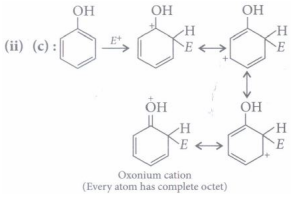
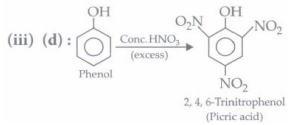
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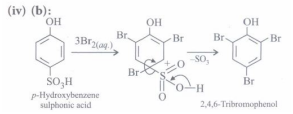
Answers Key:

Case Study Questions

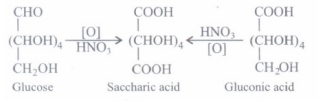
1. **(i) (d)**







2. **(i) (a)**
(ii) (b):



Strong oxidising agents like nitric acid oxidises both the terminal -CHO and -CH_2OH groups of glucose to give the dibasic acid, saccharic acid.
(iii) (b)
(iv) (d): If a certain compound gives negative test with ninhydrin and positive test with Benedict's solution then the compound should be a monosaccharide.

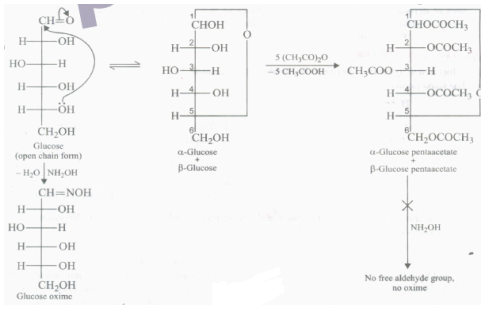
3. (A) When concentration approaches zero, the molar conductivity is known as limiting molar conductivity.
(B) When concentration decreases (dilution increases), number of ions per unit volume decreases, so conductivity decreases with decrease in concentration.
(C) Conductivity of an electrolyte decreases with decrease in concentration because during dilution, the number of ions present per unit volume carrying the current tends to decrease.

Assertion and reason

4. (a) Both (A) and (R) are true, and (R) is the correct explanation of(A).
Explanation:
Molar conductivity is defined as the conductivity of 1M of electrolyte in 1 L solution. Molar conductivity increases with decrease in concentration because the interionic interactions decrease, allowing ions to move more free The mobility of ions which affect molar conductivity also decreases with increase in concentration.

5 Marks

5. The cyclic hemiacetal form of glucose contains an OH group at C-I which gets hydrolysed in aqueous solution to produce the open chain aldehydic form which then reacts with NH_2OH to form the



corresponding oxime. Thus, glucose contains an aldehydic group. In contrast, when glucose is reacted with acetic anhydride, the OH group at C-l, along with the four other OH groups at C-2, C-3, C-4 and C-6 form a pentaacetate. Since the pentaacetate of glucose does not contain a free OH group at C-l, it cannot get hydrolysed in aqueous solution to produce the open chain aldehydic form and hence glucose pentaacetate does not react with NH_2OH to form

glucose oxime.
This proves that glucose pentaacetate does not contain the aldehyde group

6. Alanine exists as a zwitterion (I) in aqueous solution. In presence of acid (pH = 2), the basic - COO- group accepts a proton to give cation (II) but in presence of base (pH = 10), the acidic - NH_3 group donates a proton to the base and thus exists as an anion (III).

$$CH_3 \quad CH_3 \quad | \quad |\overset{+}{N}H_3 - CH - COO^- \xrightarrow{H^+} \overset{+}{N}H_3 - CH - COOH \quad Alanine \quad (I)$$

$$CH_3 \quad CH_3 \quad | \quad |\overset{+}{N}H_3 - CH - COO^- \xrightarrow{OH^-} \overset{+}{N}H_3 - CH - COO^- \quad Alanine \quad (I)$$

7. Two methods can be employed for this preparation
(i) Via Williamson's synthesis

(a) $3CH_3CH_2CH_2OH + PBr_3 \longrightarrow 3\,CH_3CH_2CH_2Br + H_3PO_3$
Propan-1-ol — 1-bromopropane

(b) $2CH_3CH_2CH_2OH + 2Na \longrightarrow 2CH_3CH_2CH_2O^-Na^+ + H_2$
Propan-1-ol — Sodium propoxide

$CH_3CH_2CH_2O^-Na^+ + CH_3CH_2CH_2—Br \xrightarrow[\text{Heat}]{\text{Dry ether}} CH_3CH_2CH_2—O—CH_2CH_2CH_3 + NaBr$
Sodium propoxide + 1-bromopropane → 1-propoxypropane

(ii) By the dehydration of propan-1-ol with conc. H_2SO_4 at 413 K

$CH_3CH_2CH_2OH + H^+ \xrightarrow{413\,K} CH_3CH_2CH_2—\overset{+}{O}H_2$
Propan-1-ol → Protonated propan-1-ol

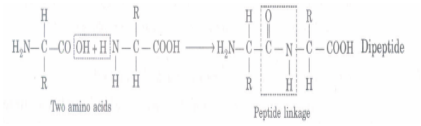
$CH_3CH_2CH_2—\ddot{O}H + CH_3CH_2CH_2—\overset{+}{O}H_2 \xrightarrow[-H_2O,\,-H^+]{413\,K} CH_3CH_2CH_2—O—CH_2CH_2CH_3$
1-propoxypropane

3 Marks

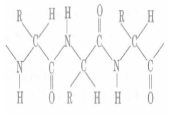
8. (i) 4-Chloro-2,3-dimethylpentan-1-ol
(ii) 2-Ethoxypropane
(iii) 2,6-Dimethylphenol
(iv) 1-Ethoxy-2-nitrocyclohexane

9. 0.331 g.2.80 $\times 10^{21}$ mnolecule.

10. **(i) Peptide linkage.** Peptide bond is formed by the condensation of two or more same or different n-amino acids. The condensation occurs between amino acids with the elimination of water. In this case, the carboxyl group of one amino acid and amino group of another amino acid get condensed with the elimination of water molecule.
The resulting $O \quad \| -C - NH-$ linkage is called peptide linkage. The formation of a dipeptide and the peptide



(ii) Primary structure. The primary structure of proteins gives the sequence in which the amino acids are linked in one or more polypeptide chains of proteins. This is shown below:



(iii) Denaturation. A process that changes the physical and biological properties of proteins without affecting the chemical composition of a protein is called denaturation. The denaturation is caused by certain physical or chemical treatments such as changes in pH, temperature, presence of some salts or certain chemical agents.

11. (i) $CH_3CH_2OH \xrightarrow{PCl_5} CH_3CH_2Cl$
(ii) $CH_3 - C1 + CH_3CH_2 - ONa \longrightarrow CH_3CH_2 - O - CH_3$

12. The amino acids exist as Zwitter ions $(H_3\,N^+ - CHR - COO^-)$ in aqueous solution. Due to this, dipolar salt like structure amino acids have strong dipole-dipole attractions. Thus, their melting points are higher than corresponding halo acids which do not have salt like character. Secondly, they interact strongly with H_2O due to their salt like character. As a result, polar amino acids dissolve in polar solvents like H_2O. Hence, the solubility of amino acids in water is higher than that of corresponding halo acids, which do not have any salt like character.

13. (i) Amylopectin.
(ii) C-2
(iii) Two peptide linkages

14. (A) Mass of Ag deposited = 2g

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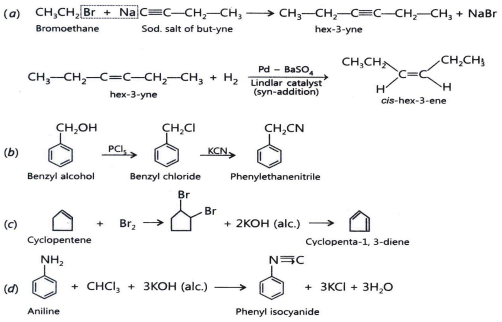
Volume = $\frac{\text{Mass}}{\text{Density}} = 2\ g/10.5 gcm^3$
= 0.190 cm^3
Thickness = 0.190 cm^3/1cm^2
= 0.190 cm^2
For current
$Ag^+ + 1e^- \rightarrow Ag$
108g of Agis deposited by 1F of charge
2g of Ag will be deposited by $\frac{1\times2}{108}$ charge
= 0.0185 F = 0.0185 x 96500 C
t = 1 hr
Q = I x t
0.0185 x 96500 = I x 60 x 60
$I = \frac{0.0185\times96500}{3600} = 0.495$ A
(B) $E^{3+}_{Cr}/Cr_r = E^{\circ}_{Cr^{3+}/Cr} - \frac{0.059}{3}\log\frac{1}{[Cr^{3+}]}$
$E^{3+}_{Cr}/C_r = 0.74 - \frac{0.059}{3}\log 10^3$
$E_{cr}{}^{3+}/_{cr}$ = 0.74 - 0.059
$E_{cr}{}^{3+}/_{cr}$ = -0.799V

15. (A) $2Fe^{3+} + 2e^- \rightarrow 2Fe^{2+}$
and $2I^- \rightarrow I_2 + 2e^-$
Hence, for the given cell reaction, n = 2
$\triangle_rG^\circ = -nFE^\circ_{cell}$ = -2 x 96500 x 0.236
= -45.55 kJ mol^{-1}
$\triangle_rG^\circ$ =- 2.303 RT log K_c
or $\log K_c = \frac{-\Delta_rG^\circ}{2.303RT}$
$= \frac{-45.55\ kJ\ mol^{-1}}{2.303\times8.314\times10^{-3}\ kJ\ K^{-1}\ mol^{-1}\times298\ K}$
= 7.94
∴ K_c = Antilog (7.983)
= 9.616 x 10^7
(B) Given, I = 0.5A, t = 2 hrs.
Number of electrons = ?
Total charge (Q) = I x t
= 0.5 x 2 x 60 x 60
= 3600 C
∴ Number of electrons
$= \frac{\text{Total charge}}{\text{Charge of one electron}}$
$= \frac{3600}{1.6\times10^{-19}}$
= 2.25 x 10^{22} electrons

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2 Marks

16. Ambident Nucleophile- An anionic nucleophile, which has two nucleophilic centers, or two negative sites is known as an ambident nucleophile. This negative charge is delocalized due to resonance.
Example – Cyanide and Thiocyanate are examples of ambident nucleophiles.
$^-C{\equiv}N \leftrightarrow :C{=}N^-$
$S{=}C{=}N^- \leftrightarrow {}^-S - C{\equiv}N$

17. 

18. In an aqueous solution, KOH almost completely ionises to give OH^- ions. OH^- ions is a strong nucleophile, which leads the alkyl chloride to undergo a substitution reaction to form alcohol.

$$R - Cl + KOH_{(aq)} \rightarrow R - OH + KCl$$

On the other hand, an alcoholic soln of KOH contains alkoxide (RO^-) ion, which is a strong base. Thus, it can abstract a hydrogen from the β^- carbon of the alkyl chloride and form an alkene by eliminating a molecule of HCl.

$$R - \underset{\beta}{CH_2} - \underset{\alpha}{CH_2} - Cl + KOH_{(alc)} \rightarrow R - CH = CH_2 + KCl + H_2O$$

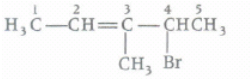
OH^- ion is a much weaker base than RO– ion. Also, OH^- ion is highly solvated in an aqueous solution and as a result the basic character of OH' ion

decreases. Therefore, it cannot abstract a hydrogen from β - carbon.

19. Tertiary structure of protein involves further folding and twisting o secondary structure of proteins. It has compact and folded structure. It involves H-bonding, disulphide linkage, ionic or salt bridges and hydrophobic interactions. It has vander Waals' and electrostatic force of attraction.
20. It is due to C -O bond is less polar due to electron-withdrawing effect of benzene ring, whereas in methanol C--O bond is more polar due to electron releasing effect of methyl group.
21. Faraday constant, F = 96500 coulombs. It is that quantity of electricity which deposits one gram equivalent of the substance or it is the charge carried by one mole of electrons.
22. It is because alcohol can form H-bonds with H_2O, whereas hydrocarbons cannot, that is why alcohols are soluble in water.
23. Both sucrose and lactose are disaccharides. Sucrose on hydrolysis gives one molecule each of glucose and fructose but lactose on hydrolysis gives one molecule each of glucose and galactose.

$$\underset{Sucrose}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow[or Invertase]{H_3O^+} \underset{D-(+)-Glucose}{C_6H_{12}O_6} + \underset{D-(+)-Fructose}{C_6H_{12}O_6}$$

$$\underset{Lactose}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow[or Lactose]{H_3O^+} \underset{D-(+)-Glucose}{C_6H_{12}O_6} + \underset{D-(+)-Galactose}{C_6H_{12}O_6}$$



24. 4-bromo-3-methylpent-2-ene
25. $$\Lambda_m = \frac{\kappa \times 1000}{\text{Molarity}}$$
$$= \frac{0.0248 \text{Scm}^{-1} \times 1000 \text{ cm}^3 \text{ L}^{-1}}{0.20 \text{molL}^{-1}}$$
= 124 S cm^2 mol^{-1}

Multiple Choice Question

26. (d) 10^{30}
27. (a) 1
28. (a) $CH_3CH_2CH_2OH$
29. (a) vitamin H
30. (c) Cytosine
31. (b) 10.8g
32. (b) polypeptides
33. (d) pH does not affect the primary structure of protein.
34. Since, $\Lambda_m = \frac{\kappa \times 1000}{M}$
So, $\Lambda_m \propto \frac{1}{M}$
Molar conductivity is inversely proportional to molarity.
Therefore, lower the concentration, higher is the molar conductivity. Among the given solutions, 0.01 M KCl has the lowest concentration and hence the highest molar conductivity.
35. Platinum or palladium metal is used as catalyst and it increases the rate of electrode reaction.

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