



FWC

G.C.E. A/L Examination June - 2016

Conducted by Field Work Centre, Thondaimanaru

In Collaboration with

Zonal Department of Education Jaffna.

Grade :- 13 (2016)

Scheme

Chemistry

Chemistry - I

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

Chemistry - II

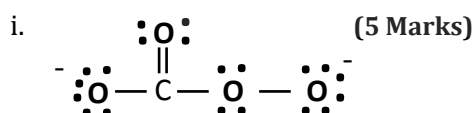
A - Structure

1. a.

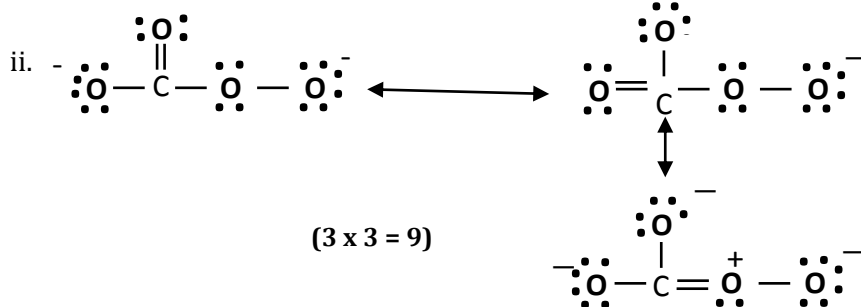
- $\text{Cr}^{3+} < \text{Fe}^{3+} < \text{Cr}$
- $\text{Br} > \text{Ca} > \text{Mg}$
- $\text{NaCl} < \text{NH}_3 < \text{CH}_3\text{OH}$
- $\text{CH}_3\text{COO}^- < \text{CN}^- < \text{CH}_3\text{CH}_2\text{O}^-$
- $\text{AsH}_3 < \text{NH}_3 < \text{SbH}_3$

(5x3 = 15 Marks)

b.



Both structures are stable (3 Marks)



Unstable more electro negative atom have (+) change high charge diaperion. (3 Marks)

Both structures are suitable. (3 Marks)

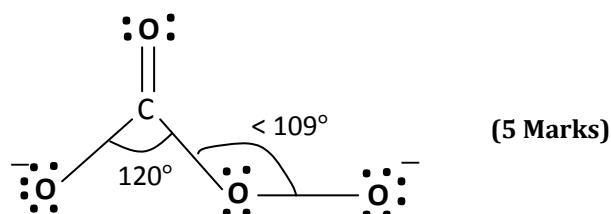
- iii. C -
- | | |
|-------------------------------|---|
| Total no of electron pairs - | 4 |
| Total no of repulsion units - | 3 |
| no of 6 bonds - | 3 |
| no of lone pair electrons - | 0 |
| Shape - Trigonal planer | |

(5 Marks)

O_b - Total no of electron pairs - 4
 Total no of repulsion units - 4
 no of 6 bonds pairs - 2
 no of lone pair electrons - 2
 Shape - Bent shape (5 Marks)

iv. C - Trigonal planer $\approx 120^\circ$ SP²
 O_b - Tetrahedral $< 109^\circ$ SP³ (6 Marks)

v.



vi. 1. SP³ Hybrid orbital of O_b - SP³ Hybrid orbital of O_a
 2. SP² Hybrid orbital of C - SP³ Hybrid orbital of O_b (2 x 5 = 10 Marks)

vii. H₂O + CO₂ (5 Marks)

viii. H₂O₂ + H₂CO₄ $\Rightarrow$ 2H₂O + CO₂ + O₂ (5 Marks)

c.

i. CF₃COH, H₂SO₄, H₂S₂O₈

ii. CF₃COOH, H₂SO₄, H₂S₂O₈

iii. Br₂ (7 x 2 = 14 Marks)

d.

i. London dispersal forces

ii. dipole - induced dipole

iii. Hydrogen bond (London dispersal forces)

iv. Ionic interaction (5 x 2 = 10 Marks) [100 Marks]

2. a.

vi. Sulphur (5 Marks)

1S² 2S² 2P⁶ 3S² 3P⁴ (5 Marks)

vii. Crystalline

Amorphous, Non crystalline (2 x 2 ½ = 5 Marks)

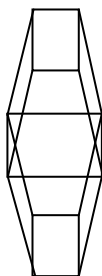
viii. Rhombic Sulphur, Monoclinic sulphur

Plastic sulphur, Milk of sulphur (5 Marks)

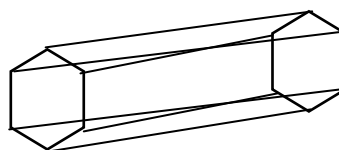
ix. Rhombic sulphur

When Rhombic sulphur is heated to temperatures greater 96°C, Needle line, Crystals are formed. (2 + 3 = 5 Marks)

x.

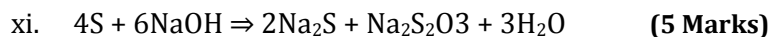


Rhombic Sulphur

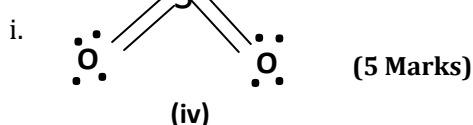


Monoclinic Sulphur

(2 x 2 ½ = 5 Marks)

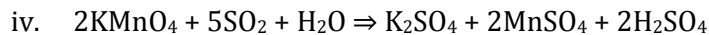
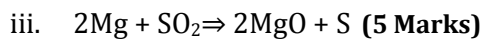


b.

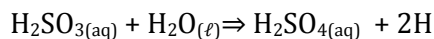
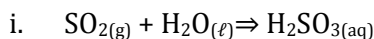


(iv)

ii. Suphuric and (5 Marks)

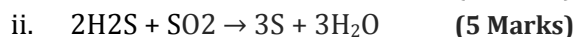


c.



ii. Bleaching is done by reduction of substance by SO_2 . The reduce substance can be oxidised by atmosphere. (5 Marks)

d.



iii. Yellow, Orange, Yellow (5 Marks)



(100 Marks)

3. a.

xii. $-\log_{10}[H^+] = 1$

$[H^+] = \log^{-1} -1 = 10^{-1} \text{mol dm}^{-3}$ (05 Marks)

xiii. in $NaOH_{\text{solution}} [H^+] = 1 \times 10^{-12} \text{mol dm}^{-3} [OH^-] = \frac{1 \times 10^{-14} \text{mol dm}^{-6}}{10^{-12} \text{mol dm}^{-3}}$

$n OH^- = 1 \times 10^{-2} \text{mol dm}^{-3} \times 0.2 \text{ dm}^3$
 $= 2 \times 10^{-3} \text{mol}$

$nHCl = 10^{-1} \text{mol dm}^{-3} \times 5 \times 10^{-2} \text{dm}^3$
 $= 5 \times 10^{-3} \text{mol}$

$nH^+_{\text{remaining}} = 3 \times 10^{-3} \text{mol}$

$[H^+] = \frac{3 \times 10^{-3} \text{mol}}{300 \times 10^{-3} \text{dm}^3} = \frac{1}{100} \text{mol dm}^{-3}$
 $= 1 \times 10^{-2} \text{mol dm}^{-3}$

$pH = 2$

(10 Marks)

b.



initially	0.1	-	-
atcaulibrium	0.1 - x	x	x

$K_a = \frac{[H_3O^+] \times [CH_3COO^-]}{[CH_3COOH]} = \frac{x^2}{0.1-x}$

$x = \sqrt{K_a \times 0.1 \text{mol dm}^{-3}}$

$= 1 \times 10^{-5} \text{M} \times 0.1 \text{M}$

$= 1 \times 10^{-3} \text{mol dm}^{-3}$

$pH = -\log 10^{-1} \times 10^{-3} = 3$

(10 Marks)

ii. $[\text{OH}^-] = 1 \times 10^{-2} \text{ mol dm}^{-3}$
 $n \text{ OH}^- = 1 \times 10^{-2} \text{ mol dm}^{-3} \times 50 \times 10^{-3} \text{ dm}^3$
 $= 0.5 \times 10^{-3} \text{ mol}$

$n \text{ HAc} = 0.1 \text{ mol dm}^{-3} \times 55 \times 10^{-3} \text{ dm}^3$
 $= 5.5 \times 10^{-3} \text{ mol}$

(10 Marks)

$n \text{ HAc}_{\text{remaining}} = (5.5 - 0.5) \times 10^{-3} \text{ mol} = 5 \times 10^{-3} \text{ mol}$

$$\text{pH} = \text{pK}_a + \frac{[\text{Salt}]}{[\text{Acid}]} = 5 + \log \frac{\frac{0.5 \times 10^{-3} \text{ mol}}{105} \times 1000 \text{ dm}^{-3}}{\frac{5.5 \times 10^{-3} \text{ mol}}{105} \times 1000 \text{ dm}^{-3}}$$

 $= 5 + \log 10^{-1} = 4$ (10 Marks)

iii. $n \text{ HAc}_{\text{remaining}} \quad K_b = \frac{K_w}{K_a}$
 $\text{CH}_3\text{COO}^-_{(\text{aq})} + \text{H}_2\text{O}_{(\ell)} \rightleftharpoons \text{CH}_3\text{COOH}_{(\text{aq})} + \text{OH}^-_{(\text{aq})}$

$$\frac{K_w}{K_a} = \frac{[\text{OH}^-_{(\text{aq})}]^2 [\text{CH}_3\text{COOH}_{(\text{aq})}]}{[\text{CH}_3\text{COO}^-_{(\text{aq})}]}$$
 $[\text{OH}^-_{(\text{aq})}] = [\text{CH}_3\text{COOH}_{(\text{aq})}]$

$$\frac{K_w}{K_a} [\text{CH}_3\text{COO}^-_{(\text{aq})}] = [\text{OH}^-_{(\text{aq})}]^2$$

$$[\text{OH}^-_{(\text{aq})}] = \sqrt{\frac{K_w}{K_a} [\text{CH}_3\text{COO}^-_{(\text{aq})}]}$$

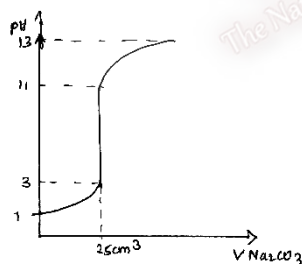
$= \sqrt{10^{-9} \text{ mol dm}^{-3} \times 0.1} = 10^{-5} \text{ mol dm}^{-3}$

$\text{pOH} = -\log 10^{-5} \text{ mol dm}^{-3} = 5$

$\text{pH} = 9$ (20 Marks)

iv. pH doesn't change, it's a buffer solution = 4 (5 Marks)

c. i.



(5 Marks)

ii. Eq point :- The point at all base completely react with acid (5 Marks)

iii. End point :- The point that the indicator used in titrated change colour (5 Marks)

v. Phenolphthalein

d. i. $n \text{ CH}_3\text{COOH}_{(\text{aq})} = 0.25 \text{ mol dm}^{-3} \times 250 \times 10^{-3} \text{ dm}^3$

$= 6.25 \times 10^{-2} \text{ mol}$

$n \text{ HCOOH}_{(\text{aq})} = 0.32 \text{ mol dm}^{-3} \times 250 \times 10^{-3} \text{ dm}^3$

$= 8 \times 10^{-2} \text{ mol}$

$[n \text{ H}^+] = [n \text{ OH}^-_{(\text{aq})}] = 14.25 \times 10^{-2} \text{ mol}$

$[\text{OH}^-_{(\text{aq})}] \times 425 \times 10^{-3} \text{ dm}^3 = 14.25 \times 10^{-2} \text{ mol}$

(15 Marks)

$[\text{OH}^-_{(\text{aq})}] = 0.335 \text{ mol dm}^{-3}$

ii. $\text{POH} = -\lg 3.55 \times 10^{-1} \text{ mol dm}^{-3}$
 $= 1 - \lg 3.35$
 $\text{PH} = 14 - 1 + \lg 3.35 = 13 + \lg 3.35$
 $= 13.525$

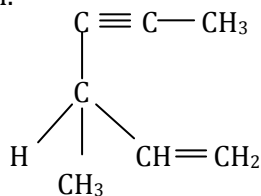
(5 Marks)

100

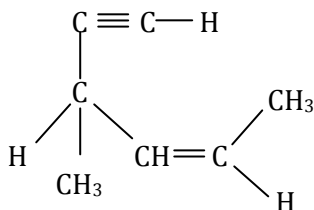
4.

i. C_7H_{10}

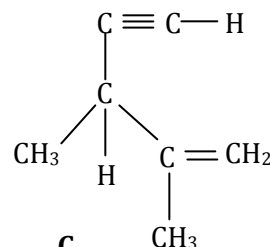
ii.



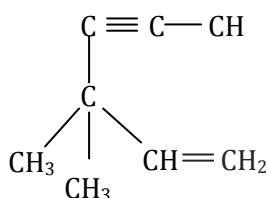
A



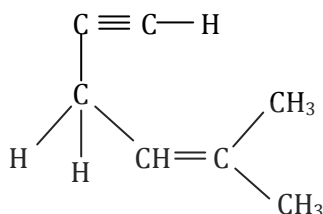
B



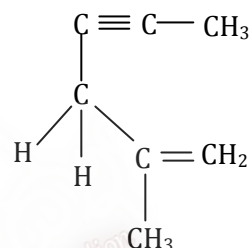
C



X



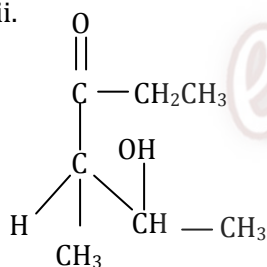
Y



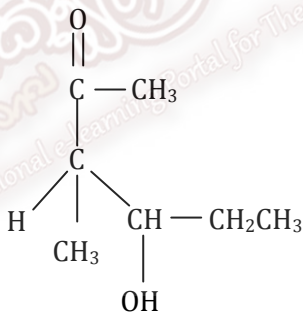
Z

(6 X 10 = 60 Marks)

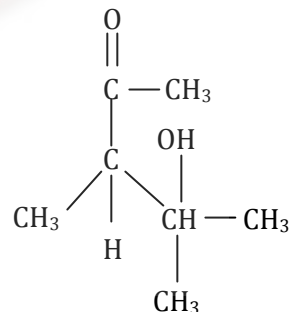
iii.



(P)



(Q)



(R)

(3 x 5 = 15 Marks)

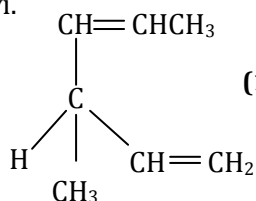
iv. 4 - Methyl - 5 - hydroxyl hexan - 3 - one

3 - Methyl - 4 - hydroxyl hexan - 2 - one

(2 x 5 = 10 Marks)

v. 4 (four) (5 Marks)

vi.

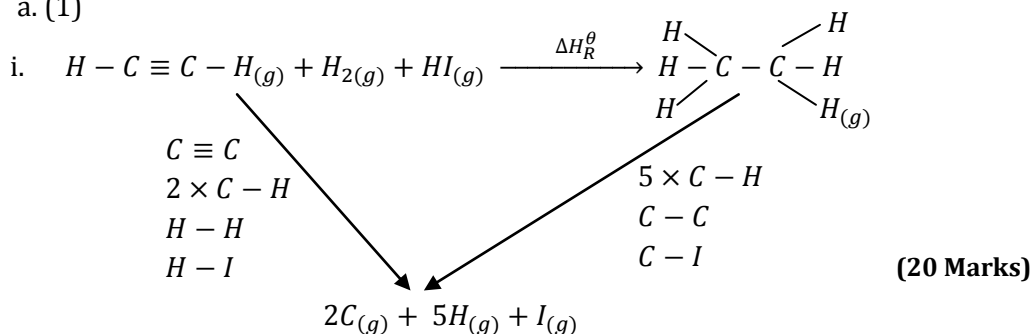


(10 Marks)

100

B - Essay

5. a. (1)



$$\Delta H_R^\theta = \Delta H_D^\theta C \equiv C + 2 \times \Delta H_D^\theta (C-H) + \Delta H_D^\theta (H-H) + \Delta H_D^\theta (H-I) - 5 \times \Delta H_D^\theta (C-H) - \Delta H_D^\theta (C-C) - \Delta H_D^\theta (C-I)$$

$$\begin{aligned} \text{But } \Delta H_D^\theta (C \equiv C) &= \Delta H_D^\theta (C-C) + [\Delta H_D^\theta C = C - \Delta H_D^\theta C - C] \times 2 \\ &= 346 \text{ KJmol}^{-1} + (265 \times 2) \text{ KJmol}^{-1} = 876 \text{ KJmol}^{-1} \end{aligned} \quad \textbf{(10 Marks)}$$

ii. $\Delta H_R^\theta = (876 + 824 + 432 + 297) \text{ KJmol}^{-1} - (2060 + 346 + 218) \text{ KJmol}^{-1}$

iii. $= -595 \text{ KJmol}^{-1} \quad \textbf{(10 Marks)}$

(2)

i. $CO_{2(g)} + 2NH_{3(g)} \rightleftharpoons CO(NH_2)_2(g) + H_2O(l)$

$$\begin{aligned} \Delta H_R^\theta &= \sum \Delta H_f^\theta \text{ product} - \sum \Delta H_f^\theta \text{ reactants} \\ &= (-330 \text{ KJmol}^{-1} + -286 \text{ KJmol}^{-1}) - (-394 - 92) \text{ KJmol}^{-1} \\ &= -616 \text{ KJmol}^{-1} + 486 \text{ KJmol}^{-1} = -130 \text{ KJmol}^{-1} \end{aligned} \quad \textbf{(10 Marks)}$$

$$\Delta S^\theta = 1 \Delta H_{R1}^\theta \times 2 = -260 \text{ Jmol}^{-1} \quad \textbf{(5 Marks)}$$

$$\begin{aligned} \Delta G^\theta &= \Delta H_1^\theta - T\Delta S^\theta \\ &= -130 \text{ KJmol}^{-1} - (298 \times -260) \text{ Jmol}^{-1} = -52520 \text{ Jmol}^{-1} \end{aligned} \quad \textbf{(10 Marks)}$$

ii. $\Delta G < 0$, Therefore it's spontaneous at 25°C .

(5 Marks)

b. (1)

i. In the saturated solution :

$$K_{sp} = [Br^{2+}_{(aq)}] [SO_4^{2-}_{(aq)}] \quad \textbf{(10 Marks)}$$

Let the concentration of Br^{2+} be $x \text{ moldm}^{-3}$.

$$\text{then } [SO_4^{2-}_{(aq)}] = x \text{ moldm}^{-3}.$$

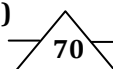
$$K_{spBaSO_4(aq)} = x^2 \text{mol}^2 \text{dm}^{-6}$$

$$x = 1 \times 10^{-5}$$

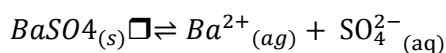
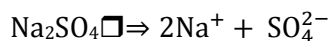
$$[Br^{2+}_{(aq)}] = [SO_4^{2-}_{(aq)}] = 1 \times 10^{-5} \text{ moldm}^{-3} \quad \textbf{(15 Marks)}$$

ii. Number of moles of $Na_2SO_4 = \frac{15.62 \times 10^{-3} \text{ g}}{142 \text{ gmol}^{-1}} = 1.1 \times 10^{-4} \text{ mol} \quad \textbf{(10 Marks)}$

$$[Na_2SO_4(aq)] = [SO_4^{2-}_{(aq)}] = 1.1 \times 10^{-4} \text{ mol} = 11 \times 10^{-5} \text{ mol}$$



(2)



$$1.1 \times 10^{-10} = [\text{Ba}^{2+}_{(g)}][\text{SO}_4^{2-}_{(aq)}] \quad (10 \text{ Marks})$$

$$1.1 \times 10^{-10} = S(S + 1.1 \times 10^5)$$

$$1.1 \times 10^{-10} = S \times 1.1 \times 10^5 \quad S \ll 1.1 \times 10^5$$

$$\text{Solubility } S = 1 \times 10^{-15} \text{ mol dm}^{-3}$$

$$\text{Precipitate} = 1.1 \times 10^{-5} - 1.1 \times 10^{-15} = 1 \times 10^{-5} \text{ mol}$$

$$W_{\text{BaSO}_4} = 1 \times 10^{-5} \times 233 = 2.33 \times 10^{-3} \text{ g} \quad (20 \text{ Marks})$$

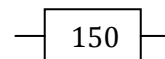
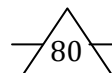
(3)



$$n\text{Pb}(\text{NO}_3)_2 = n \text{PbSO}_4$$

$$= \frac{32.62 \times 10^{-3}}{303}$$

$$W \text{ Pb}(\text{NO}_3)_2 = \frac{32.62 \times 10^{-3}}{303} \times 331 = 35.64 \times 10^{-3} \text{ g} \quad (10 \text{ Marks})$$



6. a.



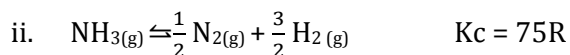
$$K_p = \frac{P_{\text{NH}_3}^2}{P_{\text{N}_2} \times P_{\text{H}_2}^3} = \frac{[(\text{NH}_3)\text{RT}]^2}{[\text{N}_2](\text{RT}) \times [(\text{H}_2)\text{RT}]^3} = \frac{(\text{NH}_3)^2}{[\text{N}_2][\text{H}_2]^3} (\text{RT})^{-2}$$

$$PV = nRT$$

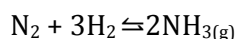
$$P = \frac{n}{V} RT = CRT$$

(5 Marks)

$$K_p = K_c(\text{RT})^{-2} \quad (10 \text{ Marks})$$

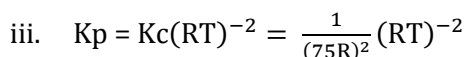


$$K_{c1} = \frac{(\text{N}_2)^{\frac{1}{2}}(\text{H}_2)^{\frac{3}{2}}}{(\text{NH}_3)} = 75 R \text{ mol dm}^{-3} \quad (10 \text{ Marks})$$



$$K_c = \frac{(\text{NH}_3)^2}{[\text{N}_2][\text{H}_2]^3}$$

$$= \frac{1}{(K_{c1})^2} = \frac{1}{(75R)^2} \text{ mol}^2 \text{ dm}^{-3} \quad (20 \text{ Marks})$$



$$= \frac{1}{(75R)^2} \times (600^{-2})(\text{Nm}^{-2})^{-2} = 5 \times 10^{-10} \text{ N}^2 \text{ m}^{-3} \quad (10 \text{ Marks})$$

iv. $[N_2] = [H_2] = 0.2 \text{ mol dm}^{-3}$

$$K_c = \frac{(NH_3)^2}{[N_2][H_2]^3}$$

$$\frac{1}{(75R)^2} = \frac{(NH_3)^2}{(0.2 \times 10^3 \text{ mol dm}^{-3})^4}$$

$$(NH_3)^2 = \frac{16 \times 10^8}{(75R)^2} = \frac{4 \times 10^4}{75R} \text{ mol dm}^{-3} \quad (20 \text{ Marks})$$

v. $V = 1.5 \text{ dm}^{-3}$

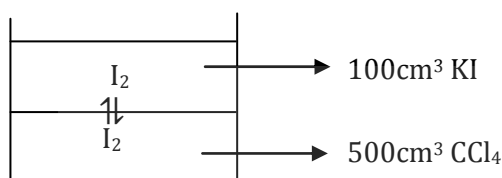
$$n_{N_2} = n_{H_2} = 0.2 \text{ mol dm}^{-3} \times 1.5 \text{ dm}^{-3} = 0.3 \text{ mol}$$

$$P \times 1.5 \times 10^{-3} \text{ m}^3 = 0.3 \text{ mol} \times 8.314 \text{ Nm K}^{-1} \text{ mol}^{-1} \times 600 \text{ K}$$

$$P_{N_2} = 1 \times 10^6 \text{ Pa} = P_{H_2} \quad (15 \text{ Marks})$$

90

b.



i.

$$[I_2]_{CCl_4} = \frac{13.716 - x}{500} \text{ g cm}^{-3} \quad (5 \text{ Marks})$$

$$[I_2]_{H_2O} = \frac{x}{100} \text{ g cm}^{-3} \quad (5 \text{ Marks})$$

$$\frac{\frac{13.716 - x}{500}}{\frac{x}{100}} = 9$$

$$45x = 13.716x$$

$$46x = 13.716$$

$$x = 13.716 / 45$$

$$\text{Weight of extracted } I_2 \text{ in KI} = 0.304 \text{ g} \quad (10 \text{ Marks})$$

ii. Weight of extracted I_2 in KI from 13.76 g = 0.304 g

$$\text{Weight of extracted } I_2 \text{ in KI from } 13.42 \text{ g} = \frac{0.304}{13.76} \times 13.42 = \frac{4.079}{13.76} = 0.29 \text{ g}$$

(5 Marks)

$$\text{Weight of extracted } I_2 \text{ in KI from } 13.13 \text{ g} = \frac{0.304}{13.76} \times 13.13 = \frac{3.99}{13.76} = 0.28 \text{ g}$$

(5 Marks)

$$\text{Total weight in three time} = 0.874 \text{ g} \quad (5 \text{ Marks})$$

iii. $\frac{\frac{13.716 - x}{500}}{\frac{x}{100}} = 9$

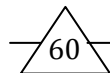
$$x = \frac{13.716}{16} = 0.857 \text{ g} \quad (10 \text{ Marks})$$

iv. The best way is done individually three times

(5 Marks)

v. Can't extract Cl_2 with using KI because no complex ion forming between KI + Cl^-

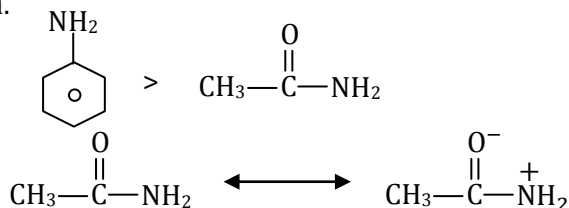
(10 Marks)



7. a.

(150 Marks)

vi.

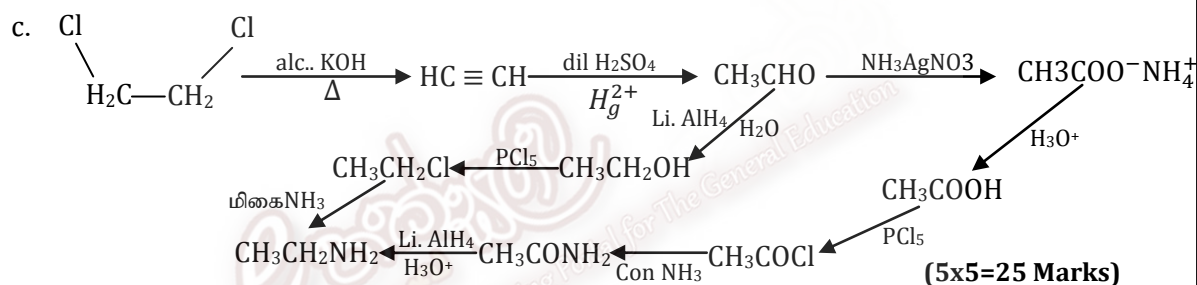


This compounds is neutral (10 Marks)

b. - OH is strong activating group so increases electron density in benzene ring

- NO_2 is deactivating group decreases electrons density in benzene ring

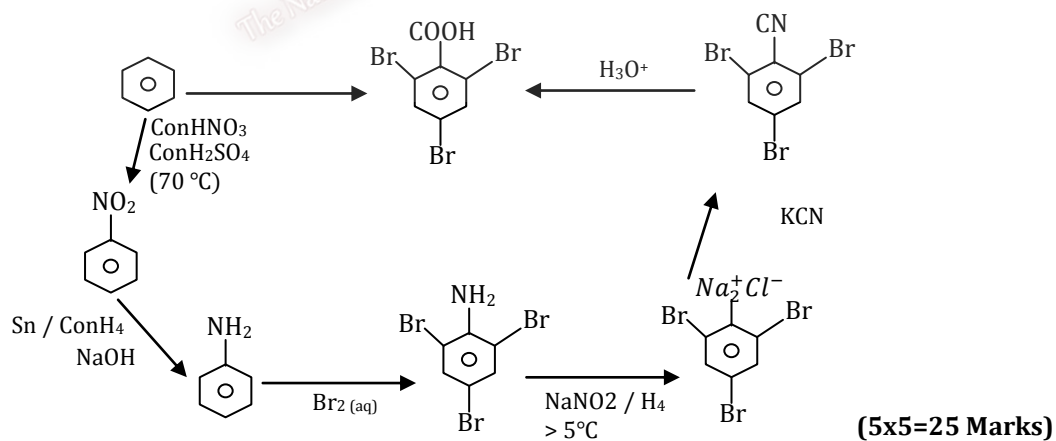
(10 Marks)



(4x5=20 Marks)

d.

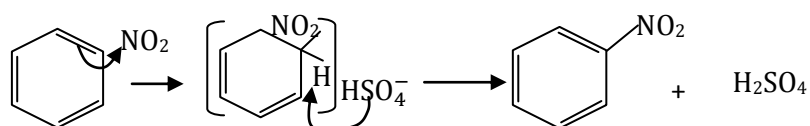
i.



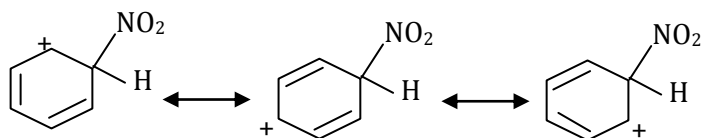
(6x5=30 Marks)

ii. $HNO_3 + H_2SO_4 \rightleftharpoons NO_2^+ + HSO_4^- + H_2O$

(10 Marks)



(10 Marks)



(10Marks)

150

8. b. 1.

- A chloride ppt found PbCl_2 , AgCl , Hg_2Cl_2 , Cu_2Cl_2
- Amphoteric metal may present.
- A chromium salt / Cr^{3+} , Salt with a white ppt (Amphoteric meal may present Zn
- Zn is present
- Cr is present
- Zn is present
- AgCl ppt Ag^+ salt found / Cu is found
- Confirms Ag is found.

(8x4=32 Marks)

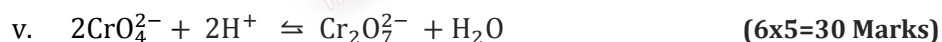
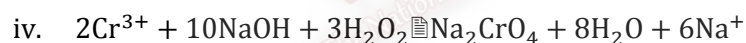
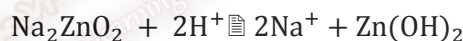
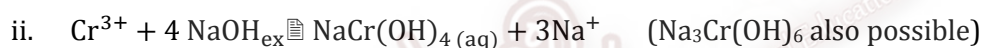
Metals : Zn , Cr , Cu

(3 x 5 = 15 Marks)

Salt Ag^+ salt

(5 Marks)

2.



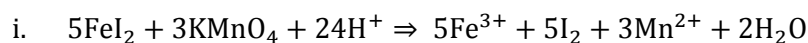
3. A - CrCl_3 / $[\text{CrCl}_3(\text{H}_2\text{O})_3]$ / $\text{Cr}_{(\text{aq})}^{3+}$ - Green

B - $\text{NaCr}(\text{OH})_4$ - Green

C - $\text{Cr}_2\text{O}_7^{2-} (\text{aq})$ - Orange

(6x3=18 Marks)

c.



(4x5=20 Marks)

$$\text{ii. } n \text{MnO}_4^- = 0.2 \text{mol dm}^{-3} \times 50 \times 10^{-3} \text{dm}^3 = 10 \times 10^{-3} \text{mol}$$

$$n \text{MnO}_4^- : n \text{I}_2 = 3 : 5$$

$$n \text{I}_2 = \frac{10}{3} \times 5 \times 10^{-3} \text{mol} = \frac{50}{3} \times 10^{-3} \text{mol}$$

$$n \text{I}_2 : n \text{Na}_2\text{S}_2\text{O}_3 = 1 : 2$$

$$n \text{Na}_2\text{S}_2\text{O}_3 = \frac{\frac{100}{3} \times 10^{-3} \text{mol}}{0.2 \text{mol dm}^{-3}} = 133.34 \text{cm}^3$$

$$n \text{Fe}^{3+} : n \text{MnO}_4^- = 5 : 3$$

$$n \text{Fe}_{(\text{aq})}^{3+} = \frac{10}{3} \times 5 \times 10^{-3} \text{mol}$$

$$\frac{50}{3} \times 10^{-3} \text{mol}$$

(20 Marks)

$$\text{iii. } n \text{Mn}^{2+} = n \text{MnO}_4^- (\text{aq}) = 10 \times 10^{-3} \text{mol}$$

$$\text{Total weight} = 10 \times 10^{-3} \text{mol} \times 54 \text{gmol}^{-1} + \frac{50}{3} \times 10^{-3} \text{mol} \times 54 \text{gmol}^{-1} = 1.4734 \text{g}$$

(10 Marks)

150

9. a.

- | | | | |
|---|--------------------------|-------------------------------|------------------|
| i. 1 - Seawater | 6 - NaHCO_3 | 11 - CaCO_3 | 16 - Coconut oil |
| ii. 2 - NaCl | 7 - Heat | 12 - Coaltar | |
| iii. 3 - conc $\text{NaCl}_{(\text{aq})}$ | 8 - CaO | 13 - CaC_2 | |
| iv. 4 - NaOH | 9 - CO_2 | 14 - $\text{Ca}(\text{OH})_2$ | |
| v. 5 - Soap | 10 - 900°C | 15 - NH_4^+ | |

(15x4 = 70 Marks)

(1) Solvay process (3 Marks)

(2) Solubility KHCO_3 is High No precipitate (5 Marks)



b.

i. $\text{NO}, \text{NO}_2, \text{CO}_2, \text{CO}, \text{SO}_2, \text{C}_x\text{H}_y$ (10 Marks)

ii. C dust, Pb Dust, PbO dust (5 Marks)

iii. NO_2, SO_2 (5 Marks)

iv. CO_2 solution $\text{pH} > 5.1$

acid rain $\text{pH} < 5.1$ (10 Marks)

v. $\text{NO}, \text{NO}_2, \text{CO}_2, \text{CO}, \text{H}_2\text{O}, \text{SO}_2$ (10 Marks)

vi. No, G.H keep the temperature normally. Excess G.H is increase tempratane

(10 Marks)

vii. $\text{NO}_2, \text{NO}, \text{C}_x\text{H}_y$ (10 Marks)

viii. Aldehyde, PAN / PBN

(10 Marks)

10. a.

i. Cathode - Cu Anode - Zn (2 x 5 = 10 Marks)

ii. Positive electrode - Cu Negative electrode - Zn (5 Marks)

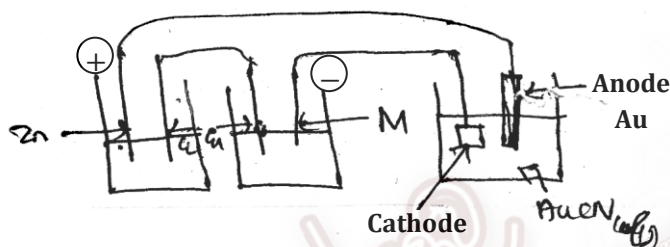
iii. Current flow $\text{Cu} \rightarrow \text{Zn}$

Electron flow $\text{Zn} \rightarrow \text{Cu}$ (10 Marks)

- iv. $E^\theta = E^\theta_{\text{cathode}} - E^\theta_{\text{anode}}$
 $= E^\theta_{\text{Cu}^{2+}/\text{Cu}_{(s)}} - E^\theta_{\text{Zn}^{2+}/\text{Zn}_{(s)}}$
 $= +0.34\text{V} - (-0.76\text{V}) = +1.1\text{V}$ (10 Marks)
- v. No change because $\text{Zn}^{2+}_{(aq)}$ No change (5 Marks)
- vi. Complete the electrical circuit without changing in electrolytes (5 Marks)
- vii. KCl, NaNO_3 ionic compounds and soluble in water (5 Marks)
- viii. (1) EMF - No change
 (2) EMF - No change
 (3) EMF - No change
 (4) EMF - No change (10 Marks)

60

b.



(10 Marks)

- i. 2.61V (5 Marks)
- ii. Anode : $\text{Au}_{(s)} \rightarrow \text{Au}^{+}_{(aq)} + e^-$
 Cathode : $\text{Au}^{+}_{(aq)} + e^- \rightarrow \text{Au}_{(s)}$ (5 Marks)
- iii. No change in concentration of solution and E.M.F (5 Marks)

c.

- i. $V = IR$
 $I = \frac{V}{R} = \frac{2.61\text{V}}{0.522\Omega} = 5\text{A}$ (10 Marks)
- ii. Volume placed = $25\text{mm} \times 50\text{mm} \times 0.1\text{mm} = 125 \times 10^{-9} \text{m}^3$ (5 Marks)
 Mass of Au = $125 \times 10^{-9} \text{m}^3 \times 19300 \text{Kg m}^{-3} = 2.4125 \times 10^{-9} \text{Kg} = 2.4125\text{g}$ (10 Marks)
- iii. $n \text{ Au} = \frac{2.4125\text{g}}{197 \text{g mol}^{-1}} = 0.012 \text{mol}$
 $Q = It \Rightarrow 0.012 \text{mol} \times 96500 \text{C mol}^{-1} = 5\text{A} \times t$
 $t = 236.35 \text{seconds}$ (10 Marks)

iv.

- 1) $2\text{KMnO}_4 \xrightarrow{\Delta} \text{K}_2\text{MnO}_4 + \text{MnO}_2 + \text{O}_2$
- 2) $\text{NH}_4\text{NO}_2 \xrightarrow{\Delta} \text{N}_2 + 2\text{H}_2\text{O}$
- 3) $3\text{NH}_4\text{NO}_3 + 8\text{NaOH} + 8\text{Al} \longrightarrow 6\text{NH}_3 + 8\text{NaAlO}_2 + \text{H}_2\text{O}$
- 4) $2\text{Cr}(\text{OH})_3 + 10\text{NaOH} + 3\text{Br}_2 \longrightarrow 2\text{Na}_2\text{CrO}_4 + 6\text{NaBr} + 8\text{H}_2\text{O}$
- 5) $\text{S} + \text{conc. HNO}_3 \longrightarrow \text{H}_2\text{SO}_4 + 6\text{NO}_2 + 2\text{H}_2\text{O}$
- 6) $4\text{NH}_3 + \text{Cl}_2 \longrightarrow 3\text{NH}_4\text{Cl} + \text{NCl}_3$ (6 X 5 = 30 Marks)

90

150