வடமாகாணக் கல்வித் திணைக்களத்துடன் இணைந்து
தொண்டைமானாறு வெளிக்கள நிலையம் நடாத்தும்
தவணைப் பரீட்சை, நவம்பர் - 2019
Conducted by Field Work Centre, Thondaimanaru
In Collaboration with Provincial Department of Education Northern Province
Term Examination, November - 2019

FWC

**Grade - 13 (2020)** **Chemistry** **Marking Scheme**

Part - I MCQ

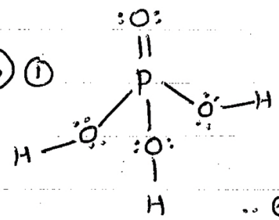
| | | | | |
|---|---|---|---|---|
| 01) 3 | 11) 5 | 21) 3 | 31) 1 | 41) 1 |
| 02) 1 | 12) 3 | 22) 1 | 32) 5 | 42) 2 |
| 03) 2 | 13) 5 | 23) 1 | 33) 4 | 43) 2 |
| 04) 4 | 14) 4 | 24) 5 | 34) 3 | 44) 1 |
| 05) 5 | 15) 1 | 25) 4 | 35) 2 | 45) 5 |
| 06) 1 | 16) 2 | 26) 5 | 36) 1 | 46) 5 |
| 07) 3 | 17) 3 | 27) 2 | 37) 4 | 47) 3 |
| 08) 3 | 18) 5 | 28) 5 | 38) 4 | 48) 4 |
| 09) 2 | 19) 1 | 29) 5 | 39) 3 | 49) 3 |
| 10) 4 | 20) 2 | 30) 3 | 40) 2 | 50) 1 |



## Part - II

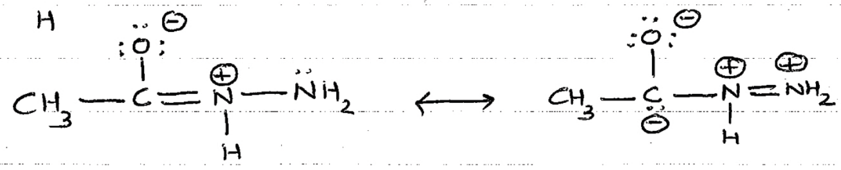
(1) (A) (i) Cl (ii) S (iii) Al (iv) Na (v) Ar (vi) Al   $04 \times 6 = 24$

(B) (i)



(07)

(ii)



(04)   (04)   unstable (02)

(iii)

| | $O^1$ | $C^3$ | $N^4$ | $N^5$ |
|---|---|---|---|---|
| | 4 | 2 | 3 | 3 |
| | Tetrahedral | linear | Trigonal planar | Trigonal planar |
| | $sp^3$ | sp | $sp^2$ | $sp^2$ |
| | Angular | Linear | Angular | Trigonal planar |

$(01 \times 16 = 16)$

(iv)

| | | | |
|---|---|---|---|
| H | 1s | O | $sp^3$ |
| $O^1$ | $sp^3$ | $C^2$ | sp |
| $C^3$ | sp | $N^4$ | $sp^2$ |
| $N^4$ | $sp^2$ | $N^5$ | $sp^2$ |
| $N^5$ | $sp^2$ | F | 2p |

$(01 \times 10 = 10)$

(v)

| | | | |
|---|---|---|---|
| $C^2$ | 2p | $C^3$ | 2p |
| $N^4$ | 2p | $N^5$ | 2p |

$(01 \times 4 = 04)$

(1)(B) 47 marks

(C)

| | | | | |
|---|---|---|---|---|
| (i) | 3 | 2 | ✓ | ✓ |
| (ii) | ✓ | 1 | ✓ | 3p |
| | ✓ | 1 | ✓ | 3p |
| | ✓ | 1 | ✓ | 3p |
| (iii) | ✓ | 0 | 0 | ✓ |
| (iv) | ✓ | 1 | ✓ | 2p |
| (v) | ✓ | 0 | 0 | ✓ |

$(01 \times 14 = 14)$

3

(D) (i) $BeSO_4 < MgSO_4 < CaSO_4$

(ii) $NO_4^{3-} < NO_3^- < NO_2^- < NO_2^+$

(iii) $LiF < NaF < KF$ **(05×3) = 15**

(2) (A) (i) K (07) (ii) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$ (06) (iii) $K_2O, K_2O_2, KO_2$

(02×3 = 06)

(iv) I $KO_2$ (03)

II $2KO_2 + 2H_2O \longrightarrow 2KOH + H_2O_2 + O_2$ (05)

III $4KO_2 + 2H_2O \longrightarrow 4KOH + 3O_2$ (05)

(v) Double Cobalt glass (03)

(vi) Y – Li (03)

(vii) Diagonal relationship (03)

(viii) * decomposition of $Li_2CO_3$ is same as $MgCO_3$ (03)

* decomposition of $LiNO_3$, LiOH are similar to compounds of Mg (03)

* Li can form $N^{3-}$ like Mg (03)

**(2)(A) 50 marks**

(B) I

(i) NaOH (ii) HCl (iii) NaBr (iv) $HNO_3$ (v) $Na_2S_2O_3$ (03×5=15)

II

A – $NH_3$ B – $PbCl_2$ C – AgBr D – $CO_2$ E – $PbS_2O_3$

(04×5=20)

III

$PbCl_{2(s)} \rightleftharpoons Pb^{2+}_{(aq)} + 2Cl^-_{(aq)}$

$AgBr_{(s)} + NH_{3(aq)} \rightleftharpoons [Ag(NH_3)_2]Br_{(aq)}$

IV

$PbS_2O_3 \longrightarrow PbS\downarrow + SO_3$ (05×3 = 15)

**(2)(B) 50 marks**

(3) (i) I – To reduce the reaction between Mg tape and HCl (05)

II It is difficult to get initial reading due to the fast reaction (05)

(ii) I – NO, (03)

II Because, Rapid reaction takesplace, difficult to get initial reading (05)

(iii) $Mg + 2HCl \longrightarrow MgCl_2 + H_2$ (07)

(iv) $V_{H_2} = (46.00 - 2.20) = 43.80\ cm^3$ (04+01)

(v) $\frac{760 - 31.8}{760} \times 10^5\ Nm^{-2}$

(05) (04+01)

(vi) $PV = nRT$ (05)

P – Pressure exerted by gas  n – Amount of substance  T – Absolute temperature

V – Volume occupies by gas  R – universal gas constant (01×5 = 05)

(vii)

$$\frac{728.2 \times 10^5}{760} Pa \times \frac{43.8 \times 10^{-6}\ m^3}{8.314\ J mol^{-1} K^{-1} \times 303\ K}$$

$= 1.665 \times 10^{-3}$ mol  {(03+01) × 5 = 20}

(viii) $H_2$ act as Ideal gas (05)

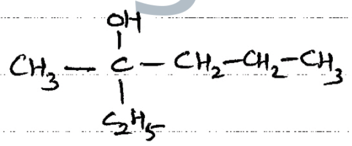
(ix) $n = \frac{w}{M}$ (05)  $M = \frac{0.04 g}{1.665 \times 10^{-3} mol}$ (04+01)

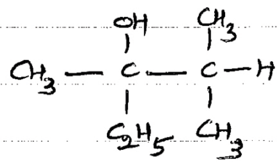
$= 24.02\ g mol^{-1}$ (04+01)

Relative molecular mass $Mg = 24$ (04+01)

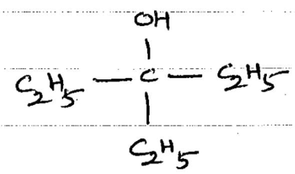


(4) (A) (i)

A –


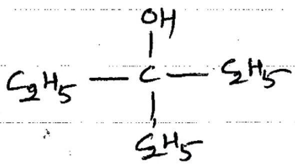
B –


• Structures A, B and C are Interchangeable.

C –


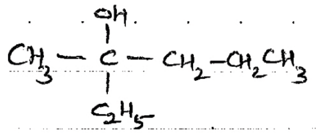
(06 × 3 = 18)

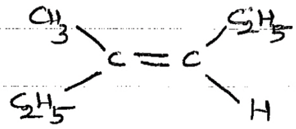
(ii)

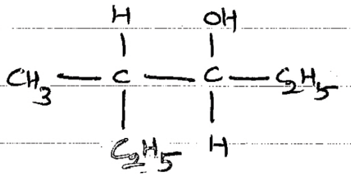


(06)

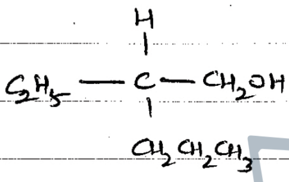
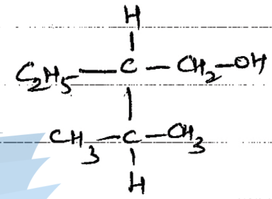
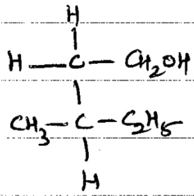
(III)

A – 

G – 

H 

$(06 \times 3 = 18)$

(IV)   

$(06 \times 3 = 18)$

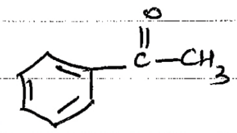
(V) When $H^+/KMnO_4$ or $H^+/K_2Cr_2O_7$ is added to the A, B, C and D by heating; (03)

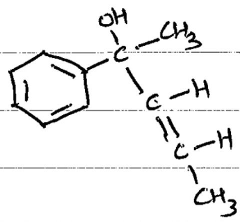
* D shows colour change → $H^+/KMnO_4$ – Violet to colourless, $H^+/K_2Cr_2O_7$ orange – Green (03)
* A, B, C do not show any colour change

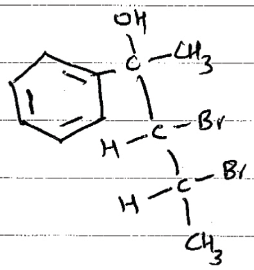
**4(A) 66 marks**

(B) I P – $CaC_2$ Q – $Na / C_2H_5Cl$ $(05 \times 2 = 10)$

II R – $C_2H_5-C\equiv C^-Na^+$

S – 

T – 

U – 

$(06 \times 4 = 24)$

**4(B) 34 marks**

## Part II B

(5) (A) (i) [20]

$$CH_3COOH_{(aq)} + H_2O_{(l)} \rightleftharpoons CH_3COO^-_{(aq)} + H_3O^+_{(aq)}$$

Initial: 0.02 — — — $mol\,dm^{-3}$

At equilibrium: $(0.02 - x)$ $x$ $x$ $mol\,dm^{-3}$

$$K_a = \frac{[CH_3COO^-_{(aq)}][H_3O^+_{(aq)}]}{[CH_3COOH_{(aq)}]} \text{ ---- } (05)$$

$$1.8 \times 10^{-5}\,mol\,dm^{-3} = \frac{x^2}{(0.02 - x)\,mol\,dm^{-3}} \text{ --- } (05)$$

Since $x << 0.02$, $0.02 - x \simeq 0.02$

$\therefore x^2 = 36 \times 10^{-8}\,mol^2dm^{-6}$

$\Rightarrow x = 6 \times 10^{-4}\,mol\,dm^{-3}$

$[H_3O^+_{(aq)}] = 6 \times 10^{-4}\,mol\,dm^{-3}$ --- (05)

$pH = -\log_{10}[H_3O^+_{(aq)}]$

$= -\log_{10}(6 \times 10^{-4}) = 4 - \log_{10}6$

$= 4 - 0.7782 = 3.2218$ -- (05)

(ii) [50] Amt. in moles of $CH_3COOH$ in $25\,cm^3$ sol^n

$= 0.02\,mol\,dm^{-3} \times 25 \times 10^{-3}\,dm^3$

$= 0.5 \times 10^{-3}\,mol$ --- (03)

Amt. in moles of NaOH added

$= 0.03\,mol\,dm^{-3} \times 12.5 \times 10^{-3}\,dm^3$

$= 3.75 \times 10^{-4}\,mol$ --- (03)

$$CH_3COOH_{(aq)} + NaOH_{(aq)} \longrightarrow CH_3COONa_{(aq)} + H_2O_{(l)}$$

Remaining amt. of $CH_3COOH = (5 \times 10^{-4} - 3.75 \times 10^{-4})\,mol$

$= 1.25 \times 10^{-4}\,mol$ -- (03)

Concentration of remaining $CH_3COOH$

$$= \frac{1.25 \times 10^{-4}\,mol}{37.5 \times 10^{-3}\,dm^3} \text{ -- } (03)$$

Concentration of $CH_3COO^-Na^+$ formed

$$= \frac{3.75 \times 10^{-4}\,mol}{37.5 \times 10^{-3}\,dm^3}$$

-- (03)

$$K_a = \frac{[CH_3COO^-_{(aq)}][H_3O^+_{(aq)}]}{[CH_3COOH_{(aq)}]} \text{ ---- (02)}$$

$$[H_3O^+_{(aq)}] = \frac{K_a \times [CH_3COOH]}{[CH_3COO^-]}$$

$$= \frac{1.8\times10^{-5}\,mol\,dm^{-3} \times \frac{1.25\times10^{-4}}{37.5\times10^{-3}}\,mol\,dm^{-3}}{\frac{3.75\times10^{-4}}{37.5\times10^{-3}}\,mol\,dm^{-3}} \text{ ---- (03)}$$

$$= \frac{1.8\times10^{-5}\times1.25\times10^{-4}}{3.75\times10^{-4}} = 6\times10^{-6}\,mol\,dm^{-3} \text{ ---- (03)}$$

$$pH = -\log[H_3O^+]$$
$$= -\log(6\times10^{-6}) = 6-\log 6$$
$$= 5.2218 \text{ ---- (03)}$$

(ii) $HCl_{(aq)} \xrightarrow{H_2O(l)} H_3O^+_{(aq)} + Cl^-_{(aq)}$ ---- (04)

$[H_3O^+_{(aq)}] = 0.02\ mol\,dm^{-3}$ ----

$pH = -\log(0.02/mol\,dm^{-3}) = 2-\log_{10}2$ (05)

$= 1.6990$ ----

(iii) Contribution of $H^+$ ions from $CH_3COOH$ can be neglected in comparison to that of HCl. ---- (05)

After mixing, $[HCl] = 0.01\ mol\,dm^{-3}$ ---- (05)

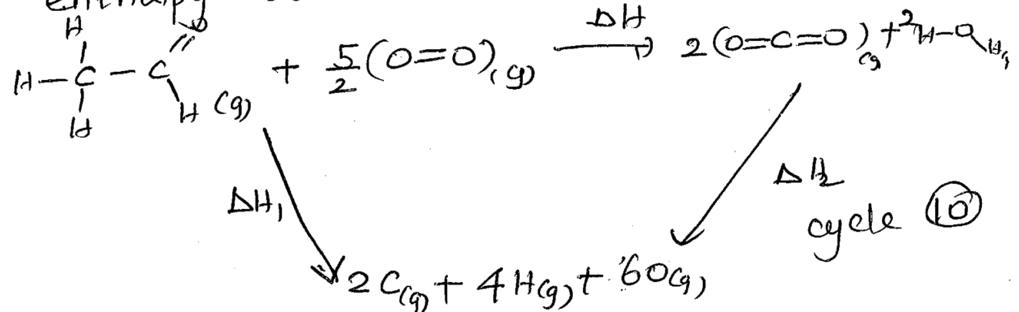
$\therefore pH = -\log(0.01)$

$= 2$ ---- (05)

Q(5)(a) 70

B (5)/45

(5) (i) Definitions of std. enthalpy of formation and enthalpy of combustion. ---- 2x 05 = (10)




$\Delta H_1 = 4\times\Delta H_D(C-H) + \Delta H_D(C=O) + \frac{5}{2}\times\Delta H_D(O=O) + \Delta H_D(C-C)$ ---- (05)

$= [(4\times412) + (743) + (\frac{5}{2}\times496) + 348]\ kJ\,mol^{-1}$ (05)

$= 3979\ kJ\,mol^{-1}$ ---- (05)

$\Delta H_2 = 4\times\Delta H_D(C=O) + 4\times\Delta H_D(O-H)$

$= [(4\times743) + (4\times463)]\ kJ\,mol^{-1} = 4824\ kJ\,mol^{-1}$ (05)

By Hess's law, $\Delta H = \Delta H_1 - \Delta H_2$

$= (3979 - 4824) \text{ kJ mol}^{-1}$ (−845)

$= -1193 \text{ kJ mol}^{-1}$ ---- (05)

(II) [35]

$CO_{(g)} + \frac{1}{2}O_{2(g)} \rightarrow CO_{2(g)}$, $\Delta H^\theta = -284 \text{ kJ mol}^{-1}$ ---- ①

$2NO_{(g)} + 2CO_{(g)} \rightarrow N_{2(g)} + 2CO_{2(g)}$, $\Delta H^\theta = -748 \text{ kJ mol}^{-1}$ ②

① × 2 − ② ⇒ $N_{2(g)} + O_{2(g)} \rightarrow 2NO_{(g)}$

∴ $2 \times \Delta H^\theta_{f(NO_{(g)})} = 2 \times -284 \text{ kJ mol}^{-1} - (-748 \text{ kJ mol}^{-1})$

$= 180 \text{ kJ mol}^{-1}$ ---- (05)

$\Delta H^\theta_{f(NO_{(g)})} = 90 \text{ kJ mol}^{-1}$ ---- (05)

(I) For the given reaction

$\Delta H^\theta_R = \sum \Delta H^\theta_{Products} - \sum \Delta H^\theta_{Reactants}$

$= [(4 \times 90 \text{ kJ mol}^{-1}) + (6 \times -242 \text{ kJ mol}^{-1})] - [(-46 \text{ kJ mol}^{-1} \times 4) + 0 \text{ kJ mol}^{-1}]$

$= -908 \text{ kJ mol}^{-1}$ ---- (05)

(II) $\Delta S^\theta_R = \sum S^\theta_{Products} - \sum S^\theta_{Reactants}$

$= [(211 \text{ J mol}^{-1}\text{K}^{-1} \times 4) + (189 \text{ J mol}^{-1}\text{K}^{-1} \times 6)] - [193 \text{ J mol}^{-1}\text{K}^{-1} \times 4 + 205 \text{ J mol}^{-1}\text{K}^{-1} \times 5]$

$= 181 \text{ J mol}^{-1}\text{K}^{-1}$ ---- (05)

(III) $\Delta G^\theta = \Delta H^\theta_R - T\Delta S^\theta_R$ ---- (05)

$= -908 \text{ kJ mol}^{-1} - (298 \text{ K} \times 181 \times 10^{-3} \text{ kJ mol}^{-1}\text{K}^{-1})$

$= -961.9 \text{ kJ mol}^{-1}$ ---- (05)

Since $\Delta G^\theta < 0$, the reaction is ~~non~~ spontaneous ---- (05)

Q ⑤ (B) ⇒ 180

---

⑥ (i) [75] Initial rates ⇒ $16 \times 10^{-4}$, $32 \times 10^{-4}$, $4 \times 10^{-4}$, $4 \times 10^{-4}$ } $4 \times 04 = 16$

(units not necessary)

(ii) $R = k[X]^a[Y]^b[Z]^c$ ---- (04)

9

(iii) $16\times10^{-4}\ mol\,dm^{-3}s^{-1} = k(0.2\ mol\,dm^{-3})^a(0.1\ mol\,dm^{-3})^b(0.1\ mol\,dm^{-3})^c$ — ①

$32\times10^{-4}\ mol\,dm^{-3}s^{-1} = k(0.2\ ,,)^a(0.2\ ,,)^b(0.1\ ,,)^c$ — ②

$4\times10^{-4}\ mol\,dm^{-3}s^{-1} = k(0.1\ ,,)^a(0.1\ ,,)^b(0.2\ ,,)^c$ — ③

$4\times10^{-4}\ mol\,dm^{-3}s^{-1} = k(0.1\ ,,)^a(0.1\ ,,)^b(0.1\ ,,)^c$ — ④

Four eqns $4\times05 = (20)$

$\frac{①}{②} \Rightarrow \frac{1}{2} = \left(\frac{1}{2}\right)^b \Rightarrow b = 1$

$\frac{①}{④} \Rightarrow 4 = 2^a \Rightarrow a = 2$

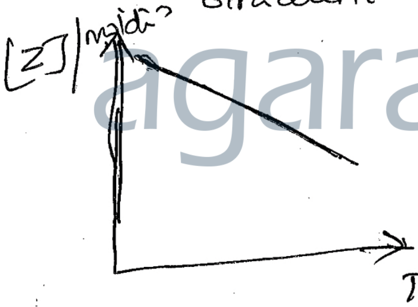
$\frac{③}{④} \Rightarrow 1 = 2^c \Rightarrow c = 0$

$3\times05 = (15)$

$\therefore R = k[X]^2[Y][Z]^0 = k[X]^2[Y]$

(iv). Since order w.r.t Z is 0, rate is independant of the concentration of Z. --- (05)

∴ Gradient is a constant




graph (05)

(v) The rate will increase by a factor 8 --- (05)

(B) (iii) (contd) $k = \frac{R}{[X]^2[Y]}$

$= \frac{16\times10^{-4}\ mol\,dm^{-3}s^{-1}}{(0.2\ mol\,dm^{-3})^2(0.1\ mol\,dm^{-3})}$

$= 0.4\ mol^{-2}dm^{6}s^{-1}$ --- (05)

(B) (i) $K_c = \dfrac{[C_{(g)}]^3}{[A_{(g)}][B_{(g)}]^2}$ ---- (05)

75

$= \dfrac{(0.3\ mol\ dm^{-3})^3}{(0.4\ mol\ dm^{-3})(0.1\ mol\ dm^{-3})^2}$ ---- (05)

$= \dfrac{27}{4} = 6.75$ ---- (05)

(ii) $A_{(g)} + 2B_{(g)} \rightleftharpoons 3C_{(g)}$

Initially; a b —

At eq$^m$: (a−x) (b−2x) 3x

$3x = 0.3$

$x = 0.1$ ---- (05)

$a - x = 0.4$ $b - 2x = 0.1$

$a = 0.5$ mol $b = 0.3$ mol

Initial amounts of $A = 0.5$ mol, $B = 0.3$ mol } 2×05 = (10)

(iii) ~~After 10 s~~, At time t = t,

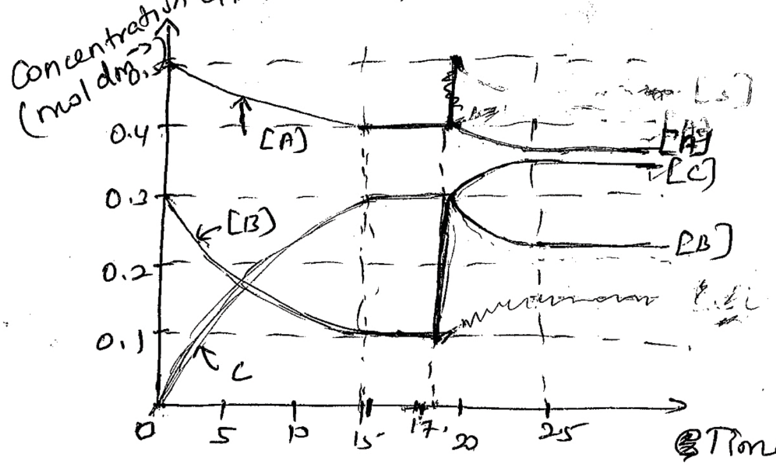
$Q_c = \dfrac{[C]^3_{t=10}}{[A]_{t=10}[B]^2_{t=10}}$

$= \dfrac{(0.3\ mol\ dm^{-3})^3}{(0.6\ mol\ dm^{-3})(0.3\ mol\ dm^{-3})^2}$ ---- (10)

$= 0.5$ ---- (05)

$Q_c < K_c$

∴ The reaction proceeds in the forward direction. ---- (05)




graph (25)

- Plots of A, B and C before equilibrium 3×05 = (15)
- for graphs indicating new equilibrium (10)

11

(7) (a) (i) M = Co, ඔක්සිකරණ අංකය +2 / $Co^{2+}$ (10)

(100)

(ii) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^7$ —— (10)

(iii) m = 2, n = 6 —— 2 x 05 = (10)

(iv) Q : $Co(OH)_2$ —— (05), R : $[Co(NH_3)_6]^{2+}$ —— (05), S : $[CoCl_4]^{2-}$ —— (05)

(v) P ⇒ hexaaquacobalt(II) ion
R ⇒ hexaamminecobalt(II) ion
S ⇒ tetrachloridocobaltate(II) ion
} 3 x 10 = (30)

(vi) Yellow colour is due to the formation of $[Co(NH_3)_6]^{2+}$. Further addition of concentrated $NH_3$, leads to the formation of this. However, due to auto-oxidation $[Co(NH_3)_6]^{2+}$ is converted to $[Co(NH_3)_6]^{3+}$ which is yellow brown.

(15)

(b) (i) +3 —— (10)

(50)

(ii) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^0 3d^7$ —— (10)

(iii) $NH_3$ —— (05)

(iv) A ⇒ $[Co(NH_3)_4 I_2]NO_2$, B ⇒ $[Co(NH_3)_4(NO_2)I]I$

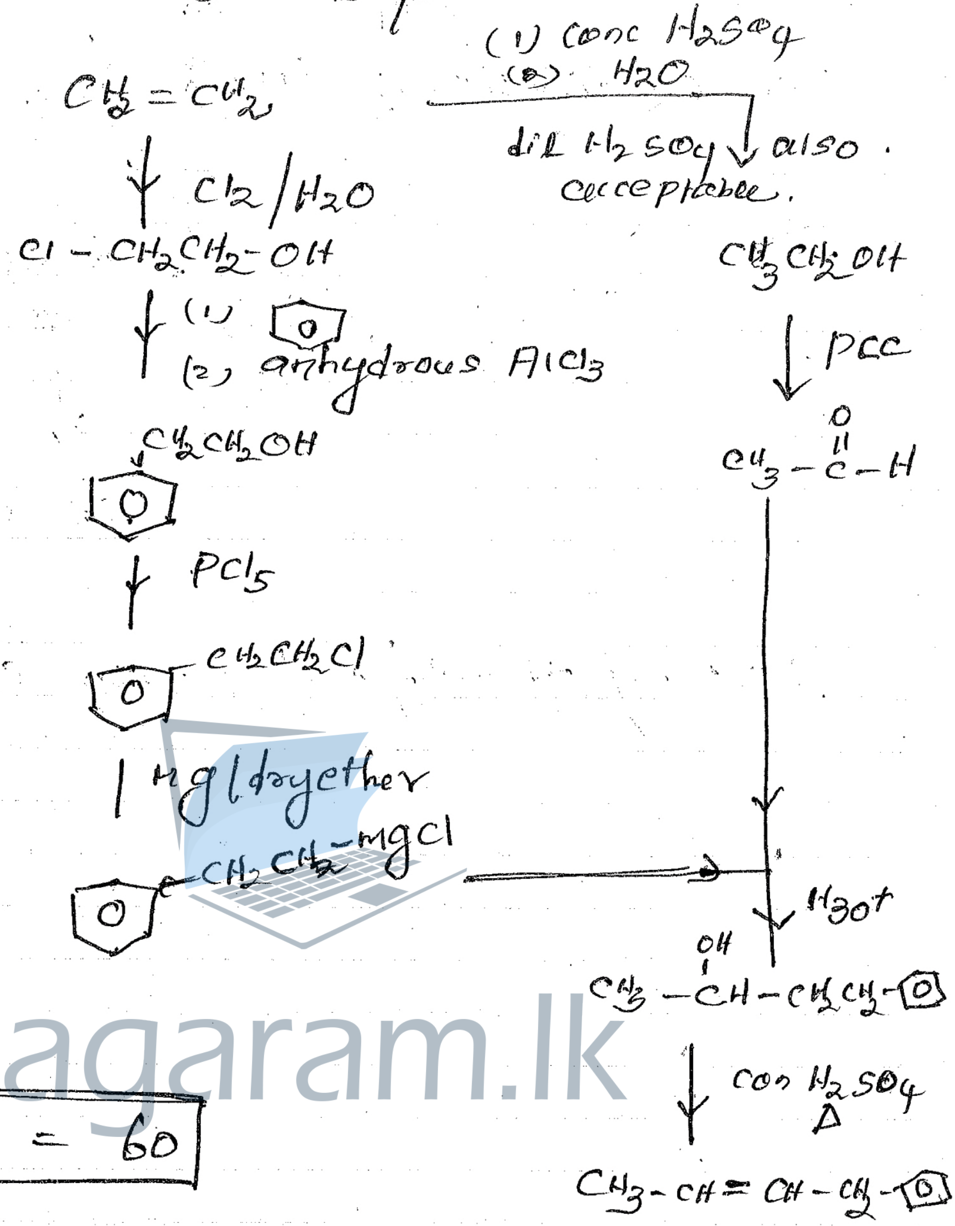
2 x 05 = 10

(v) $NO_2^-$ any test : eg: Evolution of brown coloured gas on addition of dil. HCl

—— (15)

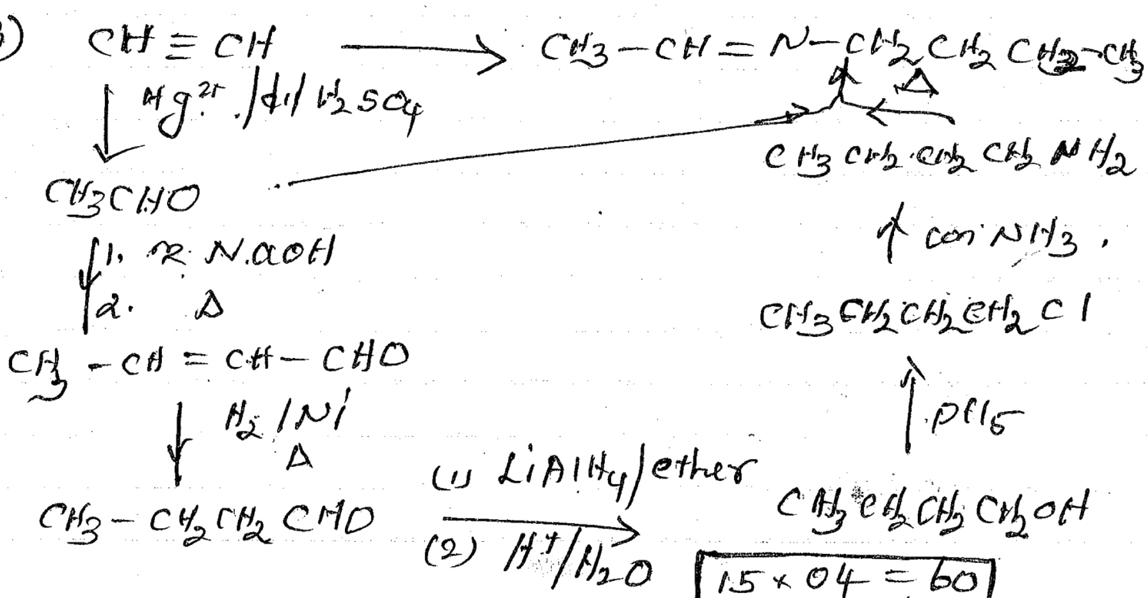
13 chemistry

8.(A)




$15 \times 04 = 60$

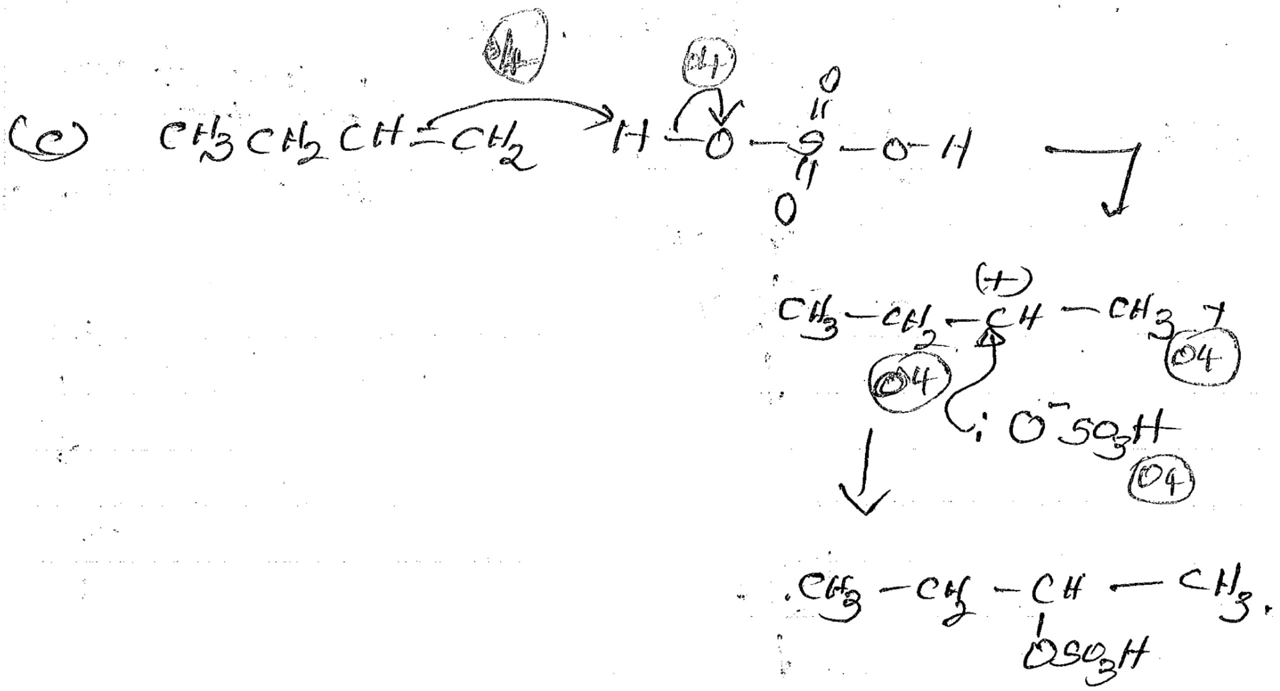
(B)




$15 \times 04 = 60$

13

(c)



பிரதான விளைவு [illegible] ஆகும் $CH_3-CH_2-CH(OSO_3H)-CH_3$ (10)

30

150

NO. Date: / /

Q9.

a) I. $Ag^+$, $Fe^{3+}$, $C_2O_4^{2-}$, $NO_2^-$

II. $X_1$ - $Ag_2O$
$X_2$ - $Fe(OH)_3$
$X_3$ - $Ag_2S_2O_3$
$X_4$ - $Ag_2S$
$X_5$ - $[Fe(SCN)(H_2O)_5]^{2+}$
$X_6$ - $AgCl$
$X_7$ - $CaCO_3$
$X_8$ - $Ca(HCO_3)_2$
$X_9$ - $CaC_2O_4$
$X_{10}$ - $NO_2$

[14 × 05 = 70 marks]

b) molar mass of AgBr = $188\ g\,mol^{-1}$ ✓

mole of AgBr $= \frac{3.761\,g}{188\,g\,mol^{-1}}$ ✓

$= 2\times10^{-3}$ mol ✓

So, mole of $Br^-$ $= 2\times10^{-3}$ mol ✓

$C_{Br^-} = \frac{2\times10^{-3}\,mol}{25\times10^{-3}\,dm^3}$ ✓

$= 0.08\ mol\,dm^{-3}$ ✓

$$5S^{2-} + 6MnO_4^- + 28H^+ \longrightarrow 6Mn^{2+} + 5SO_2 + 14H_2O$$
$$2MnO_4^- + 8H^+ + C_2O_4^{2-} \longrightarrow 2Mn^{2+} + 2CO_2 + 4H_2O$$
(10 marks)

Mole of $C_2O_4^{2-}$ $= 0.3\ mol\,dm^{-3} \times 20\times10^{-3}\,dm^3$ ✓

$= 6\times10^{-3}$ mol ✓

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Excess $MnO_4^-$ mole

$$\frac{n_{MnO_4^-}}{n_{C_2O_4^{2-}}} = 2/5 \checkmark$$

$$n_{MnO_4^-} = 2/5 \times 6\times10^{-3}\ mol \checkmark$$

$$= 2.4\times10^{-3}\ mol \checkmark$$

Initial mole of $MnO_4^-$ $= 0.2\ mol\ dm^{-3} \times 30\times10^{-3}\ dm^3$ ✓

$$= 6\times10^{-3}\ mol \checkmark$$

mole of $MnO_4^-$ react with HgS

$$= 6\times10^{-3}\ mol - 2.4\times10^{-3}\ mol \checkmark$$

$$= 3.6\times10^{-3}\ mol \checkmark$$

So, mole of HgS

$$\frac{n_{HgS}}{n_{MnO_4^-}} = 5/6 \times 3.6\times10^{-3}\ mol \checkmark$$

$$= 3\times10^{-3}\ mol \checkmark$$

no. of mole of $Hg^{2+}$ in $25\ cm^3$

$$= 3\times10^{-3}\ mol \checkmark$$

$$C_{Hg^{2+}} = \frac{3\times10^{-3}\ mol}{25\times10^{-3}\ dm^3} \checkmark$$

$$= 0.12\ mol\ dm^{-3} \checkmark$$

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No. of mole of $Ba(OH)_2$ = $0.4\,mol\,dm^{-3} \times 25\times10^{-3}\,dm^3$ ✓

$= 1.0 \times 10^{-3}$ mol ✓

So, $OH^-$ mole $= 20\times10^{-3}$ mol ✓

$H^+_{(aq)} + OH^-_{(aq)} \longrightarrow H_2O_{(l)}$ — (05 marks)

So, No. of mole of $H^+$ $= 20\times10^{-3}$ mol ✓

$$C_{H^+} = \frac{20\times10^{-3}\,mol}{25\times10^{-3}\,dm^3}$$ ✓

$= 0.8\,mol\,dm^{-3}$ ✓

✓ 26 × 2.5 = 65 marks

3 equation = 15 marks

80 marks

| $\overline{70}$ + $\overline{80}$ = $\overline{150}$ |



Q10.

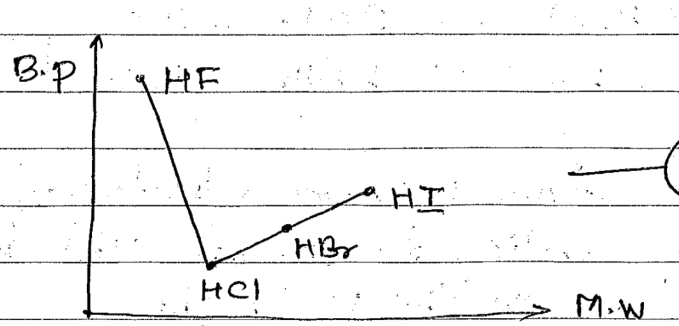
a) I. Cl, $Cl_2$ — (10)

II. $1s^2 2s^2 2p^6 3s^2 3p^5$ — (5)

III. −1, +1, +3, +5, +6, +7, 0 — (4)

IV. HOCl, $HClO_2$, $HClO_3$, $HClO_4$ — (4)

V.




— (10)

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As molecular mass/size increases, boiling point increases. But with HF boiling point is higher than expected because of H-bonding between HF molecules. — (10)

VI. $8NH_3$ (excess) $+ 3Cl_2 \longrightarrow N_2 + 6HCl$ — (5)

$3Cl_2 + 6NaOH \longrightarrow 5NaCl + NaClO_3 + 3H_2O$ — (5)

VII.
- to make drinking water safe
- paper products
- plastics
- dyes
- textiles
- medicines — (2)

b)

| | $Na_2O$ | $MgO$ | $Al_2O_3$ | $SiO_2$ | $P_4O_{10}$ | $SO_3$ | $Cl_2O_7$ |
|---|---|---|---|---|---|---|---|
| Oxidation No: | +1 | +2 | +3 | +4 | +5 | +6 | +7 |
| Bonding type | I | I | I | Nc | c | c | c |
| Nature | Strong B | B | Am | Very weak A | weakly A | A | strong A |

28 × 1 = (28)

I – Ionic  Nc – Network covalent  c – Covalent

B – Basic  Am – Amphoteric  A – Acidic

10 (c)

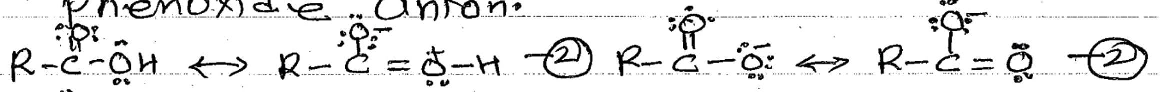
$C_6H_5OH + H_2O \rightleftharpoons C_6H_5O^- + H_3O^+$ — (2)

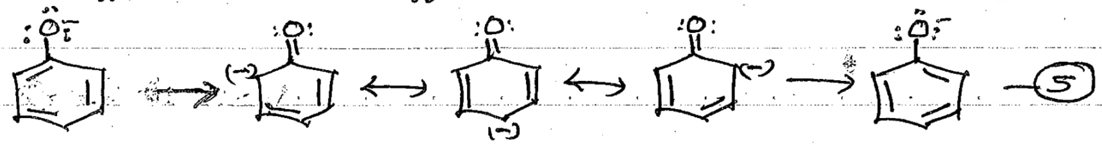
$RCOOH + H_2O \rightleftharpoons RCOO^- + H_3O^+$ — (2)

The equilibrium point of the above equilibrium is more ~~stf~~ shifted towards the right side relative to the corresponding equilibrium attained by the phenols. The reason for this is that the stabilization of the carboxylate ion relative to the carboxylic acid is greater than the stabilization of the phenoxide ion relative to phenol. Both the carboxylate ion and carboxylic acid are stabilized by reasonance as in the case of phenoxide ion and phenols. — (6)

The stabilization of the carboxylate anion by reasonance is greater than the stabilization of the acid because unlike in the acid there is no charge separation in the reasonance structures of the anion. — (4)

The higher acidity of the carboxylic acids can be explained by the fact that the carboxylate ion is ~~oxygen atom~~ stabilized by the delocalization of the negative charge between two equivalent electronegative oxygen atoms in contrast to the delocalization of the negative charge on oxygen and carbon atoms in phenoxide anion. — (4)


— (2) — (2)


— (5)

d)

I. $4LiNO_3 \longrightarrow 2Li_2O + 4NO_2 + O_2$

II. $2SCl_2 + 3H_2O \longrightarrow H_2SO_3 + S + 4HCl$

III. $3Br_2 + 6NaOH \longrightarrow 5NaBr + NaBrO_3 + 3H_2O$

IV. $2KMnO_4 + 3H_2SO_4 + 5H_2S \longrightarrow K_2SO_4 + 5S + 2MnSO_4 + 8H_2O$

V. $Cr_2O_7^{2-} + 3H_2O_2 + 8H^+ \longrightarrow 2Cr^{3+} + 3O_2 + 7H_2O$

$5 \times 05 = 25$

e) $KIO_3 + 8KI + 6HCl \longrightarrow 3KI_3 + 6KCl + 3H_2O$ — (5)

No. of mole $KIO_3 = \frac{2.568 g}{214 g mol^{-1}}$ — (2)

$= 12 \times 10^{-3}$ mol — (2)

$\frac{n_{KIO_3}}{n_{HCl}} = 1/6$ — (2)

$\frac{12 \times 10^{-3} mol}{3 mol dm^{-3} \times V \times 10^{-3} dm^3} = \frac{1}{6}$ — (2)

15

$V = 24 \ cm^3$ — (2)

150

21