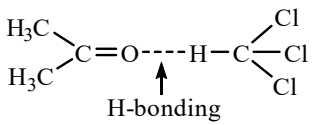


12th SOLUTION (ANS & SOLUTION)

01. (3) Both composition and properties are uniform throughout the mixture
02. (1) Solutions are homogenous mixture.
03. (1) Na-Hg amalgam
Hg is liquid solute and sodium is solid solvent.
04. (3) $\text{ppm} = \frac{w_{\text{solute}}}{w_{\text{solution}}} \times 10^6 \Rightarrow \frac{5.85}{10^6} \times 10^6 = 5.85 \text{ ppm}$
 $\text{mole (n)} = \frac{\text{mass}}{\text{Molar mass}} \Rightarrow \frac{w_{\text{NaCl}}}{58.5} w_{\text{NaCl}} = 5.85 \text{ gm}$
05. (3) $X_1 + X_2 + X_3 = 1$
(The sum of mole fraction of all components in a solution is always equal to 1)
06. (1) Volume depends on temperature so those concentration terms in which volume of solution is used depends on temperature.
Eg. Molarity, Normality etc.
07. (4) Solute + Solvent $\xrightleftharpoons[\text{crystallisation}]{\text{dissociation}}$ solute
at dynamic equilibrium
rate of dissociation = rate of crystallisation.
08. (1) Partial pressure \propto solubility
at high altitude the partial pressure of oxygen is less so solubility of oxygen is less in blood.
09. (4) Bends, Helium
10. (4) $P_S = P_{A \times A} + P_{B \times B}$
 $= P_{A \times A} + P_B(1 - X_A)$
 $= P_{A \times A} + P_B - P_{B \times B}$
 $P_S = P_B + X_A(P_A - P_B)$
11. (2) Raoult's law
12. (3) A-B attraction = A-A or B-B attraction
13. (4) -ve deviation from Raoult's law
A-B interaction > A-A or B-B interaction
 $\Delta H_{\text{mix}} = -\text{ve} \Rightarrow \Delta V_{\text{mix}} = -\text{ve}$
14. (2) Ideal solution always follow Raoult's law
 $P_{\text{total}} = P_1 + P_2$
15. (3) Chloroform and acetone show -ve deviation from Raoult's law. This is because there is an attractive interaction (H-bonding) between them,

16. (3) There are four colligative properties
a) Relative lowering in vapour pressure
b) Elevation in boiling point
c) Depression in freezing point
d) Osmotic pressure
17. (1) There will be no net movement across semipermeable membrane because both non electrolytes have same concentration.
18. (3) Van't Hoff factor (i)
For dissociation $i > 1$
For association $i < 1$
For non electrolytes $i = 1$
19. (4) For an ideal solution,
 $\Delta H_{\text{mix}} = 0, \Delta V_{\text{mix}} = 0$
 $P_{\text{Total}} = P_1 + P_2 \Rightarrow P_{\text{Total}} = P_1^0 X_1 + P_2^0 X_2$
20. (2) +ve deviation from Raoult's law solution are minimum boiling azeotrope mixture.
21. (3) vapour pressure of liquid equal to atmospheric pressure
22. (3) Molal depression constant
23. (1) Osmosis is spontaneous net flow of solvent from dilute solution to concentration solution through semipermeable membrane.
24. (1) $\pi = iCRT \Rightarrow \pi \propto c \propto \frac{n_{\text{solute}}}{V_{\text{solution}}} \Rightarrow \pi \propto T$
25. (4) Isotonic solutions have same osmotic pressure so there is no net flow of solvent.
26. (2) Edema occurs when an excessive volume of fluid accumulates in the tissue because of osmosis.
27. (3) When external pressure applied on the solution side is larger than the osmotic pressure then solvent flows from solution side to solvent side through semi-permeable membrane is called reverse osmosis.
28. (2) If solute gets associated or dissociated in solution the observed molar mass is found to be different from actual molar mass which is known as abnormal molar mass.
29. (4) The value of Van't Hoff factor for non- electrolyte is 1.
30. (4) $\Delta T_f = K_f \times m$
 $1.86 = K_f \cdot 1 \quad K_f = 1.86 \text{ K kg mol}^{-1}$

31. (3) $\Delta T_b = K_b \cdot m = 0.52 \cdot 2 = 1.04 \text{ K}$
 $\Delta T_b = T_b - T_b^0$
 $T_b = \Delta T_b + T_b^0$
 $T_b = 1.04 + 373$
 $T_b = 374.04 \text{ K}$
32. (1) Those solutions in which solute-solute (B-B) and solvent-solvent (A-A) interactions are almost similar to solute-solvent (B-A) interactions are called ideal solutions.
33. (1) Lowering of vapour pressure is not a colligative property. Remaining three are colligative properties.
34. (2) Data insufficient
35. (1) When Raoult's law becomes a special case of Henry's law when K_H becomes equal to P_1^0 in Henry's law.
36. (3) Acetone and Chloroform are the example of non-ideal solutions showing negative deviation.
37. (2) Electrolyte i
 NaCl 2
 H₂SO₄ 3
 K₄[Fe(CN)₆] 5
 CH₃COOH $\alpha(n-1)+1$
38. (4) Normality involves volume so it is dependent over temperature.
39. (2) Relative lowering of vapour pressure of solution containing non-volatile solute is equal to the mole fraction of solute.
 $X_1 =$ mole fraction of solvent
 $X_2 =$ mole fraction of solute
40. (1) A binary solution which boils at a temperature more than the boiling point of either of the component shows negative deviation from Raoult's law and form maximum boiling azeotropes.
41. (3) On increasing temperature saturated solution converted into super saturated solution.
 A plant cell shrink when placed in hypertonic solution.
 The depression in freezing point is directly proportional to molality of the solution.
 Lowering in vapour pressure is not a colligative property but relative lowering in vapour pressure is a colligative property.
42. (3) As the solubility increases, value of Henry's law constant decreases. Since CO₂ is most soluble in water among the given set of gases. Therefore CO₂ gas has the lowest value of Henry's law constant.
43. (3) Brass is an example of solid solution
 Ethanol-water forms non-ideal solution showing positive deviation.
 Solubility of gases decreases with increase in temperature.
44. (1) All solutions are mixtures but all mixtures are not solutions. Only homogeneous mixtures are called solutions.
45. (4) Azeotropes are formed by the non-ideal solutions.
 Ideal solutions may or may not have the same vapour pressure.
46. (1) Ideal solutions have vapour pressure equal to the sum of partial pressure of all components in solution because in ideal solutions the solvent - solvent and solute - solute interaction are same as the solute - solvent interaction.
47. (1) 1 M aqueous solution of NaCl is hypertonic over 1 M aqueous solution of Urea because NaCl is an electrolyte and dissociate in aqueous solution as Na⁺ and Cl⁻ ions, So Van't Hoff factor of NaCl is 2 and urea is 1.
48. (4) Non ideal solutions have same vapour pressure in solution phase and in vapour phase.
 Both minimum boiling and maximum boiling azeotropes have same vapour pressure in solution phase and vapour phase.
49. (1) In case of association Van't Hoff factor is less than one. Acetic acid dimerises in benzene, So Van't Hoff factor of acetic acid in benzene is less than one.
50. (1) Pressure does not have any significant effect on solubility of solids in liquids because solid and liquid are less compressible compared to gases.

ELECTROCHEMISTRY (SOLUTION)

01. (1) Batteries and fuel cells convert chemical energy into electrical energy.
02. (3) Electrochemistry deals with study of production of electric energy by spontaneous reaction (Galvanic cell) and use of electrical energy to bring about non-spontaneous reaction. (Electrolytic cell).
03. (1) In Batteries, chemical energy convert into electrical energy by spontaneous redox reaction.
04. (4) In the electrolytic cell, the electrons flow from anode to cathode through external supply.
05. (4) If both the electrodes are dipped in the same vessel then salt bridge is not required.
06. (4) The cell reaction in Daniel cell is

$$\text{Zn(s)} + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{Cu(s)}$$
07. (4) Gibb's energy converted into electrical work in a electrochemical cell.
08. (2) Two half cells in electrochemical cell is also referred as redox couples.
09. (2) The electrode at which oxidation takes place in a electrochemical cell is called anode.
10. (4)
$$E_{\text{cell}}^{\circ} = E_{\text{Anode}}^{\circ} + E_{\text{Cathode}}^{\circ}$$

$$= E_{\text{Cathode}}^{\circ} - E_{\text{Anode}}^{\circ} = E_{\text{Anode}}^{\circ} - E_{\text{Cathode}}^{\circ}$$

 Correction in option - 2

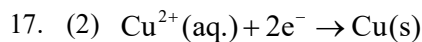
$$E_{\text{cell}}^{\circ} = E_{\text{Anode}}^{\circ} - E_{\text{Cathode}}^{\circ}$$
11. (2) Notation of SHE $\text{Pt(s)}, \text{H}_2(\text{g}) | \text{H}^+(\text{aq.})$
 1 bar 1M
12. (2) $\text{Zn(s)} + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq.}) + \text{Cu(s)}$

$$E_{\text{cell}}^{\circ} = E_{\text{c}}^{\circ} - E_{\text{A}}^{\circ}$$

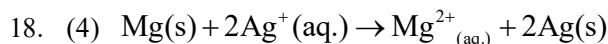
$$= 0.34 - (-0.76)$$

$$= 1.1\text{V}$$
13. (3) SRP of $\text{Cu}^{2+} | \text{Cu}$ greater than SHE
 \therefore half cell R_x^{n} at cathode

$$\text{Cu}^{2+} + 2\text{e}^{-} \rightarrow \text{Cu}$$
14. (4) Weakest reducing agent \rightarrow Minimum SOP or Maximum SRP
15. (4) Application of electrochemical cell-
 (i) To determine p^{H} of sol^{n}
 (ii) To determine K_{sp} value
 (iii) To determine equilibrium constant
16. (1) Strong oxidising agent \rightarrow more SRP
 Strong reducing agent \rightarrow more SOP
 Strong oxidising agent $\rightarrow \text{F}_2$
 Strong reducing agent $\rightarrow \text{I}^{-}$



$$E_{\text{Cu}^{2+}/\text{Cu}} = E_{\text{Cu}^{2+}/\text{Cu}}^{\circ} - \frac{RT}{2F} \ln \frac{1}{[\text{Cu}^{2+}]}$$



$$E_{\text{cell}}^{\circ} = 3.17\text{V.}$$

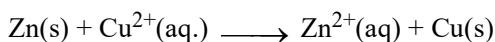
$$E_{\text{cell}} = 3.17 - \frac{0.06}{2} \log \frac{[\text{Mg}^{2+}]}{[\text{Ag}^{+}]^2}$$

$$= 3.17 - 0.03 \log \frac{0.13}{10^{-8}}$$

$$= 3.17 - 0.03 [\log 13 \times 10^6]$$

$$= 3.17 - (0.03 \times 7.1)$$

$$E_{\text{cell}} = 2.96\text{V}$$



$$E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.059}{2} \log \frac{[\text{Zn}^{2+}]}{[\text{Cu}^{2+}]}$$

$$\text{At eq}^{\text{m}} E_{\text{cell}} = 0$$

$$E_{\text{cell}}^{\circ} = \log K_{\text{c}}$$

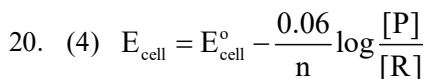
$$\log K_{\text{c}} = \frac{1.1 \times 2}{0.0591}$$

$$\log K_{\text{c}} = 37.23$$

$$K_{\text{c}} = 10^{37.23}$$

$$K_{\text{c}} = 10^{37} \times 10^{0.23}$$

$$K_{\text{c}} \approx \frac{2 \times 10^{37}}{1}$$



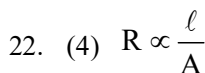
$$\text{if } [\text{P}] = [\text{R}]$$

$$\text{then } E_{\text{cell}} = E_{\text{cell}}^{\circ}$$



$$E_{\text{cell}}^{\circ} = -\frac{\Delta G^{\circ}}{nF}$$

$$E_{\text{cell}}^{\circ} = \frac{212300}{2 \times 96500} \Rightarrow E_{\text{cell}}^{\circ} = 1.1$$



$$23. (1) \text{ Conductivity (K)} = \frac{1}{R} \left(\frac{\ell}{A} \right)$$

$$\text{Conductance} = \frac{1}{R}$$

$$K \propto \frac{1}{R}$$

$$24. (1) \lambda_m = \frac{K \times 1000}{M}$$

$$K = \frac{M \times \lambda_m}{1000}$$

$$K \propto M$$

$$25. (4) \lambda_m = \frac{K \times 1000}{M} \text{ (In CGS Unit)}$$

$$\lambda_m = \frac{K}{C} \text{ (In S.I. Unit)}$$

$$\lambda_m = \frac{K}{10^{-3} \times M}$$

$$26. (1) (\lambda_m)_{\text{H}_2\text{SO}_4} = 2 \times \lambda_{\text{H}^+}^\circ + \lambda_{\text{SO}_4^{2-}}^\circ$$

$$= 2 \times 349.6 + 160$$

$$= 859.2$$

27. (4) Smaller the size of an ion greater will be its limiting molar conductivity.

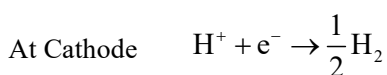
$$28. (2) \propto = \frac{\lambda_m}{\lambda_0}$$

29. (3) Proportional to its mass

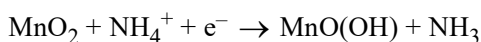
30. (4) All of these

31. (3) Electrolysis of aq. NaCl.

At Anode	At cathode
Cl^-	Na^+
OH^-	H^+



32. (4) Manganese is reduced from the +4 oxidation state to the +3 state.



33. (2) In mercury cell, electrolyte is a paste of KOH and ZnO.

34. (1) On charging the battery $\text{PbSO}_4(\text{s})$ on anode and cathode is converted into Pb and PbO_2 .

35. (2) Fuel cell

36. (2) (a) Unit of Resistance = Ω

$$(b) \text{ Conductance} = \frac{1}{R}$$

Unit \rightarrow S

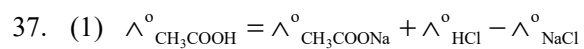
$$(c) \text{ Conductivity (K)} = \frac{1}{R} \left(\frac{\ell}{A} \right)$$

Unit \rightarrow S m^{-1}

$$(d) \text{ Resistivity (P)} = R \left(\frac{A}{\ell} \right)$$

$$= R \left(\frac{A}{\ell} \right)$$

Unit $\rightarrow \Omega \cdot \text{m}$



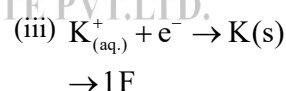
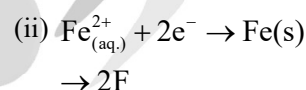
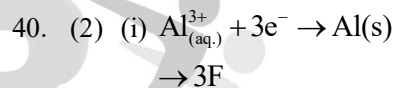
38. (1) (a) In mercury cell electrolyte is a paste of KOH and ZnO.

(b) In Lead storage battery 38% solution of sulphuric acid is used as an electrolyte.

(c) In Dry cell, paste of NH_4Cl and ZnCl_2 is used.

(d) The electrolyte in the fuel cell is an aqueous (water based) solution of potassium hydroxide (KOH).

39. (1) Molar conductivity increases with increase in dilution for strong and weak electrolyte.



41. (1)

42. (4) Product of electrolysis does not depend upon time of electrolysis.

43. (3) Zn can reduce Hg^{2+} .

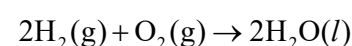
44. (3) All redox reaction are not spontaneous reaction.

45. (1)

46. (3) Zn acts as anode and oxidation of Zn takes place. In basic medium zinc anode corrodes less rapidly than in acidic medium.

47. (1) $W = Z_{\text{it}}$

48. (1) Net cell Rxn of fuel cell.



49. (3) Metals with negative SRP values have tendency to donate electron.

50. (1) $\Delta G^\circ < 0$ for spontaneous redox Rxn

CHEMICAL KINETICS (SOLUTION)

01. (1) Chemical kinetics deals with the speed / rate of reaction.
02. (2) $\Delta G < 0 \Rightarrow$ Spontaneous / Feasible process
 $\Delta G = 0 \Rightarrow$ Equilibrium
 $\Delta G > 0 \Rightarrow$ Non-Spontaneous process
03. (3) $\text{Ag}^+ + \text{Cl}^- \rightarrow \text{AgCl} \downarrow$
 Ionic reactions are very fast
04. (4) Rate of a reaction decreases with time. As the reaction proceeds, concentration of reactant decreases and concentration of product increases.
05. (4) $2\text{HI} \rightarrow \text{H}_2 + \text{I}_2$
 Rate of reaction $\Rightarrow \frac{-1}{2} \frac{\Delta[\text{HI}]}{\Delta t} = \frac{\Delta[\text{H}_2]}{\Delta t} = \frac{\Delta[\text{I}_2]}{\Delta t}$
06. (3) Rate of reaction = $\frac{1}{4} \frac{d[\text{NO}_2]}{dt}$
 $\frac{1}{4} \frac{d[\text{NO}_2]}{dt} = 4 \times 6.79 \times 10^{-4}$
 $\Rightarrow 2.72 \times 10^{-3} \text{ mol l}^{-1} \text{ min}^{-1}$
07. (4) Rate of reaction increases with increase in concentration and temperature and addition of catalyst.
08. (1) $\text{A} + \text{B} \rightarrow \text{C} + \text{D}$
 $r = k[\text{A}]^x [\text{B}]^y$ Order $\Rightarrow x + y$
09. (1) Order is an experimental quantity
10. (4) $r = k[\text{A}]^x [\text{B}]^y$ Order $\Rightarrow x + y$
11. (1) For first order, $r = k[\text{A}]^1$
 $k \Rightarrow \frac{r}{[\text{A}]} \Rightarrow \frac{\text{mol l}^{-1} \text{ time}^{-1}}{\text{mol l}^{-1}} \Rightarrow \text{Time}^{-1}$
12. (3) Units of rate constant for a second order reaction is “ $\text{Lmol}^{-1} \text{ sec}^{-1}$ ”.
13. (3) Complex reaction has a sequence of elementary reactions in its mechanism.
14. (1) Mechanism of a complex reaction has multiple reaction steps.
15. (2) IO^- is formed in the first step and then consumed in the 2nd step (Not the part of final reaction.) Hence, it is an intermediate.
16. (3) $r = k[\text{A}]^0 [\text{B}]^2$ Order $\Rightarrow 0 + 2 = 2$
17. (3) $\frac{-d[\text{A}]}{dt} = k[\text{A}]^x$
 These equations showing concentration dependence of rate is called differential rate equation.
18. (2 or 3) Integrated rate law express the reaction rate as a function of the initial concentration and a measured concentration of one or more reactants after a specific amount of time has passed.

19. (2) For a zero order reaction :

$$\frac{dx}{dy} = k[\text{A}]^0$$

$$\int_0^x dx = \int_0^t dt$$

$$x = kt$$

$$[\text{R}]_0 - [\text{R}]_t = kt$$

$$\frac{[\text{R}]_0 - [\text{R}]_t}{t} = k$$

20. (2) Decomposition of NH_3 on platinum surface at high pressure has constant rate of reaction (Zero Order) because metal surface get saturated at high pressure.
21. (1) It follows zero order become concentration of gaseous reactant here remains constant on the surface.
22. (4) For a first order reaction :
- $k t \Rightarrow \ln \frac{[\text{R}]_0}{[\text{R}]_t} \Rightarrow \frac{[\text{R}]_0}{[\text{R}]_t} = e^{kt}$ $[\text{R}]_t = [\text{R}]_0 e^{-kt}$
23. (2) All radioactive decays follow first order kinetics.
24. (3) Integrated rate law expression for first order is :

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

25. (3) $\text{A} \rightarrow \text{B} + \text{C}$
 $t = 0$ P_i 0 0
 $t = t$ $P_i - x$ x x
 $\Rightarrow P_t \Rightarrow P_i - x + x + x = P_i + x$
 $\Rightarrow x = P_t - P_i$

Initial pressure of A = P_i

$$\begin{aligned} \text{Pressure of 'A' at time 't'} &\Rightarrow P_i - x \\ &\Rightarrow P_i - P_t + P_i \\ &\Rightarrow 2P_i - P_t \end{aligned}$$

For 1st order reaction :

$$k = \frac{2.303}{t} \log \frac{P_0}{P_t} \Rightarrow k = \frac{2.303}{t} \log \frac{P_i}{2P_i - P_t}$$

26. (1) $\text{A(g)} \rightarrow \text{B(g)} + \text{C(g)}$
 $t = 0$ P_i 0 0
 $t = t$ $P_i - x$ x x
 $P_t = P_i - x + x + x$
 $\Rightarrow P_t + x (\because x = P_t - P_i)$
 $[\text{R}]_t = P_i - x$
 $\Rightarrow P_i - P_t + P_i$
 $\Rightarrow 2P_i - P_t$

27. (2) For a zero order reaction : $t_{1/2} \Rightarrow \frac{1}{2ak}$
 $a \rightarrow$ initial concentration of reactant

28. (2) $k = \frac{0.693}{t_{1/2}} \Rightarrow \frac{0.693}{t}$

For 99.9% Completion :

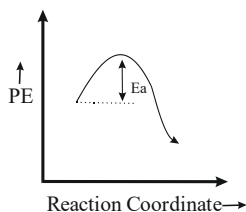
$$t = \frac{2.303}{k} \log \frac{100}{0.1} \Rightarrow t = \frac{2.303}{0.693} \times t \times 3 \Rightarrow 10t$$

29. (4) For first order reaction $\Rightarrow t_{1/2} = \frac{0.693}{k}$

30. (2) If water is taken in excess, it's concentration does not change and hence, reaction will be pseudo first order reaction.

31. (1) Temperature coefficient $\Rightarrow \frac{k_{T+10}}{k_T} = 2$ or 3

32. (4) $k = Ae^{-\frac{E_a}{RT}}$



33. (3)

34. (3) It's a question from "Gaseous State" chapter. In Boltzmann Distribution curve. Energy is plotted on 'X' axis, so at the peak (with highest fraction of molecules), the energy observed is called most probable energy.

35. (1) $k = Ae^{-\frac{E_a}{RT}} \Rightarrow \ln k = \ln A - \frac{E_a}{RT}$

So, slope $\Rightarrow \frac{-E_a}{R} \Rightarrow y - \text{intercept} \Rightarrow \ln A$

36. (1) Zero order : $\text{mol l}^{-1} \text{sec}^{-1}$ ($r = k$)
 First order : sec^{-1} ($r = k[A]$)
 Second order : $\text{L mol}^{-1} \text{sec}^{-1}$ ($r = k[A]^2$)
 Third order : $\text{L}^2 \text{mol}^{-2} \text{sec}^{-1}$ ($r = k[A]^3$)

37. (4) Direct formula of half life

$$t_{1/2} \Rightarrow \frac{[A]_0}{2k} \text{ (Zero order)}$$

$$t_{1/2} \Rightarrow \frac{0.693}{k} \text{ (First order)}$$

$$t_{1/2} \Rightarrow \frac{1}{[A]_0 k} \text{ (Second order)}$$

38. (4) $[R]_0 = 0.64 \text{ M}$

$$\text{Reactant remaining after } (t_{1/2})_1 \Rightarrow \frac{0.64}{2} = 0.32 \text{ M}$$

$$\text{Reactant remaining after } (t_{1/2})_2 \Rightarrow \frac{0.32}{2} = 0.16 \text{ M}$$

$$\text{Reactant remaining after } (t_{1/2})_3 \Rightarrow \frac{0.16}{2} = 0.08 \text{ M}$$

$$\text{Reactant remaining after } (t_{1/2})_4 \Rightarrow \frac{0.08}{2} = 0.04 \text{ M}$$

39. (4) 1st order $\Rightarrow k = \frac{1}{t} \ln \frac{[R]_0}{[R]_t}$

$$2^{\text{nd}} \text{ order} \Rightarrow kt = \frac{1}{[R]_t} - \frac{1}{[R]_0}$$

$$\text{zero order} \Rightarrow k = \frac{[R]_0 - [R]_t}{t}$$

$$\text{Arrhenius equation} \Rightarrow \ln k = \ln A - \frac{E_a}{RT}$$

40. (1) Activation energy is independent of Temperature

41. (3) Catalyst gives a new path of lower activation energy to the reaction and hence, rate of reaction increases.

42. (4) According to collision theory, collisions with proper orientation and capability to pass energy barrier (E_a) are responsible for a reaction.

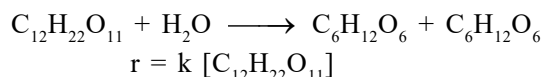
43. (1) $\frac{-d[N_2]}{dt} = -\frac{1}{3} \frac{d[H_2]}{dt} = \frac{1}{2} \frac{d[NH_3]}{dt}$

44. (1) As temperature increases, fraction of molecule with higher K.E increases and hence, rate increases. (Note : When KE of molecule increases, more reactants will pass the energy barrier)

45. (3) Catalyst can increase the rate of reaction. ΔG is not dependent on catalyst at all.

46. (1) Catalyst give a new path with lower activation energy and hence, rate of reaction increases.

47. (3) Inversion of cane sugar is a pseudo first order reaction because concentration of excess water does not change here.



48. (4) Decomposition of NH_3 over gold plate at high pressure is a zero order Reaction. And decomposition reactions are of different Kinetics, not only first order.

49. (2) It follows an S_N1 mechanism (Unimolecular). And it follows first order kinetics because RDS is unimolecular.

50. (1) Order of a complex reaction can be calculated from rate determining step of the mechanism.

p-BLOCK ELEMENTS - [GROUP 15-18] (SOLUTION)

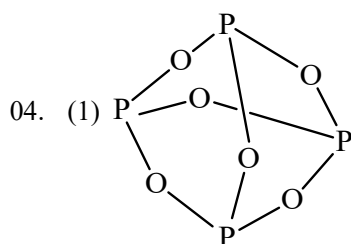
01. (4) H_3PO_2 has maximum no. of P-H bonds hence it is the strongest reducing agent.

02. (1) $\overset{+5}{\text{H}}\overset{+2}{\text{N}}\overset{0}{\text{O}}_3, \overset{+2}{\text{N}}\overset{0}{\text{O}}_2, \overset{-3}{\text{N}}\overset{+1}{\text{H}}_4\text{Cl}$

03. (4) $\text{H}_4\text{P}_2\text{O}_5 \quad 4 + 2x - 10 = 0 \Rightarrow 2x = 6 \Rightarrow x = +3$

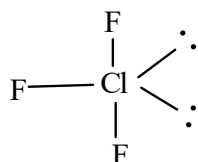
$\text{H}_2\text{P}_2\text{O}_6 \quad 4 + 2x - 12 = 0 \Rightarrow 2x = 8 \Rightarrow x = +4$

$\text{H}_4\text{P}_2\text{O}_7 \quad 4 + 2x - 14 = 0 \Rightarrow 2x = 10 \Rightarrow x = +5$



Bridged oxygen ato = 6

05. (2) In ClF_3 the hybridisation is sp^3d , the shape of molecule is see-saw.



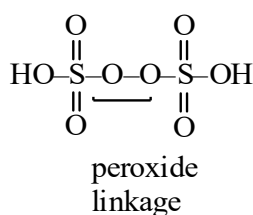
Axial bonds are longer than equatorial bonds due to more repulsion.

06. (3) $\text{Cu} + \text{HNO}_3 \xrightarrow{\text{conc.}} \text{Cu}(\text{NO}_3)_2 + \text{NO}_2 + \text{H}_2\text{O}$

07. (1) In $\overset{+5}{\text{N}}_2\overset{0}{\text{O}}_5, \overset{+4}{\text{N}}\overset{0}{\text{O}}_2, \overset{+3}{\text{N}}_2\overset{0}{\text{O}}_3, \overset{+2}{\text{N}}\overset{0}{\text{O}}$

08. (2) Fact

09. (2) The structure of $\text{H}_2\text{S}_2\text{O}_8$.



10. (2) $(\text{NH}_4)_2\text{Cr}_2\text{O}_7 \xrightarrow{\Delta} \text{N}_2 + \text{Cr}_2\text{O}_3 + 4\text{H}_2\text{O}$

other compounds on decomposition release O_2 gas.

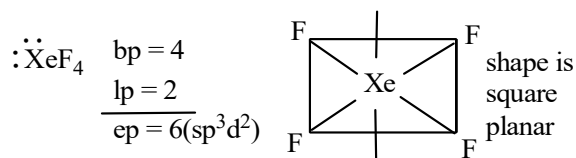
11. (1) A/R: Reason itself is a relation.

12. (1) A/R: Reason itself is a relation.

13. (2) A/R: Reason itself is a relation.

14. (2) O_3 2σ & 1π bonds

15. (1)



16. (1) Fe shows variable O.S +2 & +3 hence, more than one compounds can be formed eg. FeCl_2 & FeCl_3 .

17. (4) Due to very high H.E. and low bond dissociation energy F_2 is the strongest oxidising agent.

18. (1) Acidic strength increases as we move across the period with higher the o.s. higher will be the acidic strength hence HClO_4 is the strongest acid.

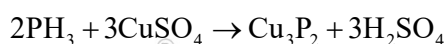
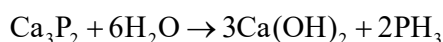
19. (2) The order of BDE: $\text{Cl}_2 > \text{Br}_2 > \text{F}_2 > \text{I}_2$

20. (1) Fact

21. (4) As N has only S & P orbitals the max covalency is four. Due to absence of d-orbital it can't extend its covalency more than four.

22. (4) Noble gases have very weakly van der waal's force of attraction hence they have low m.p & b.p.

23. (2) The compound X is Ca_3P_2 .



24. (3) Fact

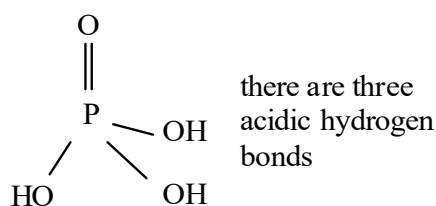
25. (1) α -sulphur $\xrightleftharpoons[T < 369\text{K}]{T > 369\text{K}}$ β -sulphur

369 K is known as transition temperature.

26. (2) $2\text{SO}_2 + \text{O}_2 \xrightleftharpoons{\text{V}_2\text{O}_5} 2\text{SO}_3$ (Contact method)

27. (4) Fact

28. (3) The structure of H_3PO_4



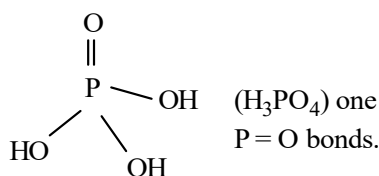
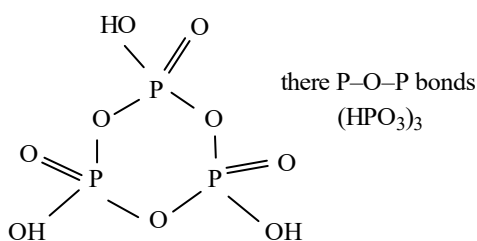
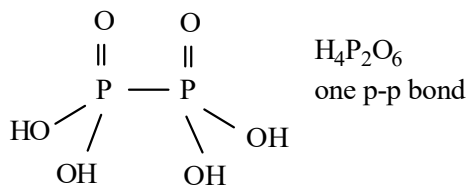
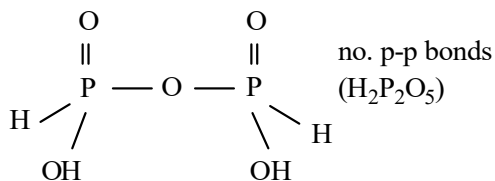
29. (3) $\overset{7-3=4}{\text{BrF}_3}$ $lp = 2$

30. (1) Fact

31. (3) $\text{CO} + \text{I}_2\text{O}_5 \rightarrow \text{I}_2 + \text{CO}_2$

The concentration of I_2 is determined from the titration with standard solution of type or aq $\text{Na}_2\text{S}_2\text{O}_3$ (sodium thiosulphate) from hydric concentration of CO is determined.

32. (1) The structures of oxyacids-



33. (3) $\text{Cl}_2 + \text{NaOH} \rightarrow \text{NaCl} + \text{NaClO} + \text{H}_2\text{O}$
cold & dil

34. (2) $4\text{I}^-_{(\text{aq})} + 4\text{H}^+_{(\text{aq})} + \text{O}_2(\text{g}) \rightarrow 2\text{I}_2(\text{s}) + 2\text{H}_2\text{O}(\text{l})$

35. (3) $\text{Cl}_2 + \text{NaOH} \rightarrow \text{NaCl} + \text{NaClO}_3 + \text{H}_2\text{O}$
Hot & Conc.

36. (2) $\text{Pb}(\text{NO}_3)_2 \xrightarrow{\Delta} \text{PbO} + \text{NO}_2 + \text{O}_2$
Brown gas

37. (3) $\text{XeF}_2 + \text{H}_2\text{O} \rightarrow \text{O}_2 + \text{Xe} + \text{HF}$

$$6 - 4 = 2$$

38. (2) TeF_4 bp = 4

$$\frac{+lp = 1}{ep = 5} (\text{sp}^3\text{d})$$

39. (1) $\text{TeO}_3, \text{SeO}_2, \text{SO}_3 \rightarrow$ acidic oxides.

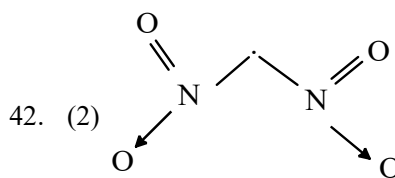
$\text{As}_2\text{O}_3, \text{Sb}_2\text{O}_3 \rightarrow$ amphoteric oxides.

$\text{Bi}_2\text{O}_3 \rightarrow$ Basic oxide

$\text{N}_2\text{O} \rightarrow$ Neutral oxide.

40. (1) Required pressure is 200 atm & optimum temperature of 723K.

41. (4) OF_2 as F has only -1 o.s.

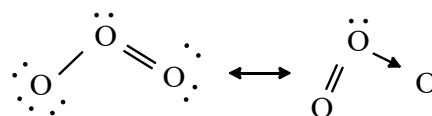


42. (2)

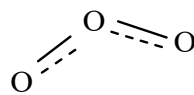
43. (4) $\text{NH}_4\text{NO}_3 \xrightarrow{\Delta} \text{N}_2\text{O} + 2\text{H}_2\text{O}$

44. (3) $\text{PbS} + \text{O}_3 \rightarrow \text{PbSO}_4 + \text{O}_2$
lead sulphate

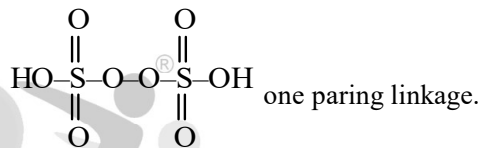
45. (3) O_3 is less stable than O_3 and decomposes to give O_2 . bond lengths are identical.



$$\text{BO} = \frac{1+2}{2} = \frac{3}{2} = 1.5$$



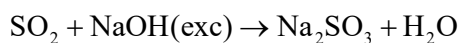
46. (1) See the solution of Q. No.32.



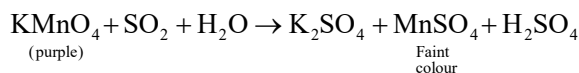
47. (1) $(\text{NH}_4)_2\text{Cr}_2\text{O}_7 \xrightarrow{\Delta} \text{N}_2 + \text{Cr}_2\text{O}_3 + 4\text{H}_2\text{O}$

48. (2) $\text{ZnS} + \text{O}_2 \rightarrow \text{ZnO} + \text{SO}_2$

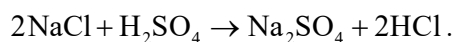
SO_2 can be liquified under moderate pressure at room temperature (298K).



Sodium sulphite



49. (3) H_2SO_4 has intermolecular H-bonding hence it is less volatile and used to produce more volatile acid like HCl.



50. (3) Among the same compounds of elements of same period higher the o.s. higher the oxidising strength. But in HNO_3 nitrogen with smallest size and +5 o.s. is strongest o.x

So. BBr_3 has sp^2 hybridisation with no lone pair hence B.A. is 120° .

d- & f-BLOCK ELEMENT (SOLUTION)

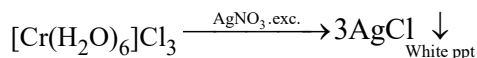
01. (2) $X^{+3} = [\text{Ar}] 4d^5 = 23$, As X^{3+} ion is formed by the loss of 3 electrons from X, X will have 26 electrons
02. (1) 3d- series starts from **Z = 21 to 30 i.e. Sc-Zn**
03. (2) Magnetic moment 5.9 means 5 unpaired electrons, Fe^{3+} contains 5 unpaired electrons
04. (3) Ni^{2+} and Ti^{3+} ions are coloured ions in aqueous solution due to the presence of unpaired electrons in d-subshell.
05. (4) $\text{Cr}_2\text{O}_7^{2-} + 6\text{I}^- + 14\text{H}^+ \longrightarrow 3\text{I}_2 + 7\text{H}_2\text{O} + 2\text{Cr}^{3+}$
06. (3) In $\text{Cr}_2\text{O}_7^{2-}$ ion, every chromium atom is linked to four oxygen atoms. Two chromium atoms are present at the centre with Cr–O–Cr linkage and each chromium atom is bonded to three more oxygen atom. So, each chromium atom is bonded to four 'O' atom.
07. (3)
08. (2) $\text{Cr}^{3+} = 3d^3$
Hence $\mu = \sqrt{n(n+2)}$
 $\mu = \sqrt{3(3+2)}$
 $\mu = \sqrt{15}$
 $\mu = 3.873$
09. (1) The stability of the ions depends on their hydration energy released when the ions gets linked to the water molecules.
Cu(II) ion has a smaller size and a greater charge.
So, stability of Cu(II) is more
10. (1) Copper is present below the hydrogen in electrochemical series So, it does not liberate H_2 from acids.
11. (4) $3d^5$ consist of more number of unpaired e^- s higher the unpaired e^- s, higher the magnetic moment.
12. (4) Thulium (Tm) having atomic number [69] belongs to lanthanoid
13. (4) When sulphuric acid (H_2SO_4) is added to potassium permanganate, a highly explosive substance Mn_2O_7 is formed. This explosive substance further changes to MnO_2 the reaction is as given below.
 $\text{H}_2\text{SO}_4 + 2\text{KMnO}_4 \rightarrow \text{K}_2\text{SO}_4 + \text{Mn}_2\text{O}_7 + \text{H}_2\text{O}$
14. (2) Across the lanthanide series the size of the cations decreases there by decreasing ionic character and increasing covalent character of hydroxides of lanthanides Thus, the basicity of hydroxides decreases.
15. (2) The higher oxidation state of a transition metal is usually exhibited in its oxide and fluoride.
16. (4) (1) After loss of electrons Ti^{+4} , Sc^{+3} gets noble gas configuration where as Fe^{3+} gets half filled configuration So, they are stable.
17. (3) Usually across the first transition series, the negative values for standard electrode potential decreases except for Mn due to stable d^5 -configuration
 \Rightarrow The electronic configuration of various elements in Mn^{2+} state is
 $\text{Cr} - [\text{Ar}] 3d^5 4s^1$ (half filled)
 $\text{Mn} - [\text{Ar}] 3d^5 4s^2$
 E^- values of M^{2+}/M with negative sign
 $\text{Cr} = -0.9\text{ V}$, $\text{Mn} = 1.18\text{ V}$, $\text{Fe} = -0.44\text{ V}$, $\text{Co} = -0.28\text{ V}$,
Thus, the order is $\text{Mn} > \text{Cr} > \text{Fe} > \text{Co}$.
18. (4) Oxides in the lower oxidation state are basic and in the higher oxidation state, they are acidic. In the intermediate state, they are amphoteric.
 V_2O_5 , Cr_2O_3
19. (3) In alkaline solution, the iodide ions are oxidised by KMnO_4 to Iodates (IO_3^-)
 $2\text{KMnO}_4 + \text{H}_2\text{O} + \text{KI} \rightarrow 2\text{MnO}_2 + 2\text{KOH} + \text{KIO}_3$.
20. (4) The stability of higher oxidation states are related to bond formation capacity.
21. (2) $\text{La}(\text{OH})_3$ is more basic than $\text{Lu}(\text{OH})_3$ where as less basic than $\text{Cu}(\text{OH})_2$
 \Rightarrow Basic character of hydroxides decreases as the ionic radius decreases.
22. (2) $2\text{MnO}_4^- + 16\text{H}^+ + 6\text{C}_2\text{O}_4^{2-} \rightarrow 2\text{Mn}^{2+} + 8\text{H}_2\text{O}$
Oxalate Oxidation
Iron (II) oxidation
 $\text{MnO}_4^- + 8\text{H}^+ + 5\text{Fe}^{2+} \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O} + 5\text{Fe}^{3+}$
Hence, moles of KMnO_4 that will be needed to react completely with one mole of ferrous oxalate $\text{Fe}(\text{C}_2\text{O}_4)$ is $\frac{3}{5}$ (2 moles for oxalate and 1 mole for Iron (II))
23. (2) Ferric ion Fe^{3+} has half filled d-orbital the electronic configuration of Fe is $[\text{Ar}]3d^6 4s^2$
The electronic configuration of Fe^{3+} is $[\text{Ar}] 3d^5$.
24. (4) Zr^{+4} and Hf^{+4} has almost same atomic radii due to lanthanide contraction.
25. (4) +3 is the most common oxidation state shown by lanthanoid and actinides.
26. (3) lanthanide ion with No unpaired electron is diamagnetic in nature.
 ${}_{70}^{yb} = [\text{Xe}] 4f^{14} 5d^0 6s^2$
 ${}_{70}^{yb^{+2}} = [\text{Xe}] 4f^{14}$
Hence ${}_{70}^{yb^{+2}}$ is diamagnetic, due to the absence of the unpaired electron.

27. (3) Transition elements exhibit variable valency to form intermediate compounds. Hence they act as good catalyst.
28. (3) Cr^+ and Cu^+ attains a very stable filled d-orbital electronic configuration, So the copper and Cr have highest second ionisation energy
29. (4) $\text{Eu} = 63 \rightarrow [\text{Xe}] 4f^7 6s^2$
 $\text{Gd} = 64 \rightarrow [\text{Xe}] 4f^7 5d^1 6s^2$
 $\text{Tb} = 65 \rightarrow [\text{Xe}] 4f^9 6s^2$
30. (2) Transition metals are coloured due to d-d transitions.
31. (1) VO_4^{-3} , CrO_4^{2-} and MnO_4^- are pale yellow, strong yellow and intense purple respectively in aqueous solution. The darkening of colour is due to charge transfer phenomenon. Absence of unpaired electrons in V, Cr and Mn, So no d-d transition.
32. (1) Oxidising power depends up on the stability of the reduction product obtained since lower oxides of Mn are more stable than that are more stable than that of Cr and V.
33. (1) The oxidation state of Nickel in $\text{Ni}(\text{Co})_4$, $(\text{CH}_3\text{COO})_2\text{Ni}$, NiO and $\text{NiCl}_2(\text{PP}_3)_2$. are 0, +2, +2, and +2 respectively. Thus, $\text{Ni}(\text{Co})_4$ has lowest oxidation state.
34. (1) MnO_2 oxidation state $\rightarrow +4$
 +2 is the stable oxidation state of Mn.
 Most stable oxidation state of Mn in oxides is +7
 characteristic oxidation state of lanthanoids is +3
35. (1) Sc^{+3} contains zero electron, so no magnetic moment.
 V^{+2} contains 3 unpaired e^- s, So, 3.87 B.M. Fe^{3+} contains 5 unpaired e^- s, So 5.92 B.M. Cu^{+2} contains 1 unpaired e^- , So 1.13 BM
36. (2) Fact based
37. (2) Electronic configuration of cerium is $[\text{Xe}] 4f^1 5d^1 6s^2$ Thus its most stable oxidation state is +3 but +4 is also exist because it is favoured by its noble gas configuration.
38. (1) $\text{Ga}^{+3} \rightarrow 4f^7 5d^0 6s^2$
 $4f^7$ has seven unpaired e^-
 $\mu = \sqrt{7(7+2)}$ B.M.
 $\mu = \sqrt{63}$ B.M.
39. (4) $\text{Lu} \rightarrow 71 \rightarrow [\text{Xe}] 4f^{14} 5d^1 6s^2$
40. (1) Ce^{+4} has the tendency to attain +3 oxidation state due to which ceric sulphate $[\text{Ce}(\text{SO}_4)_2]$ is widely used as an oxidising agent in volumetric analysis.
41. (1) Sm^{+3} and Dy^{+3} both have 5 unpaired electrons and due to same f-f transition both have yellow colour.
42. (1) The ionisation energies increase with increase in atomic number. however, the trend is some irregular among d-block elements on the basis of electronic configurations
 $\text{Zn} : 1s^2 2s^2 2p^6 3s^2 3p^6 d^{10} 4s^2$
 $\text{Fe} : 1s^2 2s^2 2p^6 3s^2 3p^6 d^6 4s^2$
 $\text{Cu} : 1s^2 2s^2 2p^6 3s^2 3p^6 d^{10} 4s^1$
 $\text{Cr} : 1s^2 2s^2 2p^6 3s^2 3p^6 d^5 4s^1$
 IE1 follows the order $\text{Zn} > \text{Fe} > \text{Cu} > \text{Cr}$
43. (3) Due to d^5 configuration, metallic bonds are weak. d^5 orbital is half filled as a result 3d electrons are more highly held by the nucleus and this reduces the delocalisation of electrons results in weaker metallic bonding.
44. (1) Due to negligible screening effect of F^- orbital.
45. (3) Cu is present below the 'H' of the electro chemical series So, Cu is having positive value.
46. (3) Transition metals shows variable valency is due to incomplete d-orbitals.
 Transition metals shows variable valency due to very small energy difference between the ns and (n-1) electrons
47. (1) Of all the elements, Zirconium and hafnium are two of the most difficult to separate. As their chemistry is identical, the density of zirconium is about half of hafnium.
 \Rightarrow Due to lanthanide contraction, the lanthanide series size of the atom decreases with an increase in the atomic number
48. (2) Transition elements exhibit variable oxidation state due to the presence of unpaired e^- In contact process V_2O_5 (or) pt is used as a catalyst.
49. (3) Due to variable valency transition metals have less energy difference between ns^2 and (n-1) d electrons.
50. (2) The magnetic moments are lesser than the fact that 5f elements of actinides are less effectively shielded which results in quenching of orbitals contraction.
 Actinide elements are strongly para magnetic due to the presence of unpaired electrons.

COORDINATION COMPOUNDS (SOLUTION)

01. (1) Ca^{2+} ion has C.N. = 6 hence only one EDTA ligand is required.

02. (2) The condition is satisfied by $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$



03. (3) As CO is a neutral ligand.

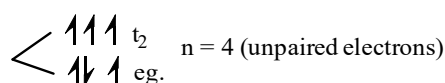
04. (4) Fact

05. (4) $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6] \xrightarrow[\text{Water}]{\text{In}} [\text{Co}(\text{NH}_3)_6]^{3+}$

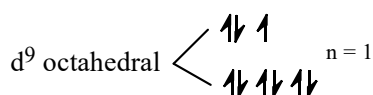
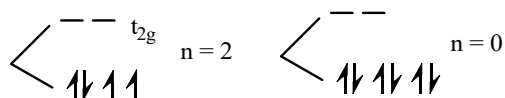
$+[\text{Cr}(\text{CN})_6]^{3-}$. Such type of complexes show coordination isomerism.

06. (4) Such isomerism is due to exchange of H_2O molecules with counter ions as given in the question.

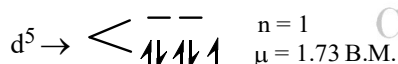
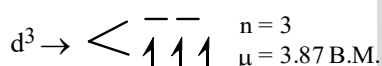
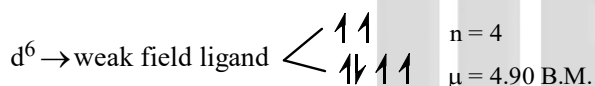
07. (2) In. d^6 [tetrahedral] according to CFT.



d^4 : octahedral low spin d^6 : octahedral low spin



08. (1) $d^4 \rightarrow$ strong field ligand $\begin{array}{c} \text{---} \\ \uparrow \uparrow \uparrow \end{array} t_{2g} \quad n = 2$
 $\mu = 2.84 \text{ B.M.}$



09. (1) According to spectrochemical series CO is the strongest field ligand.

10. (4) All are the limitations of VBT.

11. (1) With Ni^{2+} NH_3 is WFL ligand and also two inner d-orbitals can never be made available as it has d^8 configuration. Hence only possible hybridisation is sp^3d^2 ie. outer orbital complex.

12. (1) As the given isomers produce different ions in solution, hence they are ionisation isomers.

13. (2) In the given compound Cl^- in acts as counter ion which will be ionised as Cl^- ion.

14. (3) The complex is $[\text{Cr}(\text{C}_2\text{O}_4)_2\text{Cl}_2]^{3-}$ ion the oxidation state (primary valency) is +3 and coordination number (secondary valency) of Cr^{3+} is 6.

15. (3) Fact

16. (2) $\text{PtCl}_4 \cdot 4\text{NH}_3$ or $[\text{Pt}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}_2$. all the NH_3 are ligand which satisfy only secondary valency. Primary valency. or O.S. of Pt^{+4} which is satisfied by all the Cl^- ions. But out of four Cl^- ions, two Cl^- ions (half

of total) are present as ligand which also satisfy secondary valency.

17. (3) Splitting in octahedral complex $\begin{array}{c} dx^2-y^2 \quad dz^2 \\ \text{---} \quad \text{---} \\ \text{---} \quad \text{---} \\ dxy \quad dyz \quad dxz \end{array}$

18. (1) Fact

19. (2) As ligand are generally lone pair **donors** hence acts as Lewis base

NH_4^+ can't acts as ligand as there is no lone pair on nitrogen.

SCN^- is an ambidentate ligand hence shows linkage isomerism.

Ni^{2+} has $3d^8$ E.C. hence two inner d-orbitals can not be obtained for d^2sp^3 hybridisation only sp^3d^2 hybridisation is possible.

20. (3) As all the complexes have strong field ligand which cause pairing of electrons in CMI so they all are diamagnetic.

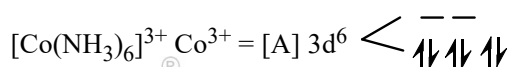
21. (3) Fact

22. (3) $[\text{CoF}_4]^{2-} \text{Co}^{2+} = [\text{Ar}]3d^7 \begin{array}{c} \uparrow \uparrow \uparrow \\ \uparrow \uparrow \end{array} e_g$

$$\text{CFSE} = -0.6\Delta_t \times 4 + 3 \times 0.6\Delta_t$$

$$= -2.4\Delta_t + 1.8\Delta_t = -0.6\Delta_t$$

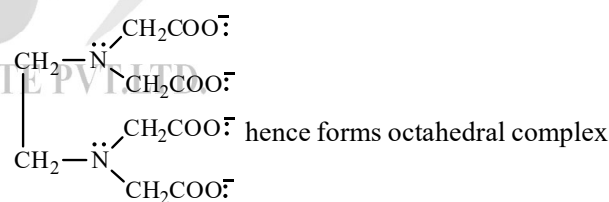
$[\text{Co}(\text{SCN})_4]^{2-} \rightarrow$ same as above



$$\text{CFSE} = -0.4\Delta_0 \times 6$$

$$\text{CFSE} = -2.4\Delta_0$$

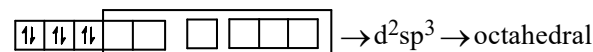
23. (1) EDTA^{4-} has six donor atoms



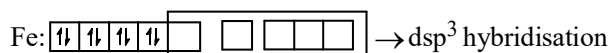
with CMI.

24. (3) $\Delta_t = \frac{4}{9}\Delta_0 \Rightarrow \Delta_t \times 9 = \Delta_0 \times 4$

25. (1) $\text{Ni}^{2+} = [\text{Ar}]3d^8$ with CN^- after pairing the hybridisation is dsp^2 hence it is a square planar complex. $[\text{ZnCl}_4]^{2-} \text{Zn}^{2+} = [\text{Ar}]3d^{10} 4s^0 4p^0 \rightarrow$ Gives sp^3 hybr. hence has tetrahedral geometry $[\text{Co}(\text{en})_3]^{3+}$ en is strong field ligands $\text{Co}^{3+} = [\text{Ar}]3d^6 4s^0 4p^0$ after pairing.



$[\text{Fe}(\text{CO})_5]$ CO is as a strong field ligand after pairing

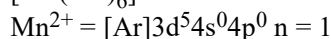
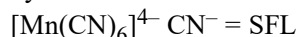


hence shape is trigonal bipyramidal.

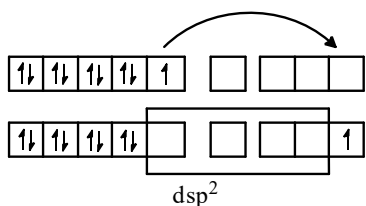
26. (1) $[\text{CrF}_6]^{4-}$: $\text{Cr}^{2+} = [\text{Ar}]3d^4$ since F^- is a WFL hence no. pairing takes place so $n = 4$
 $[\text{MnF}_6]^{4-}$ $\text{Mn}^{2+} = [\text{Ar}]3d^5$ $n = 5$
 $[\text{Cr}(\text{CN})_6]^{4-}$ $\text{Cr}^{2+} = [\text{Ar}]3d^4 4s^0 4p^0$ CN^- is a strong field



$n = 2$ selective pairing takes place for d^2sp^3 hybridisation.

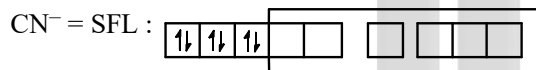
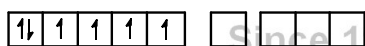


27. (3) $[\text{Cu}(\text{NH}_3)_4]^{2+}$: $\text{Cu}^{2+} = [\text{Ar}]3d^9 4s^0 4p^0$



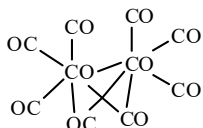
* experimentally this complex is square planar hence dsp² is compulsory.

28. (4) $\text{K}_4[\text{Fe}(\text{CN})_6]$: $\text{Fe}^{2+} = [\text{Ar}] 3d^6 4s^0 4p^0$

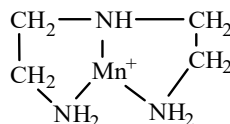


→ d²sp³

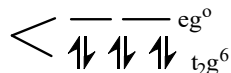
29. (1) [MABCD] forms three G.I. two cis and one trans
 30. (1) Max. no. of ions are given by $[\text{Pt}(\text{NH}_3)_6]\text{Cl}_4$ complex. (5 ions)
 31. (4) Fact
 32. (3) $[\text{M}(\text{AA})_2\text{a}_2]$ shows both G.I & O.I.
 33. (4) $\begin{matrix} \text{eg} \\ \uparrow +0.6 \Delta_0 \\ \text{t}_{2g} \\ \downarrow -0.4 \Delta_0 \end{matrix}$
 34. (1) Acetate is monodentate ligand $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\ddot{\text{O}}:^-$ due to steric reason only one oxygen is used as donor atom.
 35. (1) Fact
 36. (3) Fact
 37. (4) Coordination compound having both the ions as complex ion having same magnitude of charge show coordination isomerism.
 38. (4) Generally trans isomer of $(\text{M}(\text{AA})_2\text{a}_2)$ has plane of symmetry hence optically inactive
 39. (4) The structure of $\text{CO}_2(\text{CO})_8$ has two bridging CO ligands.



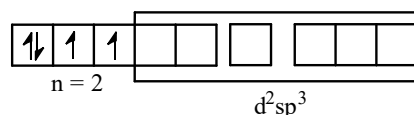
40. (1) Two five membered rings are formed when dien combines with EMI.



41. (2) $\text{K}_4[\text{Fe}(\text{CN})_6]$ has SFL as CN^- . $\text{Fe}^{2+} = [\text{Ar}]3d^6$



42. (1) $[\text{Mn}(\text{CN})_6]^{3-}$ $\text{Mn}^{3+} = [\text{Ar}]3d^4 4s^0 4p^0$
 selective pairing taken place



$[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$: $\text{C}_2\text{O}_4^{2-}$ is SFL with $\text{Co}^{3+}(d^6)$ causes pairing of electrons hence unpaired electrons $n = 0$

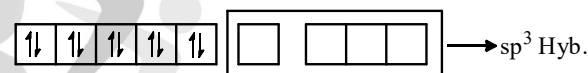
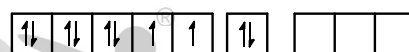
hence the complex is diamagnetic

$(\text{FeF}_6)^{3-}$: $\text{Fe}^{3+} = [\text{Ar}]3d^5$ as F^- is WFL hence $n = 5$
 So, magnetic moment corresponding to five unpaired electron

$[\text{Fe}(\text{CN})_6]^{4-}$ CN^- is SFL have inner orbital complex

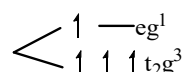
43. (3) See the solution of Q. no. 42

$[\text{Ni}(\text{CO})_4]$ CO is SFL $\Rightarrow \text{Ni}^{(0)} = [\text{Ar}]3d^8 4s^2 4p^0$



→ Tetrahedral geo and low spin complex

44. (2) For d⁴ configuration with the condition $\Delta_0 < P$



45. (2) Chlorophyll has Mg^{2+} ion.
 46. (3) The complex is of type $[\text{Ma}_3\text{b}_3]$ having two isomers facial and meridional
 47. (3) Max ions are given by $\text{K}_4[\text{Fe}(\text{CN})_6]$ i.e. 5 ions
 $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3 \rightarrow 4$ ions
 $[\text{Ni}(\text{CO})_4] \rightarrow$ zero ions
 $[\text{Cu}(\text{NH}_3)_4]\text{Cl}_2 \rightarrow 3$ ions
 48. (4) In $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$: $\text{Mn}^{2+} = [\text{Ar}]d^5$ an H_2O WFL hence does not cause pairing so $n = 5$.
 $[\text{Fe}(\text{CN})_6]^{4-}$: $\text{Fe}^{2+} = [\text{Ar}] 3d^6$ $\text{CN}^- = \text{SFL}$ $n = 0$
 $[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$ $\text{Cu}^{2+} = [\text{Ar}]3d^9$ $n = 1$ an H_2O is WFL hence no pairing taken place.
 $[\text{Cu}(\text{NH}_3)_4]^{2+}$ $\text{Cu}^{2+} = [\text{Ar}]3d^9$ $n = 1$ (see solution of Question no. 27)

49. (4) Fact

50. (3) (Ma_3b_3) shows facial and meridional isomers.

HALOALKANE & HALOARENES (SOLUTION)

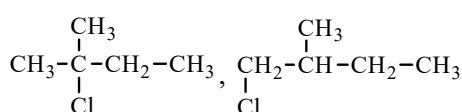
01. (2) The antibiotic which is produced by soil microorganism is very effective for the treatment of typhoid fever is chloramphenicol

02. (1) Common name of given compound is Isobutyl chloride.

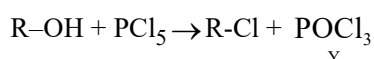
03. (2) $\text{CH}_3-\text{CH}=\text{CH}-\text{CH}_2-\text{Br}$
 1-Bromo-2-butene

04. (2) Halogen directly attached sp^2 carbon known as vinyl halide.

05. (4) $\text{CH}_3-\overset{\text{CH}_3}{\underset{\text{Cl}}{\text{C}}}-\text{CH}_2-\text{CH}_2-\text{Cl}$, $\text{CH}_3-\overset{\text{CH}_3}{\underset{\text{Cl}}{\text{C}}}-\text{CH}-\text{CH}_3$



06. (3) $\text{R-OH} + \text{PCl}_3 \rightarrow \text{R-Cl} + \text{H}_3\text{PO}_3$

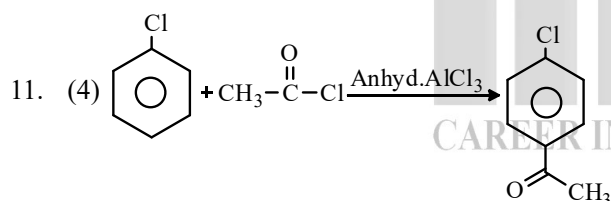


07. (2) dichlorodifluoro methane [CCl_2F_2] known as freon 12.

08. (2) 1° alkyl halide in aq. KOH undergo SN^2 reaction.

09. (3) 3° alkyl halide generally do not undergo SN^2 reaction

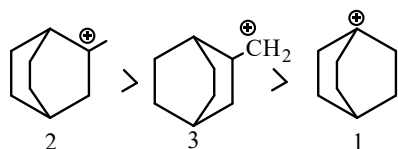
10. (3) Electron withdrawing group [$-\text{NO}_2$] increases rate of reaction as increases. [more NO_2 in 2^{nd}]



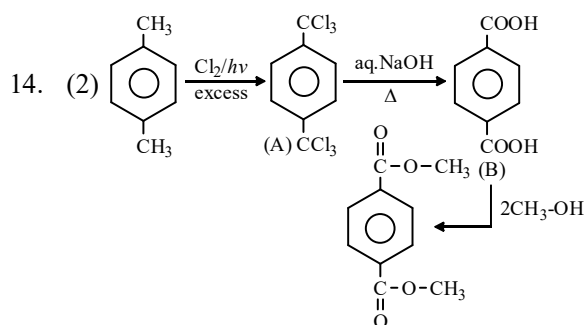
Cl is electron withdrawing group & also ortho para directing because it withdraws e^- through inductive & release e^- through resonance. Hence major product obtain as para substituted because at para position less $-I$ & more $+M$

12. (4) Electron withdrawing group increases reactivity towards ArSN . & more $-\text{NO}_2$ more reactivity also at ortho & para position it will show $-M$ & at meta position it will show $-I$ only hence correct order will be $1 > 4 > 3 > 2$

13. (2) Order of reactivity is depend on stability of carbocation.

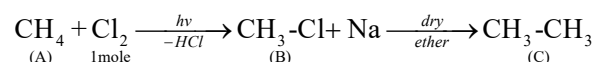
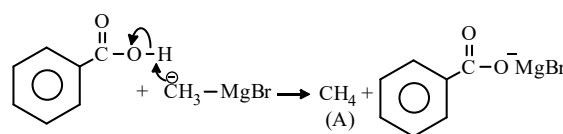


$2 > 3 > 1$



As 2 $-\text{COOH}$ form in (B) it required 2 mole of CH_3-OH

15. (1)

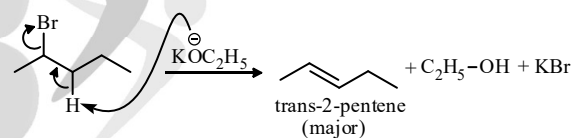


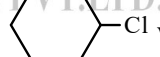
16. (1) Phosgene (COCl_2) is toxic (Poisonous) gas.

17. (1) triiodomethane. (CHI_3) was used earlier as an antiseptic

18. (2) ($\text{p-Cl-C}_6\text{H}_4$) $_2\text{CHCCl}_3$ (DDT) is used as an Insecticide

19. (1)

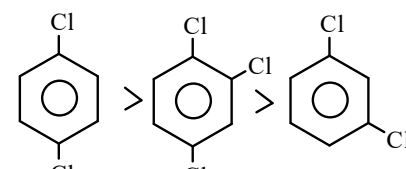


20. (2)  will be more soluble in water because

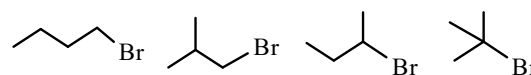
reaction follow SN^1 mechanism & it will give more stable carbocation.



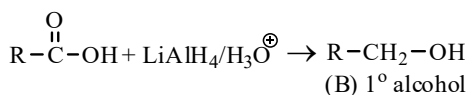
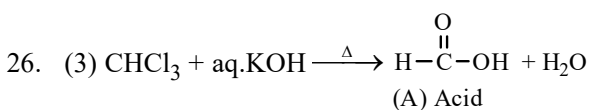
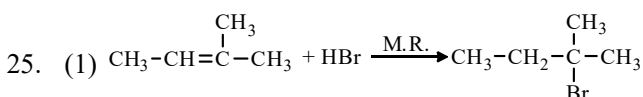
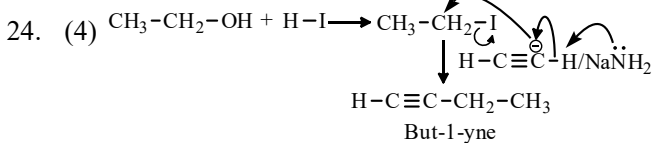
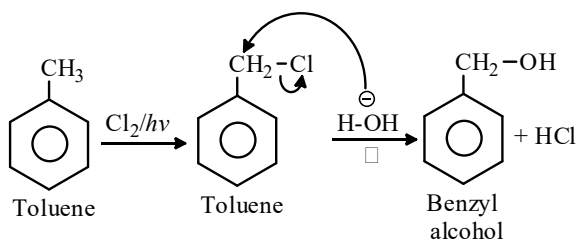
allyl carbocation

21. (3) 
 m.p./k 323 256 249

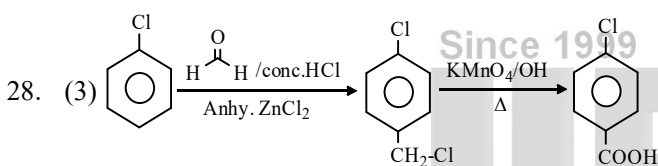
22. (1) $\text{C}_4\text{H}_9\text{Br}$



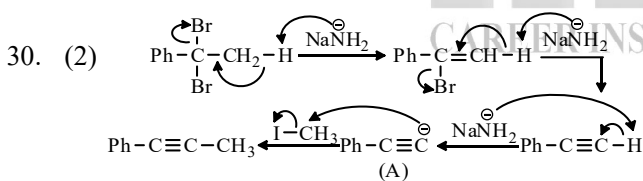
23. (1)



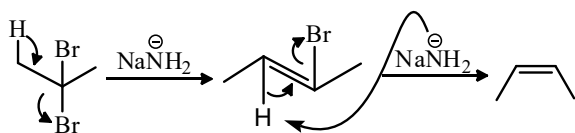
27. (2) Reaction between alkyl halide (R-X) & Aryl halide (Ar-X) known as wurtz fitting reaction.



29. (3) Na (atomic no. 11) use as metal in Finkelstein reaction.



$\therefore X = 3$



$y = 2$

In 1st reaction 3 NaNH₂ are use & in 2nd reaction reaction 2 NaNH₂ are use

$\therefore x = 3$ & $y = 2$ [$x + y$] = 5

31. (1) Order of rate of SN¹ reaction 3° > 2° > 1°

In (ii) & (iv) Both are 2° in which Br is good leaving group.

32. (2) 1° alkyl halide will easily undergo SN² mechanism. in (ii) & (iv) I is good leaving group.

33. (3) If carbocation cant undergo rearrangement then SN¹ & SN² product are same.

34. (1) Density \propto Molecular mass

35. (4) 4th is incorrectly match

The correct Match For 4 is

Fluorohydrocarbon- arrhythmias.

36. (1) Both assestion & reason are true & reason is correct explanation of assestion. Because in SN¹ carbocation will form and stability of carbocation \propto Reactivity

37. (1) Both assestion & reason are true & reason is correct explanation of assestion. Because aryl halide do not undergo nucleophilic substitution reaction. Due to C and X in aryl halide has double bond character.

38. (3) Only assestion is true.

\Rightarrow correct reason for this assestion is reactivity depend on stability of carbocation for SN¹ reaction.

39. (4) Assestion and reason both are false

Assestion is false because para-nitrobenzene is more reactive towards aqueous KOH.

Reason is false because in this reaction intermediate form is carbanion and not carbocation.

40. (2) Both assestion & reason are true but reason is not correct explanation

\Rightarrow Correct reason for this is 2-chlorobutane will undergo recemization because it have chiral carbon.

41. (4) Assestion & reason both are false

\Rightarrow chlorofluoro carbon responsible for ozone layer depletion not fullerenes

\Rightarrow Freon are chemically very stable because they contain no hydrogen

42. (2) Both assestion & reaction are true but reason is not correct explanation.

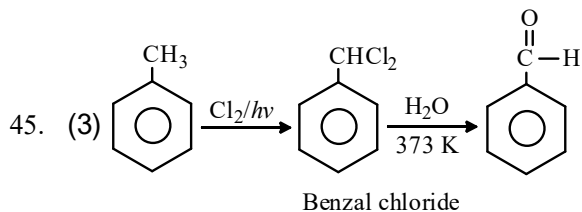
\Rightarrow Correct explanation is AgCN is mainly covalent in nature & Nitrogen is free to donate e⁻ pair forming Isocyanide.

43. (4) Statement-I is false because product of sandmeyer's reaction is aryl halide not benzyl chloride.

Statement-II is correct.

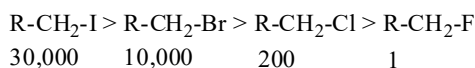
44. (1) Statement-I is true because as moelcular mass increases boiling point also increases.

\Rightarrow Statement-II also true. due to symmetry of para isomer that fits in crystal lattice better as compared to ortho & para isomer.



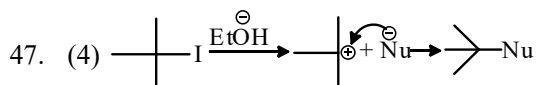
Statement-I is true but statement-II is false because Intermediate form is benzal chloride & not dichlorotoluene

46. (1) Order of rate of reaction is

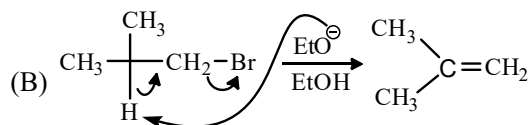


C-I bond is weak than C-Br than C-Cl than C-F

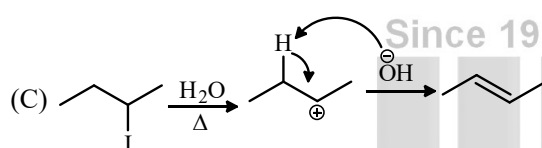
Reactivity is inversely proportional to strength of bond.



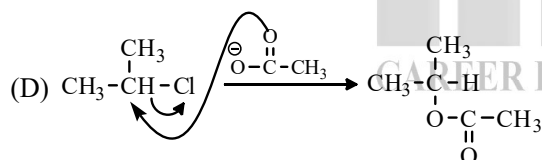
(A) \rightarrow SN¹ [No alcoholic condition hence no elimination]



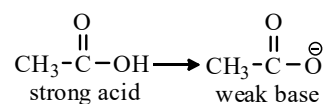
alcoholic condition follow E₂ elimination



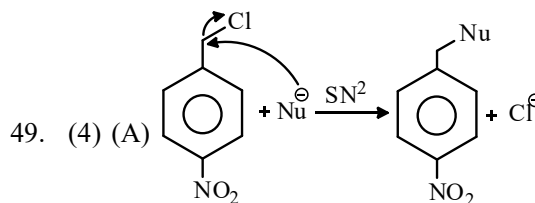
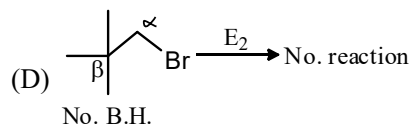
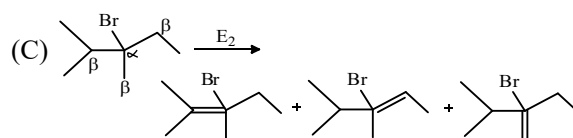
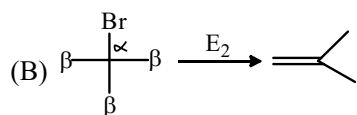
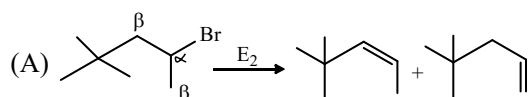
E1 mechanism follow under heating condition



SN² follow when weak base is use



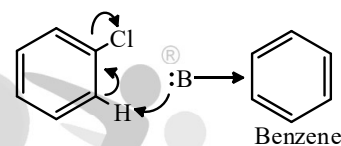
48. (2) No. of structural isomer is equal to type of β -hydrogen.



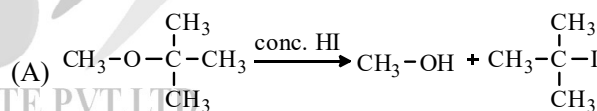
(B) Generally haloarenes do not undergo SN-Ar but if electron withdrawing group attached to aryl halide it decreases e⁻ density over ring & it can undergo SN-Ar. In (B) option. Fluorobenzene attached to two nitro(-NO₂) group hence undergo SN-Ar reaction easily

(C) Ortho substituted benzoic acid show sterically inhibited resonance due to ortho effect.

(D) Chlorobenzene with strong base undergo benzene mechanism.

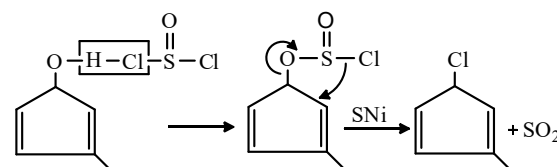


50. (3)



This reaction follow SN¹ mechanism because one alkyl group is 3° & In this reaction departure of leaving group [HO-CH₃] creates more stable carbocation (CH₃)₃C⁺.

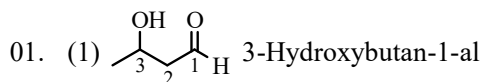
(B) Alcohol react with SOCl₂ In absence of pyridine follow SN_i [intramolecular nucleophilic substitution.] mechanism.



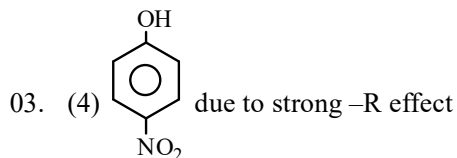
(C) Alcohol react with PCl₅/PCl₃ in pyridine follow SN².

(D) Alcohol react with SOCl₂/pyridine follow SN².

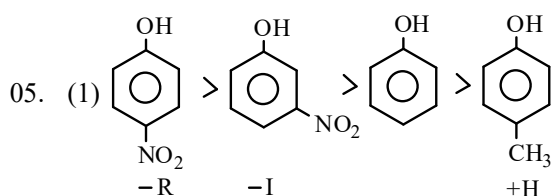
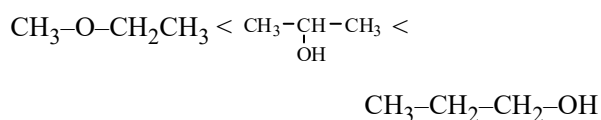
ALCOHOLS, PHENOLS AND ETHERS (SOLUTION)



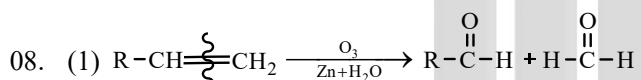
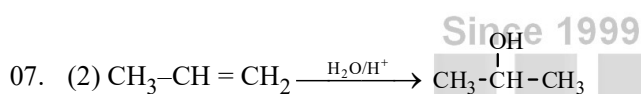
02. (4) Ethoxybenzene



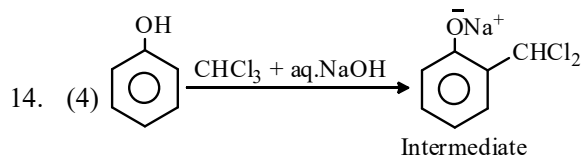
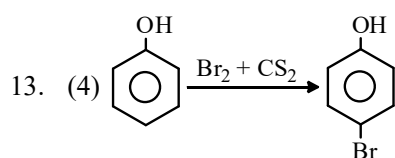
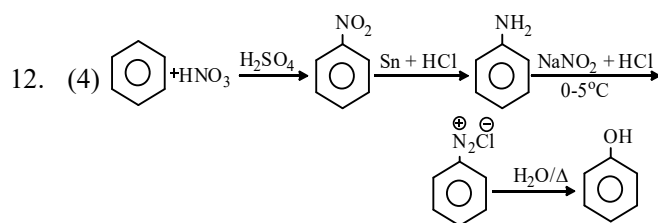
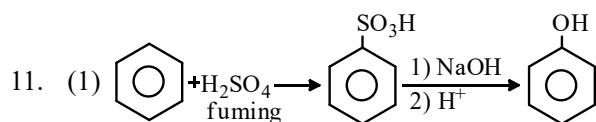
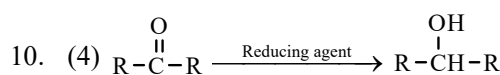
04. (2) Bp α attractive forces (H-bonding)



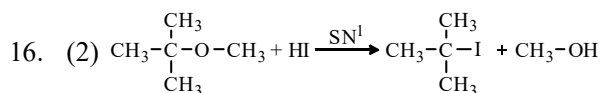
06. (1) aq KOH is weak Nucleophile. So it follow SN^1



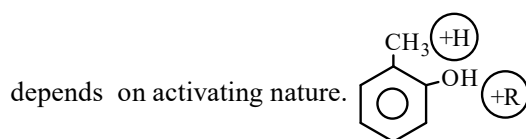
09. (4) Carbonyl compounds with grignard reagent gives all type of alcohols.



15. (4) In williamson's synthesis alkylhalide is converted into ether

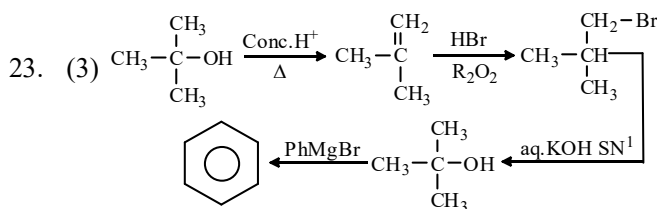
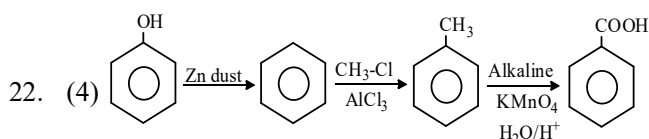
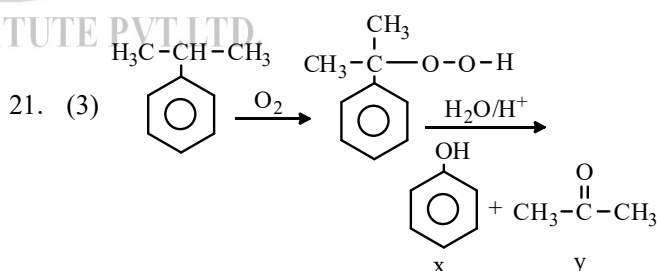
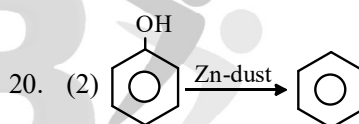
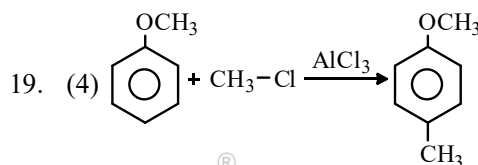


17. (1) Reactivity towards electrophilic substitution



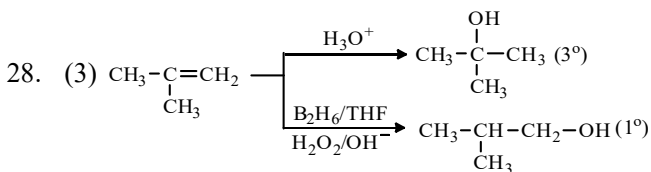
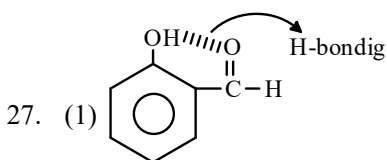
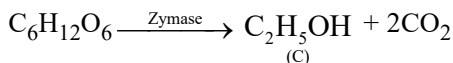
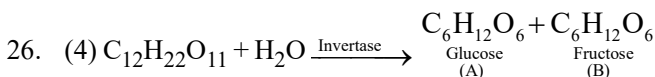
Activating nature: $-\text{OH} > -\text{CH}_3$

18. (1) $\text{R-OH} + \text{SOCl}_2 \rightarrow \text{R-Cl} + \text{SO}_2 + \text{HCl}$

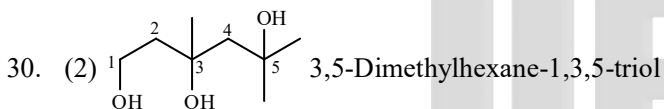
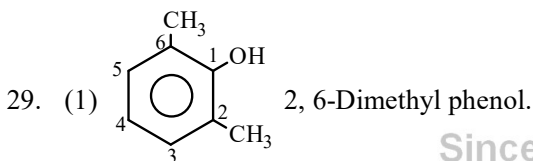


24. (2) Hydrocarbons are non-polar compounds so BP is very less

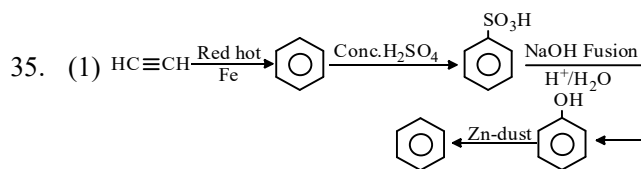
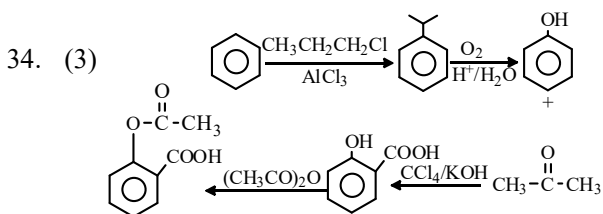
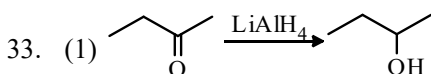
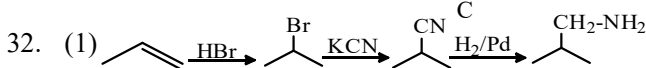
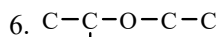
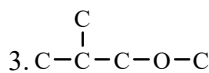
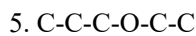
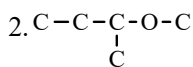
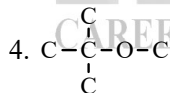
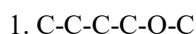
25. (1) SOCl_2 with pyridine given inversion product ($\text{S}_{\text{N}}2$)



Lucas reagent is used to distinguish 1° , 2° , and 3° -OH



31. (1) ($\text{C}_5\text{H}_{12}\text{O}$)

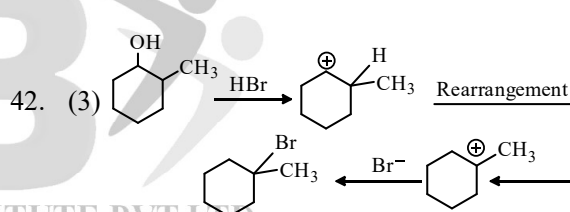
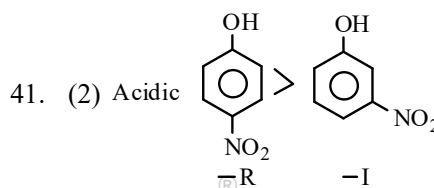
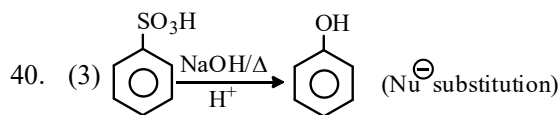
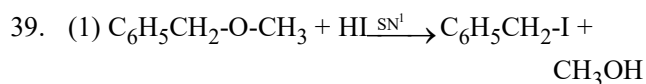


36. (3) It is Reimer-Tiemann reaction. It does not form carbocation as intermediate

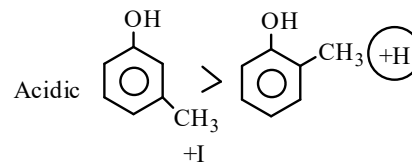
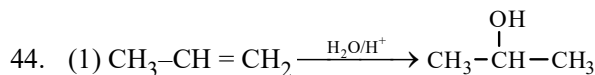
37. () No Answer

Assertion is false and Reason is correct

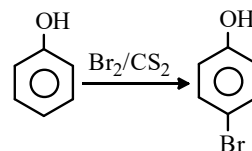
38. (2) Activating nature $-\text{OH} > -\text{OCH}_3$

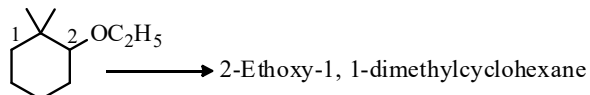
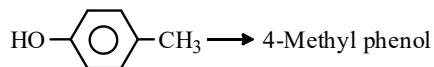
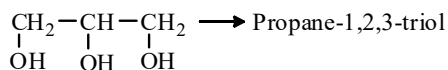
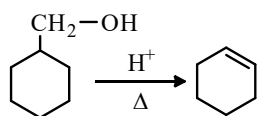
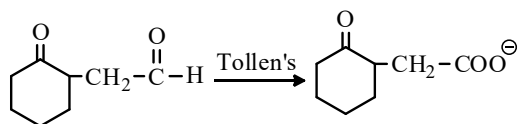
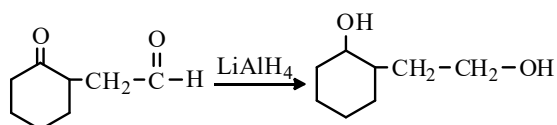


43. (3) CH_3OH is a wood spirit

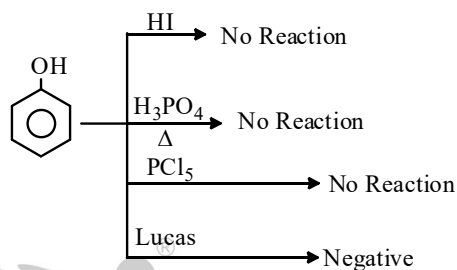
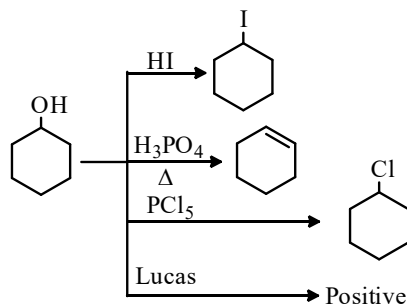
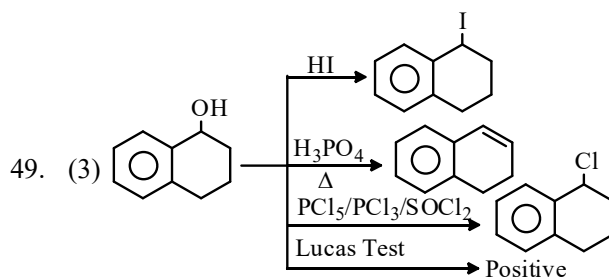
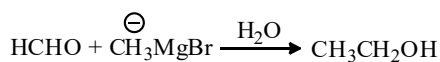
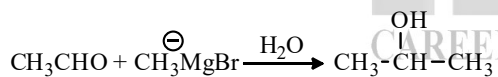


45. (3) B.P: Alcohol > Ether > Hydrocarbon.

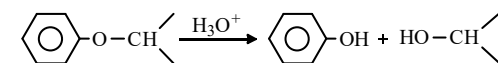
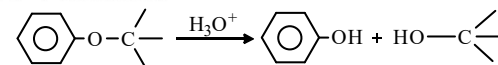
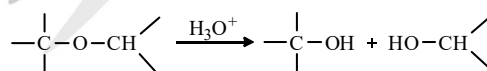


46. (2) $C_6H_5OCH_2CH_3 \rightarrow$ Ethoxy benzene47. (3) $CH_3-CH=CH_2 \xrightarrow{H_2O/H^+} CH_3-\overset{OH}{\underset{|}{CH}}-CH_3$ 

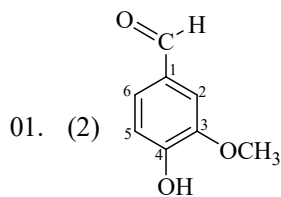
48. (4)



50. (4)

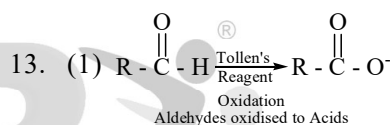
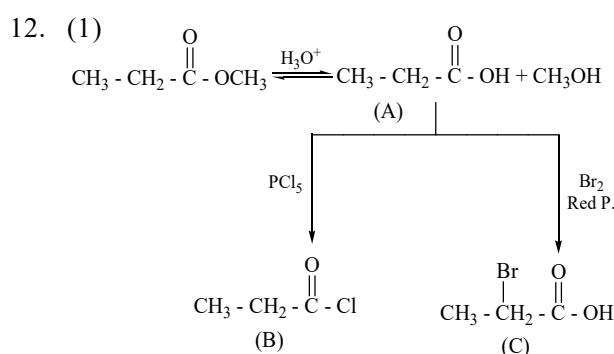
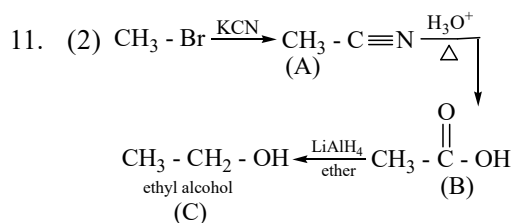
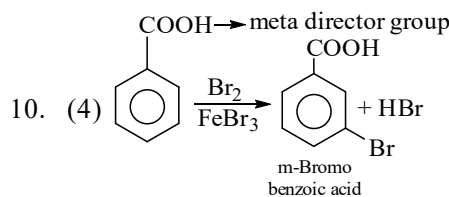
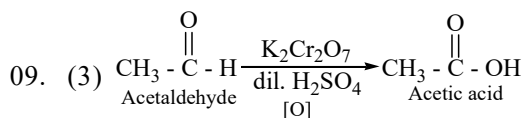
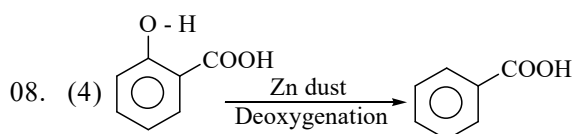
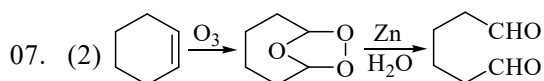
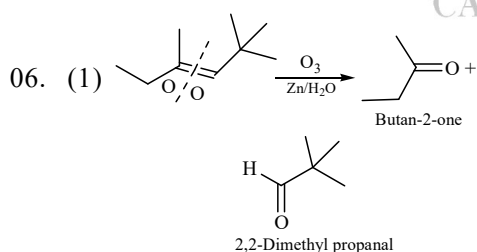
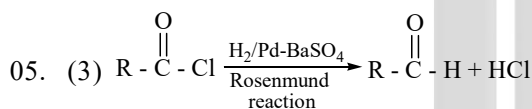
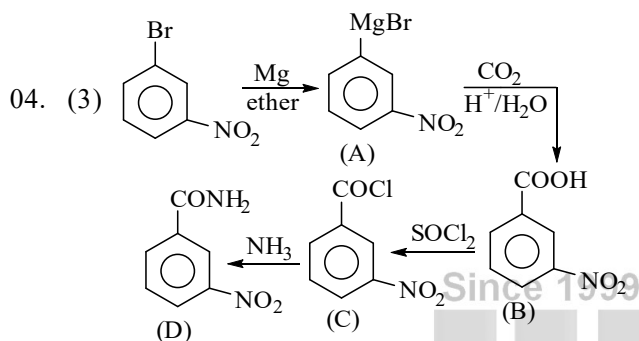
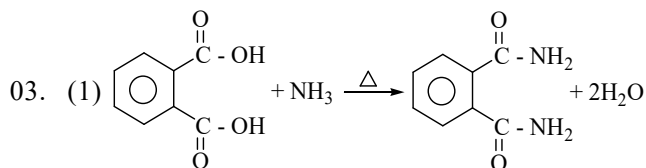


ALDEHYDES, KETONES AND CARBOXYLIC ACIDS (SOLUTION)



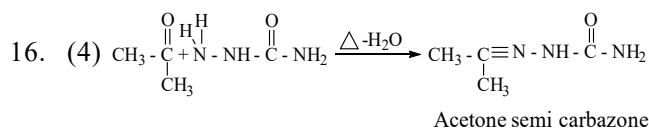
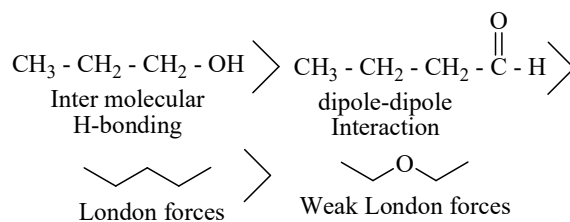
4-Hydroxy-3-Methoxybenzaldehyde

02. (1) Benzophenone is common as well as IUPAC name for given structure.

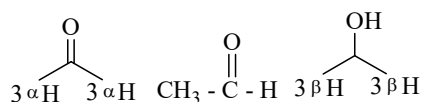


14. (3) The electrophile form in Gatterman-Koch reaction is $H-C^+=O$

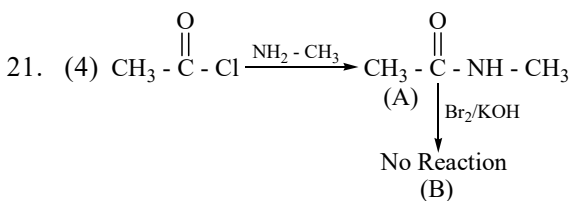
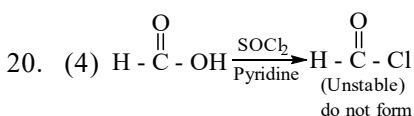
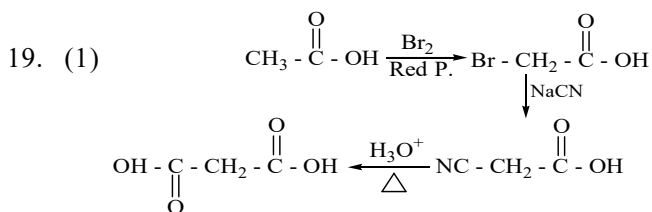
15. (3) ii > i > iii

Decreasing order of B.P. : \Rightarrow 

17. (1) Aldehydes and ketone having minimum three α -H atoms and 1° and 2° alcohols containing minimum three β -H atoms shows haloform reaction.



18. (4) Requirement of minimum one α -H atom on carboxylic acid for HVZ reaction.



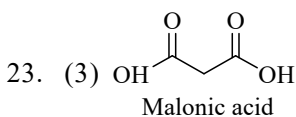
In Hoffmann bromamide degradation unsubstituted

amide $\left(\text{R} - \overset{\text{O}}{\parallel} \text{C} - \text{NH}_2 \right)$ is used. Substituted amides

$\left(\text{R} - \overset{\text{O}}{\parallel} \text{C} - \text{NH} - \text{R} \right)$ and $\left(\text{R} - \overset{\text{O}}{\parallel} \text{C} - \text{N} - \text{R} \right)$ do not should reaction

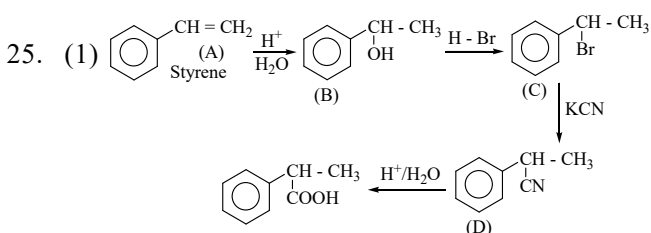
22. (1) Carbonyl compounds i.e. Aldehydes and Ketones when treated with 1° amine to form Schiff's base $\text{R} - \text{CH} = \text{N} - \text{R}$ and $\text{R} - \text{C} = \text{N} - \text{R}$ respectively.

|
R



24. (4) Strength of Aliphatic carboxylic acid \propto -I effect.

$$\propto \frac{1}{+I \text{ effect}}$$

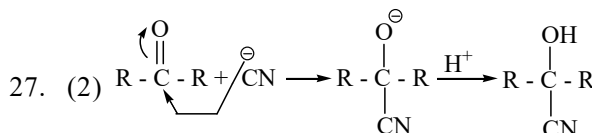


26. (1) Reactivity of aldehydes and ketones towards nucleophilic addition reaction \propto Electrophilic character of $\text{C} = \text{O}$ group.

We know,

$$\text{Electrophilic character of } \text{C} = \text{O} \text{ group} \propto \frac{1}{\text{No. of R-groups and size of R-group}}$$

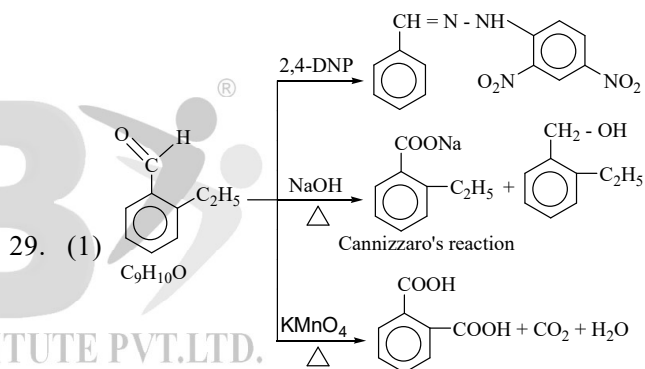
$$\propto \frac{1}{+I \text{ effect}}$$



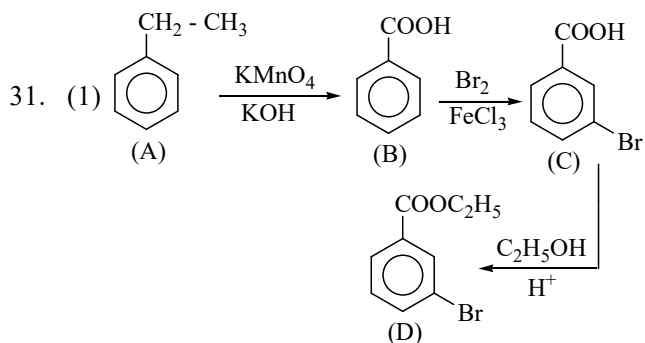
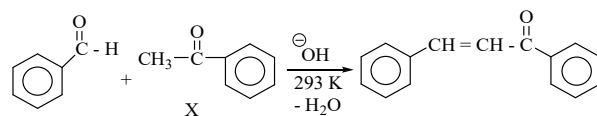
28. (1) For Aldol condensation α -carbon have minimum

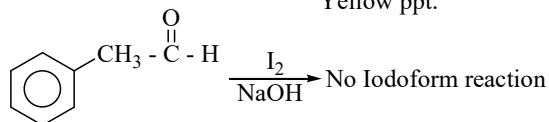
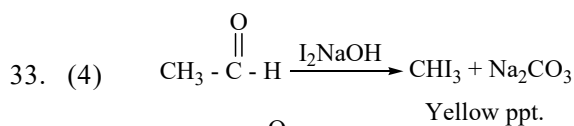
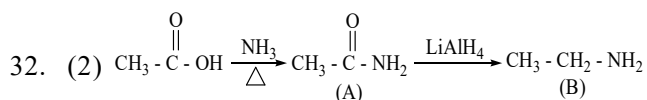
one H-atom. In case of chloral $\left(\text{Cl} - \overset{\text{O}}{\parallel} \text{C} - \text{H} \right)$ α -

H atom is absent.

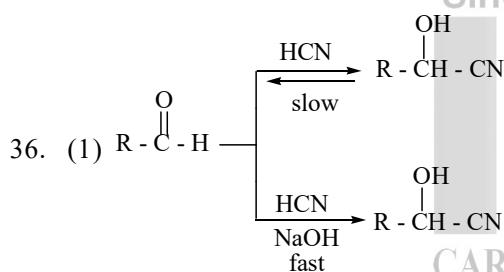
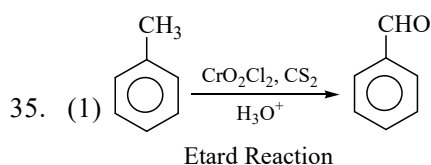
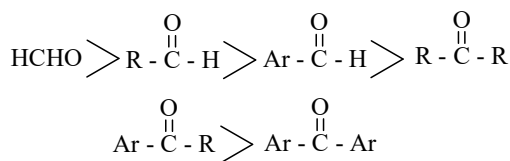


30. (3) This is the example of cross Aldol condensation.





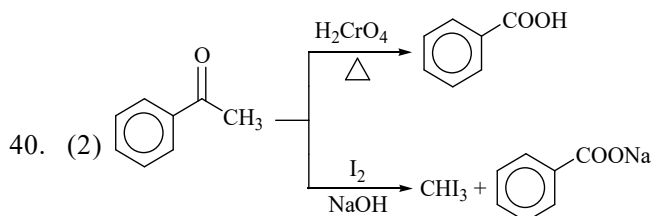
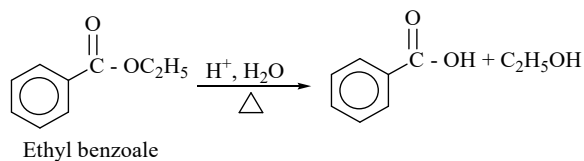
34. (3) Decreasing order of reactivity of Aldehydes and Ketons according to steric factor and electronic factor as –



37. (2) The IUPAC name of cinnamaldehyde is 3-phenyl-pro-2-enal.

38. (3) Aq. solution of 7 to 8% Acetic acid solution is known as Vinegar. Sodium benzoate is use as a food preservative.

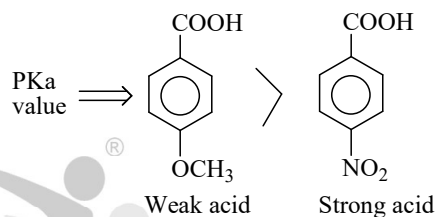
39. (2) $-\text{COOH}$ group shows strong $-M$ effect and deactivation of benzene fail to undergoes F.C. Acylation and F.C. alkylation reaction.



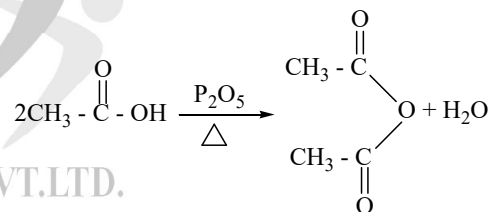
41. (2)

42. (2) Solubility of carboxylic acid inversely proportional to molar mass.

43. (1)



44. (4)

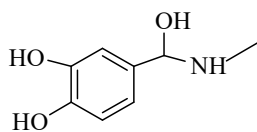


45. (3) $\text{PKa} \propto \frac{1}{\text{Acidic Strength}}$

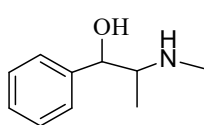
46. (2) 47. (4) 48. (1) 49. (3) 50. (2)

AMINES (SOLUTION)

01. (2) Adrenaline



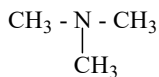
ephedrine



02. (4)

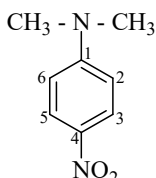
n-propylamine

Isopropylamine



trimethylamine

03. (3)



4-Nitro-N,N-dimethyl aniline

04. (2)

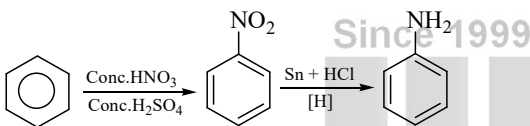
Aromatic amine is less basic than aliphatic amine

05. (2) Hoffmann Bromamide degradation reaction is

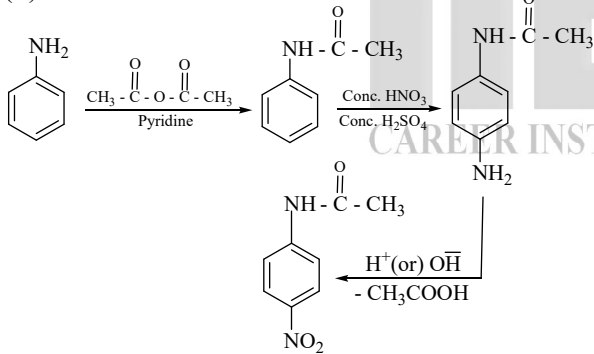
shown by only Acid amides i.e. $R-C(=O)-NH_2$

06. (3) This method is applicable only to prepare $R-NH_2$ i.e. only aliphatic primary amines.

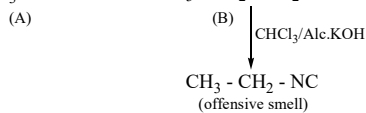
07. (2)



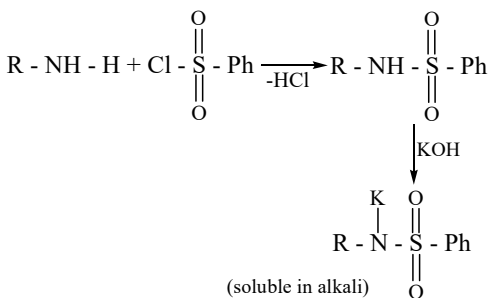
08. (4)



09. (3) $CH_3-CN \xrightarrow{\text{Reduction}} CH_3-CH_2-NH_2 \xrightarrow{HNO_2} CH_3-CH_2-OH$



10. (1)



11. (1)

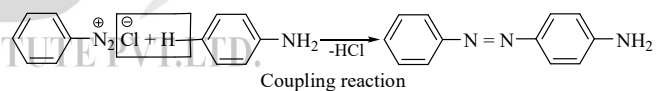
12. (2)

13. (1) $R-\text{NH}_2$
 + I
 electron donating group
 lone pair is in delocalisation
 line pair is free on N

14. (1) Electron withdrawing groups decreases basic strength of Amines.

15. (3) Aliphatic amines are more basic than aromatic amines

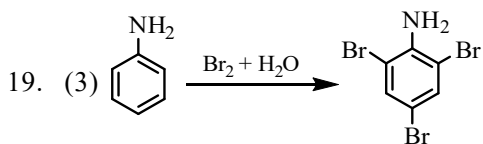
16. (2)



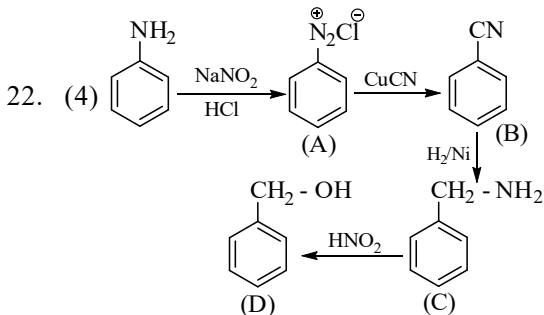
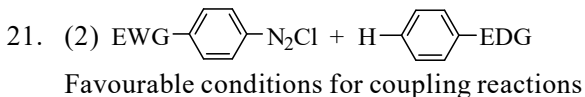
17. (4)

18. (1) Boiling point of alcohols is greater than Amines

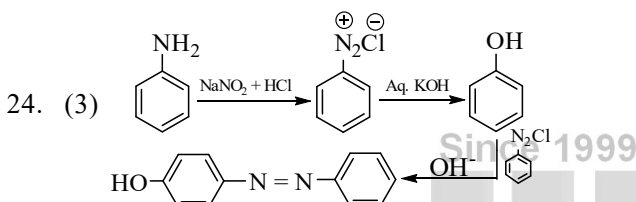
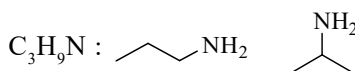
Boiling point is 1° - amines $>$ 2° - amines $>$ 3° - amines



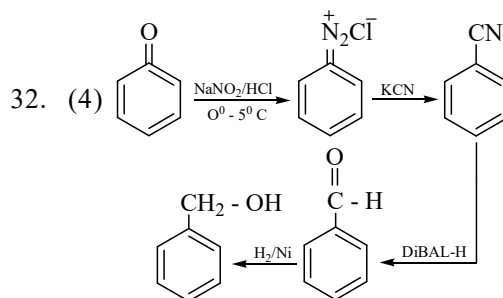
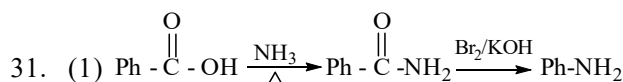
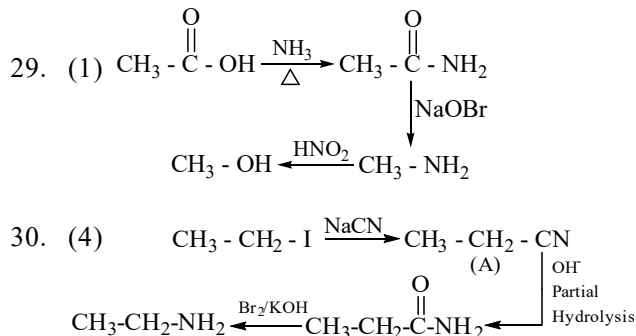
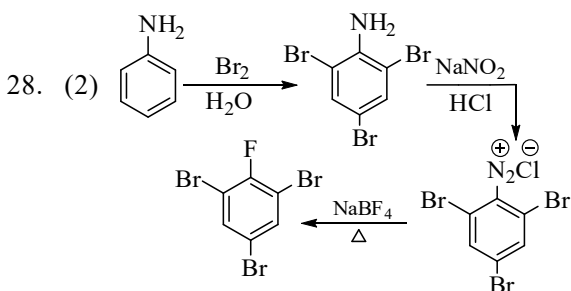
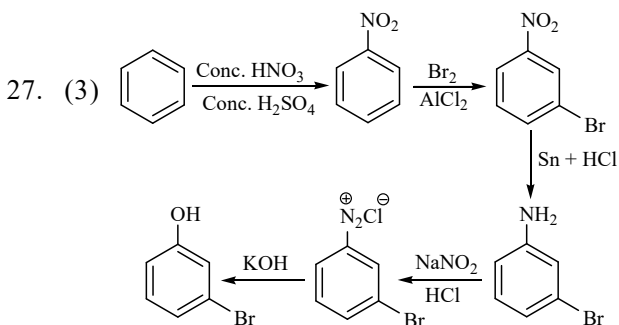
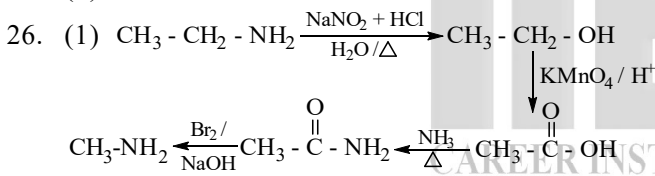
20. (1) Sandmeyer reaction



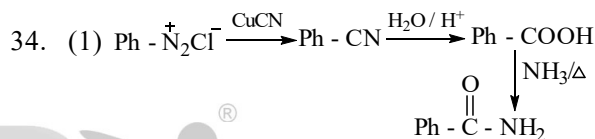
23. (3) Only primary amine can liberate N₂ with HNO₂



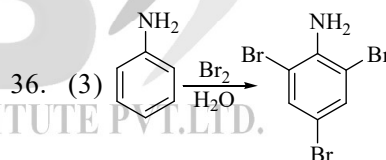
25. (1)



33. (3) Aromatic ring is Hydrophobic in nature
As size of allyl group increases solubility decreases

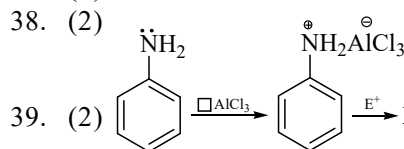


35. (2) 2° > 1° > 3° amines
Aromatic amines are less basic than aliphatic compounds.



-NH₂ groups is strong activating group.

37. (2)

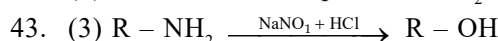


39. (2)

40. (4)

41. (3) Gabriel phthalamide synthesis is use fule to prepare only 1° - amines.

42. (1) Nitration mixture produce N⁺O₂ as electrophile



44. (1)

45. (4)

46. (1) As surface area increases B.P also increases

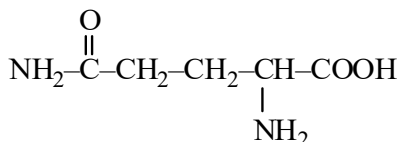
47. (3)

48. (4) Basic Strength $\propto \frac{1}{\text{P}k_b}$

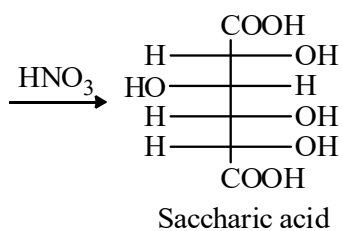
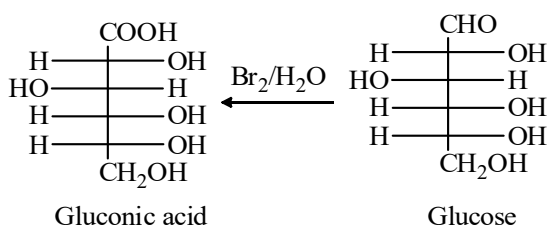
49. (1)

50. (3)

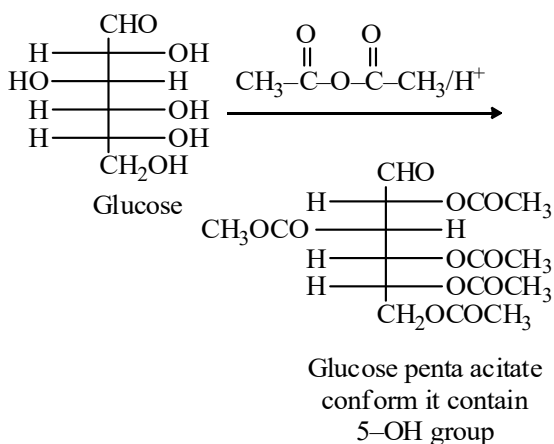
23. (4) RNA contain four bases - Adenine, Guanine, Cytosine, Uracil.
DNA contain base Thymine
24. (3) In DNA stand adenine form hydrogen bond with "Thymine".
25. (3) Progesterone
26. (2) Vitamin 'D'
27. (1) Glutamine



28. (2)

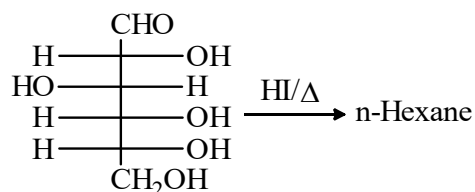


29. (3) Amylone 15-20% of starch.
30. (3) Br₂/H₂O is mild oxidising agent it oxidised only aldehyde group to carboxylic acid.
31. (3)



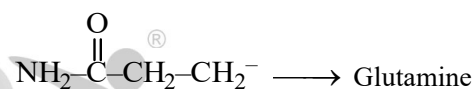
32. (4) Glucose does not react with "schiff's reagent" and "NaHSO₃".

33. (1) Primary structure of proteins remain impact during denaturation.
34. (1)



⇒ Suggesting that all the six carbon atom are linked in a straight chain.

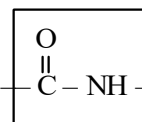
35. (4)
36. (4)
37. (3) Unit formed by the attachment of above to '1' position of sugar is called "Nucleoside".
38. (3) It is compound of B-D glucose unit.
39. (1) Vit - B₆ → Convulsions
Vit - A → Night Blindness
Vit - C → Scurvy
Vit - D → Rickets
40. (4) -CH₃ → Alanine



41. (2) (i)-(b), (ii)-(c), (iii)-(a), (iv)-(d)
42. (1) (i)-(b), (ii)-(a), (iii)-(d), (iv)-(c)
43. (3)
(i)-(a), (ii)-(c), (iii)-(b), (iv)-(d)

44. (2) Fat soluble vitamins do not excreted in urine.
45. (1) Glucose contain 6-carbon as well as aldehyde group there for glucose is an "aldohexoses".
46. (4) Acetylation of glucose with acetic anhydride gives 'Glucose pentaacetate'.
47. (1)
48. (4) Sucrose is disaccharides. It contain C₁-C₂ linkage b/w α -D Glucose and B-D-Fructose.
49. (1)

50. (2) Peptide linkage



PRINCIPLES RELATED TO PRACTICAL CHEMISTRY (SOLUTION)

01. (2) Dumas method
02. (3) Estimation of sulphur and halogen done by "Carius method"
03. (1) $\% N = \frac{1.4 \times N_1 V_1}{\text{Mass of organic compound}}$
 $N(H_2SO_4) = M \times \text{nfactor} = 1 \times 2 = 2N$
 $V_1 = \text{Volume of neutralization}$
 $\% N = \frac{1.4 \times 2 \times 10}{0.5} = 56\%$
04. (2)
- $\% Br = \frac{\text{Atomic mass Br} \times \text{wt. of AgBr} \times 100}{\text{Molar mass of AgBr} \times \text{wt. of organic comp.}}$
 $\% Br = \frac{80 \times 0.12 \times 100}{188 \times 0.15} = 34.04\%$
05. (1)
- $R_f = \frac{\text{Distance moved by substance from base line}}{\text{Distance moved by the solvent from base line}}$
06. (2) Extraction of compound takes place based on 'solubility'
07. (3) Distillation under reduced pressure.
08. (1) Sparingly soluble at room temperature but appreciably soluble at high temperature.
09. (4) Aniline + water mixture can be separated by steam distillation.
10. (3) Paper chromatography.
11. (3) $C + 2CuO \longrightarrow 2Cu + CO_2$
 $2H + CuO \longrightarrow Cu + H_2O$
 Both carbon and hydrogen.
12. (2) $Fe_4[Fe(CN)_6]_3 \Rightarrow$ Prussian blue colour
13. (2) Kjeldahl method is not applicable compound containing nitrogen in nitro, nitrogen present in the ring.
14. (2)
- $\% \text{ of sulphur} = \frac{32 \times (\text{wt})BaSO_4 \times 100}{233 \times \text{mass of organic compound}}$
 $\% \text{ of s} = \frac{32 \times 0.4813 \times 100}{233 \times 0.157} = \frac{1540.16}{36.58} = 42.10\%$
15. (1) Distillation
16. (1) $Fe_4[Fe(CN)_6]_3 \Rightarrow$ Prussian blue colour
17. (4) $Fe^{+3} + SCN^- \longrightarrow [Fe(SCN)]^{+2}$
 Blood red colour
18. (4) Chlorine
19. (1) $(NH_4)_3PO_4 \cdot 12MoO_3 \Rightarrow$ Yellow colour ppt.
20. (1) Ammonia (NH_3)
21. (4) Halogen
22. (1) $5H_2O + CuSO_4 \longrightarrow CuSO_4 \cdot 5H_2O$
 white ppt Blue colour
23. (2) In Dumas method-nitrogen present in the compound liberate in the form of N_2 .
24. (1) NO_2
25. (1) $\text{>C=C<} \xrightarrow[\text{cold}]{\text{Dill. } KMnO_4/OH^-} \text{>C(OH)-C(OH)<}$
26. (4) Bayer's test
27. (4) Differentiating $1^\circ, 2^\circ$ and 3° alcohol \Rightarrow Lucas test. ($ZnCl_2 + HCl$)
28. (3) Phenolic ($-OH$) group can be detected by $FeCl_3$ test.
29. (3) $FeCl_3$ give green colour.
30. (4) Aldehyde give \Rightarrow 2, 4 DNP, Fehling and Benadict test.
31. (4) Give 2, 4-DNP test
32. (2) $NaHCO_3$ test is given by $-COOH$ group.
33. (3) Give Tollen's test.
34. (3) Aromatic aldehyde give Tollen's test.
35. (1) Aldehyde give schift test.
36. (1)
37. (3) In paper chromatography stationary and mobile phase is liquid.
38. (1)
39. (2) In detection of sulphur black ppt. are formed due to the formation of PbS .
 $S^{-2} + Pb^{+2} \longrightarrow PbS$ (Black ppt)
40. (1)
41. (3) $\text{>C=C<} \xrightarrow[\text{cold}]{\text{dil. } KMnO_4/OH^-} \text{>C(OH)-C(OH)<}$
 $MnO_4^- \longrightarrow MnO_2$
 Purple Brown-black solid
42. (1) Assertion : C_6H_5OH shows positive $FeCl_3$ test
 Reason : It contain phenolic $-OH$ group.
43. (2) a-iii, b-ii, c-iv, d-i
44. (2) a-(i), b-(ii), c-(iii, iv), d-(i)
45. (1) a-(iv), b-(iii), c-(ii), d-(i)
46. (3) a-(iv), b-(ii), c-(ii, iii), d-(i)
47. (1) a-(ii), b-(i), c-(iii), d-(iv)
48. (3) 49. (4) 50. (3)