(01). (a).

(I). $LiOH < NaOH < KOH$

(II). $NH_4^+ < NOCl_3 < NO_2Cl$

(III). $F < C < Be < S$

(IV). $C < B < F < O$

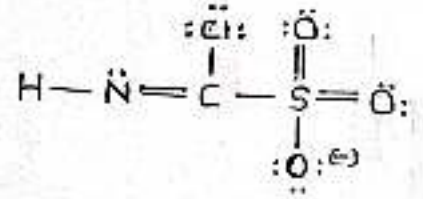
(V). ඇ කිරණ < u.v < IR < ක්ෂුද්‍ර තරංග

(VI). $H_2O < H_2O_2 < O_2F_2 < OF_2$

04×6 = 24

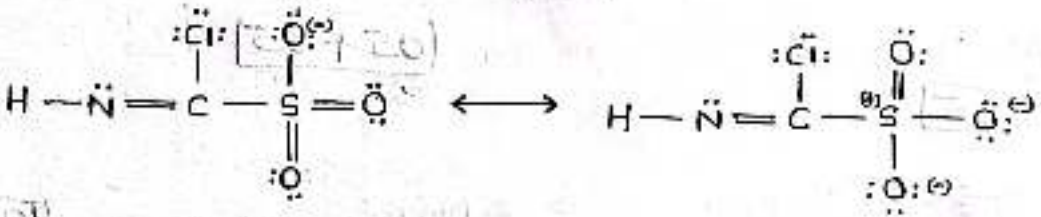
(b).

(I).



09

(II).



05×4
20

(III).

	C^1	N^2	N^3	C^4
VSEPR යුගල්	3	4	3	3
ඉලෙක්ට්‍රෝන යුගල ජ්‍යාමිතිය	තලීය ත්‍රිකෝණාකාර	චතුස්තලීය	තලීය ∆	තලීය ∆
හෝඩිය	〃	පිරමිඩීය	කෝණික	〃
මුහුම්කරණය	Sp^2	Sp^3	Sp^2	Sp^2

16

(IV).

$C^1 - Sp^2$	$O - 2p/Sp^2$
$C^1 - Sp^2$	$N^2 - Sp^3$
$N^2 - Sp^3$	$H - 1S$
$N^2 - Sp^3$	$N^3 - Sp^2$
$N^3 - Sp^2$	$C^4 - Sp^2$
$C^4 - Sp^2$	$Cl - 3p$

12

$N^3 — 2P$ $C^4 — 2P$ [04]

(c).

(i). සත්‍යය (ii). අසත්‍යය (iii). සත්‍යය (iv). සත්‍යය (v). අසත්‍යය [03×5=15]

(02). (i). A = Na B = Mg C = Al [30]

(ii). $2Na + 2H_2O \longrightarrow 2NaOH + H_2$ [05]

(iii). $Mg + H_2O \longrightarrow Mg(OH)_2 + H_2$ [05]

$Mg + H_2O_{(g)} \longrightarrow MgO + H_2$ [05]

(iv). $2Mg + O_2 \longrightarrow 2MgO$ [05]

$3Mg + N_2 \longrightarrow Mg_3N_2$ 05

(v). NH_3 [05]

(vi). ෆිනොප්තලීන් දර්ශකය – තද රෝස වීම. [05+05]

(vii). තද [05]

(viii). $2NaOH + 2Al + 6H_2O \longrightarrow 2NaAl(OH)_4 + 3H_2$ [10]

(ix). $2Na + O_2 \longrightarrow Na_2O_2$ [8]

$Na + O_2 \longrightarrow Na_2O$ [7]

(03). (i). $K_2CO_{3(aq)} + 2HNO_{3(aq)} \longrightarrow 2KNO_{3(aq)} + CO_{2(g)} + H_2O_{(l)}$ [6]

(ii). K_2CO_3 මවුල $= \frac{2.76\ g}{138\ g\ mol^{-1}} = 0.02\ mol$ [3+1]

HNO_3 මවුල $= \frac{1}{1000} \times 50 = 0.05\ mol$ [3+1]

ප්‍රතික්‍රියා කරන K_2CO_3 මවුල $= 0.02\ mol$ [2+1]

වැයවන HNO_3 මවුල $= 0.04\ mol$ [2+1]

සීමාකාරී සාධකය $= K_2CO_3$ [6]

(iii). $Q = mc\Delta t$ [3]

$= 1\ g\ cm^{-3} \times 50\ cm^3 \times 4.2\ J\ g^{-1}K^{-1} \times 3.5\ K$ [6+1]

$= 735\ J$ [4+1]

(iv). උෂ්ණත්වය වැඩි වී ඇත. එම නිසා තාපදායක වේ. [4+4]

$\Delta H = \dfrac{-735 \times 10^{-3}\ kJ}{0.02\ mol}$ [4+1]

$= -36.75\ kJmol^{-1}$ [5+2+1] (unit, (−))

VII . [illegible] [4]

. [3+3]

(VII). $2HNO_{3(aq)} + K_2CO_{3(s)} \xrightarrow{\Delta H} 2KHCO_{3(s)} + 2HNO_{3(aq)}$ [5+1]

$-36.75\ kJmol^{-1}$ [5+1] ↘ ↙ $+50\ kJmol^{-1}$ [5+1]

$KNO_{3(aq)} + 2CO_{2(g)} + 2H_2O_{(l)}$

$\Delta H + 50\ kJmol^{-1} = -36.75\ kJmol^{-1}$ [4+1]

$\Delta H = -86.75\ kJmol^{-1}$ [4+1]

(04). (a). A

$CH_3CH_2CH = CH_2 / CH_3CH = CHCH_3$

B

$CH_3 - C(CH_3) = CH_2$

C

$CH_3CH_2CH_2CH_3$

D

$CH_3 - C(CH_3)(H) - CH_3$

E

$CH_3CH_2CH(Br) - CH_3$

F

$CH_3 - C(CH_3)(Br) - CH_3$

[05×6=30]

(b).

(I). $CH_3CH_2CH_2CH_3$

(II). $CH_2(Br) - CH_2(Br)$

(III). $CH_3CH_2CH(Br) - CH_3$

(IV). $CH_2(OH) - CH_2(OH)$

(V). $CH_3 - CH_2(OSO_3H)$

(VI). $CH_3CH_2CH(OH)CH_3$

(VII). $CH_3 - C(Br)(Br) - CH_3$

(VIII). $CH_3 - C(=O) - CH_3$

(IX). $CH_2 = CH_2$

(X). $H - C(Br)(Br) - C(Br)(Br) - H$

[05×10=50]

(ඈ). $CH_3CH = CH_2$ 4 → $\overset{\delta+}{H} - \overset{\delta-}{Br}$ → $CH_3\overset{+}{C}HCH_3$ + Br^- 2

$CH_3CH^+CH_3$ 4 Br^- → $CH_3CH(Br)CH_3$ 2

[20]

රචනා

(05). (අ).

(I). ජල වාෂ්ප සඳහා $n = \frac{PV}{RT}$ [5]

$n = \frac{1 \times 10^5\ Pa \times 8.314 \times 10^{-3} m^3}{8.314\ J mol^{-1} K^{-1} \times 500 K}$ [8+2]

$n = 0.2\ mol$ [4+1]

$XCO_3 \cdot 2H_2O$: H_2O

1 : 2 [5]

$XCO_3 \cdot 2H_2O$ මවුල = 0.1 mol [5]

(II). 1. $XCO_3 : CO_2$ 1:1 බැවින්

$CO_2 = 0.1\ mol$ [5]

2. CO_2 සඳහා $P = \frac{nRT}{V}$

$= \frac{0.1\ mol \times 8.314\ J K^{-1} mol^{-1} \times 600 K}{8.314 \times 10^{-3}\ m^3}$ [4+1]

$= 6 \times 10^5\ Pa$ [4+1]

3. $nCO_2 + nH_2O = 0.3\ mol$ [02]

$P = \frac{0.3\ mol \times 8.314\ J mol^{-1} K^{-1} \times 600 K}{8.314 \times 10^{-3}\ m^3}$ [4+1]

$1.8 \times 10^5\ Pa$ [4+1]

4. CO_2 සහ $H_2O_{(g)}$ පරිපූර්ණ වායු ලෙස හැසිරෙන බව [03]

XCO_3 හා XO ඝනයන්හි පරිමාවන් නොසැලකිය හැකි තරම් කුඩා වේ. [02]

(I). $I_{2(s)} \longrightarrow I_{2(g)}$

(II). $\frac{1}{2}Br_{2(l)} \longrightarrow Br_{(g)}$

(III). $Cl_{(g)} + e \longrightarrow Cl^-_{(g)}$

(IV). $2C_{(s)} + 3H_{2(g)} + \frac{1}{2}O_{2(g)} \longrightarrow C_2H_5OH_{(l)}$ **05×4=20**

(c). (I). $C_3H_{8(g)} + 3H_2O_{(g)} \xrightarrow{\Delta H^\phi} 3CO_{(g)} + 7H_{2(g)}$

$\Delta H^\phi = \sum \Delta H^\phi$ ඵල $- \sum \Delta H^\phi$ ප්‍රතික්‍රියක **5**

$= -110 \times 3\ kJmol^{-1} - [-104\ kJmol^{-1} + (-214 \times 3)]$

$= (-330 + 746)\ kJmol^{-1}$ **8+2**

$= +416\ kJmol^{-1}$ **8+2**

$\Delta S^\phi = \sum S^\phi$ (ඵල) $- \sum S^\phi$ ප්‍රතික්‍රියක **5**

$= [(197 \times 3) + (131 \times 7)] - [288 + (189 \times 3)]\ Jmol^{-1}K^{-1}$ **8+2**

$= 653\ Jmol^{-1}K^{-1}$ **8+2**

$\Delta G = \Delta H - T\Delta S$ **5**

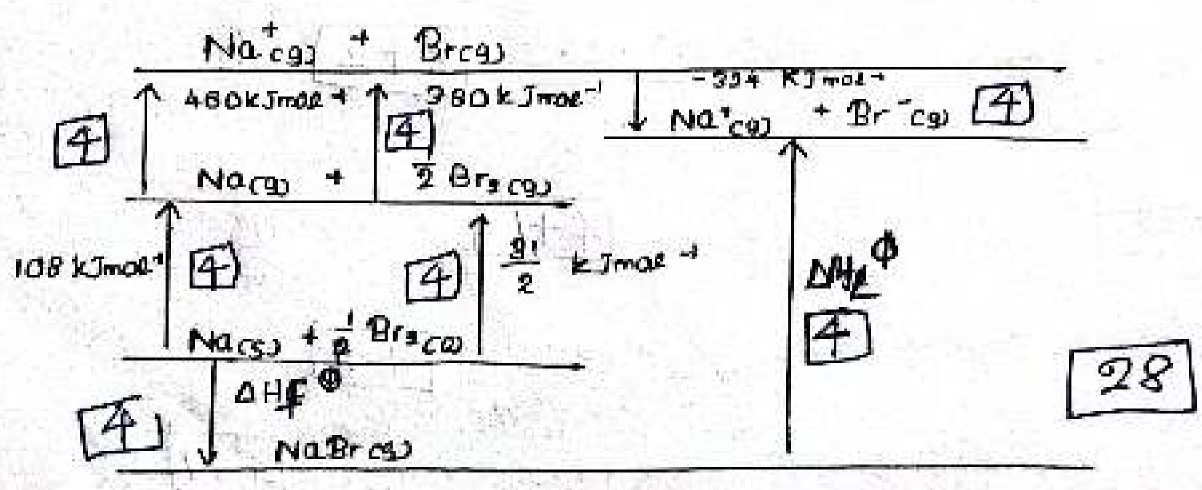
$= 416\ kJmol^{-1} - 500K \times 653 \times 10^{-3}\ kJmol^{-1}K^{-1}$ **6+2**

$= +89.5\ kJmol^{-1}$ **4+1**

(06). (a).

(I). සම්මත තත්ත්වයේදී ඝන අයනික සංයෝගයක මවුලයක් එහි වායුමය ධන හා සෘණ අයන බවට පත් කිරීමේදී සිදුවන එන්තැල්පි විපර්යාසය. **10**

(II).



නිවැරදි කරමගයක් [2]

$(108 + \frac{31}{2} + 460 + 380 - 924)\ kJmol^{-1} = \Delta H_2^{\phi} - 360\ kJmol^{-1}$ [4+1]

$999.5\ kJmol^{-1} = \Delta H_2^{\phi}$ [5+1]

(II). $NaBr_{(s)} \xrightarrow{\Delta H^{\phi}_{sol}}$ [5] $Na^+_{(aq)} + B^-_{(aq)}$

$999.5\ kJmol^{-1}$ [5] ↓

$Na^+_{(g)} + Br^-_{(g)}$ → $(-362 + -348)\ kJmol^{-1}$ [5] ↑

නිවැරදි කරමගයක් [2]

$\Delta H^{\phi}_{sol} = 999.5 - 362 - 348\ kJmol^{-1}$ [4+1]

$= 289.5\ kJmol^{-1}$ [4+1]

(III). $\Delta G^{\phi} = \Delta H^{\phi} - T\Delta S^{\phi}$ [5]

$-408\ kJmol^{-1} = -360\ kJmol^{-1} - 298\ k \cdot \Delta S^{\phi}$ [8+1]

$298\ \Delta S^{\phi} = 48\ kJmol^{-1}$

$= 0.161\ kJmol^{-1}k^{-1}$

$= 161\ Jmol^{-1}k^{-1}$ [4+1]

(b). (I). $2\ kMnO_4 \longrightarrow k_2MnO_4 + MnO_2 + O_2$ [10]

(III). O_2 ස්කන්ධය $= (22.72 - 22.08)\ g$ [5]

$= 0.64\ g$

$nO_2 = \frac{0.64\ g}{32\ g\ mol^{-1}}$ [2]

$= 0.02\ mol$ [4+1]

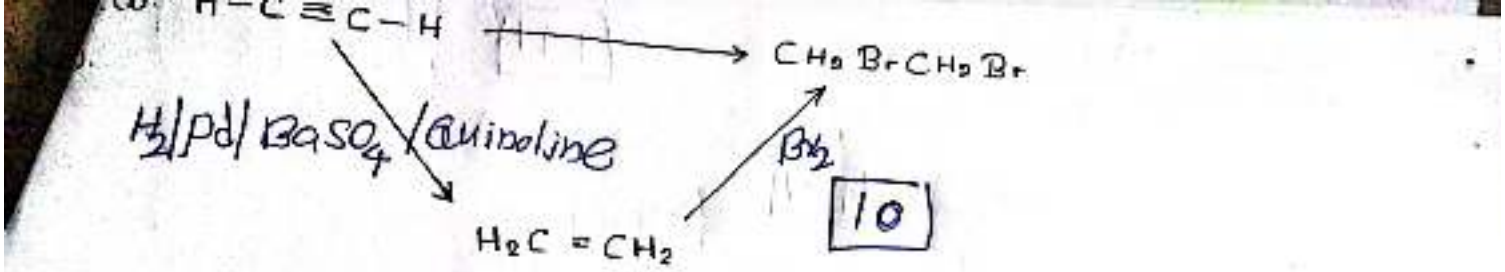
(IV) $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ [5]

$\frac{760\ Hg\ mm \cdot V}{273\ k} = \frac{(760-32) \cdot 540}{303}$ [8+2]

$V = 466\ cm^3$ [4+1]

(IV). O_2 වල මවුලික පරිමාව $= \frac{4.66\ cm^3}{0.02\ mol}$ [4+1]

$= 23300\ cm^3\ mol^{-1}$ [4+1]



10

(V). $CH_3C \equiv C-H$ → $CH_3CH(Br)CH_2Br$

$H_2/Pd/BaSO_4$/Quinoline

$CH_3CH=CH_2$ —Br_2→ $CH_3CH(Br)CH_2Br$

10

(VI). $CH_3-C \equiv C-H$ → $CH_3CH(OH)CH_3$

$H_2/Pd/BaSO_4$/Quinoline

$CH_3CH=CH_2$ —dil. H_2SO_4, Δ→ $CH_3CH(OH)CH_3$

10

(VII) $H-C \equiv C-H$ → $CH_2(OH)-CH_2(OH)$

$H_2/Pd/BaSO_4$/Quinoline

$CH_2=CH_2$ —OH^-/MnO_4^-→ $CH_2(OH)-CH_2(OH)$

10

(VIII). $H_2C=CH_2$ + $H-O-S(=O)(=O)-O-H$ → $CH_3-CH_2^+$ + $O^- SO_3H$

(4) (4) (4) (4)

$CH_3-CH_2^+$ + $O^- SO_3H$ → $CH_3-CH(H)-OSO_3H$

(4)

20

(ii) $[H_2SO_4] = \frac{1.20 \times 10^3}{98} \times \frac{98}{100}$ mol dm^{-3} 4+1

$= 12$ mol dm^{-3} 4+1

(iii) $C_1V_1 = C_2V_2$

12 mol dm$^{-3} \times V = 0.5$ mol dm$^{-3} \times 250$ cm^3 4+1

$V = 10.4$ cm^3 4+1

(iii) $H_2SO_4 + 2\,NaOH \longrightarrow Na_2SO_4 + 2\,H_2O$

H_2SO_4 මවුල $= \frac{0.5}{1000} \times 25$ mol 5

$[NaOH] = \frac{0.5}{1000} \times 25 \times 2 \times \frac{1000}{30}$ mol dm^{-3} 5

$= 0.83$ mol dm^{-3} 5

(iv) $5C_2O_4^{2-} + 16H^+ + 2MnO_4^- \longrightarrow 10CO_2 + 2Mn^{2+} + 8H_2O$ 10

$5SO_3^{2-} + 6H^+ + 2MnO_4^- \longrightarrow 5SO_4^{2-} + 2Mn^{2+} + 3H_2O$ 10

$BaSO_4$ මවුල $= \frac{0.699\,g}{233\,g\,mol^{-1}}$

$= 0.003$ mol 5

SO_3^{2-} මවුල $= 0.003$ mol

$[SO_3^{2-}] = \frac{0.003}{25} \times 1000$

$= 0.12$ mol dm^{-3} 4+1

එකතු $KMnO_4$ මවුල $= \frac{1}{1000} \times 20 = 2 \times 10^{-2}$ mol 4+1

SO_3^{2-} සඳහා යෙදූ $KMnO_4$ මවුල $= \frac{2}{5} \times 2 \times 10^{-3}$

$= 1.2 \times 10^{-3}$ mol 4+1

$C_2O_4^{2-}$ සඳහා යෙදූ $KMnO_4$ මවුල $= (2 \times 10^{-2} - 1.2 \times 10^{-3})$

$= 18.8 \times 10^{-3}$ mol 4+1

$C_2O_4^{2-}$ මවුල $= \frac{5}{2} \times 18.8 \times 10^{-3}$

$= 47 \times 10^{-3}$ mol 4+1

$[C_2O_4^{2-}] = \frac{47 \times 10^{-3} \times 10^3}{25}$ mol dm^{-3}

$= 1.88$ mol dm^{-3} 4+1

(08).

ⓐ (I). A = N B = S [5+5]

(II). X = NH_3 Y = H_2S [10+10]

(III). NO +2 N_2O +1 N_2O_3 +3 $(02+1)\times 3 = 09$

(IV).

a). $2Na + 2NH_3 \longrightarrow 2NaNH_2 + H_2$ [4]

b). $4NH_3 + 3O_2 \longrightarrow 2N_2 + 6H_2O$ [4]

c). $2Na + 2NH_3 \longrightarrow 2NaNH_2 + H_2$ [4]

d). $NH_3 + HCl \longrightarrow NH_4Cl$ [4]

(V). සුදු ජෙලටිනීය අවක්ෂේපය [5]

$Al(OH)_3$ [5]

(VI). නෙස්ලර් ප්‍රතිකාරකය [5]

තද දුඹුරු පැහැය [3]

(VII). HNO_3 [5]

$Cu + 4HNO_3 \longrightarrow Cu(NO_3)_2 + 2NO_2 + 2H_2O$ [10]

(VIII). අම්ලයක් ලෙස $H_2S + 2Na \longrightarrow Na_2S + 2H_2O$ [5]

(IX). ඔක්සිකාරකයක් ලෙස - $2Na + H_2S \longrightarrow Na_2S + H_2$ [5]

ඔක්සිහාරකයක් ලෙස

$6H^+ + MnO_4^- + 5H_2S \longrightarrow 2Mn^{2+} + 5S + 4H_2O$ [5]

(X). $(CH_3COO)_2Pb + H_2S \longrightarrow PbS + 2CH_3COOH$ [6]

ⓑ. (I). SO_3^{2-} , NO_3^- , HCO_3^- [10×3 = 30]

(II). $2H_2O + SO_2 \longrightarrow SO_4^{2-} + 2e + 4H^+$ [2]

$8H^+ + MnO_4^- + 5e \longrightarrow Mn^{2+} + 4H_2O$ [2]

$2MnO_4^- + 5SO_2 + 2H_2O \longrightarrow 5SO_4^{2-} + 2Mn^{2+} + 4H^+$ [7]

09. a). M = Co [15]

(a). +2 [5]

(II) $1s^2\ 2s^2 2p^6\ 3s^2 3p^6\ 3d^7$ [5]

(III). n = 6 m = +2 [3+3]

(IV). R = $[CoCl_4]^{2-}$ Q = $Co(OH)_2$ S = $[Co(NH_3)_6]^{2+}$ [06×3 = 18]

(V). R - tetrachloridocobaltate (II) ion [8]

S - hexaamminecobalt (II) ion [8]

(b). (I). Ag^+, Pb^{2+} Fe^{3+} Ni^{2+} [08×4 = 32]

(II). X_1 = $PbCl_2$ හා AgCl [5+5]

X_2 = PbS [5]

X_3 = $Fe(OH)_3$ [5]

X_4 = NiS [5]

(III). සංඝටක 1 - $[Ni(H_2O)_6]^{2+}$ [5] - hexaaquanickel (II) ion [4]

සංඝටක 2 - $[NiCl_4]^{2-}$ [5] - tetrachloridonickelate (I) ion [5]

සංඝටක 3 - $[Ni(NH_3)_6]^{2+}$ [5] - hexaamminenickel (II) ion [4]

M.C.Q answer

1) 4	11) 4	21) 3	31) 4	41) 1
2) 3	12) All	22) 4	32) 3	42) 1
3) 4	13) 3	23) 3	33) 4	43) 2
4) 3	14) 4	24) 3/All	34) 2	44) 4
5) 3	15) 2	25) 3	35) 2	45) 3
6) 2	16) 3	26) 3	36) 3	46) 4
7) 4	17) 3	27) 4	37) 1	47) 4
8) 4	18) 3	28) 3	38) 1	48) 1
9) 5	19) 1	29) 3	39) 1	49) 5
10) 4	20) 3	30) 3	40) 1	50) 3