PRACTICE PAPER-2 (CLASS-XII)

CHEMISTRY SOLUTIONS

SECTION – A

1. (c) $PhCH_2CH_2CH_3$

2. (d) Vitamin B_{12}

3. (c) Ionization isomerism

4. (a) Cl_2 / UV light

5. (c) CH_3NH_2 on reaction with nitrous acid releases NO_2 gas.
Wrong statement. The evolution of nitrogen gas takes place.

6. (c) 3

7. (b) 1-methylcyclohexene
According to Saytzeff rule i.e. highly substituted alkene is major product. Here dehydration reaction takes place, alkene is formed due to the removal of a water molecule.

8. (d) infinite

9. (d) 2.0 M

10. (b) 115 Scm^2/mol

$$\wedge°CH_3COOK = \wedge°CH_3COOH + \wedge°KCl - \wedge°HCl$$

$$= 390 + 150 - 425 = 115\ Scm^2/mol$$

11. (b) Maltose

12. (a) Diamminedichloridoplatinum (II)

13. (c) $C_6H_5CH\ (C_6H_5)Br$

$C_6H_5\overset{\oplus}{C}HC_6H_5$ carbocation formed is more stable

14. (c) $RCONH_2$

15. (d) Assertion (A) is wrong, but Reason (R) is correct statement.

16. (a) Both A and R are true but R is the correct explanation of (A).

17. (a) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

18. (d) Assertion (A) is wrong, but Reason (R) is correct statement.

SECTION – B

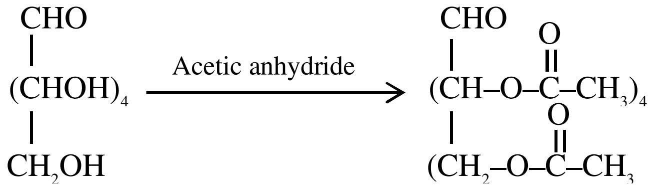
19. $\Delta T_f = K_f m$

$$\Delta T_f = K_f \times \frac{w \times 1000}{m \times W}$$

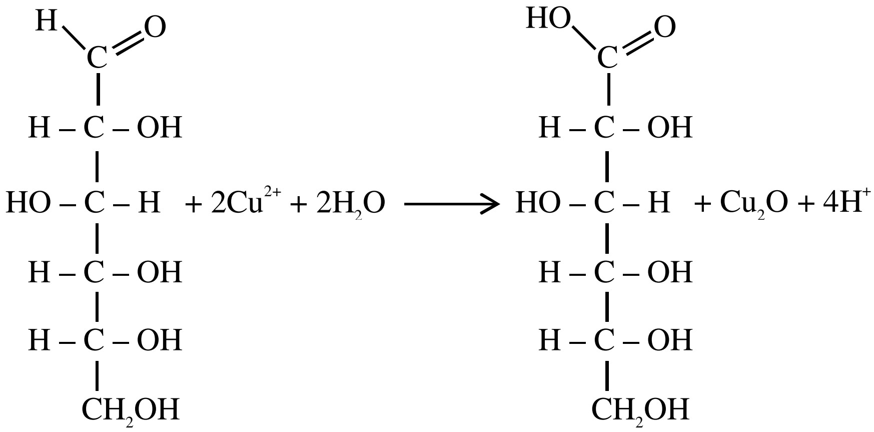
$$1.5 = 3.9 \times \frac{w \times 1000}{176 \times 75}$$

mass of ascorbic acid (w) = 5.08 g

20. **(a)** Acetylation of glucose with acetic anhydride gives glucose pentaacetate which confirms the presence of five –OH groups. Since it exists as a stable compound, five –OH groups should be attached to different carbon atoms.

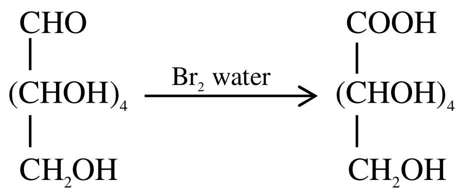


(b) Glucose reduces Fehlings reagent



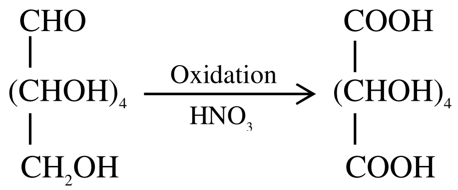
OR

(a)



Gluconic acid

(b)



Saccharic acid

21. (a) A = C_6H_5COCl B = C_6H_5CHO

(b) A = CH_3COCH_3 B = $CH_3CH_2CH_3$

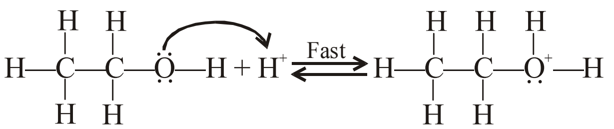
OR

(a) $(CH_3)_3C$-OH/tertiary butyl alcohol is formed.

(b) $C_6H_5COCH_3$/acetophenone is formed.

22. The mechanism of the reaction involves the following three steps:

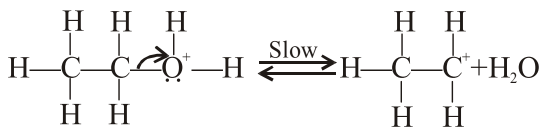
Step 1: Formation of protonated alcohol.



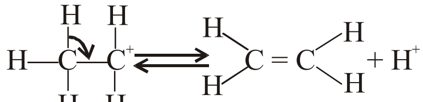
Ethanol

Protonated alcohol
(Ethyl oxonium ion)

Step 2: Formation of carbocation: It is the slowest step and hence, the rate determining step of the reaction.



Step 3: Formation of ethene by elimination of a proton.


Ethene

The acid used in step 1 is released in step 3. To drive the equilibrium to the right, ethene is removed as it is formed.

23. **Anode:** $Zn\ (s) \rightarrow Zn^{2+}\ (aq) + 2e^-$

Cathode: $O_2(g) + 2H_2O(l) + 4e^- \rightarrow 4OH^-\ (aq)$.

Overall: $2\ Zn(s) + O_2(g) + 2H_2O(l) \rightarrow 2Zn^{2+}\ (aq) + 4OH^-\ (aq)$

$2Zn\ (s) + O_2(g) + 2H_2O(l) \rightarrow 2Zn(OH)_2\ (ppt)$

24. It is defined as the sum of powers to which the concentration terms are raised in the rate law equation.

(a) First order

(b) Zero order

25. **(a)** Due to comparable energies of 5f, 6d and 7s orbitals.

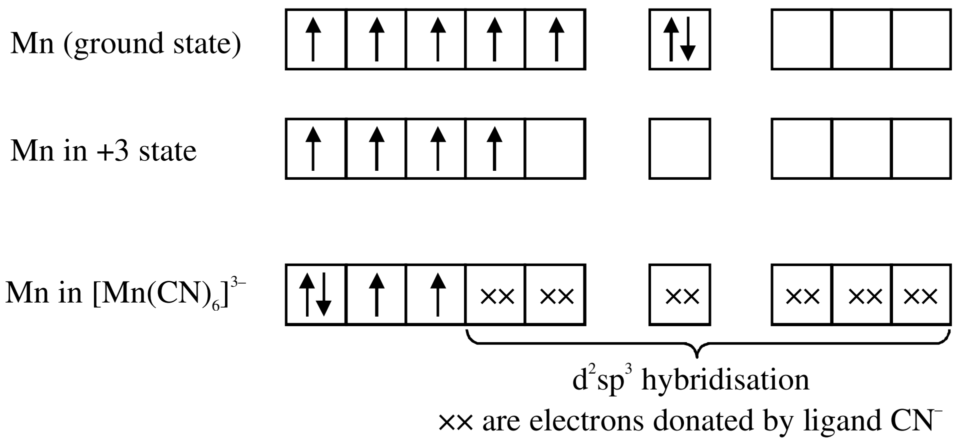
(b) Due to d-d transitions / due to presence of unpaired electrons in d-orbitals.

SECTION – C

26. $[Mn(CN)_6]^{3-}$

$Mn = [Ar]\ 3d^5 4s^2$

$Mn^{3+} = [Ar]\ 3d^4$



Type of hybridization – d^2sp^3

Magnetic moment value $\sqrt{n(n+2)} = \sqrt{2((2+2))} = 2.87BM$

(n = no. of unpaired electrons)

Type of complex – inner orbital

27. **(a)** Cu^{+1} $(3d^{10})$ compounds are white because of absence of unpaired electrons while Cu^{+2} $(3d^{9})$ compounds are coloured due to unpaired e^{-}/shows d-d transition.

(b) chromate (CrO_4^{2-}) changes to dichromate $(Cr_2O_7^{2-})$ ion in acidic medium.

(c) due to completely filled d-orbitals in their ground state as well as in common oxidation state.

28. **(a)**

$$\underset{\text{D-Glucose}}{\begin{matrix} CHO \\ | \\ (CHOH)_4 \\ | \\ CH_2OH \end{matrix}} \xrightarrow{\text{Conc. } HNO_3} \underset{\text{D-saccharic acid}}{\begin{matrix} COOH \\ | \\ (CHOH)_4 \\ | \\ COOH \end{matrix}}$$

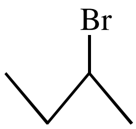
(b) The amino acids contains both acidic –COOH group & basic $-NH_2$ (amino) group in their structure, due to which they can exist both as acid & base, this nature is called Amphoteric nature

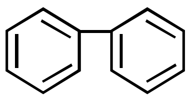
$$R-\underset{\underset{\ddot{N}H_2}{|}}{CH}-\overset{\overset{O}{||}}{C}-OH \qquad (\alpha\text{-amino acid})$$

(c) In α-helix, a polypeptide chain form by all possible hydrogen bonds by twisting into a right handed helical structure with –NH group of each amino acid.

In β-pleated all peptide chains are stretched out to nearly extensions & then laid side by side which are held together by intomolecular hydrogen bonding.

29. **(a)** $(CH_3)_3C-C(CH_3)=CHCH_3$

(b) 

(c) A = , B = C_6H_5MgBr

(d) $C_6H_5N_2Cl + KI \rightarrow C_6H_5I + KCl + N_2$

30. **(a)** Aniline is acetylated, before nitration reaction in order to avoid formation of tarry oxidation products and protecting the amino group, so that p-nitro derivative can be obtained as major product.

(b) pK_b of aniline is lower than the m-nitro aniline. The basic strength of aniline is more that m-nitroaniline. pK_b value is inversely proportional to basic strength. Presence of Electron withdrawing group decrease basic strength.

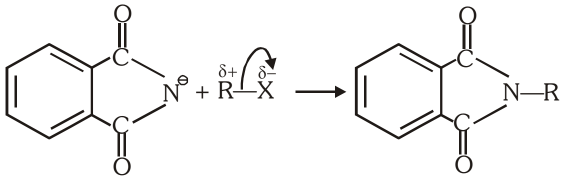
(c) Due to protonation of aniline/formation of anilinium ion

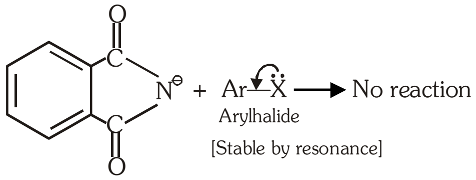
OR

(a) Due to the presence of acidic hydrogen in the N-alkylbenzenesulphonamide formed by the treatment of primary amines.

(b) Aniline does not react with methylchloride in the presence of $AlCl_3$ catalyst, because aniline is a base and $AlCl_3$ is Lewis acid which lead to formation of salt.

(c) The success of Gabriel phthalimide reaction depends upon the nucleophilic attack by the phthalimide anion on the organic halogen compound.





As arylhalides do not undergo nucleophilic substitution reaction easily, aromatic primary amines cannot be prepared by Gabriel phthalimide reaction.

SECTION – D

31. **(a)** The freezing point of the solution is always lower than that of pure solvent as the vapour pressure of the solvent decreases in the presence of non-volatile solute.

(b) Depression in freezing point (ΔT_f) = $K_f \times m$

$$= \frac{K_f \times W_{solute} \times 1000}{W_{solvent} \times M_{solute}}$$

$$M_{solute} = \frac{K_f \times W_{solute} \times 1000}{\Delta T_f \times W_{solvent}}$$

(c) Given,

$W_{solute} = 5g$, $M_{solute} = 180 \text{ g mol}^{-1}$

$W_{solvent} = 95$ g

Molality of glucose solution = $\frac{5}{180} \times \frac{1000}{95} = 0.2924$

$\Delta T_f = K_f \times m$

$\Delta T_f = 13.962 \times 0.2924 = 4.08$

OR

Molality of solution, $m = \frac{w_2}{M_2} \times \frac{1000}{w_1}$ .....(i)

where, w_2 weight of glucose = 60 g

M_2 molar mass of glucose = 180 g

w_1 weight of solvent (water) = 250 g

Putting value in Eq.(i) = $\frac{60g}{180g} \times \frac{1000g}{250g}$

$m = 1.33$ ....(1)

Now, $\Delta T_f = K_f m$, $K_f = 1.86 \text{ K kg mol}^{-1}$

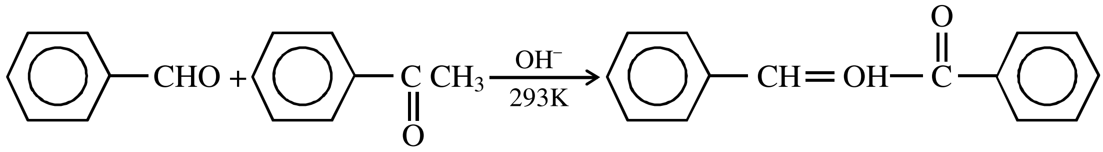
$\Delta T_f = 1.86 \text{ K kg mol}^{-1} \times 1.33 \text{ m}$

$\Delta T_f = 2.47$ K

32. **(a)** Aldols readily lose water to give α, β-unsaturated carbonyl compounds.

(b) Formaldehyde (HCHO), benzaldehyde (C_6H_5CHO) and benzophenone ($C_6H_5COC_6H_5$) do not undergo aldol condensation as they do not contain α-H atoms.

(c)



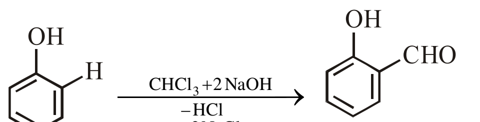
OR

$$\underset{\text{Acetaldehyde}}{2CH_3CHO} \underset{}{\overset{\text{Dil.NaOH}}{\rightleftharpoons}} \underset{\text{3–hydroxy butanal}}{CH_3-\underset{\large OH}{\underset{|}{CH}}-CH_2CHO} \xrightarrow[-H_2O]{\Delta} \underset{\text{But–2–enal}}{CH_3CH=CH-CHO}$$

SECTION – E

33. **(a)** Tert-butyl alcohol, because it forms more stable 3° carbocation than 1° carbocation.

(b) **(i)**



Salicyaldehyde

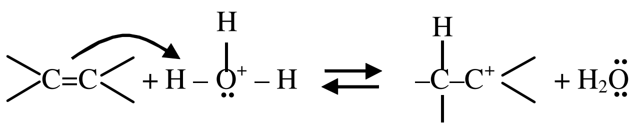
(ii) $(CH_3)_3CCl \xrightarrow{2NaOH(aq)+C_2H_5Cl} (CH_3)_3COC_2H_5$

(iii) $CH_3CH=CH_2 \xrightarrow[(2NaOH+3H_2O_2)]{B_2H_6} CH_3-CH_2-\underset{\large OH}{\underset{|}{CH_2}}$

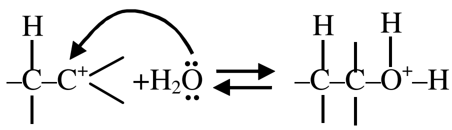
OR

(a) **Step 1 :** Protonation of alkene to form carbocation by electrophilic attack of H_3O^+.

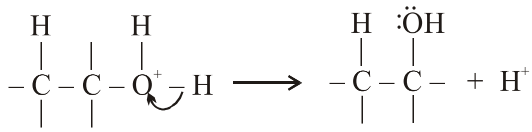
$H_2O + H^+ \rightarrow H_3O^+$



Step 2 : Nucleophilic attack of water on carbocation



Step 3 : Deprotonation to form an alcohol.



(b) **(i)** $(K_2Cr_2O_7 + H_2SO_4)$ OR $(Na_2Cr_2O_7 + H_2SO_4)$

(ii) Br_2 in CH_3COOH

(iii) Br_2 aq./Bromine water

34. (a) The cell potential remains constant during its life as the overall reaction does not involve any ion in solution whose concentration can change during its life time.

(b) $KCl\ (aq) \rightarrow K^+(aq) + Cl^-(aq)$

Cathode: $H_2O(l) + e^- \rightarrow \frac{1}{2} H_2\ (g) + OH^-\ (aq)$

Anode: $Cl^-\ (aq) \rightarrow \frac{1}{2}Cl_2\ (aq) + e^-$

Net reaction:

$KCl(aq) + H_2O(l) \rightarrow K^+\ (aq) + OH^-\ (aq) + \frac{1}{2}H_2(g) + \frac{1}{2}Cl_2\ (g)$

(c) Given, potential of hydrogen gas electrode = –0.59 V

Electrode reaction: $H^+ + e^- \rightarrow 0.5\ H_2$

Applying Nernst equation,

$$E_{H^+/H_2} = E^o_{H^+/H_2} - \frac{0.059}{n}\log\frac{[H_2]^{1/2}}{[H^+]}$$

$-0.59 = 0 - 0.059\ (-\log\ [H^+])$

$-0.59 = -0.059pH$

$\therefore$ pH = 10

$E^o_{H^+/H_2} = 0$ V

$E_{H^+/H_2} = -0.59$ V

n = 1

$[H_2]$ = 1 bar

OR

(a) "A" is copper, metals are conductors thus have high value of conductivity.

(b) $Mg^{2+} + 2e^- \rightarrow Mg$

1 mole of magnesium ions gains two moles of electrons or 2F to form 1 mole of Mg

24 g Mg requires 2 F electricity

4.8 g Mg requires 2 × 4.8/24 = 0.4 F = 0.4 × 96500 = 38600C

$Ca^{2+} + 2e^- \rightarrow Ca$

2 F electricity is required to produce 1 mole = 40 g Ca 0.4 F electricity will produce 8 g Ca

(c) F = 96500C, n = 2

$Sn^{2+}\ (aq) + 2e^- \rightarrow Sn(s);\ E^o_{Sn^{2+}/Sn} = -0.14$ V

$Cu^{2+}(aq) + e^- \rightarrow Cu^+(aq);\ E^o_{Cu^{2+}/Cu} = 0.15$ V

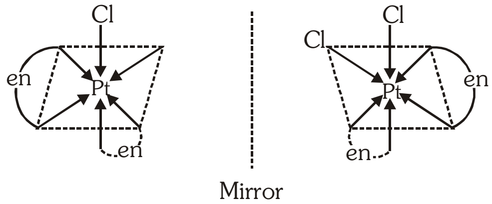
$E°_{cell} = E°_{cathode} - E°_{anode}$

$= 0.15 - (-0.14) = 0.29V$

$\Delta G° = -nF\ E°_{cell}$

$= -2 \times 96500 \times 0.29 = 55970$ J/mol

35. (a) $[PtCl_2(en)_2]^{2+}$



(b) $[Pt(NH_3)_6]Cl_2$

(c) dsp^2, square planar

(d) Pentaamminechloridocobalt (III) chloride

(e) Because crystal field splitting energy is not sufficient for pairing the unpaired electrons.