G.C.E. A/L Examination March - 2018

Conducted by Work Centre, Thondaimanaru

In collaboration with

Provincial Department of Education, Northern Province.

Grade :- 13 (2018)	Chemistry	Marking scheme

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

Correction Q. 08, C Part iv^th. Question (1)

Q10 d. - mole fraction of P in the Liquid Phase 0.24 (iv) NCl_5 ✗ correct NCl_3

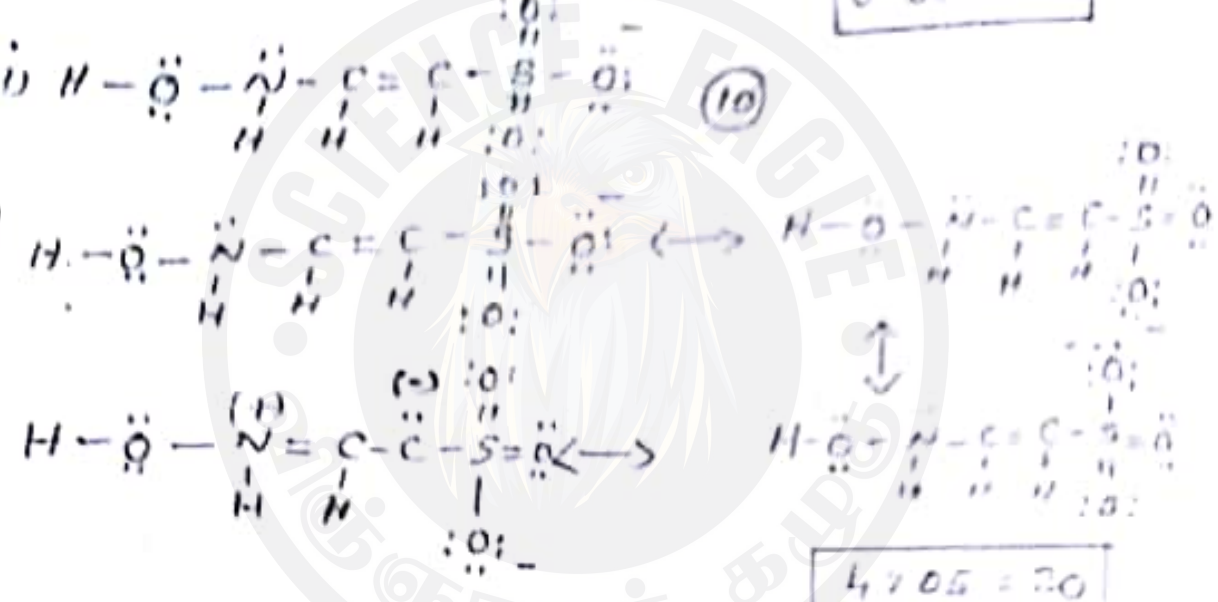
Marking scheme - Chemistry. Grade - 13.
March - 2018

Structure

(A) (i) I, (ii) P^{3-} (iii) K_2CO_3 (iv) $\bar{N}O_2 < NO_2 < \bar{N}O_3$
(v) Zn, Be (vi) $SO_3^{2-} < CO_3^{2-} < \overset{+}{N}O_2$

6 × 05 = 30

(B) (i) (ii) (iii)



(10)

4 × 05 = 20

(iii)

	N	C'	S
(i)	4	3	4
(ii)	Tetrahedral	Trigonal planer	Tetrahedral
(iii)	Trigonal Pyramidal	Tigonal Planer	Tetrahedral
(iv)	sp^3	sp^2	sp^3

01 × 12 = 12

(iv) N Sp^3(h·o) H 1S(a·o)
N Sp^3(h·o) C' sp^2(h·o)
C' sp^2(h·o) H 1S(a·o)
C² sp^2(h·o) S sp^3(h·o)

01 × 8 = 08

(C) (i) XeF_2 (ii) Graphite (iii) K_2SO_4 (iv) V.

4 × 05 = 20

100

Ans 02 (A) (i) Al (ii) $1s^2 2s^2 2p^6 3s^2 3p^1$ (iii) $AlCl_3$ (B), H_2 (C), $NaAlO_2$ (D) (2)

(iv) $2Al + 6HCl \longrightarrow 2AlCl_3 + 3H_2$

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

(v) Preparation of electric cable, used as vehicle-body. Any Possible usiess

(vi) Charcoal Block test

10 × 04 = 40

(B) A: $Ba(NO_3)_2$, B: Na_2CO_3 (C) $MgSO_4$ (D) H_2SO_4

4 × 07 = 28

(C) (i) +II, +III, +IV, +VI

(ii) CrO weakly basic

Cr_2O_3 Amphoteric

CrO_2 weakly acid

CrO_3 Acidic

(iii) CrO_4^{2-}, $Cr_2O_7^{2-}$

(iv) $Cr_2O_{7(aq)}^{2-} + 14H^+_{(aq)} + 6e \longrightarrow 2Cr^{3+}_{(aq)} + 7H_2O_{(l)}$

4 × 08 = 32

(03) (i) $2N_2O_{(g)} \xrightarrow{slow} N_{2(g)} + O_{(g)} + N_{2(g)}$

$N_2O_{(g)} + O_{(g)} + N_{2(g)} \xrightarrow{fast} 2N_{2(g)} + O_{2(g)}$

(ii) O(g) and $N_2(g)$ — 02 × 2 = 04 | 4 × 02 = 08

(iii) $\Delta H = -164$ $E_a = 110$ | 05 × 2 = 10

(iv)(a) $\Delta S = \Sigma S_P - \Sigma S_R$ (02)

$= [2(192) + 205 - 2(220)]\ J mol^{-1} K^{-1}$ (03)

(b) $= 0.149\ kJ mol^{-1}$ // (02)

$\Delta G_T = \Delta H - T\Delta S$ (1)

$= -164\ kJ mol^{-1} - [500k \times 0.149\ kJ mol^{-1} K^{-1}]$ (2)

$= -238.5\ kJ mol^{-1}$ // (2)

(c) $\Delta G < 0$ at 500k, ∴ reaction is Spontaneous (5) (5)

45

Ans 03(B)(i)

	Na	S	H	O
mass ratio	18.5	25.8	4.0	51.7
mol	$\frac{18.5}{23}$	$\frac{25.8}{32}$	$\frac{4}{1}$	$\frac{51.7}{16}$ (5)
	0.8043	0.8062	4	2.2312 (5)
	1	1	5	4 (5)

Empirical formula $NaSH_5O_4$ (5)

(ii) molecular formula $(NaSH_5O_4)_n = 248$

$124n = 248$

$n = 2$ (5)

$Na_2S_2H_{10}O_8 \longrightarrow Na_2S_2O_7 \cdot 5H_2O$

(5) (5)

(iii) Tetrahedral (5)

(iv) $2S_2O_3^{2-}(aq) + I_3^-(aq) \longrightarrow 3I^-(aq) + S_4O_6^{2-}(aq)$

$n_{S_2O_3^{2-}} = 0.5\ mol\ dm^{-3} \times 25 \times 10^{-3}\ dm^3$

$= 12.5 \times 10^{-3}\ mol$ (5)

$n_{I_3^-} = 6.25 \times 10^{-3}\ mol$ (5)

$V_{I_3^-} = \frac{6.25 \times 10^{-3}\ mol}{0.2\ mol\ dm^{-3}} = 31.25\ cm^3$ (5)

55

4 (A) (i) A: $CH_3CH_2CH_2CH_2Cl$ B: $CH_3CH_2\underset{Cl}{CH}-CH_3$ (C) $CH_3-\underset{CH_3}{\overset{Cl}{C}}-CH_3$

D: $CH_3CH_2CH_2CH_2OH$ E: $CH_3CH_2\underset{OH}{CH}CH_3$ (F) $CH_3-\underset{CH_3}{\overset{OH}{C}}-CH_3$

G: $CH_3CH_2CH_2CHO$ H: $CH_3CH_2-\underset{O}{\overset{\|}{C}}-CH_3$ 5×08=40

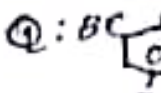
(5)

(ii)(a) I: $CH_2=\underset{CH_3}{C}-CH_3$

(b) $CH_3-\underset{CH_3}{C}=CH_2 \xrightarrow{H^+ + HSO_4^-}$ $CH_3-\overset{(+)}{\underset{CH_3}{C}}-CH_3$ (with $:OH_2$ attached) $+ H_2SO_4$

$H_3O^+ + CH_3-\underset{CH_3}{\overset{OH}{C}}-CH_3 \longleftarrow CH_3-\underset{CH_3}{\overset{O-H}{C}}-CH_3$ (with $H_2O:$ attached)

04(B) P: $CH_3CH=CHCH_3$

Q: 

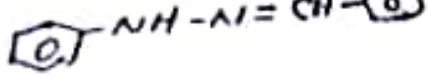
R: $CH_3\underset{OH}{C}HCH_2CHO$

S: $CH_3-\underset{CH_3}{\overset{OH}{C}}-CH_3$

T: $HC\equiv C^-Na^+$

U: 

V: $CH_3-\underset{NH_2}{C}HCH_2Br$

W: 

X $CH_3COOC_2H_5$

(4)

9 × 05 = 45

40

Essay (B)

Q05 (a) (i) $PV = nRT$ (5)

P. Ideal gas Pressure
V – Volume of the ideal gas
n – number of moles
R – Universal gas constant
T – absolute temperature

(iii) $PV = \frac{m}{M}RT$

$m = M\frac{PV}{RT}$

$m = \frac{35\,g\,mol^{-1} \times 1\times10^5\,Pa \times 1.5\times10^4\times10^{-3}\,m^3}{8.314\,J\,mol^{-1}K^{-1} \times 300\,K}$ 01 × 5 = 5

(10)

$= 21.049\,kg$ (10)

(iii) $C_3H_8(g) + 5O_2(g) \xrightarrow{-2220\,kJmol^{-1}} 3CO_2(g) + 4H_2O(l)$

(5)

(5) $\Delta H^\circ_f[C_3H_8]$?

$[3(-393) + 4(-286)]\,kJmol^{-1}$ (10)

$3C(s) + 4H_2(g) + 5O_2(g)$

According to Hess's Law

$\Delta H^\circ_{f[C_3H_8(g)]} + (-2220)\,kJmol^{-1} = [3(-393) + 4(-286)]\,kJmol^{-1}$ (05)

$\Delta H^\circ = -103\,kJmol^{-1}$ (05)

60

05.(b) $2P_{(g)} \rightleftharpoons Q_{(g)} + R_{(g)}$ (03) (ii)

Initial	3 mol	0	0
Dissociation	1.2	—	0.6 mol
formation	—	0.6	0.6 mol (03)
eqm	1.8	0.6	0.6 mol

eqm Pressure $\frac{1.8}{3} \times 6\times10^5 Pa$, $\frac{0.6}{3} \times 6\times10^5 Pa$, $\frac{0.6}{3} \times 6\times10^5 Pa$; $3\times05 = 15$

$$K_p = \frac{P_{Q(g)} \cdot P_{R(g)}}{P^2_{P(g)}} = \frac{\left(\frac{0.6}{3} \times 6\times10^5 Pa\right)^2}{\left(\frac{1.8}{3} \times 6\times10^5 Pa\right)^2} = \frac{1}{9} \quad (05)$$

$$= 0.11 \quad (05)$$

$K_p = K_c (RT)^{\Delta n}$ (04)

$K_p = K_c$ ($\because \Delta n = 0$)

$K_c = \frac{1}{9} = 0.11$ (05)

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$2P_{(g)} \rightleftharpoons Q_{(g)} + R_{(g)}$

eqm 0.6 0.975 0.975 mol.

$S_{(g)}$ 0.225 mol

$05\times4 = 20$

$$K_p = \frac{P_{Q(g)} \cdot P_{R(g)}}{P^2_{P(g)}} = \frac{\left(\frac{0.975}{n_T} \times P_T\right)^2}{\left(\frac{0.6}{n_T} \times P_T\right)^2} = \left(\frac{9.75}{6}\right)^2 \quad (5)$$

$= 2.64$ // (5)

Reaction is endothermic (05)

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90

(a) i) suitable definition — (10)

Q.no 06

ii) $R = k[A]^x[B]^y[C]^z$

$8 \times 10^{-4}\ mol\ dm^{-3}\ s^{-1} = k(0.1\ mol\ dm^{-3})^x (0.1\ mol\ dm^{-3})^y (0.1\ mol\ dm^{-3})^z$ — (1)

$3.2 \times 10^{-3}\ mol\ dm^{-3}\ s^{-1} = k(0.2\ mol\ dm^{-3})^x (0.2\ mol\ dm^{-3})^y (0.1\ mol\ dm^{-3})^z$ — (2)

$1.6 \times 10^{-3}\ mol\ dm^{-3}\ s^{-1} = k(0.1\ mol\ dm^{-3})^x (0.1\ mol\ dm^{-3})^y (0.1\ mol\ dm^{-3})^z$ — (3)

$1.6 \times 10^{-3}\ mol\ dm^{-3}\ s^{-1} = k(0.2\ mol\ dm^{-3})^x (0.1\ mol\ dm^{-3})^y (0.1\ mol\ dm^{-3})^z$ — (4)

$4 \times 02 = 08$

$\frac{(3)}{(1)} \Rightarrow \frac{1.6}{0.8} = \left(\frac{2}{1}\right)^z$

$z = 1$

$\frac{(4)}{(1)} \Rightarrow \left(\frac{1.6}{0.8}\right) = \left(\frac{2}{1}\right)^x$; $\frac{(2)}{(1)} \Rightarrow \frac{3.2}{1.6} = \left(\frac{2}{1}\right)^y$

$x = 1$; $y = 1$

$04 \times 3 = 12$

(iii) Total order = 3 (5)

(iv) any three possible factors $3 \times 05 = 15$

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(b) n_y (initial) $= 0.36\ mol\ dm^{-3} \times 500 \times 10^{-3}\ dm^3$

$= 0.180\ mol$ (05)

n_y (in water) $= (0.180 - 0.165)\ mol$

$= 0.015\ mol$ (05)

(i) $K_D = \frac{[Y]_{CCl_4}}{[Y]_{H_2O}} = \frac{\frac{0.165}{500 \times 10^{-3}}\ mol\ dm^{-3}}{\frac{0.015}{500 \times 10^{-3}}\ mol\ dm^{-3}} = \frac{165}{15} = 11$ (05)

03 + 02

(ii) $11 = \frac{\frac{x}{250 \times 10^{-3}}\ mol\ dm^{-3}}{\frac{0.18 - x}{500 \times 10^{-3}}\ mol\ dm^{-3}}$ (05) (at eqm x mol in CCl_4 layer)

$3.96 = 2x$

$x = 0.172\ mol$ (05)

$11 = \frac{y}{250 \times 10^{-3}} \Big/ \frac{0.008 - y}{250 \times 10^{-3}}$ (05)

$y = 0.0076\ mol$ (05)

Total amount in cely layer = $x+y = 0.1796$ mol (05) (7)

(iv) effient Procedure is ∩ (05)

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(c) (i) $AgBr_{(s)} \rightleftharpoons Ag^+_{(aq)} + Br^-_{(aq)}$

$K_{sp}[AgBr_{(s)}] = [Ag^+_{(aq)}][Br^-_{(aq)}]$ (05)

$9\times10^{-12}\ mol^2dm^{-6} = [Ag^+_{(aq)}]^2$

$[Ag^+_{(aq)}] = 3\times10^{-6}\ mol\,dm^{-3}$ // (05)

(ii) If the concentration of $Ag^+_{(aq)}$ reduced by half

$9\times10^{-12}\ mol^2dm^{-6} = (1.5\times10^{-6}\ mol\,dm^{-3})[Br^-_{(aq)}]$ (05)

$[Br^-_{(aq)}] = 6\times10^{-6}\ mol\,dm^{-3}$ // (05)

∴ mol of Br^- in NaBr solution in $1\,dm^3$ sol^n

$= 6\times10^{-6}\ mol - 1.5\times10^{-6}\ mol$

$= 4.5\times10^{-6}\ mol$ (05)

∴ mass of NaBr in $1\,dm^3 = 4.5\times10^{-6}\ mol \times 103\ g\,mol^{-1}$

$= 4.63\times10^{-4}\ g$ // (05)

(iii) Let the solubility Product of AgBr is x and CuBr is y $mol\,dm^{-3}$.

$AgBr_{(s)} \rightleftharpoons Ag^+_{(aq)} + Br^-_{(aq)}$

$x \qquad x+y\ mol\,dm^{-3}$

$CuBr_{(s)} \rightleftharpoons Cu^+_{(aq)} + Br^-_{(aq)}$

$y \qquad x+y\ mol\,dm^{-3}$

$x(x+y)\ mol^2dm^{-6} = 9\times10^{-12}\ mol^2dm^{-6}$ — (1) (05)

$y(x+y)\ mol^2dm^{-6} = 4.2\times10^{-9}\ mol^2dm^{-6}$ — (2) (05)

(2)/(1) $\frac{y}{x} = \frac{4.2}{9}\times10^3 = 467$ //

$$\therefore x(x + 467x) = 9 \times 10^{-12}$$

$$468x^2 = 9 \times 10^{-12}$$

$$x^2 = 0.0192 \times 10^{-12}$$

$$= 192 \times 10^{-16}$$

$$x = 13.86 \times 10^{-8}$$ (05)

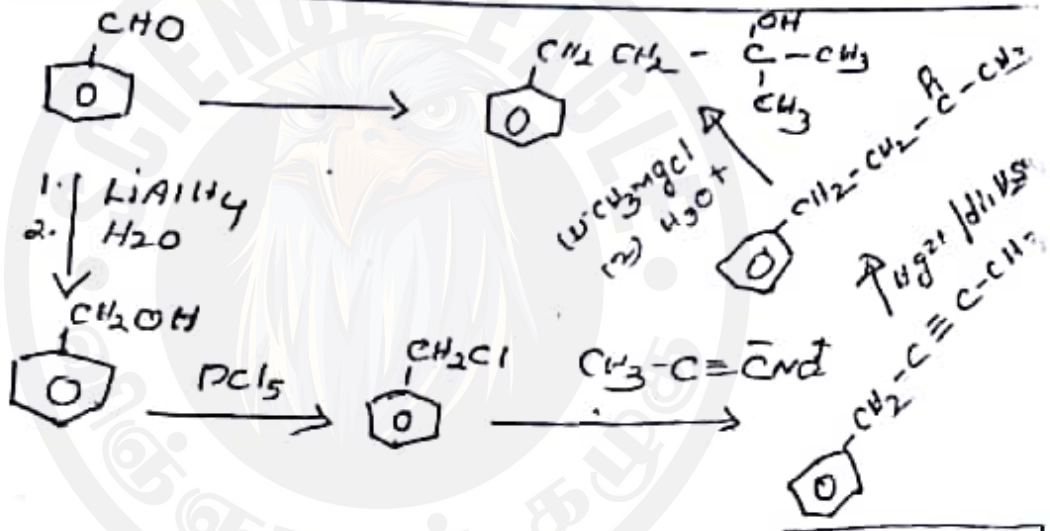
$$[Ag^+_{aq}] = 13.86 \times 10^{-8} \text{ mol dm}^{-3}$$ //

$$\therefore [Cu^{2+}_{aq}] = 467 \times 13.86 \times 10^{-8} \text{ mol dm}^{-3}$$

$$= 6.472 \times 10^{-5} \text{ mol dm}^{-3}$$ // (05)

50

ஆ07 (i)

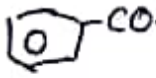
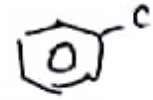


9 × 05 = 45

P_1 : NaOH(aq) ; P_2 : H_3O^+, P_3 : $NONO_2$ / HCl

P_4 : $CONH_3$, Δ ; P_5 : PCl_5 5 × 06 = 30

Q_1 :  Q_2 :  Q_3 : 

Q_4 :  Q_5 :  Q_6 : 

used as catalyst $P_1 \rightarrow P$ 6 × 07 = 42

(03)

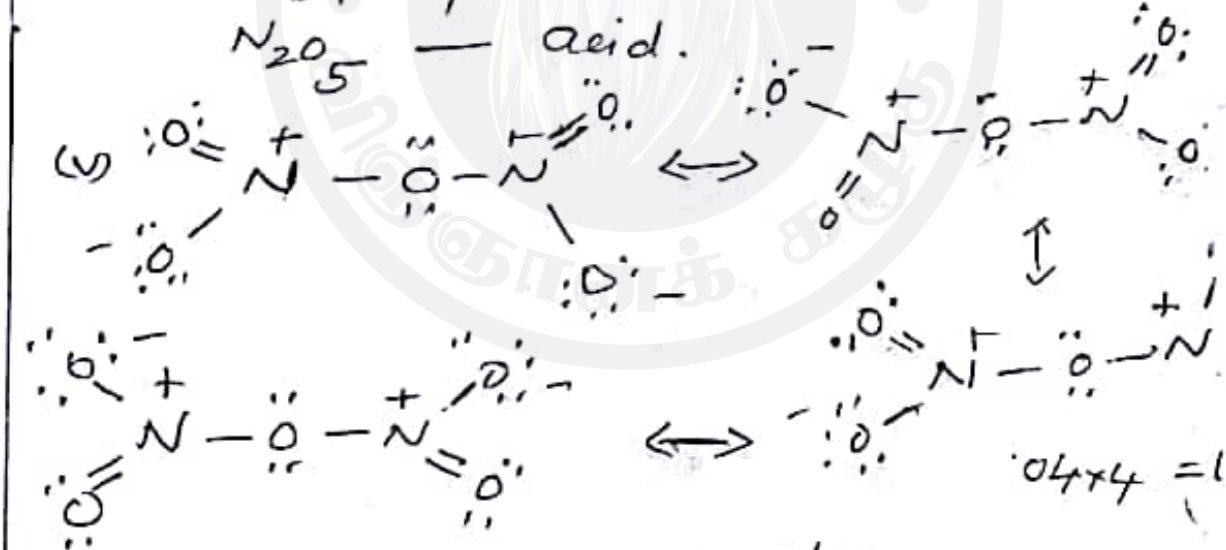
75

09 (A) (iv) Bond energy of N_2 is greater value,
$N \equiv N$ has short bond length
Dissociation of $N_2(g)$ is very high.
∴ Reactivity of N_2 is very less. 4

(ii) N_2O Nitrous oxide.
NO Nitric oxide | N_2O_2 Dinitrogen
N_2O_3 Dinitrogen trioxide
NO_2 Nitrogendioxide | N_2O_4 Dinitrog
N_2O_5 Dinitrogen Pentoxide. $10 \times 02 =$

(iii) +I, +II, +III, +IV, +V $5 \times 2 = 10$

(iv) N_2O — neutral
NO — neutral
N_2O_3 — Acidic | weak acid
NO_2 / N_2O_4 — weak acid. $5 \times 2 = 10$
N_2O_5 — acid.

(v) 

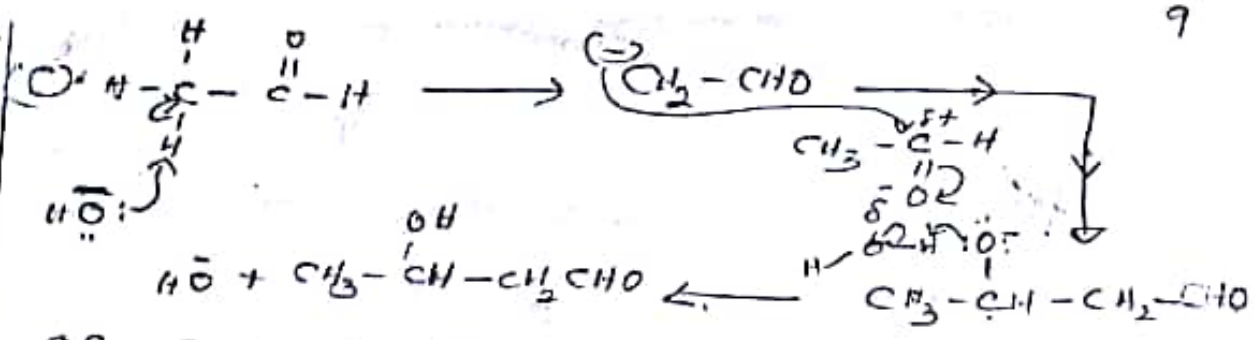
$04 \times 4 = 1$

Any four resonance structure.

(vi) $4NH_3(g) + 5O_2 \xrightarrow[900^\circ C,\ 1-9\ atm]{Pt/Rh\ (1)} 4NO(g) + 6H_2O(l)$

$2NO + O_2 \xrightarrow[150^\circ C]{(1)} 2NO_2(g)$ — (3)

$4NO_2 + O_2 + 2H_2O \longrightarrow 4HNO_3$ — (3)



08 × 3 = 24
Arrow 6 × 01 = 06] (30)

150

ANOB (A) (i) Cr^{3+}, $Mn^{2+}_{(aq)}$, $Sr^{2+}_{(aq)}$ 10 × 3 = 30

(ii) $Cr(OH)_3$, MnS ... , $SrCO_3$ 05 × 3 = 15

(iii) $Cr(OH)_3 + 3OH^- \rightleftharpoons [Cr(OH)_6]^{3-}$

green. (10)

55

(B) (a) $PbCl_2$ / $PbBr_2$ / PbI_2 / $PbSO_4$ / $PbCO_3$ any suitable argument (any three)

(b) $PbCl_2$ / $PbBr_2$ / PbI_2 may be present

(c) PbI_2 is Present. —— (05)

(2) $SO_2(g)$ and S as the Product.

∴ $S_2O_3^{2-}$ is Present. —— (05)

(3) ... $NH_3(g)$ may be evolved

$NH_3(g)$ is evolved —— (05)

∴ NO_3^- is Present in the solution.

(i) I^-, $S_2O_3^{2-}$, and NO_3^- 10 × 3 = 30

45

(C) (i), (ii) and (iii) any possible reaction.

$NCl_3 + 3H_2O \longrightarrow NH_3 + 3HOCl$

$BiCl_3 + H_2O \rightleftharpoons BiOCl_{(s)} + 2HCl$ 5 × 10 = 5

$= 0.4 \times 10^{-3}$ mol (05) 12

moles of MnO_4^- reacted with $C_2O_4^{2-}$ =

$= (2 \times 10^{-3} - 0.4 \times 10^{-3})$ mol

$= 1.6 \times 10^{-3}$ mol (05)

$n_{C_2O_4^{2-}(aq)} = \frac{5}{2} \times 1.6 \times 10^{-3}$ mol

$= 4 \times 10^{-3}$ mol (05)

$n_{SO_3^{2-}(aq)} = 1 \times 10^{-3}$ mol (05)

$[SO_3^{2-}{}_{(aq)}] = \frac{1 \times 10^{-3} \text{ mol}}{25 \times 10^{-3} \text{ dm}^3} = 0.04 \text{ mol dm}^{-3}$ (05)

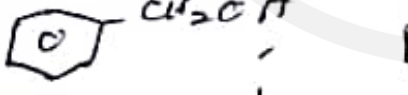
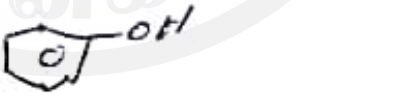
$[C_2O_4^{2-}{}_{(aq)}] = \frac{4 \times 10^{-3} \text{ mol}}{25 \times 10^{-3} \text{ dm}^3} = 0.16 \text{ mol dm}^{-3}$ (05)

(b) (i) $CH_3CHClCHClCH_3$ $CH_3CH_2CHClCH_2Cl$

$CH_3 - C \equiv C - CH_3$ ↓ AlCl/KOH Δ. $CH_3CH_2C \equiv CH$

↓ NH_3/CuCl

No change. Red Precipitate

(ii)  

↓ neutral $FeCl_3$

No change violet sol^n

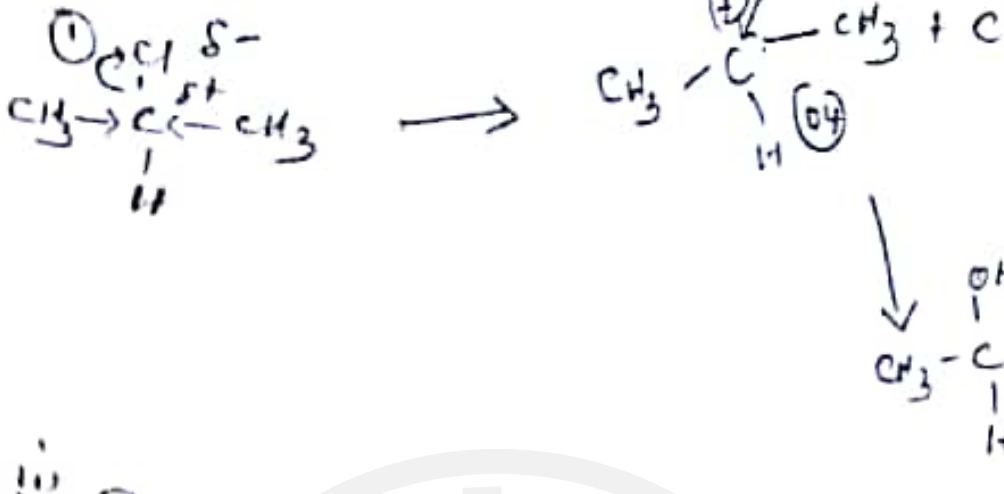
(iii) $CH_3CH_2NH_2$ $CH_3CH_2NHCH_3$

↓ $NaNO_2$/HCl

Gas librated. Yellow resin

(any possible answer) $3 \times 10 = 30$

(c) $CH_3CHClCH_3 \xrightarrow{NaOH(aq)} CH_3-CH(CH_3)-OH$ (04)



(04) (04)

(d) (i) $P_P = x_P P_T$ $P_Q = x_Q P_T$

$P_P = 0.72 \times 1 \times 10^5$ Pa (05) $= 0.28 \times 1 \times 10^5$ Pa (05)

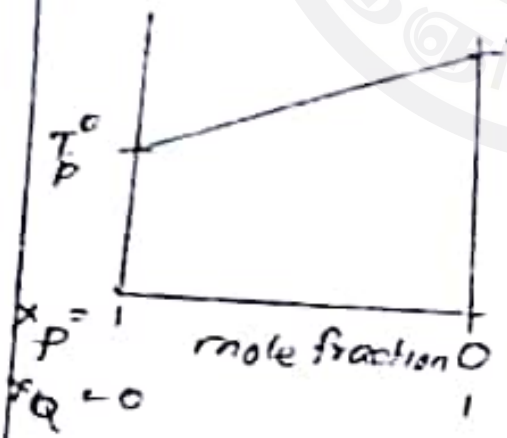
$= 7.2 \times 10^4$ Pa (05) $= 2.8 \times 10^4$ Pa (05)

(ii) $P_A = y_A P_A^o$

$P_A^o = \frac{7.2 \times 10^4 \text{ Pa}}{0.24} = 3 \times 10^5$ Pa (05) (05)

$P_Q^o = \frac{2.8 \times 10^4}{0.76}$ (05)

$= 3.68 \times 10^4$



$5 \times 02 = 10$

Structure (A) $4 \times 100 = 400$ MCQ $1 \times 50 = 5$

Essay (B) $2 \times 150 = 300$

(C) $2 \times 150 = 300$

correction: Q1(d) mole fraction of P in Liquid Phase 0.24