

Half Yearly Exam
Chemistry - XII
Marking Scheme

Ans 1 (b)

Ans 2 (b)

Ans 3 (b)

Ans 4 (a)

Ans 5 (b)

Ans 6 (c)

Ans 7 (b)

Ans 8 (b)

Ans 9 (d)

Ans 10 (a)

Ans 11 (b)

Ans 12 (b)

Ans 13 (a)

Ans 14 (d)

Ans 15 (b)

Ans 16 (a)

1 X 16 = 16 marks
[Total]

Ans. 17. In chlorobenzene lone pair of e⁻ is involved in resonance, hence it has partial double bond character.

(2) The phenyl carbocation is highly unstable.

[1x2=2]

Ans. 18 (i) $i^{\circ} = 5$

(11)

(ii) $i^{\circ} = 2$

(11)

Ans. 19.

Anode:

(1/2)

Cathode:

(1/2)

Rxn at anode:

(1/2)

Rxn at cathode:

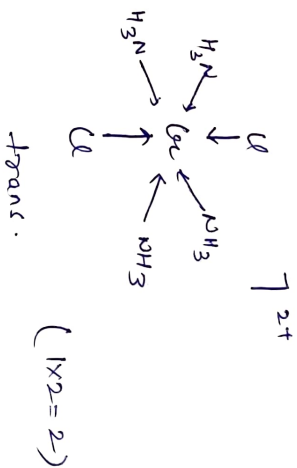
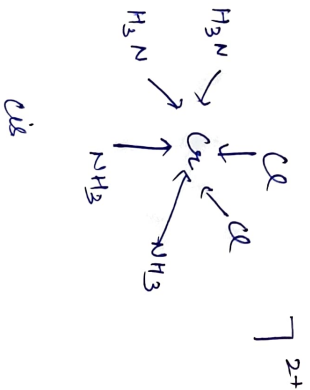
(1/2)

Ans. 20. (i) Zero Order.

(11)

(ii) Second Order

Ans. 21.



Section-C

Q.22-
(1)



(1/2)

Benzyllic carbon cation is a very stable carbocation (1/2)

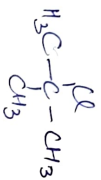
(ii)

On reaction with moisture, it forms corresponding alkane. (1)

(iii)

2-chloro-2-methylpropane

(1/2)



(1/2)

Q.23



$$\begin{aligned} E_{cell}^{\circ} &= E_C^{\circ} - E_A^{\circ} \\ &= E_{Ag^+/Ag}^{\circ} - E_{Mg^{2+}/Mg}^{\circ} \\ &= 0.8 V - (-2.37 V) \\ &= 3.17 V \end{aligned}$$

$$\begin{aligned} E_{cell} &= E_{cell}^{\circ} - \frac{0.059}{n} \log \frac{[Mg^{2+}][Ag]}{[Mg][Ag^+]^2} \\ &= 3.17 V - \frac{0.059}{2} \log \frac{(1)}{[0.001]^2} \\ &= 3.17 - \frac{0.059}{2} \log \frac{[1]}{[10^{-6}]} \end{aligned}$$

$$t_{1/2} = 77.78 \text{ min}$$

$$t = \frac{2.303}{k} \log \frac{[A]_0}{[A]_t}$$

(1/2)

$$k = \frac{0.693}{t_{1/2}}$$

(1/2)

$$k = \frac{0.693}{77.78} \text{ min}^{-1}$$

$$= 0.0089 \text{ min}^{-1}$$

(1/2)

$$t = \frac{2.303}{0.0089} \log \frac{[A]_0}{\frac{10}{100} [A]_0}$$

(1/2)

$$= \frac{2.303}{0.0089} \log \frac{10}{1}$$

$$= \frac{2.303}{0.0089} [\log 10 - \log 1]$$

$$= \frac{2.303}{0.0089} \times [1 - 0.8450]$$

$$t = 40.10 \text{ min}^{-1}$$

(1/2)

a) Due to the presence of number of unpaired d-electrons. (1/2)

b) Due to formation of CoO_2^- ion (1/2)

c) Due to large number of oxidation states possible and also bog of anionoid contraction. (1/2)

$$p^{\circ} = 0.850 \text{ bar}$$

$$w = 0.5 \text{ g}$$

$$p_s = 0.845 \text{ bar}$$

(4)

$$\frac{p^{\circ} - p_s}{p^{\circ}} = \chi_2 \quad (1)$$

$$\frac{0.850 - 0.845}{0.850} = \frac{0.5/m}{78/78} \quad (1/2)$$

$$= \frac{0.05}{0.850} = \frac{0.5}{m} \quad (1/2)$$

$$m = \frac{0.850 \times 0.5}{0.05} = 8.5 \text{ g/mol} \quad (1/2 + 1/2)$$

OR

$$\Delta T_f = K_f m \quad (1/2)$$

$$T_f^{\circ} - T_f = K_f m \quad (1/2)$$

$$0 - T_f = 1.86 \times \frac{45/62}{600/1000} \quad (1)$$

$$T_f = -1.86 \times \frac{45}{62} \times \frac{1000}{600} = -2.25^{\circ}\text{C} \quad (1/2 + 1/2)$$

Ans 27

(1)

ambidentate ligand

Have more than one donor site; but binds through only one atom at a time to central.

atom/ion.

eg CN^- , NO_2^-

Bidentate ligand.

Binds through two donor sites at the same time to central atom/ion.

eg COO^- , $\text{NH}_2\text{CH}_2\text{COO}^-$.

$(\frac{1}{2} + \frac{1}{2})$

$\frac{1}{2}$

(ii)

CN^- is a SFL and hence spair up the d-electrons of Ni while Cl^- is a wFL, and there is presence of unpaired d-electrons in Ni.

(1)

(5)

(111)



(1/2)

SO_4^{2-} is a bidentate ligand and gives results in octahedral structure which is more stable than complex formed by monodentate. (1/2)

Ans 28.

$$\log \frac{k_2}{k_1} = \frac{E_a}{2.303R} \left[\frac{1}{T_1} - \frac{1}{T_2} \right] \quad (1/2)$$

$$\log \frac{0.07}{0.02} = \frac{E_a}{2.303 \times 8.314} \left[\frac{1}{500} - \frac{1}{700} \right] \quad (1/2)$$

$$\log \frac{7}{2} = \frac{E_a}{19.14} \left[\frac{700 - 500}{350000} \right]$$

$$\frac{0.84}{0.3010} = \left[0.84 - 0.3010 \right] = \frac{E_a}{19.14} \times \frac{200}{350000} \quad (1)$$

$$0.539 = \frac{E_a}{19.14} \times \frac{200}{350000}$$

$$E_a = \frac{19.14 \times 0.539 \times 350000}{200}$$

$$E_a = \frac{36553}{2} = 18230.8 \text{ J}$$

(1/2)

Section-DAns 29

$$(a) \quad \Delta H_{\text{mix}} = 0 \quad \& \quad \Delta V_{\text{mix}} = 0$$

(1/2)

(b) A-B weaker forces than A-A or B-B

(1)

(c) Negative deviation; A mix of Positive deviation; Acetone

(1/2)

Ethanol & Acetone

(2)

$$P_T = P_A + P_B \quad \underline{OR}$$

$$= P_A^0 x_A + P_B^0 x_B \quad (1/2)$$

$$= P_A^0 (1 - x_B) + P_B^0 x_B \quad (1/2)$$

$$= P_A^0 - P_A^0 x_B + P_B^0 x_B$$

$$= P_A^0 - x_B (P_A^0 - P_B^0) \quad (1)$$

Qs 30
(a) Benzyl chloride (5)

Stable carbocation (hydrolysis proceed (1/2) by S_N1 mechanism).

(b) It will react in racemic product (1)

(c) 1) 1-Bromopentane (1)

(ii) 2-Bromo-2-methylbutane (1)

OR

S_N1

→ Follows first order kinetics

→ takes place in two steps.

S_N2

→ Follows second order kinetics

→ takes place in one single step. (1+1)

or any other relevant point

Section - C

Qs 31

(i) Δ_m^0 (AgCl) = Δ_m^0 (AgNO₃) + Δ_m^0 (KCl) - Δ_m^0 (KNO₃) (1/2)

$$= (133.4 + 149.9) - (144.9) \quad (1/2)$$

$$= 138.4 \text{ J cm}^{-2} \text{ mol}^{-1} \quad (1/2 + 1/2)$$



$$E_{\text{cell}}^{\circ} = \frac{0.059}{n} \log K_c \quad (1/2)$$

$$(0.8 - (-0.25)) = \frac{0.059}{2} \log K_c$$

$$1.05 \text{ V} = \frac{0.059}{2} \log K_c$$

$$\log K_c = \frac{1.05 \times 2}{0.059}$$

$$\log K_c = 35.59 \quad (1/2)$$

$$K_c = \text{Antilog}(35.59)$$

$$= 3.89 \times 10^{35}$$

(1/2)

$$\Delta G = -nFE_{\text{cell}}^{\circ}$$

$$= -2 \times 96500 \times 1.05$$

$$\Delta G^{\circ} = -mFE_{\text{cell}}^{\circ} \quad (1/2)$$

$$= -2 \times 96500 \times 1.05 \quad (1/2)$$

$$\rightarrow -202650 \text{ J mol}^{-1}$$

$$= -202.65 \text{ kJ/mol} \quad (1/2)$$

OR



$$Q = It$$

$$= 600 \times 10^{-3} \times 60 \text{ sec}$$

$$= 36 \text{ Coulombs}$$

(1/2)

96500 C deposit 1 mole of Na atoms i.e.
6022 $\times 10^{23}$ atoms

$$36 \text{ C will deposit} = \frac{6.022 \times 10^{23} \times 36}{96500}$$

$$= 2.24 \times 10^{20} \text{ atoms} \quad (1) \quad (8)$$

(b)



(1)

(i) Zn is negatively charged.

(1)



(1/2)



(1/2)

As. 3/2

(1)

(a) Backage Isomerism - Beoz of presence of ambidentate ligand.



(1)

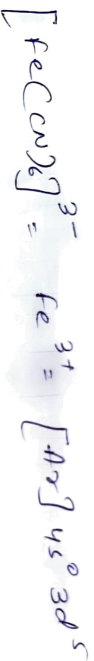
(b)

Coordination Isomerism :- Due to exchange of atom / ions within coordination sphere.

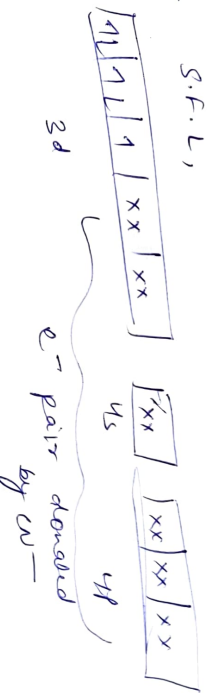


(1)

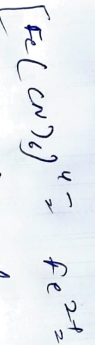
(ii)



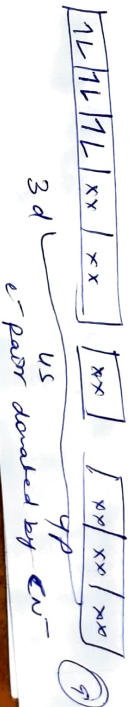
Since CN^- is a S.F.L,



Due to presence of one unpaired e- in 3d orbital of Fe, it is weakly paramagnetic. (1.5)



Fe (in ground state)



Due to absence of any unpaired d-electron, it is diamagnetic. (1.5)

OR



Oxidation no. of Pt = +2

($\frac{1}{2}$)

Coordination no. of Pt = 4

($\frac{1}{2}$)



(1)

(iii) Complexes showing ~~at~~ more than one type of ligands associated with the central metal ion/atom in coordination complex. eg $[Ni(en)_2 Cl_2]$ (1)

(b) In $[Ni(H_2O)_6]^{2+}$, H_2O is a w.f.l., hence pairing of e^- doesn't happen, hence due to presence of unpaired d-electron it is green in colour but CN $^-$ is a S.F.L. hence pairing of e^- takes place and therefore it is colourless. (2)

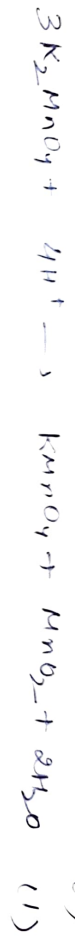
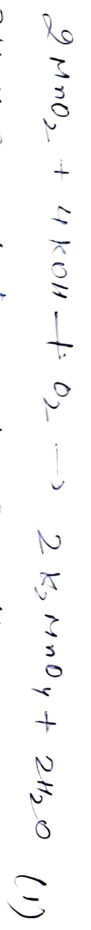
Au-33

(i) (a) Due to presence of free electrons in d-orbital. (1)

(b) Mn^{2+} is stable due to stable d^5 (half-filled) configuration. (1)

(c) Due to f^{14} configuration, it only loses e^- but doesn't gain any electron. (1)

(17)



OR

