CHEMISTRY
SOLUTION

SECTION-A

Q.	1	2	3	4	5	6	7	8	9	10
A.	B	A	A	B	B	A	A	A	C	A
Q.	11	12	13	14	15	16				
A.	A	C	B	A	D	A				

SECTION – B

17. Specific conductivity of a solution is defined as the conductance offered by 1 cm^3 of electrolytic solution.

The number of ions decreases when the solution is diluted. As a result, the conductivity of a solution decreases with dilution.

18. (i)

2-Hydroxybenzoic acid
(Salicylic acid)

(ii)
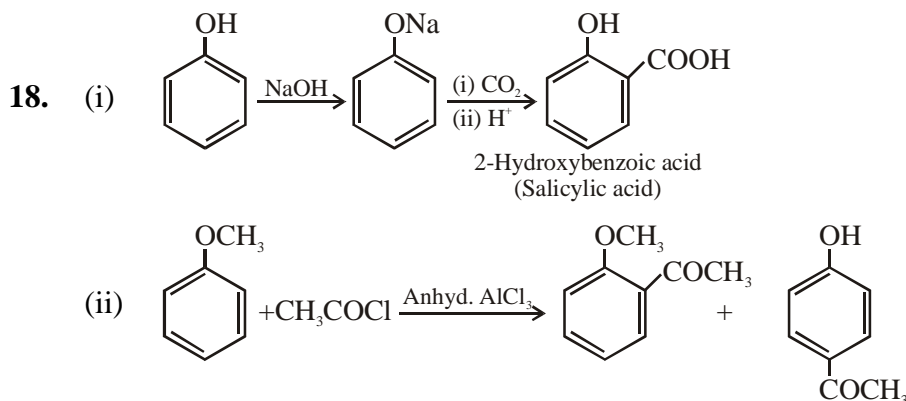
19. (a) $E_{cell} = E_{cell}^0 \dfrac{-0.059}{n} \log \dfrac{[Cr^{3+}]^2}{[Fe^{2+}]^3}$

$0.261V = E_{cell}^0 \dfrac{-0.059}{6} \log \dfrac{[0.01]^2}{[0.01]^3}$

$0.261V = E_{cell}^0 \dfrac{-0.059}{6} \log 100$

$E_{cell}^0 = 0.261 + 0.0197 = 0.2807$ V

(b) A because low value of SRP

20. (a) Polydentate ligands range in the number of atoms used to bond to a central metal atom or ion. e.g. EDTA

(b) Homoleptic complex are those which has all identical ligand. e.g. metal carbonyl [Ni(CO)$_4$]

OR

(a) K$_3$ [Cr(OX)$_3$]

(b) [Mn(H$_2$O)$_6$]SO$_4$

21. (a) **Nucleoside :** A nucleoside has chemical composition that consists of a sugar and a base without the phosphate group.

Nucleotide: The chemical composition of nucleotide consists of a phosphate group, a sugar and a nitrogenous base.

(b) When a nucleotide from the DNA containing thymine is hydrolyzed, thymine, β-D-2-deoxyribose and phosphoric acid are obtained as products.

SECTION – C

22. Given, $\kappa = 7.896 \times 10^{-5} \, \text{S cm}^{-1}$

$C = 0.00241 \, \text{mol L}^{-1}$

Then, molar conductivity,

$$\Lambda_m = \frac{\kappa}{c} = \frac{7.896 \times 10^{-5} \, \text{S cm}^{-1}}{0.00241 \, \text{mol L}^{-1}} \times \frac{1000 \, \text{cm}^3}{L} = 32.76 \, \text{S cm}^2 \, \text{mol}^{-1}$$

Again, $\Lambda_m^0 = 390.5 \, \text{S cm}^2 \, \text{mol}^{-1}$
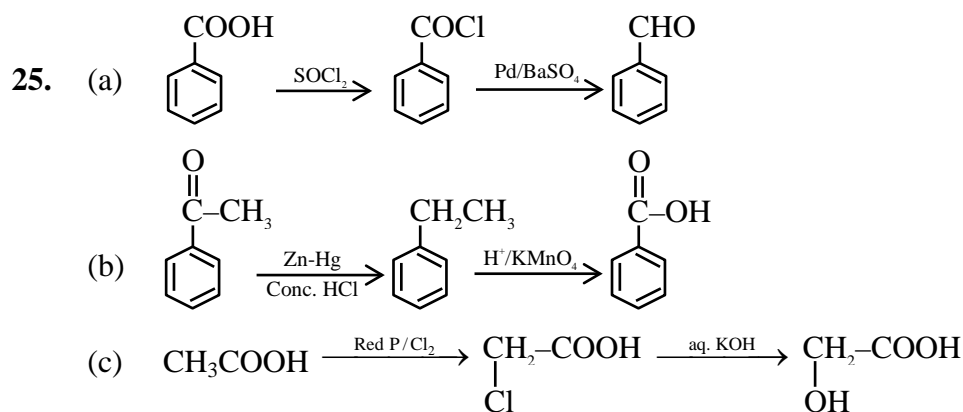
Now, $\alpha = \dfrac{\Lambda_m}{\Lambda_m^0} = \dfrac{32.76 \, \text{S cm}^2 \, \text{mol}^{-1}}{390.5 \, \text{S cm}^2 \, \text{mol}^{-1}} = 0.084$

∴ Dissociation constant,

$$K_a = \frac{c\alpha^2}{(1-\alpha)} = \frac{(0.00241 \, \text{mol L}^{-1})(0.084)^2}{(1-0.084)} = 1.86 \times 10^{-5} \, \text{mol L}^{-1}$$

23. (a) Maltose

(b) In acidic amino acid more carboxyl groups as compared to amino groups are present & In basic amino acid more number of amino than carboxyl groups are present

(c) Phosphodiester linkage

24. $k = \dfrac{2.303}{t} \log \dfrac{[A]_0}{[A]}$

$= \dfrac{2.303}{80} \log \dfrac{100}{60}$

$= \dfrac{2.303}{80} \times (1 - 0.7782)$

$= 0.0064 \, \text{min}^{-1}$

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

$= \dfrac{2.303}{0.0064} \log \dfrac{100}{10}$

$= 360 \, \text{min}$

25. (a)

(b)

(c) $CH_3COOH \xrightarrow{\text{Red P}/Cl_2} \underset{\underset{Cl}{|}}{CH_2-COOH} \xrightarrow{\text{aq. KOH}} \underset{\underset{OH}{|}}{CH_2-COOH}$
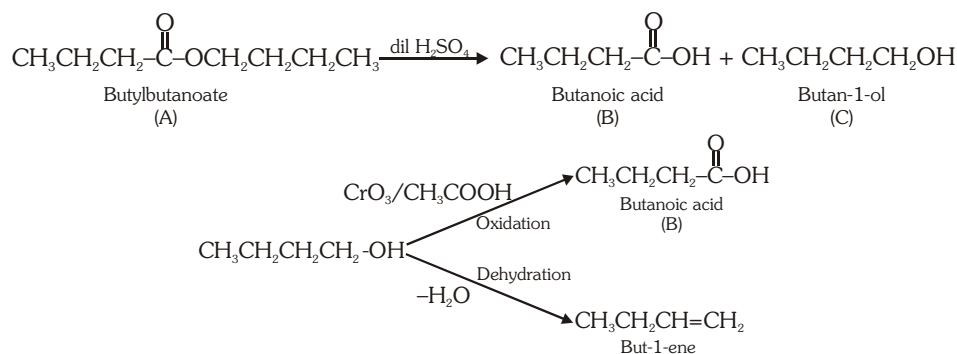
26. Rate $= k[A]^p[B]^q$

On solving,

(a) Order with respect to A = 2, B = 1
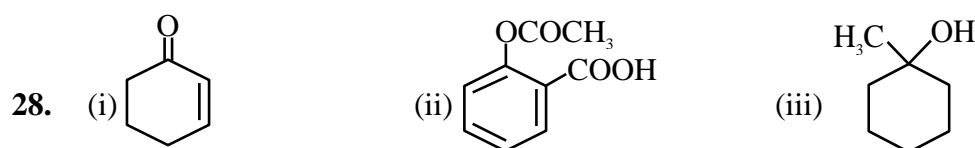
(b) Rate $= k[A]^2[B]^1$; overall order = 3

(c) Experiment-1 $4.2 \times 10^{-2} = k(0.2)^2(0.3)$; k = 3.5

     Experiment-2 $6.2 \times 10^{-3} = k(0.1)^2(0.1)$; k = 6
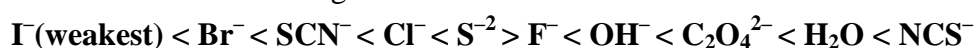
27. Hydrolysis of ester gives acid and alcohol

$\underset{\substack{\text{Butylbutanoate} \\ (A)}}{CH_3CH_2CH_2-\overset{O}{\overset{||}{C}}-OCH_2CH_2CH_2CH_3} \xrightarrow{\text{dil H}_2SO_4} \underset{\substack{\text{Butanoic acid} \\ (B)}}{CH_3CH_2CH_2-\overset{O}{\overset{||}{C}}-OH} + \underset{\substack{\text{Butan-1-ol} \\ (C)}}{CH_3CH_2CH_2CH_2OH}$

(Only 1-Alkanol gives acid on oxidation)

28. (i)

(ii)

(iii)

SECTION – D

29. (a) A spectrochemical series is the arrangement of common ligands in the increasing order of their crystal - field splitting energy (CFSE) values.

The ligands present on the R.H.S of the series are strong field ligands while that on the L.H.S are weak field ligands. Also, strong field ligands cause higher splitting in the d orbitals that weak field ligands.

$I^-\textbf{(weakest)} < Br^- < SCN^- < Cl^- < S^{-2} > F^- < OH^- < C_2O_4^{2-} < H_2O < NCS^-$

$< edta^{4-} < NH_3 < en < NO_2^- < CN^- < CO\textbf{(strongest)}$

OR

$\Delta_t = \dfrac{4}{9}\Delta_O$

    (b)   It is because CO can form σ (sigma) as well as π-bond.

    (c)   The difference of energy two sets of d-orbitals (which are no longer degenerate under different kinds of electric fields).

        Is called crystal field stabilization energy or (CFSE) represented by symbol Δ_0.
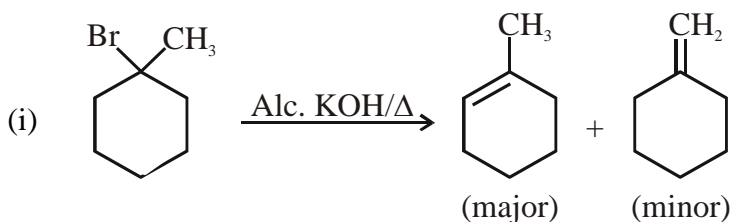
        d^4 when $\Delta_0 > P$ $t^4_{2g} eg^0$.

        d^4 when $\Delta_0 < P$ $t^3_{2g} eg^1$.

30. (a) $C_6H_5 - CH_2CH_2 - Br$

    (b) $CH_3CHClCH_2CH_3$ is more reactive than $CH_3CH_2CH_2CH_2Cl$ as the former one gives more stable carbocation intermediate.
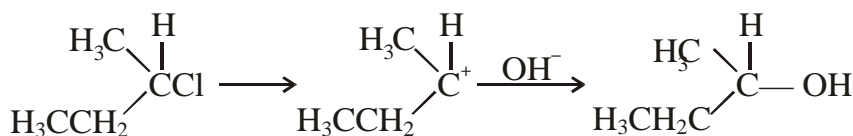
    (c)   p-nitrochlorobenzene undergoes nucleophilic substitution reaction faster than chlorobenzene due to resonance effect.

<div align="center">OR</div>

    (i)

    (ii) 1-Methylcyclo Hexene

<div align="center">SECTION – E</div>

31. (a)   Aniline is a Lewis base and it reacts with $AlCl_3$ to form a salt / N of aniline acquires positive charge with $AlCl_3$ and hence is a deactivating group.

    (b)   Add Hinsberg reagent (benzene sulphonyl chloride) to both the compounds.

        $CH_3CH_2NH_2$ gives ppt. that is soluble in alkali while the ppt. formed by $(CH_3CH_2)_2NH$ is insoluble in alkali.

    (c)   N, N-di ethyl butanamine

    (d) $C_6H_5NH_2 < NH_3 < C_2H_5 - NH_2$

    (e) $CH_3NH_2 + CHCl_3 + 3KOH \rightarrow CH_3NC + 3KCl + 3H_2O$

32. (a)   Due to increase of pressure in cooker, boiling point of water increases

    (b)   RBC looses water in saline water and absorb water in distilled water due to osmosis.

    (c)   In water, oxygen is in dissolved state & as temperature rises, the solubility of oxygen decreases, solubility of oxygen in water is an exothermic phenomena because of this reason Aquatic animals are more comfortable in cold water than in warm water.

(d) The value of Van't Haff factor is twice in 1M KCl than 1M sugar solution due to which elevation of Boiling point is more.

The solvent is somewhat but KCl is ionic due to which it dissociates completely.

The elevation of B.P. is $\boxed{\Delta T_b = i\,K_b m}$ {In both 1M KCl & 1M sugar solution}.

(e) Due to more van't hoff factor.

33. (a) Due to comparable energies of 5f, 6d and 7s orbitals/level

(b) Because of strong interatomic interactions/strong metallic bonding between atoms.

(c) Due to stable $3d^5$ configuration, interatomic interaction is poor between unpaired electrons.

(d) Because Ce is more stable in +3 oxidation state.

(e) Due to the basis of much larger negative hydration enthalpy (ΔH_{hyd}) of $Cu^{2+}_{(aq)}$ than Cu^+.