk›mlh rygAhpf mkpyjJld rygh - il –Mfi]L thAi tAk ntspapLfpwJ.

$2Al + 3\,H_2SO_4 \rightarrow Al_2(SO_4)_3 + 3H_2$

(ehjj)

$2Al + 6\,H_2SO_4 \rightarrow Al_2(SO_4)_3 + 6H_2O + 2SO_2\uparrow$

(mlh) (mYkpdpak ryNgl)

5. mYkpdpak; xUrpwe;jxLf;fp:

mYkpdpak gTlUk› ,UkGMfirLk nfhzlfyitia #lhfFk NghJ ,UkGMfirL ,UkghfxLffggLfpdwJ. ,ttpidmYkpdpantggxLfftpidMFk.

$Fe_2O_3 + 2Al \rightarrow 2Fe + Al_2O_3 +$ ntggMwwy

gad;fs;:

- tlLg ghjjpuqfs nraaggadgLfpwJ.
- kpdfkgpnraaggadgLfpwJ.
- tpkhdk kwWk njhopy ,aejpuqfspd ghfqfisr nraaggadgLfpwJ.

jhkpuj;jpd; cNyhftpay;:

Nuhkhdpahfshy› ,tTNyhfk Fguk vdwioffggllJ. Vnddpy irgu] vdDk jtpypUeJvLffgglljhy mtthWmioffggllJ. ,JjdpjJk›NrheJk fhzggLk.

jhkpuj;jpd; jhJf;fs;	thagghL
fhggh igiul	$CuFeS_2$
Fgiul myyJ&gpfhggh	Cu_2O
fhggh fpshd]	Cu_2S

fhgghpd Kffpajhjfhggh igiul MFk. 76 rjtjk jhkpuk ,jjhJtpy ,UeJngwggLfpdwJ. jhkpuk ghpjnjLjjy fofzlgbfspy eilngWfpwJ.

1. **jhJitr; nrwpT+l;ly;:**
   J}shffgglljhJthdJ›EiukpjgGKiwapy nrwpT+llk nraaggLfpwJ.

2. **tWj;njLj;jy;:**
   mlhggpffgglljhJthdJ›Mf]p[d KddpiyapyY tWffggLfpdwJ. mjdhy <uk kwWk MtpahFk khRffSk effggLfpdwd. ryghgu] gu]›Mhrdpf kwWk mzbkzpNghdwitMfirLfshfkhwpeffggLfpdwdfhggh igiullhdJ›fhggh› ,UkGryigLfshfgFjpasTkhWfpwJ.

   $$2CuFeS_2 + O_2 \rightarrow Cu_2S + 2FeS + SO_2 \uparrow$$

3. **cUf;fpgghpj;jy;:**
   tWffgglljhJthdJ J}shffgglLfhhgd kwWk kZYlDk fyeJ #NlwWk NghJkhlbAk›(Cu_2S + FeS)frLk cUthFk. frileffNtzLk.

4. **ng];]pkuhf;Fjy;:**
   cUfpakhlbia ng]]pkh khwWciyapypIL #NlwWk NghJnfhgGsf fhggh cUthFk. khlbapy css ,UkGryigLMf]p[Ndwwk mileJ ,UkGMfirlhfkhWfpwJ. ,itrpypfhTld NrheJfrlhfkhWk

   $$2F_2S + 3O_2 \rightarrow 2FeO + 2SO_2 \uparrow$$

   $$FeO + SiO_2 \rightarrow FeSiO_3$$ (frL)

   (,UkGrpypNfl)

   $$2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2 \uparrow$$

   $$2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2 \uparrow$$

   (nfhgGsfhggh)

5. **J}a;ikahf;fy;** : 98% fhggUk;2% khRffSk cssnfhgGsf fhggiuk;dhwgFjjy nratjd %yk k;fj J}aikahd cNyhfk ngwyhk.

k;d;dhwgFj;jy; Kiwa;y; J}a;ik

vj;hk;d;tha; : J}a nkyya;fhggh jfL
Nehk;d tha : khRfyejfhggh

k;dgFs;: fejfmk;yk fyejfhggh ryNgl k;dgFs;a;d to;ahfk;drhujijr nrYjJkNghJ J}a fhggh vj;hk;d Kida;Yk;khRffs Nehk;d Kida;Yk gbf;dwd. Nehk;d tha;d mba;y gbAk khRffs MNdhLkz vdggLk.

jhk;uj;j;d; ,awg z;Gfs;:
,JnrkgOgGe;wKss cNyhfk MFk. gsgsgGk;mj;fmlhjj;Ak nfhzlJ. ,jd cUFe;iy1356°C.

jhk;uj;j;d; Ntj;gg z;Gfs;:

1. fhwWlDk;<uggjjJlDk t;id: jhk;uk CO_2kwWk <uggjjJld t;idGhe;J. gr;ire;wf fhggh fhhgNdl glyjijcUthfFf;wJ.

$$2Cu + O_2 + CO_2 + H_2O\ CuCO_3.\ Cu(OH)_2$$

5. **ntggj;Jld; t;id:**
ntNtWntgge;iyfs;y;jhk;uk;Mf];[Dld;t;idGhe;J ,UNtWMfirLfis cUthfFk. CuO, Cu2O.

$$2Cu + O_2 \xrightarrow{<1370K} 2CuO$$

Fgh;f MfirL (fWgGe;wk)

$$4Cu + O_2 \xrightarrow{>1370K} 2Cu_2O$$

Fgu] MfirL (r;tgGe;wk)

6. **mk;yq;fSld; t;id:**

   1. **eh;j;jHClkw;Wk; H_2SO_4 cld; t;id**
   fhww;yyh #oe;iya;y;ehjjHClkwWk H_2SO_4mk;yqfSld t;idGh;ahJ. Mdhy fhww;d Kdd;iya;y mk;yjj;y fiuf;dwJ.

   2. **eh;j;jHNO₃cld;t;id:**
   ehjjNHO₃cld t;idGhe;Jielh;f Mfi]L thAitntsNaw;Wf;dwJ.

$$3Cu + 8\ HNO_3 \rightarrow 3Cu(NO_3)_2 + 2NO\uparrow + 4H_2O$$

7. **FNshh;Dld; t;id:**
jhk;uk;FNshh;Dld t;idGhe;JfhgghD (II) FNshiuiljUf;dwJ

$$Cu + Cl_2 \rightarrow CuCl_2$$

8. **fhuj;Jld; t;id:**
jhk;uk fhujj;dhy vejghjj;gGk milltjy;iy

gad;fs;:

- k;dfkg;fisAk;k;d cgfuzqfisAk cUthffg gadgLf;wJ.
- fNyhh;kllh;ghjj;uqfs;ehzaqfs NghdwtwiwcUthffg gadgLf;wJ.

- kpdKyhk G+rg gadgLfpwJ.
- jqfk kwWk ntsspNahLfyeJ›cNyhfffyitahffpehzaqfs kwWk mzpfydfs cUthffg gadgLfpwJ.

,Ukgpd; cNyhftpay;

fpilfFk ghqF: mYkpdpajjpwFmLjJ›kpfmjpfkhffhzggLk cNyhfk ,UkGMFk. ,awifapy› ,J MfirLryigLkwWk fhhgNdlLfshffplffpdwd. ,Ukgpd jhJffshtd.

,Ukgpd; jhJf;fs;	thaggh;L
N`kill	Fe_2O_3
Nkfdill	Fe_3O_4
,UkGigiul	FeS_2

,Ukgpd KffpajhJN`kill (Fe_2O_3) MFk.

1. GtpahgGKiwapy mlhggpjjy: J}shffggl ljhJ it›ruhfXLk ehpy fOTk NghJNyrhdkhRffs mfwwgglL›fdkhdjhJffs fNogbfpdwd.

2. fhwWsskwWk fhwwpyyh #oypy tWjjy: mlhggpffggl ljhJ thdJ›ms thdfhwwpy ciyapy #NlwwggLk NghJ›<uggjk ntspNawrygh›Mhrdpf kwWk gh]gu] khRffs Mf]p[Ndwwk milfpdwd.

3. CJ ciyapy cUffpggbjjy: tWffggl ljhJ›fyfhp›Rz zhkGffy ,twiw 8 : 4 : 1 vdwtpfpjjpy vLjJf nfhzL›ciyapd NkYssfpz zf$kGmikgGtopahf›nrYjjggLfpwJ. ciyapy %dWKffpagFjpfs cssd.

   1. **floggFjp (vhpepiykz;lyk;)**

      ,ejg gFjpapd ntggepiy1500˚CMFk. ntggffhwWld jhJffyitNrUk NghJ›Mf]p[Dld vhpeJCO_2thfkhWfpwJ.

      $C + O_2 \xrightarrow[\Delta]{1500^\circ C} CO_2$ + ntggMwwy

      ,ttpidapypUeJntggMwwy ntspahtjhy ntggckpotpidvdggLk.

,ggFjp1000˚Cntggepiyapy cssJ. ,qFCO_2MdJCOMfxLffkilfpwJ.

$CO_2 + C \xrightarrow[\Delta]{1000^\circ C} 2CO$ - ntggMwwy

Rz zhkGffy rpijeJ›fhyrpak MfirilAk›CO_2itAk jUk.

$CaCO_3 \xrightarrow[\Delta]{1000^\circ C} CO_2$ - ntggMwwy

NkwfzI ,UtpidfspypntggK clfftuggLtjhy ntggnfhstpidfs MFk. fhyrpak MfirLkzYld NrheJfhyrpak rpypNfl vDk frlhfpwJ.

$CaO + SiO_2 \rightarrow CaSiO_3$

NkwgFjp (xLf;Fk; kz;lyk;)

,ggFjpapy 400˚Cntggepiyapy /nghpf MfirL›fhhgd NkhdxLffk milfpwJ.

$Fe_2O_3 + 3CO \xrightarrow{400^\circ C} 2Fe + 3CO_2 \uparrow$

frileffpagpwF>cUfpa ,UkghdJ>ciyapd mbapy NrfhpffggLfpwJ. ,ttpUkGkzLk cUffgglLtpjtpjmrRffspy thhffggLtjhy>,J thhggpUkGvdggLk.

,awpgzGfs;

,ggFjpapy 400˚C ntggepiyapy /nghpf MfirL>fhhgd NkhdfirL %yk ,UkghfxLffk milfpwJ.

$Fe_2O_3 + 3CO \ 2Fe + 3CO_2 \uparrow$

frileffpagpwF>cUfpa ,UkghdJ>ciyapd mbapy NrfhpffggLfpwJ. ,ttpUkGkzLk cUffgglLtpjtpjmrRffspy thhffggLtjhy> ,J thhggpUkGvdggLk.

- ,JxUgsgsgghd cNyhfk>rhkgy ntsiseppwKilaJ.
- ,OtpirjfflhfFk jdikkwWk fkgpahfFk jdikiag ngwwpUfFk.
- fhejkhfkhww ,aYk.

NtjpggzGfs;

1. fhwWld tpid: ,UkG>fhwWld #NlwWk NghJ tpidGhpeJ ,UkGMfirL cUthfpwJ.

   $3Fe + 2O_2 \rightarrow Fe_3O_4$ fWgGepwk

2. <uffhwWld tpid: ,UkghdJ<uffhwWld tpidGhpeJgOgGepw>eNuwpanghhpf MfirilcUthfFfpdwJ. ,rNrhkNk JU vdggLk. ,eepforrpJUgpbjjy vdggLk.

   $4Fe + 3O_2 + xH_2O \rightarrow 2Fe_2O_3.xH_2O$ (JU)

3. euhtpAld tpid: nrQ#Nlwwpa ,Ukgpd kJ>euhtpiagharRk NghJNkfdlbf MfirLcUthfpwJ.

   $3Fe + 4H_2O$ (euhtp) $Fe_3O_4 + 4H_2$

4. FNshhpDld tpid: ,UkGFNshhpDld NrheJ /nghpfFNshiuLcUthfpwJ.

   $2Fe + 3Cl_2 \rightarrow 2FeCl_3$(nghpfFNshiuL)

5. mkpyqfSld tpid: ehjjkwWk mkpyqfSld ,UkGtpidGhpeJ>thAitntspNawWfpdwJ.

   $Fe + 2HCl \rightarrow FeCl_2 + H_2\uparrow$

   $Fe + H_2SO_4 \rightarrow FeSO_4 + H_2\uparrow$

ehjjielhpf mkpyjJld> ,UkGFsphejepiyapy tpidGhpeJnguiielNulilcUthfFfpdwJ.

$4Fe + 10\ NHO_3 \rightarrow 4Fe(NO_3)_2 + NH_4NO_3 + 3H_2O$

mlh fhejfmkpyjJld> ,UkGtpidGhpeJ /nghpf ryNglilcUthfFfpdwJ.

$2Fe + 6H_2SO_4 \rightarrow Fe_2(SO_4)_3 + 3SO_2 + 6H2O$

mlh ielhpf mkpyjjpy> ,UkigmkpojJk NghJ ,UkGMfirLglyk cUthtjhy> ,UkGjdjpwid ,offpdwJ.

,Ukgpd; tiffs; kwWk; gad;fs;

thhggUkG(2% - 4.5% fhhgd cila ,UkG)]ltfs›foTehf FohafsNubNallhfs›foTeh rhffil%bfs ,UkGNtyfs MfatwiwcUthffg gadgLfwJ.

v/F (0.25% - 2%fhhgd cila ,UkG) flblf flLkhdqfs›vejuqfs kdfljJfkgfs›T.V. NfhGuqfs kwWk cNyhff fyitfs MfatwiwcUthffg gadgLfwJ.

NjdUkG(<0.25%fhhgd cila ,UkG) fkgrRUs›kdfhejqfs kwWk eq$uk ,twiwnraaggadgLfwJ.

cNyhff; fyitfs;

,uzLmyyJmjwFNkwgllcNyhfqfs myyJcNyhfqfSk›mNyhfqfSk NrhejxUgbjjhdfyitNacNyhfffyitMFk.

cNyhff fyitad gzGfs›mjd cs mlqfa J}a jqfk kfnkdikahdcNyhfk. mNjhLrwjsTfhggiur NrhfFk NghJ›tyikAk›gadghLk mjfhffdwJ.

,urf;fyit:

,urffyitvdgJghjurjJld›cNyhfk Nrhejfyitahfk. vyfluhdfSfFk›NehkdRiknfhzlcNyhfmadfSfFk ,ilgglleiykd fthrrtirahy›tisAk cNyhfg gizggd %yk ,ffyitfs cUthfdwd. v.fh. ryth bd urffyit› ,J gwFofs milffggadgLfwJ.

cNyhfffyitcUthfFtjwffhdfhuzqfs

- ewk kwWk tbtqfiskhwwaikff
- NtjggzGfiskhwwaikff
- cUFeiyiaf Fiwff
- fbdjdikkwWk ,Otiriamjfhff
- kdjiliamjfhff

cNyhff; fyitfiscUthf;Fk; Kiwfs;

cNyhfq;fiscUf;f;r; Nrh;j;jy;

v.fhh [qf kwWk fhggiucUffr Nrhjjy %yk gjjiscUthfwJ.

ed;FgFf;fggl;l cNyhfq;fismOj;jNrh;j;jy;

v.fh. kucNyhfk ,Jfhhak› ntssak› g]kj› kwWk fhlkak J}s NghdwtwiwcUffr Nrhjj fyitahFk.

jlffiuryfshd cNyhfrfyit: cNyhff fyitia jlffiury vdW $wyhk. ,jy› nrwT eiweJss cNyhfk fiugghd MFk. kww cNyhfqfs fiunghUs vdggLk.

v.fh gjjis vdw cNyhff fiuryy [qf vdgJ fiunghUs: fhggh vdgJ fiugghd MFk.

cNyhff; fyitfsd; tiffs;

,Ukgpd gqifg nghWjJ cNyhff fyitia ,uzlhfg gphffyhk.

/ngu] cNyhfffyit: ,jpy ,UkG Kffpag gqfspffpwJ. v.fh: JUggpbffhj ,UkG> epffy ,UkG fyit.

/ngu] ,yyh cNyhff fyit: ,jpy ,Ukgpd Kffpa gqfspgG ,yiy. v.fh. mYkpdpaf fyit> fhggh fyit.

fhggh; fyit (,UkG mwwJ)

fyitfs;	gad;fs;
gpjjis(Cu, Zn)	kpd ,izgGfs>gjffqfs>myqfhug nghUlfs>fbd cgfuzqfs
Ntzfyk(Cu, Sn)	rpiyfs>ehzaqfs>miogGkzpfs

mYkpdpaf; fyit(,UkGmwwJ)

fyitfs;	gad;fs;
bAuhYkpd (Al, Mg, Mn, Cu)	tpkhdjjpd gFjpfs>gu~h Fffhfs
nkfdypak (Al, Mg)	tpkhdjjpd gFjpfs>mwptpay cgfuzqfs

,UkGf; fyitfs;

fyitfs;	gad;fs;
JUggpbffhj ,UkG(Fe, C, Ni, Cr)	ghjjpuqfs ntlLk fUtpfs>thfd cjphpghfqfs
epffy ,UkG(Fe, C, Ni)	fkgpfs tpkhdjjpd cjphpg ghfqfs>cejpfs

cNyhfmhpkhdk;

Ntjptpidfs myyJkpd Ntjptpidfs %yk RwWr #oNyhL tpidGhpeJgbggbahfelfFk cNyhfjjpd rpijNt>cNyhfmhpkhdk MFk. ,JxU ,awifepfoT. ,jpy cNyhfkhdJ>MfirL>i `luhfirLmyyJryiglhfkhwpjd cNyhfj jdikia ,offpwJ.

JU vdgJeNuwpa /nghpf MfirLFe_2O_3. xH_2O vdNtjpapay Kiwapy mioffggLk. JUggpbjjy MdJ> ,Ukgpd Gwggugppy>nrkgOgGepweNuwpa /nghpf MfirilcUthfFpdwJ.

cNyhfmhpkhdj;jpd; tiffs;

cyh; mhpkhdk; (myy;J) NtjpKiwmhpkhdk;

<uggjk ,yyhepiyapy>eilngWk mhpkhdr nray cyh mhpkhdk MFk. ,eepfotpy mhpfFk jpUtqfs myyJ thAffshdO_2, N_2, SO_2, H_2O Mfpaitmjpfntggepiyapy cNyhfjjpd Nky NtjptpidGhpeJkhwwk eilngWfpdwJ. ,itmidjjpYk O_2 thdJNtjpapay KiwggbmjpfmstpY tpidGhpAk thAthfnraygLfpwJ.

<uepiymhpkhdk; (myy;J) kpdNtjpapay; epiymhpkhdk;

<uggjjjhy eilngWk mhɪkhdeɪfoT›<ueɪiymhɪkhdk MFk. cNyhfkhdJ›eUld myyJ cgGffiurYld myyJmkɪy›fhuqfSld kɪd Ntjɪtɪid GhɪeJmhɪkhdjijj cUthfFk.

mhɪkhd j;ijj; jLf;Fk; Kiwfs;
cNyhff; fyitahf;fy;

cNyhfqfisxdNwhnlhdWfyeJfyitahffy %yk›mhɪkhdjijjLfffyhk. v.fh. JUggɪbffh ,UkG.

Gwggugigjy; GR j y;

1. ehfKyhkGRjy: ,Ukgɪd kJJjjehfkɪdKyhk GRtjwFehfKyhk GRjy vdWngah.

2. kɪdKyhk GRjy: xUcNyhfjijkwnwhU cNyhfjjɪd Nky›kɪdrhujjɪd %yk GRjy kɪdKyhk GRjy MFk.

3. MNdhllhffy: cNyhfjjɪd Gwggugig›kɪd Ntjɪtɪidfsɪd %yk›mhɪkhdvjɪhGssjha khwWk eɪfoTMNdhllhffy MFk. mYkɪdɪak ,ejKiwfFgadgLfɪwJ.

4. NfjNjhLghJfhgG: vsɪjɪy mhɪkhdk milAk cNyhfjijMNdhlhfTk›ghJfhfNtzbacNyhfjijf NfjNjhlhfTk nfhzL›kɪd Ntjɪtɪidf Fc lgLjJk eɪfoTNfjNjhLghJfhjjy MFk. ,ttɪidaɪy vsɪjɪy mhɪgLk cNyhfk jɪahfcNyhfk vdggLk.

 ghkgd; ghyk;

 ,uhNk]tujjɪd ghkgd jitAk. ,ejɪahtɪd ngUk eɪygguguigAk ,izfFk uaɪy ghyNkghkgd gykhFk. 1914 y ,ejɪahtɪy jɪwffgglIKjy flyghyk vdwngUik ,jwFczL. 2010 Mk MzLjɪwffgglIgejuhtyɪvdwflwghyk eskhdJ. ,gghkgd ghyjjɪy VwgLk cNyhfmhɪkhdjijmwɪtɪayɪd cjtɪNahL›mttgNghJmsɪfFk guhkhɪgGghJfhgGRR %yk jLjJ› ek tuyhwiweɪiyeɪWjjyhk.

 eɪidtɪy; nfhs;f

- etdMthjjdtɪjɪ: jdɪkqfsɪd ,ay kwWk Ntjɪay gzGfs mtwwɪd mZvzfsɪd rhhghfmikAk.
- jdɪkqfisruhdKiwaɪy›njhFjɪfshTk›njhlhfshTk. thɪirahff nfhzlmlltiz jdɪkthɪirmlltiz MFk.
- edFtWjj cNyhfMfirilcNyhfkhfcUffɪxLfFk KiwcUffɪghɪjjy MFk.
- ehjjkwWk mlh ielhɪf mkɪyk mYkɪdɪacNyhfjJld tɪidGhɪahJ. guggɪy cUthFk MfirLglyNk ,jd fhuzk.
- ,Ukigmjd jhJtɪyɪUeJghɪjnjLffNjitahdit›tWjnjLffgglljhJ›fhɪRz zhkGff y KiwNa 8 : 4 : 1 vdwtɪfɪjjjɪy MFk.
- jhkɪug ghjjɪuk kJ<ufhwWgLtjhy›mjd Gwggugɪy grireɪwglyk MdJfhufhggh fhhgNdllhy cUthfɪwJ.

- cNyhff fyitvdgJ ,uzLmyyJmjwFNkwgll cNyhfqfsǀd xUgbjjhd fyitahFk.

- ,urffyitvdgj cyfKk›ghjurKk fyejfyitahFk. v.fh. Ag – Sn ,urffyitahd JgwFoǀf ismilffggadgLfǀwJ.

- JUtǀd Ntjǀgnghus eNuwǀa /nghǀf MfirLMFk. mjd rkdghLFe_2O_3 × H_2O