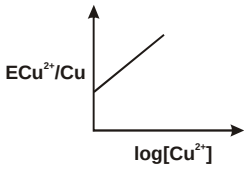
Marking Scheme

Sample Paper (2023-24) CHEM-856 Class: 12th

SECTION-A

1. (d) Vitamin B_{12} (1)
2. (c) About three times (1)
3. (b) (1)



4. (d) 40 min (1)
5. (b) Sorbitol (1)
6. (a) CH_3—⬡—NC (1)
7. (d) $[Cr(H_2O)_6]Cl_3$ (1)
8. (d) Benzyl alcohol (1)
9. (b) CrO_4^{2-} (1)
10. (b) Diethyl ether (1)
11. (a) CH_3NH_2 (1)
12. (d) Aspirin (1)
13. (d) P-Benzoquinone (1)
14. (c) $i_x = i_y = i_z$ (1)
15. (c) Assertion (A) True, Reason (R) False (1)
16. (b) Assertion (A) True, Reason(R) True (1)
    But Reason(R) not true explanation
17. (c) Assertion (A) True, Reason (R) False (1)
18. (d) Assertion (A) False, Reason (R) True (1)

SECTION-B

19. (a) Aniline being lewis base react with Anhydrous $AlCl_3$ which is lewis acid to form salt. (1)

(b) Methylamine accept proton from water and liberate OH^- ion which combine with Fe^{3+} ion to form hydrated ferric oxide $Fe(OH)_3$ or (1)

$Fe_2O_3.3H_2O$

20. (a) $CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-CH_3$ or 2,2-dimethyl propane (1)

(b) $CH_3-\underset{\displaystyle CH_3}{\overset{|}{CH}}-CH_2-CH3$ or 2-methyl butane (1)

OR

(a) Because Grignard reagent reacts with moisture and form Alkane. (1)

(b) C-Cl bond in chloro benzene acquire some double bond character due to delocalization of ions pair on chlorine so bond length decreases

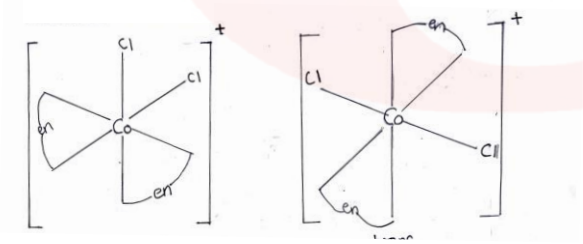
OR

any other relevant answer. (1)

21. (a) amylose is water soluble linear polymer of ∝-D glucose whereas amylopectin is water insoluble branched (C_1-C_6) glycosidic linkage carrying branched polymer. (1)

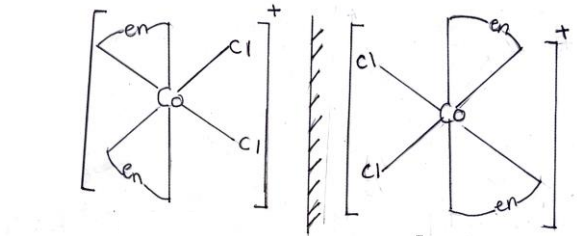
(b) Intra molecular H-Bonding (1)

22. Geometrical Isomers (1)



Cis Trans

Optical isomers (1)



dextro(+) laevo(-)

23. Q =I x t

= 0.5 x 4 x 60 x 60
= 20x360

= 7200C (1)

96500 corresponds to 6.02 x 10^{23} e^-

7200 C gives = $\frac{6.02x10^{23}}{96500}$ x 7200

= 4.49 x 10^{22} e^- (1)

24.(a)(i) Azeotropic mixture is type of liquid mixture having definite composition and boiling like a pure liquid (½)

eg. 95.37% C_2H_5OH + 4.63% H_2O (½)

OR

Any other relevant example

(ii) Solutions which have the same osmotic pressure at same temperature (½)

eg. 0.9% solution of pure NaCl is isotonic with RBC (½)

OR

Any other relevant example

OR

(b) If we have two completely miscible volatile liquid A and B having mole fraction x_A and x_B Then at certain temperature partial pressures P_A and P_B and vapour pressure in pure state PA° and PB° are expressed as

$P_A=P_A°.x_A$

$P_B=P_B°.x_B$

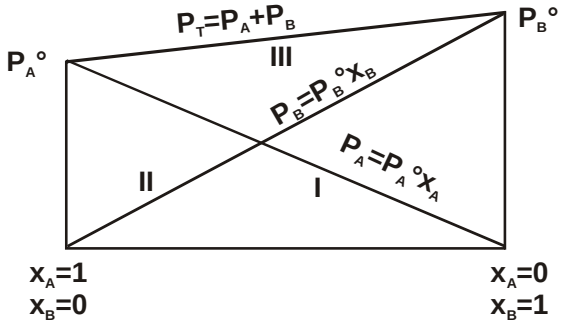
$P_T=P_A+P_B$ (½)

$P_T=P_A°.x_A+ P_B°.x_B$

$P_T=P_A°(1-x_B)+P_B°x_B$

when $x_A=1$ $P_T= P_A°.x_A$

when $x_B=1$ $P_T=P_B°x_B$ (½)



(½)

$y_A=\frac{P_A}{P_T}$ $y_B=1-y_A$ (½)

25. (i) Ea decrease (1)
(ii) No effect on ΔG (1)

SECTION-C

26. (a) It is the amide linkage present between – COOH group of one ∝ amino acid and NH_2 group of other amino acid. (1)

(b) When protein in native form is subjected to physical changes like change in temperature or pH then hydrogen bonds are broken, it looses its biological activity and all structures are destroyed and only primary structure remain intact. (1)

(c) It is the sequence in which various ∝-amino acids present in a protein are linked to one another. (1)

OR

Amino acids contain acidic and basic group within same molecule. In aqueous solution they neutralize each other, carboxyl group loses a proton and amino group accept it. (1)

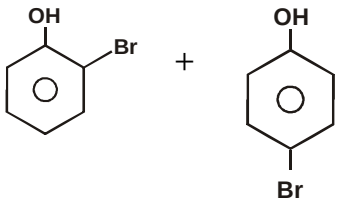
NH_2-CH(R)-COOH → NH_3^+-CH(R)-COO^-

(Zwitter ion)

NH_3^+-CH(R)-COOH $\underset{OH^-}{\overset{H^+}{\rightleftharpoons}}$ NH_3^+-CH(R)-COO^- $\underset{H^+}{\overset{OH^-}{\rightleftharpoons}}$ NH_2-CH(R)-COO^- (1)

NH_3^+ group act as acid — Amphoteric react with acid and base — COO^- group act as base (1)

27.(a) CH_3CH_2COOH (1)

(b)  (1)

(c) $CH_3\text{-}\overset{\overset{O}{\|}}{C}\text{-}CH_3 + CH_3MgBr \rightarrow CH_3\text{-}\overset{\overset{OMgBr}{|}}{\underset{\underset{CH_3}{|}}{C}}\text{-}CH_3 \xrightarrow{H^+ / H2O} CH_3\text{-}\overset{\overset{OH}{|}}{\underset{\underset{CH_3}{|}}{C}}\text{-}CH_3$ (1)

28.(a) 1st order (1)

(b) min^{-1} (1)

(c) $t½ = \frac{0.693}{K}$ (1)

29. For AB_2

$M_{AB_2} = \frac{Kf.W_B.1000}{W_A.\Delta Tf}$ (½)

$= \frac{5.1\ x\ 1\ x\ 1000}{20\ x\ 2.3}$

= 110.87u (½)

$M_{AB_4} = \frac{5.1\ x\ 1\ x\ 1000}{20\ x\ 1.3}$

= 196.5u

Atomic mass of A=a and Atomic mass of B is b

∴ a+2b = 110.87 (i) (1)

a+4b = 19.65 (ii)

(ii) – (i)

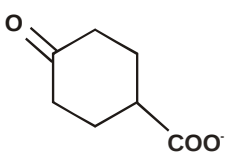
196.5 – 110.87 = a+46 – a-2b

85.28 = 2b (1)

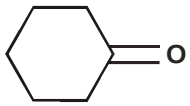
b = 42.64u

a+2b=110.87
a+2x42.64=110.87
∴ a = 110.8→ - 8528
= 25.29u
i.e. atomic mass of A = 25.59 u
atomic mass of B = 42.64 u

30.(a) $C_6H_5CH=N\ NHCONH_2$ (1)

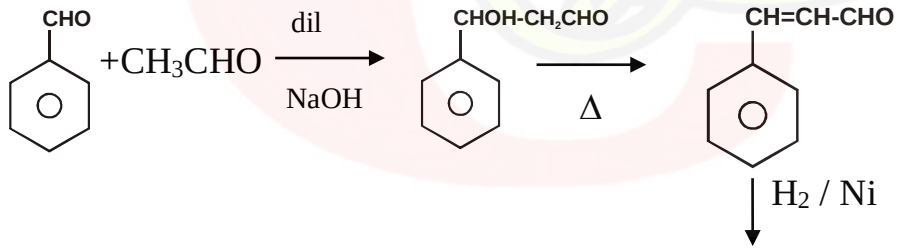
(b) 

4- Oxocyclohexane (1)
Carboxylate anion (1)

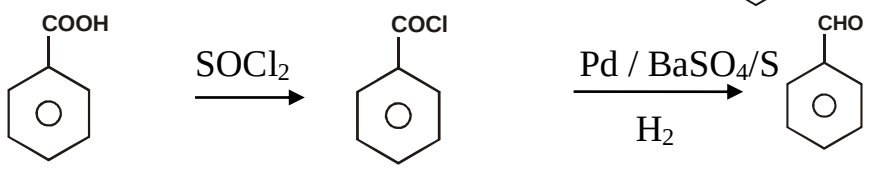
(c) 

OR

(a) $2CH_3CHO \xrightarrow{OH^-} CH_3\text{-}CH(OH)\text{-}CH_2\text{-}CHO \xrightarrow{\Delta} CH_3\text{-}CH=CH\text{-}CHO$ (1)

(b) 

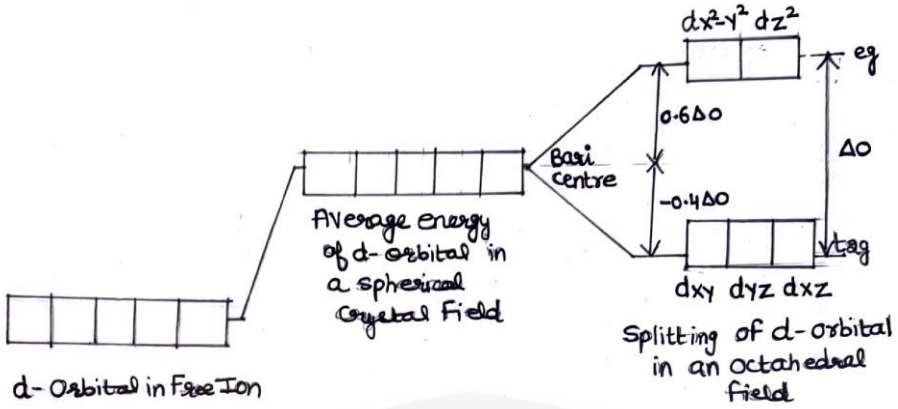
(1)

(c) 

(1)

31.(a) The difference of energy between the two sets of a orbitals is called as crystal field splitting energy. (1)

(b)



(2)

OR

$Mn^{2+}=4s^\circ\ 3d^5$

H_2O being weak ligand, don't cause pairing 5 unpaired e (1)

$\therefore t_2g^3\ eg^2$

CN^- strong ligand, cause pairing so there is 1 unpaired e^- (1)

i.e. $t_2g^5\ eg^\circ$

(c) $\Delta_O > P$ pairing occurs (1)

$\Delta_O < P$ No pairing occurs

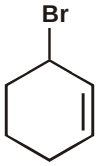
32. (a) $C_6H_5CHClC_6H_5$ (1)

(b) 1-Bromo pentane>2-Bromopentane>2-Bromo-2-methylbutane (1)

(c) Allylic carbocation is stable (1)

(d) I^- is better leaving group than Cl^- (1)

OR

(d) 

Allylic substitution (1)

33.(a) (i) $4\ FeOCr_2O_3 + 8\ Na_2CO_3 + 7O_2 \rightarrow 8Na_2CrO_4 + 2Fe_2O_3 + 8CO_2$ (1)

(ii) $2Na_2CrO_4 + H_2SO_4 \rightarrow Na_2Cr_2O_7 + Na_2SO_4 + H_2O$ (1)
(Conc)

(iii) $Na_2Cr_2O_7 + 2KCl \rightarrow K_2Cr_2O_7 + 2NaCl$ (1)

(b) (i) $Cr_2O^{2-}_7 + 14H^+ + 6I^- \rightarrow 2Cr^{3+} + 7H_2O + 3I_2$ (1)

(ii) $Cr_2O^{2-}_7 + 6Fe^{2+} + 14H^+ \rightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$ (1)

OR

(a)(i) $2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$ (1)

(ii) $2K_2MnO_4 + Cl_2 \rightarrow 2KMnO_4 + 2KCl$ (1)

OR

any other relevant answer.

(b) Lanthanoids	Actinoids	
(i) Electronic Configuration $[xe]4f^{1-14}5d^{0-1}6s^2$	$[Rn]\ 5f^{1-14}\ 6d^{0-1}7s^2$	(1)
(ii) Regular decrease in size from left to right known as lanthanoid contraction	Regular decrease in size from left to right is known as Actinoid contraction	(1)
(iii) ⇒Lanthanoids react with dilute acid to liberate H_2 gas	⇒ Actinoids are highly reactive in divided state	
⇒ Form oxide and hydroxides of type M_2O_3 / $M(OH)_3$	⇒ React with boiling water to give mixture of oxide and hydride	
⇒ With C form carbides	⇒ Attacked by HCl but the effect of HNO_3 is very small.	
⇒ With halogen form halides	⇒ No action of alkalies	

OR

any other relevant difference

34.(a) $E°cell = E°cathode - E°Anode$

$= E°Cu^{2+}/Cu - E°Mg^{2+}/Mg$

$= 0.34 - (-2.36)$ (½)

$= 2.70V$

$Mg_{(s)} + Cu^{2+} \longrightarrow Mg^{2+} + Cu_{(s)}$

(0.0001M) (0.001M)

$$Ecell = E°cell - \frac{0.0591}{2} \log \frac{[Mg^{2+}]}{[Cu^{2+}]}$$

$$= 2.70 - \frac{0.0591}{2} \log \frac{0.001]}{0.0001}$$

= 2.70 – 0.0295 log 10 (1)
= 2.70 – 0.0295 x 1
= 2.6705V

(b) Because the number of ions per unit volume decreases. (2)

OR

(a) (i) During recharging, cell is operated like electrolytic cell.

(ii) Electrical energy is supplied to it from external source.
(iii) Electrode reactions are reverse of that of discharging. (1)
(iv) At cathode (Reduction) (1)

$PbSO_4(s) + 2e^- \longrightarrow Pb(s) + SO_4^{2-}(aq)$

At Anode (oxidation)

$PbSO_4(s) + 2H_2O \longrightarrow PbO_2(s) + SO_4^{2-}(aq) + 4H^+ + 2e^-$

Overall reaction

$2PbSO_4 + 2H_2O \longrightarrow Pb(s) + PbO_2(s) + 4H(aq)^+ + 2SO_4^{2-}(aq)$ (1)

(b) E° Zn^{2+}/Zn = -0.76V

E° Cu^{2+}/Cu=0.34V

$Zn(s) + CuSO_4(aq) \longrightarrow ZnSO_4(aq) + Cu(s)$

Red

$Zn(s) + Cu^{2+} \longrightarrow Zn^{2+} + Cu(s)$

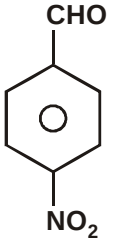
oxid

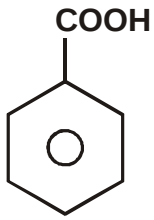
E°cell=0.34 – (-0.76)

= 1.10V

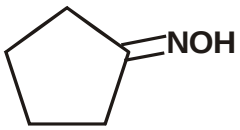
(c) E°cell +ve means reaction is spontaneous and in this reaction zinc is oxidised ∴ we can't store $CuSO_4$ in zinc pot. (2)

35. (a) (1)



(b) 

(1)

(c) 

(1)

(d) $HCHO + HCHO \xrightarrow[NaOH]{conc} CH_3OH + HCOONa$ (1)

(e) $CH_3\,CHOH\text{-}CH(CH_3)\text{-}CHO \xrightarrow[-H_2O]{\Delta} CH_3CH{=}\,C(CH_3)\text{-}CHO$ (1)

OR

(a) Phenol gives violet colouration with neutral $FeCl_3$ solution but benzoic acid does not. (1)

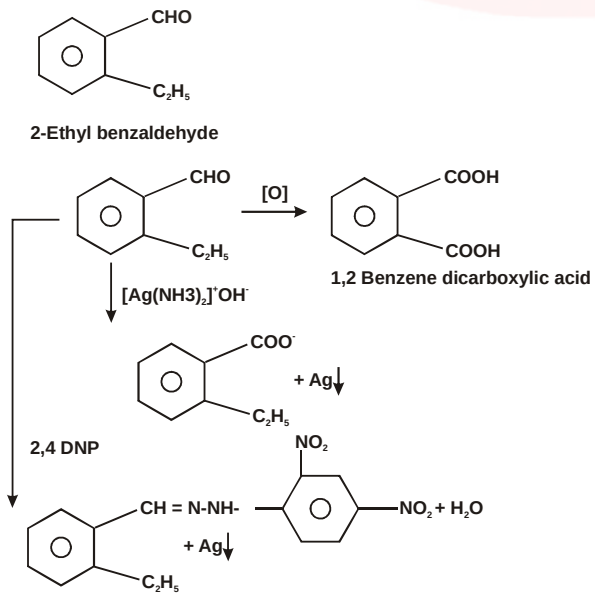
OR

any other relevant test

(b) Acetaldehyde is more reactive towards nucleophillic addition reaction because of stearic hindrance in acetone. (1)

(c)

(1)



(1)