EXHAUSTIVE QUESTION BANK IN CHEMISTRY
XII STD

S.VASUDEVAMURTHY

Chapter-1-Solid state- 4 Marks

1. Mention the characteristic properties of solid.
2. Mention the differences between crystalline solid and amorphous solid.
3. Explain the terms a) anisotropy b) isotropy. Why is crystalline solid anisotropic while amorphous solid isotropic in nature?
4. What makes glass different from quartz? Under what condition quartz is converted to glass?
5. Why are amorphous solids called pseudo solids or super cooled liquids?
6. How are crystalline solids classified on the basis of intermolecular forces? Give two examples of each type and mention their properties.
7. Compare the properties of diamond and graphite on the basis of their structures.
8. Classify the following as ionic, metallic, molecular, covalent, or amorphous.
   a) P_4O_{10} b) $(NH_4)_3PO_4$ c) I_2 d) Plastic e) graphite f) Brass g) Rb h) LiBr i) Si
9. How are molecular solids subdivided further? Give two examples each and mention their properties.
10. Account for the following:
    a) Glass panes fixed to windows of old buildings becomes slightly thicker at the bottom than at the top.
    b) NaCl(s) does not conduct electricity but it conducts either in molten state or in aqueous solution.
    c) Diamond is a non conductor while graphite is a conductor of electricity.
    d) Diamond is hard while graphite is soft.
    e) Graphite is a lubricant.
    f) Ionic solids are hard and brittle.
    g) MgO and NaCl are ionic solids but MgO has higher melting point than NaCl.

h) NaCl exhibit schottky defect and not frenkel defect.

11. Explain the terms a) lattice point b) crystal lattice c) unit cell.
12. What are Bravis lattices? Mention the characteristics of a crystal lattice.
13. Mention the characteristics of a unit cell. Draw a neat diagram of a unit cell and show its parameters.
14. What is the difference between primitive and centered unit cell?
15. Calculate the number of atoms in a) SCC b)BCCc)FCC unit cells.
16. Mention the characteristics of seven primitive unit cells and their possible variation as centered unit cells.
17. Name the centered unit cells and position of atoms in each centered unit cell.
18. What do you mean by coordination number? Give the coordination number of atoms in a) one dimensional arrangement of atoms b) square close packing in two dimension.c) hexagonal close packing in two dimension c) hexagonal close packing in three dimension d) cubic close packing or fcc in three dimension e) cation in triangular void.f) cation in tetrahedral void g) cation in cubic void h) bcc
19. A compound has hexagonal close packing structure. Determine the total number of voids, number of tetrahedral void, and number of octahedral voids in 0.5 mole of this compounds.
20. Calculate the number of octahedral and tetrahedral voids in unit cells of a)SCC b)BCC c)FCC
21. Distinguish between a) octahedral and tetrahedral voids b) Schottky and Frenkel defect. c) Hexagonal closed packing and cubic close packing d) crystal lattice and unit cell.e) para magnetism and ferro magnetism f) hexagonal and monoclinic unit cell g) face centered and end centered unit cell.
22. Calculate the % efficiency of packing in a)SCC b)BCC c) FCC
23. If the radius of octahedral void is r and the radius of atoms in close packing is R, derive the relationship between r and R.
24. What are interstitial defects? Mention its effect on density of a solid.
25. What is the effect of adding a)$SrCl_2$ to NaCl b) $CdCl_2$ to AgCl?
26. Explain the terms with suitable examples a) Stoichiometric and non stoichiometric defects b) F centre c) Metal deficiency defect d) 12-16 and 13-15 compounds e) paramagnetism f) diamagnetism g) ferromagnetism h) ferrimagnetism i) antiferromagnetism
27. What happens when a) NaCl crystal is heated with Na vapors b) ZnO is heated c) Fe_3O_4 is heated.
28. Explain n type and p type conduction with suitable examples.
29. Classify the following as n type or p type semi conductors. a) Ge doped with In b) B doped with Si.
30. In terms of band theory explain the differences between conductor , insulator, and semi conductor. Draw a neat diagram to show the valence band and conduction band in conductor, insulator and semi conductor.

31. Derive the expression for determining the density of unit cell.

Numerical

1.Iron(II) oxide crystallize as Fe 0.93O. Find the %Fe^{2+} and Fe^{3+} in this compound

2. A Solid AB has NaCl structure. If the radius of cation A^+ is 100 pm, what is the possible maximum and minimum radius of anion B^-

3. If the radius of Mg^{2+}, Cs^+, O^{2-},S^{2-} and Cl^- ion are 0.65 A^0, 1.69 A^0, 1.40 A^0, 1.84 A^0 and 1.81 A^0 respectively. Find the coordination number of MgO,MgS and CsCl.

4. In corundum, oxide ion are in hcp and aluminium ion occupy 2/3 of the octahedral void. What is the formula of aluminium oxide?

5. A cubic solid is made up of two elements P and Q. Q occupies corners of the cube and P occupies the body centre. What is the formula of the compound?

6. In a crystalline solid anion C occupies ccp, cation A occupies 50% tetrahedral void and cation B occupies 50% octahedral void. What is the formula of the compound?

7. If NaCl is doped with 10^{-3} mole % $SrCl_2$. What is the concentration of cation vacancies?

8. Sodium metal crystallizes in bcc with a cell edge of 4.3 A^0. What is the radius of sodium atom?

9. Copper crystallizes in fcc with a density 9g/cm^3.Calculate the radius of copper atom (Atomic mass of Cu=63)

10. Cr crystallizes in bcc with atomic diameter 250pm. Determine the density of unit cell. (Atomic mass of Cr=52)

11. Calculate the value of Avagadro number. Given Density of unit cell of NaCl=2.165 g/cm^3 Distance between Na^+ and Cl^- is 281pm. Atomic mass of NaCl= 58.5.

12. CsBr has bcc structure.a= 400pm Calculate the distance between Cs^+ and Br^-

13. KF has NaCl structure. Find the distance between K^+ and F^-. Density of unit cell= 2.5 g/ cm^3 (Molar mass of KF = 58)

14. An element crystallizes in bcc. a = 288 pm. How many atoms are there in 208 grams of this elements?

15. An element crystallizes in fcc with a = 200 pm. Calulate its density if 200grams of this element contains 24x 10^{23} atoms.
16. Unit cell of an element has atomic mass 108. d= 10.5 g/cm^3 a= 409 pm. Find the structure of the crystal lattice.

17. A compound has hexagonal close packing structure. Determine the total number of voids, number of tetrahedral void, and number of octahedral voids in 0.5 mole of this compounds.

18. Al crystallizes in a cubic close packing structure. Its metallic radius is 125 pm .Find the edge length of the unit cell. How many unit cells are there in 1cm^3 of Al ? How many atoms are there in 1cm^3 of Al ?

19. Silver chrysalises in FCC with an edge length 409 pm and density 10.5g/cm^3. Calculate the Atomic mass of silver.

Chapter-2-Solutions- 5 Marks

1. Define the following terms: a) molarity b) molality c) mole fraction d) mass% e) volume % f) parts per million g) azeotrope.
2. What is the effect of temperature on the molarity of the solution ?
3. molality, mole fraction, and mass% are independent of temperature. Why?
4. What is the effect of temperature on the solubility of a) solid in a liquid b) gas in a liquid ?
5. State Henry’s law. Give the mathematical expression for the law.
6. Mention three applications of Henry’s law.
7. State Raoult’s law for a solution containing two volatile solvents. Give the

mathematical expression for the law.

8. Derive the mathematical expression to show that the relative lowering of vapor pressure of a solution containing a nonvolatile solute and a volatile solvent is equal to the mole fraction of the solute.
9. Mention the condition where Raoult's law becomes a special case of Henry's law.
10. What are ideal solutions? Mention the conditions for a solution to behave ideally. Draw a graph of vapor pressure vs mole fraction for an ideal solution.
11. What are non ideal solutions? Mention the conditions for a solution to behave non ideally.
12. Explain the type of deviation exhibited by a mixture of a) ethanol and acetone b) acetone and chloroform. c) phenol and aniline. Draw a graph of vapor pressure vs mole fraction in each case.
13. What do you mean by the terms a) maximum boiling azeotrope b) minimum boiling azeotrope. Give one example each.
14. What are colligative properties? Give four examples.
15. Explain the following colligative properties with suitable graphs. a) elevation of boiling point b) depression of freezing point.
16. Define K_f and K_b. Give mathematical expression to show that K_f and K_b depends on the nature of the solvent.
17. Define osmosis and osmotic pressure. Why is osmotic pressure method is considered as a better method when compared to other colligative properties to determine molar mass of the solute.
18. What is reverse osmosis? Mention one application of the same.
19. What do you mean by abnormal molar mass? How does it occur due to a) association of solute? b) dissociation of solute?
20. What is Van't Hoff factor i? Give its value for a) association of solute. b) dissociation of solute. c) solute which is neither associates nor dissociates.
21. Which is more concentrated? 1 molar or 1 molal solution. Why?
22. What do you mean by the terms a) isotonic solution. b) hypertonic solution c) hypotonic solution?
23. Account for the following:
    a) intravenous injection is given by using 0.9% NaCl (mass/volume) solution.
    b) Dried fruits and vegetables swell when kept in fresh water.
    c) The tanks used by scuba divers are diluted with helium.
    d) Mountain climbers sometimes get symptoms of a condition known as anoxia.
    e) Calcium chloride is added to clear the roads covered by snow.
    f) Raw mango placed in concentrated salt solution shrivel in to pickle.
    g) People suffering from high blood pressure are advised to take minimum quantity of salty food.
    h) People taking lot of salty food get affected by edema.
    i) Meat is preserved by salting and fruits are preserved by adding sugar.

24. What will happen when a blood cell is placed in a) solution having NaCl concentration less than 0.9%(mass/volume) b) solution having NaCl concentration higher than 0.9%(mass/volume)?

Numerical

I- Concentration of solutions

---

1. A sample of drinking water contains 15 ppm of $CHCl_3$(by mass) Express this in % mass.Also find out the molality of the solution.
2. Concentrated H_2SO_4 is 49% by mass. Density of the solution is 1.5 g/ cm^3. Determine the molality and molarity of the solution.(Molar mass of $H_2SO_4 = 98$)
3. Concentated HNO_3 is 68% by mass. Density of the solution is 1.5 g/ cm^3. Calculate the volume of the solution containing 20 grams of HNO_3.
4. Na_2CO_3 and $NaHCO_3$ mixture containing 1 gram is completely neutralised by 0.1 M HCl. Determine the volume of HCl needed if the mixture contains equimolar mixture of Na_2CO_3 and $NaHCO_3$.
5. Calulate the molality of 1M solution of $NaNO_3$.Density of solution is 1.25 g/ cm^3. Molar mass of $NaNO_3 = 85$.
6. Calculate the number of moles of CH_3OH in 5 litres of 2 molal solution. Density of the solution is 0.981 g/ cm^3
7. Calculate the molality , molarity and mole fraction of KI if the density of 20% (mass/mass) aqueous solution of KI is 1.2 g/ cm^3
8. If the solubility product of CuS is $6x10^{-6}$. Calculate the maximum molarity of CuS in aqueous solution.
9. Calculate the volume of 80% H_2SO_4 (D=1.8 g/ cm^3) needed to prepare 1 litre of 20% H_2SO_4 (D=1.25 g/ cm^3.)
10. If the density of lake water is 1.25 g/ cm^3 and contains 92 grams of Na^+ ion per Kg of water, determine the molality of Na^+ ion in solution.

II- Henry's law

1. How many millimoles of N_2 gas would dissolve in 1 litre of water at 293K? N_2 gas exerts a pressure of 0.987 bar. K_H for N_2 at 293 K is 76.4 kilo bar.
2. Partial pressure of ethane over a saturated solution containing $6.56x10^{-2}$ gram of ethane is 1 bar. What will be the partial pressure of the gas if it contains $5x\ 10^{-2}$ grams of ethane.
3. Solubility of H_2S in water at STP is 0.195 m. Calculate K_H.
4. K_H for CO_2 in water is $1.67x10^8$ Pa at 298K. Calculate the mass of CO_2 that can be dissolved in 500 ml of water at a pressure of 2.5 atmosphere at 298K. (1 atm= $1.013\ x10^5$ Pa)
5. Air is a mixture gases. It contains 20% by volume of O_2 gas and 79% by volume of N_2 gas at 298K. Water is in equilibrium with air at a pressure of 10 atmospheres. K_H

for O_2 and N_2 at 298 K are 3.30×10^7 mm and 6.51×10^7 mm respectively. Determine the composition of these gases in water.

III- Raoult's law and Colligative properties.

1. Vapour pressure of $CHCl_3$ and CH_2Cl_2 at 298K are 200 mm Hg and 415mm Hg respectively.(i) Calulate the vapour pressure of the solution by mixing 25.5 g of $CHCl_3$ and 40 g of CH_2Cl_2 at 298K (ii) mole fraction of each component in vapour phase.(Molar mass $CHCl_3$ =118.5 CH_2Cl_2 = 85)
2. The vapour pressures of pure liquids A and B are 450 and 700 mm Hg respectively at 350K. Find the composition of liquid mixture if the total pressure is 600 mm Hg. Also find the composition in vapour phase.
3. Calculate the mass of non volatile solute which should be dissolved in 114 g of octane to reduce its vapour pressure to 80%
(Molar mass of solute=40, Molar mass of octane=114)
4. Benzene and naphthalene forms ideal solution at 300K. Vapour pressure of pure benzene and naphthalene are 50.71 and 32.06 mm Hg respectively at 300K. Find the mole fraction of each components in vapour phase if 80 g of benzene mixed with 100 g naphthalene.(Molar mass benzene = 78, naphthalene = 128)
5. Benzene and toluene forms an ideal solution at 300K Vapour pressure of pure benzene and pure toluene are 160 mm and 60 mm Hg respectively. Calculate the total pressure of the solution under the following conditions :
a)mixing equal number of moles of benzene and toluene.
b) equal mass of benzene and toluene. Also find the composition of benzene and toluene in vapour phase in each case.
6. Vapour pressure of solution containing benzene and toluene is (180x+120) mm Hg where x is the mole fraction of toluene. Find the p^0 benzene and p^0 toluene respectively.
7. A solution containing 1 mole of X and 3 moles of Y gave a vapour pressure of 550 mm Hg. The same solution containing 1 mole of X and 4 moles of Y gave a vapour pressure of 560 mm Hg. Find vapour pressure of pure X and pure Y.
8. Vapour pressure of dilute solution of glucose is 750 mm Hg at 373K. Find the mole fraction and molality of glucose in solution.
9. Vapour pressure of water is 12.3 kPa at 300K. Calculate the vapour pressure of 1 molal solute in it.
10. A solution containing 30 g of non volatile solute in 90 g of water has a vapour pressure of 2.8 kPa at 300K. Further 18 g of water added to the solution changed the vapour pressure to 2.9kPa. Calculate the molar mass of the solute added and vapour pressure of water at 300K.
11. Vapour pressure of pure benzene at 300K is 640 mm Hg. 2.175 g of non volatile solute in 39 g of benzene gave a vapour pressure of 600 mm Hg. Find the molar mass of solute added.(Molar mass of benzene=78)

12. A very small amount of solute in 60 ml of benzene gave a vapour pressure of 98.88 mm Hg. Vapour pressure of pure benzene is 100 mm Hg at this temperature. Find the molality of the solution. If $\Delta T_f = 0.73K$ find K_f of benzene.

13. 34.2 g of sucrose and 36 g of glucose dissolved in 81 g of water at 300K find the vapour pressure of the solution. Vapour pressure of water at 300K= 30 mm Hg.
Molar mass of sucrose=342, glucose = 180.

14.Two elements A and B forms two compounds AB_2 and AB_4 respectively. When dissolved in 20 g of benzene 1 g of AB_2 lowers the freezing point by 2.3K while 1 g of AB_4 decreased the freezing point by 1.3K. Calculate the atomic masses of A and B.
K_f of benzene= 5.1 K Kg mole^{-1}

15. At 300K 36 g of glucose in 1 liter solution exerted an osmotic pressure of 4.98 bar. What would be the concentration of the solution at 300K if it exerts a pressure of 1.52 bar.

16. 5% solution of sucrose (Molar mass =342) is isotonic with 0.877% solution of urea. Determine the molar mass of urea.

17. Calculate the freezing point and boiling point of 1M solution of KCl. Density of the solution = 1.04 g/ml Molar mass of KCl= 74.5 $K_b = 0.52$ K Kg mole^{-1}
$K_f = 1.86$ K Kg mole^{-1}. Assume KCl undergoes 90% dissociation.

18. $BaCl_2$ and KCl mixed in 1: 1 molal ratio showed a boiling point elevation of 2.6K. Determine the mass of each solute in 100 g water. $K_b = 0.52$ K Kg mole^{-1}
Assume that both the solute undergoes 100% dissociation. Molar mass KCl = 74.5
$BaCl_2 = 208$

19. K_f of benzene is 4.90 K Kg mole^{-1}. 3.26 g of Se in 226 gram of benzene showed a freezing point depression of 0.112^0C. Determine the molecular formula of Se.
Atomic mass of Se= 78.8 benzene = 78

20. 1.8 g of glucose in 100 ml is added to 34.2 g of sucrose in 100 ml. Find the osmotic pressure of the resulting solution. R= 0.0821 l atm mol^{-1} K^{-1}

21. 2 grams of benzoic acid (molar mass =122) in 25 g benzene gave $\Delta T_f = 1.62K$
K_f of benzene is 4.90 K Kg mole^{-1} Find i and % association of benzoic acid if it exists as a dimmer.

22. 0.6 ml of acetic acid having density 1.06 g/ml is dissolved in 1 liter of water.
$\Delta T_f = 0.0205^0C$. Find the Van't Hoff factor and dissociation constant of the acid.
Molar mass of acetic acid = 60 $K_f = 1.86$ K Kg mole^{-1}

23. 5% solution of sucrose has a freezing point of 271K.Calculate the freezing point of 5% glucose in water. Freezing point of water is 273.15K.

24. Which of the following solution in water will have a) lowest freezing point b) highest freezing point. c) lowest boiling point d) highest boiling point?
0.1M NaCl, 0.1 M $BaCl_2$, 0.1 M urea and 0.1 M $Al_2(SO_4)_3$

25. Calculate the depression in freezing point of water when 10 g of 2-Chloro butanoic acid is added to 250 g of water. $K_a = 1.4 \times 10^{-3}$ $K_f = 1.86$ K Kg mole^{-1}
Molar mass of 2-Chloro butanoic acid =122.5

26. 19.5 g of Fluoro ethanoic acid (molar mass =78) is dissolved in 500 g of water. $\Delta T_f = 1^0C$.
Calculate the Van’t Hoff factor and dissociation constant of the acid.
27. Determine the amount of $CaCl_2$(i = 2.47) dissolved in 2.5 litres of water such that its osmotic pressure is 0.75 atm at 300K.

Chapter-3-Electrochemistry-5 Marks

1. Mention the differences between electrolytic cell and electrochemical cell.
2. Explain the terms a) electrode potential b) standard electrode potential c) cell
3. potential d) electromotive force of a cell.
4. What will happen when a) $E_{ext} = 1.10$ V b) $E_{ext} < 1.10$ V c) $E_{ext} > 1.10$ V is applied on the cell $Zn / Zn^{2+} || Cu^{2+}/ Cu$?
5. What is SHE ? How will you determine the potential of a) Zn electrode b) Cu electrode using SHE ?
6. $E^0\ Zn^{2+} / Zn = - 0.76$ V and . $E^0\ Cu^{2+} / Cu = + 0.34$ V. What does positive and negative sign convey ?
7. Account for the following:
   a) Zn displaces hydrogen from dilute HCl while Cu can not.
   b) Li is the strongest reducing agent while Fluorine is strongest oxidising agent.
   c) copper sulphate solution can not be stored in zinc vessel.
   ($E^0\ Cu^{2+} / Cu = + 0.34$ V $E^0\ Zn^{2+} / Zn = - 0.76$ V $E^0\ Li^+ / Li = - 3.05$ V
   $E^0\ F_2 /2 F^- = + 2.87$ V)
8. Which of the following reactions are feasible?
   a) Fe^{3+}(aq) and I^- (aq) b) Fe^{3+}(aq) and Br^- (aq)
   ($E^0\ Fe^{3+} / Fe^{2+} = 0.77$ V, $E^0\ I_2 /2 I^- = 0.54$ V, $E^0\ Br_2 /2 Br^- = 1.09$ V)
9. Write Nernst equation for the following cells at 298 K
   a) $Cr/ Cr^{3+} || Fe^{2+} / Fe$
   (0.1M) (0.1M)
   b) $Zn + Sn^{4+} \longrightarrow Zn^{2+} + Sn^{2+}$
   (1.5M) (0.5M) (2M)

10. Explain the terms a) resistance b) resistivity c) conductance d) conductivity e) molar conductivity.
11. What is the effect of temperature on a) electrolytic conductivity b) metallic conductivity?
12. How does conductivity of an electrolyte solution varies with the dilution?
13. How does molar conductivity of an electrolyte solution varies with the dilution ?

14. Write the Kohlrausch equation and draw a graph to show the variation of molar conductivity with √c for a) KCl b) CH_3COOH.
15. State Kohlrausch law of independent migration of ions.. Mention two applications of the law.
16. Give the products of electrolysis of a) NaCl (molten) b) NaCl (aq) c) H_2SO_4(aq)
 d) $CuSO_4$(aq) using inert electrode like Pt e) $CuSO_4$(aq) using Cu electrodes
 f) $AgNO_3$(aq) using Ag electrode g) $AgNO_3$(aq) using Pt electrode.
17. Write the reactions involved at each electrode in Leclanche cell. Mention the disadvantage of this cell.
18. Write the reactions involved at each electrode in mercury cell. Why does the cell potential of this cell remains constant?
19. What are fuel cells? Write the reactions involved at each electrode in H_2-O_2 fuel cell.
20. Give one similarity and one difference between fuel cell and other primary cells.
21. What are secondary cells? Write the reactions involved at each electrode in lead storage cell when a) battery is in use b) battery is not in use.
22. Write the equation of the overall reaction in Ni-Cd cell. during discharge.
23. Explain corrosion of iron as a electrochemical process. Mention the methods to prevent corrosion.
24. Iron bar A is coated with Zn and another bar B is coated with Sn. Which will rust faster when the coating is broken ?.
25. State Faraday's laws of electrolysis. What is Faraday constant?

Numerical

I-Resistance,conductivity and Kohlrausch law

1. Resistance of a conductivity cell filled with 0.1M KCl is 100 ohm. If the resistance of the same cell filled with 0.02 M KCl is 520 ohm, calculate the conductivity and molar conductivity of 0.02 M KCl. Conductivity of the 0.1M KCl is 1.29 s/m.
2. Resistance of a column of 0.05 M NaOH solution of diameter 1 cm and length 50 cm is 5.55×10^3 ohm. Calculate the resistivity and molar conductivity of the solution.
3. Resistance of 0.01M CH_3COOH solution is 2220 ohm. Cell constant is 0.366 cm^{-1}. Calculate the degree of dissociation and dissociation of CH_3COOH at this concentration. Given Λ^0 HCl, NaCl, CH_3COONa are 425,128 and 96 scm^2 $mole^{-1}$ respectively.
4.. Λ^0 $Al_2(SO_4)_3$ is 858 scm^2 $mole^{-1}$. Find Λ^0 of Al^{3+} if Λ^0 of $SO_4^{2-}$is 160 scm^2 $mole^{-1}$.

II – Nernst Equation

5. Calculate the potential of hydrogen electrode in contact with a solution of p^H =10.
6. At what p^H of HCl solution will the standard hydrogen electrode will have a potential of -0.118V ?
7. Calculate the cell potential of $Cr/Cr^{3+}|| Fe^{2}/ Fe$.
 (0.1M) (0.1M) Given $E^0 Cr^{3+}/Cr = - 0.74V$

$E^0Fe^{2+}/Fe = -0.44V$.

8. Calculate the cell potential at 298K

$Zn + Sn^{4+} \longrightarrow Zn^{2+} + Sn^{2+}$

(1.5M) (0.5M) (2M)

Given $E^0Zn^{2+}/Zn = -0.76V$ $E^0Sn^{4+}/Sn^{2+} = 0.13V$

9.. Calculate the equilibrium constant and work done by the cell

$Ni + Cu^{2+} \longrightarrow Ni^{2+} + Cu$ Given $E^0Ni^{2+}/Ni = -0.25V$ $E^0Cu^{2+}/Cu = 0.34$ V

10 . Find the emf of the cell $Pb/Pb^{2+}(0.001M)||$ Pt, Cl_2 (1.5 atm) / $2Cl^-(1M)$

$E^0Pb^{2+}/Pb = -0.13V$ E^0 $Cl_2/ 2 Cl^- = 1.36V$

11. Find the potential of the electrode Mg^{2+}/ Mg

$Mg^{2+} + 2e^- \longrightarrow Mg$ $E^0Mg^{2+}/Mg = -2.36$ V

12. An electrochemical cell is set up by dipping Cu in 0.1M $CuSO_4$(aq) and Ag in 0.1M $AgNO_3$(aq) Write reaction taking place at each electrode and overall reaction. Determine the potential of the cell at 298K

III- Faraday's laws of electrolysis

12. Calculate the amount of chlorine gas liberated when a current of 1.5 amperes for 90 minutes is passed through molten NaCl. (Atomic mass of Cl = 35.5)
13. Silver is electrodeposited by passing a current of 0.2 amperes for 3 hours on a vessel of surface area 800 cm^2 using silver nitrate as an electrolyte solution. Calculate the thickness of silver deposited..(Atomic mass of Ag=108) Density of Ag = 10.8 g/cm^3
14. Electrolysis of a metal salt solution resulted in the deposition of 1gram of metal by passing 1.5 amperes for 2 hours. Determine the charge carried by the metal ion. (Atomic mass of the metal = 27)
15. Three electrolytes A,B and C containing solutions of $ZnSO_4$, $CuSO_4$ and $AgNO_3$ were connected in series. 1.5 grams of Ag deposited by passing 1.5 amperes. How long did current flow? Find the mass of copper and zinc deposited. (Atomic mass of Cu = 63.5, Zn = 65.5)
16. How many coulomb of electricity is needed for the following reactions?
    a) 2 moles of MnO_4^- to Mn^{2+} b) 1 mole of H_2O to O_2 c) 9 grams of Al from molten $AlCl_3$ (atomic mass of Al=27)

Chapter-4-Chemical kinetics-5 Marks

1. Explain the following terms: a) average rate of a reaction b) instantaneous rate of a reaction. c) rate constant of a reaction d) rate law of a reaction e) order of a reaction f) molecularity of a reaction.
2. What do you mean by pseudo first order reaction. Give one example.
3. Give one example each of a) zero order reaction b) first order reaction.
4. Derive integrated rate law for a) zero order reaction b) first order reaction. Show that $t_{1/2}$ for a) zero order reaction is directly proportional to initial concentration of the reactant. b) first order reaction is independant initial concentration of the reactant.

5. Give differences between order and molecularity of a reaction.
6. What is activation energy? How is it related to rate constant K?
7. Give the unit of rate constant for a) zero order b) first order c) second order reaction.
8. What is pseudo first order reaction? Give one example.
9. Mention the conditions a reactant has to satisfy to become product.
10. A+B $\longrightarrow$ C+D Rate = $PZ_{AB}e^{-Ea/RT}$ What is the significance of P and $e^{-Ea/RT}$?
11. Draw the graph of reaction coordinate Vs potential energy for a reaction a) with out catalyst b) with catalyst.
12. Generally rate of a reaction doubles when the temperature is raised by 10K. Explain this statement with the help of the Maxwell Boltzmann distribution curve.
13. Explain collision theory of reaction rate with an example.
14. Draw the graphs a) concentration Vs time for reactant. b) Concentration Vs time for product c) concentration Vs time for a zero order reaction d) ln[R] vs time for a first order reaction e) potential energy diagram of a catalysed reaction.
15. What is meant by order of reaction being zero?
16. Half life of a reaction is inversely proportional to initial concentration of the reactant. Determine the order of this reaction.

Numerical

1. The decomposition ammonia on a platinum surface follows zero order kinetics. $2NH_3(g) \longrightarrow N_2(g)+3H_2(g)$ K= 2.5x10^{-4} mole/l/sec. Determine the rate of a) disapperance of NH_3 b) rate of formation of N_2 c) rate of formation of H_2.

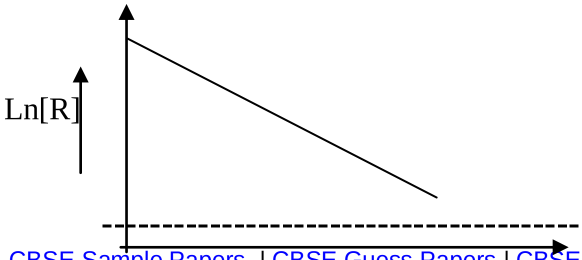
2. The decomposition ammonia on a platinum surface follows zero order kinetics. Calculate the value of rate constant K and the half life of the reaction. Given

Time (seconds)	Pressure of NH_3(g) in Pascal
0	4×10^{-2}
100	3.5×10^{-2}
200	3.0×10^{-2}
300	2.5×10^{-2}

3. A first order reaction is 20% complete in 10 minutes. Determine the time taken for 80% completion of the reaction.

4. $2A + B \longrightarrow A_2B$ K= 2.5 x10^{-4}M^{-2} sec^{-1} Find the rate when the initial concentrations of [A] = 0.1M [B] = 0.2 M. Also find the rate when 0.04 moles/litre of A has reacted. Rate=K[A][B]^2

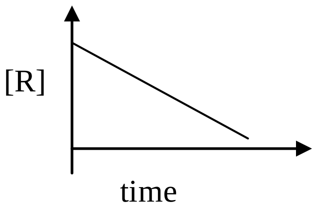
5. For a certain chemical reaction variation in the concentration in [R] versus time(s) plot is given below



Time

i) what is the order of the reactions?
ii) what are the units of rate constant k?
iii) give the relationship between k and $t_{1/2}$
iv) what does the slope of the above line indicate?
v) draw the plot $[R]_0 / [R]$ versus time(s)

6. Consider the reaction R → P. The change in the concentration of R with time is shown in the following plot.



i) Predict the order of the reaction.
ii) Write the expression for half life of this reaction.

7. $2NO_2+F_2 \longrightarrow 2NO_2F$ Write the rate of reaction in terms of (a) rate of formation of NO_2F (b) rate of disappearance of NO_2 (c)) rate of disappearance of F_2

8. The decomposition of NH_3 follows zero order. $2 NH_3 \longrightarrow N_2+3H_2$ Find the rate of production of N_2 andH_2.$K=2.5x10^{-4}MS^{-1}$

-1

9. $2A+B+C \longrightarrow A_2B+C$ Rate=$K(A)(B)_2$ $K=2x10_{-6}M_{-2}S_{-1}$ Calculate the initial rate when (A)=0.1M (B)=0.2M (C)=0.6M Find the rate when 0.04mole of (A) is consumed.

10. $2NO_2+F_2 \longrightarrow 2NO_2F$

Experiment	(NO_2)M	(F_2) M	Rate(M/S)
1	0.2	0.05	0.006
2	0.4	0.05	0.012
3.	0.8	0.10	0.048

Find the order with respect to NO_2 and F_2.Also find the overall order of the reaction. Deduce the mechanism of the reaction.

11. Show that(a) 2t½=t¾ (b)Half life of a reaction is 10seconds.Find $t_{2/3}$

12. Hydrolysis of methyl acetate in aqueous solution has been studied by titrating liberated acetic acid with NaOH rate=$K(CH_3COOCH_3)$ (H_2O)

t/min 0	30	60	90
c/M 0.8500	0.8004	0.7538	0.7096

Show that it follows pseudo first order reaction as the concentration of water remains constant (1L of water=1000g) What is the value of K?

13. The rates of a reaction starting with initial concentrations 2x10^{-3-3}M and1x10 $^{-3}$M are 2.4x10 $^{-4}$M/s and0.6x10 $^{-4}$M/s respectively. Find the order of the reaction and rate constant K.

10. $A+5B+6C \longrightarrow 3L+3M$

Experiment	(A)M	(B)M	(C)M	Rate M/minute
1.	0.02	0.02	0.02	00208
2.	0.01	0.02	0.02	0.00104
3	0.02	0.04	0.02	0.00416
4	0.02	0.02	0.04	0.00832

Determine the order with respect to each reactant. Find K .Calculate the initial rate when concentration of each reactant is 0.01M.Find the initial rate of change in concentrations of B and L

14. Rate of a reaction becomes 1.414 times when concentration of the reactant is doubled. Find the order of the reaction.

15. (a) show that for a first order reaction t½ is independent of the initial concentration of the reactant. (b) show that for a zero order reaction t½ is directly proportional to initial concentration of the reactant and inversely proportional to rate constant.

16. Rate constant of a reaction is 2M $^{-1}$ S $^{-1}$ at 700K and 32 M $^{-1}$ S $^{-}$1 at 800K.Find Ea

17. Rate of a reaction becomes 4 times when temperature changes from 27 ^{0}C to 37 ^{0}C. Find Ea.

18. Rate constant of a reaction at 700K and 760K are 0.01 M $^{-1}$S $^{-1}$and 0.105 M $^{-1}$ S $^{-1}$respectively. Find A and Ea .

19. Show that for a first order reaction, time required for 99.9% reaction is 10 times the time needed for 50% completion of the reaction.

20. A piece of wood shows C_{14} activity which is 60% activity found today. Find the age of the sample.t½=5770years.

21. The following data were obtained during the first order decomposition of SO_2Cl_2 at constant volume . $SO_2Cl_2(g) \longrightarrow SO_2(g) + Cl_2(g)$

Experiment	Time(sec)	Total pressure(atm)
1	0	0.5
2	100	0.6

Calculate the rate when total pressure is 0.65 atmospheres.

22. $2N_2O_5(g) \longrightarrow 2\,N_2O_4(g) + O_2(g)$ follows first order kinetics at constant volume.

Experiment	Time(sec)	Total pressure(atm)
1	0	0.5
2	100	0.512

Find the value of rate constant K.

23. The time required for 10% completion of a first order reaction at 298K is equal to that required for

25% completion at 308K. Find E_a. Calculate K at 318K.

24. $2HI(g) \longrightarrow H_2(g) + I_2(g)$ E_a at 581K is 209.5KJ/mole. Determine the fraction of molecules having energy equal to or greater than E_a.

25. E_a of a reaction is 75 KJ/mole in the absence of a catalyst and 50KJ/mole in the presence of a Catalyst at 300K. Determine the extent to which the rate of reaction is increased.

26. The rate constant for the first order decomposition of H_2O_2 is given as $\log K = 14.34 - 1.25 \times 10^4$ K/T. Calculate E_a for this reaction. At what temperature will its half life be 256 minutes?

27. The decomposition of hydrocarbon follows the equation $K = (4.5 \times 10^{11}\ sec^{-1})\ e^{-28000K/T}$ Calculate E_a

28. $2NO(g) + O_2(g) \longrightarrow 2NO_2(g)$ occurs in one step. What will happen to the rate when the Volume of the reaction vessel is reduced to 1/3 of the original volume?

29. A reaction is first order with respect to A and second order with respect to B. What will happen to the rate if concentration of A and B are doubled?

30. Rate of a reaction becomes 1.414 times when concentration of the reactant is doubled. Determine the order of the reaction.

31. Rate constant K of a reaction varies with the temperature according to the equation logK = constant- Ea/2.303RT where Ea is activation energy of the reaction. When a plot of logK vs 1/T , a straight line with a slope – 6670K is obtained. Find Ea. [R=8.314J/K/mole]

32. The possible mechanism for the reaction
$2\,NO(g) + O_2(g) \longrightarrow 2\,NO_2(g)$ is

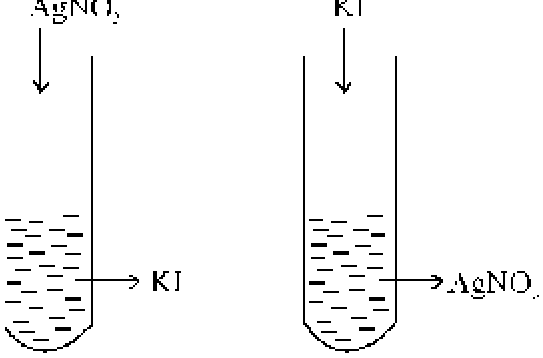
i) $NO(g) + O_2(g) \longrightarrow NO_3(g)$ [Fast]

ii) $NO_3(g) + NO(g) \longrightarrow NO_2(g) + NO_2(g)$ [slow]

Chapter -5-Surface Chemistry-4Marks

1. Give differences between a) adsorption and absorption b) physisorption and chemisorption c) lyophillic and lyophobic sol.
2. Explain the terms a) extent of adsorption(x/m) b) enthalpy of adsorption c) desorption d) adsorbent e) adsorbate
3. Mention the factors affecting the adsorption of gases on solids.
4. Explain Freundlich adsorption isotherm with suitable graphs.
5. Why is adsorption a) exothermic process b) surface property
6. Explain the effect of temperature on physisorption and chemisorption with graphs.
7. Mention five applications of adsorption.
8. Explain activity and selectivity of a catalyst with suitable examples.
9. What are shape selective catalysts? Give one example.
10. Give three examples each of homogeneous and heterogeneous catalysis.
11. Explain the mechanism of a) homogeneous catalysis b) heterogeneous catalysis.
12. Give three examples of reactions involving enzyme as catalyst. Explain the mechanism of enzyme catalysed reaction.
13. Mention the characteristics of enzyme catalysis.
14. Mention the disperse phase and dispersion medium in a) Milk b) butter c) cheese d) Fog e) mist f) froth
15. What do you mean by multi molecular and macro molecular colloids? Give two examples each.
16. What are associated colloids? How does it differ from multi molecular and macro molecular colloids? Give two examples of associated colloids.
17. Explain the terms a) kraft temperature b) CMC(critical micelle concentration)
18. Explain the mechanism of cleaning action of soap.
19. Action of soap is due to emulsification and micelle formation. Comment.
20. How is sulphur sol prepared by chemical method?

21. How is gold sol prepared by a) chemical method b) Bredig's arc method?
22. Mention the principle of dialysis.
23. What is Tyndall effect? Mention the condition for Tyndall effect to occur. Give two application of Tyndall effect.
24. What is Brownian movement? Mention the significance of Brownian movement
25. Describe and explain what is observed when a) beam of light is passed through a colloidal solution. b) an electric current is passed through a colloidal solution.
26. Account for the following:
    a) lyophillic colloids are more stable than lyophobic colloids.
    b) delta formation occurs at the river beds.
    c) alum or ferric chloride is added to stop bleeding.
    d) sky appears blue in colour.
    e) alum is used in water purification.
27. Explain the terms a) zeta potential b) Helmoltz electrical double layer c) coagulation d) Colloidion e)peptisation
28. Explain Hardy and Schulze rule with suitable examples.
29. What are emulsions? How are they classified? Give two examples each.
30. Explain the terms a) emulsification b) demulsification c) emulsifier.
31. Write two uses of emulsion.
32. List four applications of colloids.
33. What is coagulation value?
34. Out of ammonia and nitrogen which gas will be absorbed more readily on the surface of Charcoal and why?
35. How does adsorption of a gas vary with a) temperature b) pressure? Illustrate with graphs.
36. Describe some features of catalysis by zeloite. Mention one application of zeolite.
37. What do you mean by activation of adsorbent? How is it achieved?
38. A colloidal solution of AgI is prepared by two different methods shown below:-



(A) (B)

(i) What is the charge of AgI colloidal particles in the two test tubes (A) and (B)?
(ii) Give reasons for the origin of charge.

Chapter-6-General principles and process of isolation of elements-3Marks

1. Distinguish between mineral and ore.
2. Mention the steps involved in metallurgy.
3. Name the important ores of Al, Fe, Cu and Zn.
4. Explain the principles of a) Hydraulic washing b) Magnetic separation c) Froth floatation.
5. What is the role of depressant in froth floatation process? Name the depressant used in case of ore containing ZnS and PbS.
6. Mention the principle of leaching. Write the reactions involved in leaching of aluminium.
7. Write the reactions involved in leaching of Ag and Au.
8. Write the reactions involved in the extraction of a) Fe from hematite ore b) Cu from copper pyrite ore c) Zn from zinc blend ore d) Al from alumina
9. Explain roasting and calcinations with examples.
10. What is the role of cryolite in the extraction of Al from alumina?
11. How is copper extracted from its low grade ore and scraps?
12. Mention the principles of refining the metals by a) Distillation b) Liquation c) Electrolytic refining d) Zone refining e) Vapour phase refining

13. Explain the electrolytic refining of copper with the reactions involved at each electrode.
14. Mention the uses of Al, Cu, Zn , cast iron, wrought iron and steel.
15. Although thermodynamically feasible, in practice Mg is not used to reduce alumina. Why?
16. Why is the reduction of metal oxide easier if the metal formed is in liquid state at the temperature of reduction?
17. $Cr_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Cr$ $\Delta G^0 = - 421$ KJ/mole is thermodynamically feasible as is apparent from negative value of ΔG^0. Why does it not occur at room temperature ?
18. Is it true that under certain condition Mg can reduce Al_2O_3 and Al can reduce MgO? What are those conditions?
19. Out of Zn and Fe scraps, which is suitable to reduce leached copper ore and why?
20. Copper can be extracted by hydrometallurgy but not zinc. Why?
21. Mention the principle of chromatography.
22. Explain column chromatography.
23. What criterion is used for the selection of stationary phase in chromatography?
24. How is cast iron different from wrought iron?
25. Why is copper mate put in silica lined converter/
26. Out of C and Co, which is a better reducing agent for reducing ZnO and why?
27. Name the process by which chlorine is obtained as by product. What will happen when an aqueous solution of NaCl is electrolysed?

28.Standard Free energy of formation of Cr_2O_3 and Al_2O_3 are given as – 540KJ/mole and - 827KJ/mole respectively. Is it possible to reduce Cr_2O_3 using Al?
29. $\Delta_f G$ MgO and $\Delta_f G$ CO are given below
$\Delta_f G$ MgO(s) at 1273 K = - 941 KJ/mole
$\Delta_f G$ MgO(s) at 2273K = - 314 KJ/mole
$\Delta_f G$ CO (g) at 1273 K = - 439 KJ/mole
$\Delta_f G$ CO (g) at 2273 K = -628 KJ/mole
Determine which temperature is suitable for reduction of MgO using C?

Chapter-7-P block elements-8 Marks

Account for the following:

1. There is a considerable increase in covalent radius from N to P but from As to Bi only a small change is observed.
2. Ionisation enthalpy of group 15 elements is much higher than that of group 14 elements.
3. Ionic radius of Sb and Bi are very less when compared to the ionic radius of N,P and As.
4. Metallic character of group 15 elements increases on going down the group.

5. Tendency to show – 3 oxidation states in group 15 decreases on going down the group.
6. Nitrogen can't form penta halides.
7. Nitrogen exhibits $p\pi$- $p\pi$ bonding while heavier members exhibit $d\pi$-$p\pi$ bonding.
8. N_2 is a gas while P_4 is a solid.
9. Catenation tendency is weaker in nitrogen.
10. N_2 molecule is chemically inert while white phosphorus is more reactive.
11. In group 15, +3 oxidation state is more stable than +5 oxidation state on going down the group .
12. R_3 P=O is known but R_3 N=O is unknown.
13. Basicity of hydrides $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$
14. Stability of hydrides $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$
15. Reducing character of hydrides $NH_3 < PH_3 < AsH_3 < SbH_3 < BiH_3$
16. The oxides in higher oxidation states of group 15 elements are more acidic than that of lower oxidation state.
17. Basicity of group 15 oxides increases on going down the group.
18. PCl_5 is more covalent than PCl_3.
19. PCl_5 is more covalent than PF_5.
20. All the five bonds in PCl_5 are not equivalent.(Or) PCl_5 is more reactive than PCl_3.
21. Both PCl_3 and PCl_5 fumes in air.
22. PH_3 has lower boiling point than NH_3.
23. NH_3 acts as a lewis base.
24. NO_2 molecule dimerise to become N_2O_4.
25. Aluminium is rendered passive in concentrated HNO_3.
26. Concentrated HNO_3 becomes yellow when exposed to light.(Or) concentrated HNO_3 is an oxidizing agent.
27. White phosphorus is more reactive than red phosphorus. Black phosphorus is least reactive.
28. Bond angle in PH_4^+ is higher than that of PH_3.
29. HNH bond angle in NH_3 is less than the tetra hedral bond angle of 109.5^0.
30. Bond angles of HPH,HAsH and HSbH are closer to 90^0.
31. H_3PO_4 is tri protic, H_3PO_3 is diprotic while H_3PO_2 is mono protic.
32. H_3PO_2 is a good reducing agent.
33. H_3PO_2 is a stronger reducing agent than H_3PO_3.
34. NO is an odd electron molecule but does not dimerise to give N_2O_2.
35. Sulphur has very high boiling and melting point when compared to oxygen.
36. In group 16 tendencies to show -2 oxidation state decreases on going down the group.
37. In group 16 +4 oxidation state become more stable than +6 oxidation state on going down the group.
38. Oxygen can show a maximum covalency of 4 and it can not form hexa valent compound.
39. Acidity of group 16 hydrides $H_2O < H_2 S < H_2Se < H_2Te$.

40. Reducing character of group 16 hydrides H_2O <H_2 S < H_2Se < H_2Te
41. Boiling point of H_2O is higher than that of H_2 S.
42. Sulphur exhibit +6 oxidation state when it combines with fluorine.
43. SF_6 is exceptionally stable or it can not be hydrolysed easily.
44. SF_6 is known while SCl_6 is unknown.
45. SF_6 is known while SH_6 is unknown.
46. H_2O is a liquid while H_2S is a gas.
47. MnO is basic while Mn_2O_7 is acidic.
48. O_3 is thermo dynamically unstable than O_2 (or) . O_3 in higher concentration is explosive.
49. NO gas depletes ozone layer.
50. Sulphur in vapour state is paramagnetic.
51. HCl and HNO_3 are prepared by reacting NaCl and $NaNO_3$ respectively with H_2SO_4 while HBr and HI can't be prepared by this method.
52. Cane sugar chars in concentrated sulphuric acid.
53. Concentrated sulphuric acid is a good oxidizing agent.
54. Two S-O bonds in SO_2 are equivalent.
55. Ka_2 of H_2SO_4 is << Ka_1.
56. Halogens have maximum negative electron gain enthalpy in each period.
57. Fluorine has lesser negative value of electron gain enthalpy than chlorine.
58. All halogens are colored.
59. F_2 has smaller enthalpy of dissociation than Cl_2.
60. Fluorine has lesser negative value of electron gain enthalpy than chlorine but fluorine is a stronger oxidizing agent than chlorine.
61. Fluorine shows only – 1 oxidation state. Other halogens can exhibit positive oxidation state.
62. Halogens show positive oxidation state when they combine with oxygen and fluorine atoms.
63. Halogens are good oxidizing agent and oxidizing power (reactivity) decreases with the increase in atomic number.
64. Most of reactions of fluorine are exothermic.
65. HF is a liquid while other hydrogen halides are gases.
66. HF has highest boiling point while HCl has lowest boiling point among hydrogen halides.
67. Acidity of hydrogen halides HF<HCl<HBr<HI
68. Thermal stability of hydrogen halides HF>HCl>HBr>HI
69. Thermal stability of group 16 hydrides H_2O> H_2S> H_2Se> H_2Te
70. OF_2 is fluoride of oxygen and not oxide of fluorine.
71. Oxygen and chlorine has similar electro negativity. Oxygen form hydrogen bonding but not chlorine.
72. Ionic character of halides MF>MCl>MBr>MI
73. Electron gain enthalpy of $O \rightarrow O^-$ is – 141 KJ/mole and O $O \rightarrow O^{2-}$ is + 702 KJ/mole.

Large number of oxides having O^{2-} is known and not O^-.

74. In metal halides, halides in higher oxidation state of the metal is more covalent than the one in lower oxidation state.($PbCl_4$ is more covalent than $PbCl_2$)
75. Inter halogen compound is more reactive than the halogens from which it is formed.
76. Chlorine is a powerful bleaching agent.
77. HCl reacts with Fe to give $FeCl_2$ and not $FeCl_3$
78. Fluorine forms only one oxo acid HOF
79. Acidity of oxo acids $HClO_4 > HClO_3 > HClO_2 > HClO$.
80. Acidity of oxo acids HOCl>HOBr>HOI
81. Oxidizing power of $HClO_4 > HClO_3 > HClO_2 > HClO$
82. Fluorine form fluoride of oxygen while other halogens form oxides of halogen.
83. Group 18 elements are chemically unreactive.
84. Group 18 elements have very high ionization enthalpy and it decreases on going down the group.
85. Group 18 elements have positive value of electron gain enthalpy.
86. Group 18 elements have lower value of boiling and melting point and it increases on going down the group.
87. Group 18 elements have larger atomic radius.
88. Bartlett synthesized $XePtF_6$ from his knowledge of earlier known compound O_2PtF_6.
89. Xenon forms noble gas compounds.
90. Xenon forms compounds only with oxygen and fluorine.
91. Helium is used in diving apparatus.
92. Oxygen has lesser negative value of electron gain enthalpy than Sulphur.
93. XeF, XeF_3 and XeF_5 not known.
94. Chlorine uses its yellow colour in aqueous solution.
95. CN^- is known but CP^- is not known.
96. Nitrogen and Bismuth do not form pentavalent compounds.
97. PCl_5 solid is ionic in nature.
98. Cr, Al do not dissolve in concentrated HNO_3.
99. Both HF and H_2O forms Hydrogen bonding but boiling point of H_2O is higher than HF
100. Acidic character of $PH_3 < H_2S < HCl$
101. ONO bond angle in NO_2^- is higher than that of NO_2^+
102. N-O bond length in NO_2 is shorter than N-O bond length in NO_3
103. In HNO_3 N-O bond length in NO_2 is shorter than N-O bond length in N-OH
104. Oxidising power of Oxoacids of chlorine is $HClO_4 < HClO_3 < HClO_2 < HClO$

1. Draw the resonating structures of a) NO b) NO_2 c) N_2O d) N_2O_3 e) N_2O_4 f) N_2O_5. g) O_3. Also draw the structures of each clearly depicting the bond parameters.

2. Draw the resonance structures of SO_2.

3. Draw the structures of a) NH_3 b) HNO_3 c) White phosphorus d) Red phosphorus e) PCl_3 f) PCl_5 g) Phosphoric acid h) Phosphorus acid i) Hypo phosphorus acid j) Pyro phosphoric acid k) cyclic tri meta phosphoric acid l) Poly meta phosphoric acid. m) S_8 n) S_6 o) Sulphuric acid p) sulphurus acid q) Peroxo di sulphuric acid r) Pyro sulphuric acid (oleum) s) HOCl t) $HClO_2$ u) $HClO_3$ v) $HClO_4$ w) BrF_3 x) IF_5 y) IF_7 z) IF_4^- aa) SF_4 bb) SF_6 cc) $XeOF_4$ dd) BrO_3^- ee) XeF_2 ff) XeF_4 gg) XeF_6 hh) $XeOF_4$ ii) XeO_3

4. Give the formula and structure of noble gas species which is iso structural with a) ICl_4^- b) IBr_2^- c) IF_6^- d) BrO_3^-

5. Why does nitrogen shows anomalous behavior? Give examples to show the anomalous behavior of nitrogen.

6. Why does oxygen shows anomalous behavior? Give examples to show the anomalous behavior of oxygen.

7. Why does fluorine shows anomalous behavior? Give examples to show the anomalous behavior of fluorine.

8. Describe the method of preparation of a) NH_3 by Haber process b) HNO_3 by Ostwald process c) H_2SO_4 by contact process. Give three uses of each.

9. Explain brown ring test for nitrate with suitable equations.

10. What is disproportionation reaction? Give equation of the reactions involved in the disproportionation of a) HNO_2 b) Se_2Cl_2 c) H_3PO_3

11. How is ozone estimated quantitatively?

12. Give two uses each of a) N_2 b) PH_3 c) O_2 d) Ozone e) SO_2 f) Cl_2 g) ClO_2 h) BrO_3 i) I_2O_5 j) Cl_2 k) HCl l) ClF_3 m) He n)Ne O) Ar p) Kr q) Xe
13. How is NH_3(aq) used in salt analysis to determine the presence of a) Fe^{3+} b) Zn^{2+} c) Ag^+ in salt analysis. Write the equations of the reactions involved.
14. How is the presence of SO_2 detected?

15. What is aqua regia? How does it dissolve noble metals like Au and Pt? Write the equations of the reactions involved.
16. Give differences between white phosphorus and red phosphorus.
17. How is a)N_2 b) O_2 c) Cl_2 prepared in the laboratory? Write the equations of the

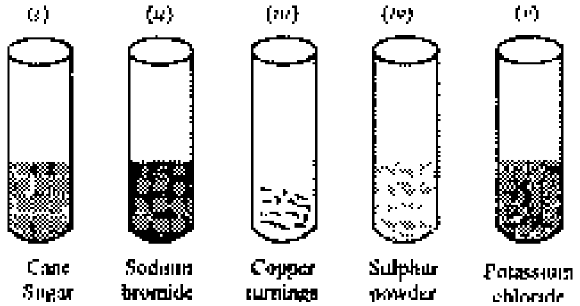
reactions involved.

18. How is a)N_2 b) O_2 c) Cl_2 manufactured in the industry? Write the equations of the reactions involved in the manufacture of Cl_2.
19. How is ammonia prepared in laboratory? Write the equation of the reaction involved.
20. How is HNO_3 prepared in laboratory? Write the equation of the reaction involved.
21. How is phosphine prepared from a) Calcium phosphide b) White phosphorus. Write the equations of the reactions involved.
22. How is PCl_5 prepared from a) Cl_2 b) SO_2Cl_2? Write the equations of the reactions involved
23. How is PCl_3 prepared from a) Cl_2 b) $SOCl_2$? Write the equations of the reactions involved
24. How is HCl prepared from NaCl? Write the equations of the reactions involved
25. Write the chemical formula of a) Chile saltpetre b) Indian saltpetre c) Fluorapatite d) Gypsum salt e) Epsom salt f) Baryte g) Galena h) Zinc blende i) Copper pyrite j) Florospar k) cryolite l) Fluoroapatite m) carnalite. n) Tear gas o) mustard gas p) phosgene
26. With what neutral molecule ClO^- is iso electronic? Is that molecule a lewis base?
27. Compare the chemistry of α and β Sulphur.What is the transition temperature of α and β Sulphur.
28. How is phosphine purified? Write the equations of the reactions involved.

29. A white waxy solid A on heating in an inert atmosphere forms its allotrope B. A reacts with concentrated alkali to form a toxic gas C. A reacts with excess of chlorine to give D. D on hydrolysis gives an acid E. Identify the compounds. Write the reactions involved.

30. An yellow colored solid A forms its hydride B. B has foul smell and extensively used in salt analysis. B on oxidation gives C. C further gets oxidized in the presence of a catalyst to give D. C decolorize acidified potassium permanganate. Identify the compounds. Write the reaction involved in the conversion of C to D and the reaction of C with acidified potassium permanganate solution.

31. Concentrated sulphuric acid is added followed by heating to each of the following test tubes labelled (i) to (v)



Identify in which of the above test tube the following change will be observed. Support your answer with the help of a chemical equation.

(a) Formation of black substance
(b) Evolution of brown gas
(c) Evolution of colourless gas
(d) Formation of brown substance which on dilution becomes blue
(e) Disappearance of yellow powder along with evolution of colourless gas.

32. Give the products and balance the following reactions:

1. $HNO_2 \xrightarrow[\Delta]{}$
2. $NH_4Cl + NaNO_2 \xrightarrow{}$
3. $(NH_4)_2Cr_2O_7 \xrightarrow[\Delta]{}$
4. $Ba(N_3)_2 \xrightarrow[\Delta]{}$
5. $NaN_3 \xrightarrow[\Delta]{}$
6. $Li + N_2 \xrightarrow{}$
7. $Mg + N_2 \xrightarrow{}$
8. $N_2 + H_2 \xrightarrow[Fe \quad 773K]{}$
9. $N_2 + O_2 \xrightarrow[200K]{}$
10. $NH_2CONH_2 + H_2O \xrightarrow[\Delta]{}$
11. $NH_4Cl + Ca(OH)_2 \xrightarrow{}$
12. $(NH_4)_2SO_4 + NaOH \xrightarrow{}$
13. $NH_3 + H_2O \xrightarrow{}$
14. $FeCl_3 + NH_4OH \xrightarrow{}$
15. $ZnSO_4 + NH_4OH \xrightarrow{}$

16. $Cu^{2+}\ NH_3 \rightarrow$
17. $AgCl+NH_3 \rightarrow$
18. $NaNO_3+H_2SO_4 \rightarrow$
19. $NH_3+O_2 \xrightarrow[\text{9 bar}]{\text{Pt/Rh 500K}}$
20. $NO+O_2 \rightarrow$
21. $NO_2+H_2O \rightarrow$
22. $HNO_3+H_2O \rightarrow$
23. $Cu+HNO_3$(Dilute) $\rightarrow$
24. $Cu + HNO_3$(Conc) $\rightarrow$
25. $Zn+ HNO_3$(Dil) $\rightarrow$
26. $Zn+ HNO_3$ (conc) $\rightarrow$
27. $I_2 + HNO_3$(conc) $\rightarrow$
28 $C + HNO_3$(conc) $\rightarrow$
29. $S_8 + HNO_3$(conc) $\rightarrow$
30. $P_4 + HNO_3$(conc) $\rightarrow$
31. $P_4+NaOH+H_2O \rightarrow$
32. $P_4 +O_2$(Excess) $\rightarrow$
33. $Ca_3P_2+H_2O \rightarrow$
34. $Ca_3P_2 +HCl \rightarrow$
35. $PH_3+HI \rightarrow$
36. $PH_3+HBr \rightarrow$
37. $PH_4I +KOH \rightarrow$
38. $P_4 +Cl_2 \rightarrow$
39. $P_4 +Cl_2$ (excess) $\rightarrow$
40. $P_4 +SOCl_2 \rightarrow$
41. $P_4 +SO_2Cl_2 \rightarrow$
42. $PCl_3 + H_2O \rightarrow$
43. $PCl_3 +CH_3COOH \rightarrow$
44. $PCl_3 + C_2H_5OH \rightarrow$
45. $PCl_5 + H_2O \rightarrow$
46. $PCl_5 + CH_3COOH \rightarrow$
47. $PCl_5 + C_2H_5OH \rightarrow$
48. $PCl_5 +Ag \rightarrow$
49. $PCl_5 + Sn \rightarrow$
50. $PCl_5 \xrightarrow[\text{Heat}]{}$
51. $H_3PO_3 \xrightarrow[\text{Heat}]{}$

52. $AgNO_3+H_2O+H_3PO_2 \rightarrow$
53. $CuSO_4 +PH_3 \rightarrow$

54. $HgCl_2 + PH_3 \longrightarrow$

55. $Se_2Cl_2 \longrightarrow$

56. $KClO_3 \xrightarrow{\text{Heat}}$

57. $Ag_2O \xrightarrow{\text{Heat, } MnO_2}$

58. $HgO \xrightarrow{\text{Heat}}$

59. $Pb_3O_4 \xrightarrow{\text{Heat}}$

60. $PbO_2 \xrightarrow{\text{Heat}}$

61. $H_2O_2 \xrightarrow[\text{}]{\text{Heat } MnO_2}$

62. $Ca+O_2 \longrightarrow$

63. $Al + O_2 \longrightarrow$

64. $C+ O_2 \longrightarrow$

65. $ZnS+ O_2 \longrightarrow$

66. $CH_4+ O_2 \longrightarrow$

67. $SO_2 + O_2 \longrightarrow$

68. $HCl + O_2 \longrightarrow$

69. $C_2H_4+ O_2 \longrightarrow$

70. $SO_2 + H_2O \longrightarrow$

71. $CaO+H_2O \longrightarrow$

72. $Al_2O_3+HCl+H_2O \longrightarrow$

73. $Al_2O_3+NaOH+H_2O \longrightarrow$

74. $O_2 \xrightarrow{\text{silent electric discharge}}$

75. $PbS +O_3 \longrightarrow$

76. $I^- +H_2O+O_3 \longrightarrow$

77. $I_2+Na_2S_2O_3 \longrightarrow$

78. $NO+O_3 \longrightarrow$

79. $SO_3^{2-} +H^+ \longrightarrow$

80. $FeS_2+O_2 \longrightarrow$

81. $SO_2+H_2O \longrightarrow$

82. $SO_2+NaOH \longrightarrow$

83. $SO_2+Na_2SO_3+H_2O \longrightarrow$

84. $SO_2+Cl_2 \longrightarrow$

85. $SO_2+O_2 \xrightarrow[V_2O_5]{}$

86. $SO_2+Fe^{3+}+H_2O \longrightarrow$
87. $SO_2+MnO_4^{-}+H^{+} \longrightarrow$
88. $SO_3+H_2SO_4 \longrightarrow$
89. $H_2S_2O_7+H_2O \longrightarrow$
90. $MX + H_2SO_4 \longrightarrow$ (X=F,Cl,NO_3)
91. $C_{12}H_{22}O_{11} \xrightarrow{\text{conc } H_2SO_4}$

92. Cu +conc $H_2SO_4 \longrightarrow$
93. S+ conc $H_2SO_4 \longrightarrow$
94. C+ conc $H_2SO_4 \longrightarrow$
95. $F_2+2X^{-} \longrightarrow$
96. $Cl_2+2X^{-} \longrightarrow$
97. $Br_2+2X^{-} \longrightarrow$
98. $F_2+H_2O \longrightarrow$
99. $X_2+H_2O \longrightarrow$ (X=Cl,Br and I)
100. $I^{-}+H^{+}+O_3 \longrightarrow$
101. Mg $+Br_2 \longrightarrow$
102. $MnO_2+HCl \longrightarrow$
103. $KMnO_4+HCl \longrightarrow$
104. $NaCl+MnO_2+HCl \longrightarrow$
105. Al+ $Cl_2 \longrightarrow$
106. Fe+ $Cl_2 \longrightarrow$
107. $H_2+ Cl_2 \longrightarrow$
108. $H_2S + Cl_2 \longrightarrow$
109. $C_{10}H_{16}+ Cl_2 \longrightarrow$
110. $NH_3+ Cl_2 \longrightarrow$
(excess)
111. $NH_3+ Cl_2 \longrightarrow$
(excess)
112. NaOH + $Cl_2 \longrightarrow$
(cold and dilute)
113. NaOH + $Cl_2 \longrightarrow$
(Hot and conc)
114. $Ca(OH)_2+ Cl_2 \longrightarrow$
115. $CH_4+ Cl_2 \longrightarrow$
116. $C_2H_4+ Cl_2 \longrightarrow$
117. $FeSO_4+H_2SO_4+ Cl_2 \longrightarrow$
118. $Na_2SO_3+H_2O+Cl_2 \longrightarrow$
119. $SO_2+ H_2O+Cl_2 \longrightarrow$
120. $I_2 + H_2O+Cl_2 \longrightarrow$
121. $NaCl+H_2SO_4 \longrightarrow$

122. $NaHSO_4+NaCl \longrightarrow$

123. $HCl + H_2O \longrightarrow$

124. $NH_3+HCl \longrightarrow$

125. $Au+H^++NO_3^-+Cl^- \longrightarrow$

126. $Pt+ H^++NO_3^-+Cl^- \longrightarrow$

127. $Na_2CO_3+HCl \longrightarrow$

128. $NaHCO_3+ HCl \longrightarrow$

129. $Na_2SO_3+ HCl \longrightarrow$

130. $Fe+ HCl \longrightarrow$

131. $Cl_2+F_2 \xrightarrow{437K}$

132. Cl_2+F_2 (excess) $\xrightarrow{573K}$

133. $I_2+Cl_2 \longrightarrow$

134. I_2+Cl_2 (excess) $\longrightarrow$

135. $Br_2+F_2 \longrightarrow$

136. Br_2+F_2 (excess) $\longrightarrow$

137. $ClF+H_2O \longrightarrow$

138. $ClF_3+H_2O \longrightarrow$

139. $BrF_5+H_2O \longrightarrow$

140. $IF_7+H_2O \longrightarrow$

141. $U+ClF_3 \longrightarrow$

142. $^{226}_{88}Ra \longrightarrow$ (α decay)

143. $Xe+F_2 \xrightarrow[1\ bar]{673K}$

144. $Xe+F_2 \xrightarrow[7\ bar]{873K}$

145. $Xe+F_2 \xrightarrow[60\text{-}70\ bar]{573K}$

146. $XeF_4+O_2F_2 \longrightarrow$

147. $XeF_2 +PF_5 \longrightarrow$

148. $XeF_4 +SbF_5 \longrightarrow$

149. $XeF_6+MF \longrightarrow$ (M=Na,K,Rb,Cs)

150. $XeF_2 +H_2O \longrightarrow$

151. $XeF_4 +H_2O \longrightarrow$

152. $XeF_6+H_2O \longrightarrow$
153. XeF_6+H_2O(partial hydrolysis) $\longrightarrow$
154. XeF_6+2H_2O(partial hydrolysis) $\longrightarrow$

Chapter-8- DandF block elements-5 Marks

Account for the following

1. Zn, Cd and Hg are not considered as transition metals.
2. Cu,Ag &Au are considered as transition metal though it has $3d^{10}$ configuration.
3. Zn, Cd and Hg are volatile and Hg is a liquid metal.
4. Transition metals have high enthalpy of atomisation.
5. 4d and 5d elements have higher enthalpy of atomisation than 3d elements.
6. Density of 3d elements increases from Sc to Ni.
7. Atomic and ionic radii generally decrease along the period.
8. Zr and Hf have similar size.
9. Transition metals do not show regular variation of ionisation enthalpies.
10. 5d elements have higher ionisation enthalpy than 3d and 4d elements.
11. Generally first ionisation enthalpy increases along the period.
12. Cr &Cu has higher second ionisation enthalpy (Cr=24,Cu=29)
13. Mn &Zn has higher 3rd ionisation enthalpy (Mn=25 Zn=30)
14. Cu, Ni and Zn normally do not exhibit oxidation state higher than +2.
15. Transition metals show variable oxidation state.
16. Transition metals do not show regular variation of E^0 values.
17. E^0 Mn^{3+}/Mn^{2+} have higher +ve value than E^0 Cr^{3+}/Cr^{2+}.(Cr=24 Mn=25).
18. E^0 Zn^{2+}/Zn has higher – value. (Zn=30).
19. Transition metals form complexes easily.
20. Transition metals act as catalysts.
21. Transition metal compounds are paramagnetic.
22. Sc^{3+},Cu^{+} and Zn^{2+} are diamagnetic .Sc=21 Cu=29 Zn=30).
23. Oxidation state of transition metals increases by one unit.
24. E^0 Ni^{2+}/Ni has higher – ve value.
25. Transition metal compounds are coloured.
26. Sc^{3+},Cu^{+} and Zn^{2+} are colourless .[Sc=21 Cu=29 Zn=30].
27. Transition metals form interstitial compounds easily.
28. Transition metals form alloys easily.
29. Higher oxides of transition metals are acidic.
30. Enthalpy of atomization of transition metals reaches a maximum in the

middle of each series

31. Lanthanoid ions are coloured and paramagnetic.
32. La^{3+} and Lu^{3+} are colourless and diamagnetic. (La=57 Lu=71).
33. Ln are paramagnetic.
34. La^{3+} is diamagnetic.
35.Ce is stable in +4 oxidation state. E^0 Ce^{4+}/Ce^{3+} has higher positive value.
36. Eu^{2+} is a good reducing agent.(Eu=63).
37.Ce^{4+} is a good oxidising agent .
38. Yb^{2+} is stable. It acts as a reducing agent. (Yb=70).
39. In lanthanoid hydroxide $M(OH)_3$ basic character decreases with increase in atomic number.
40. Actinoids show greater range of oxidation state than lanthanoids.
41. Actinoid contraction is greater than lanthanoid contraction.
42. Ionisation enthalpies of early actinoids are lesser than that of early lanthanoids.
43 In the d^4 species Mn^{3+} is an oxidising agent where as Cr^{2+} is a reducing agent
44. Co(II) is stable in aqueous solution but get oxidised in the presence of complexing agents.
45. d^1 configuration is unstable in transition metals.
46. Transition metals exhibit higher oxidation state in oxides and flourides.
47 Zn has lowest enthalpy of atomisation.
48. First ionization enthalpy of Cr is lower while Zn is higher.(Cr=24, Zn=30)
49. Zn has lower second ionization enthalpy.
50. Number of oxidation states at the extreme ends of 3d transition metals are very few.
51. Transition metals in higher oxidation states are more stabilized in oxides than in fluorides.
52. E^0 Cu^{2+}/Cu is positive.
53. E^0 Sc^{3+}/Sc^{2+} has lower value (Sc=21)
54. E^0 Zn^{3+}/Zn^{2+} have higher positive value.
55. E^0 Fe^{3+}/Fe^{2+} has comparatively lower positive value than E^0 Mn^{3+}/Mn^{2+} (Mn=25, Fe=26)
56. E^0 V^{3+}/V^{2+} have lower negative value (V=23)
57. Cu^{2+} (aq) is more stable than Cu^+ (aq) despite the d^{10} configuration of Cu^+
58. Highest fluoride of Mn is MnF_4 while highest oxide is Mn_2O_7.
59. Oxidising power of Oxides $VO^{2+} < Cr_2O_7^{2-} < MnO_4^-$
60. $KMnO_4$ titration is not carried out using HCl as acid medium.
61. Third ionization enthalpy of La, Gd and Lu are abnormally low(La=57, Gd=64, Lu=71)
62. 5f electrons can take part in bonding to a greater extent than 4f electron though both have similar angular wave function.

63. Highest oxidation state is exhibited by oxoanion in transition metals.
64. Generally negative value of $E^0\ M^{2+}/M$ decreases across the series of 3d elements.
65. It is unsatisfactory to review the chemistry of actinoids in terms of oxidation state.
66. Lower oxides of transition metal are basic while higher oxides are acidic.
67. Sc exhibits only one oxidation state.
68. Cr^{2+} is stronger reducing agent than Fe^{2+}
69. Mo(VI) and W(VI) are more stable than Cr(VI)
70. There is a greater horizontal similarity in the transition metals than in the main group elements.
71. Nickel (II) does not form low spin octahedral complexes.
72. Transition elements form pi complexes.
73. There is more frequent metal-metal bonding in 4d and 5d transition elements.

1. What is lanthonoid contraction? What is the reason for lanthonoid contraction? Mention the consequences of lanthonoid contraction.

2. What is mischmetal? Mention two uses of mischmetal.

3. How is a) $KMnO_4$ prepared from pyrolusite ore? b) $K_2Cr_2O_7$ prepared from chromite ore?

4. Write the ionic equations of the reactions involved when acidified $KMnO_4$ is treated with
a) FAS solution b) oxalic acid solution c) hydrogen sulphide d) KI solution e) Sn^{2+}solution
f) SO_3^{2-} g) NO_2^- h) SO_2

5. Write the ionic equation of the reaction involved when alkaline $KMnO_4$ is reacted with a) KI solution. b) $S_2O_3^{2-}$

6. Write the ionic equation of the reaction involved when acidified $K_2Cr_2O_7$ reacts with a) Sn^{2+} solution b) SO_2 c) hydrogen sulphide d) Fe^{2+}

7. What is the effect of P^H on chromate and dichromate solutions?

8. Compare the chemistry of lanthonoids and actinoids with reference to
a) electronic configuration b) oxidation state c) ionization enthalpy d)chemical reactivity e) magnetic behaviour f) atomic size
9. What is actinoid contraction? Why is it more pronounced than lanthonoid contraction?

10. Compare the general characteristic of first row transition metals with those of second and third series metals in the respective vertical columns with reference to a) electronic configuration b) oxidation state c) ionization enthalpies d) atomic size.

11.Compare the stability of +2 oxidation state for the elements of the 3d series.

12. Cr^{2+}(aq) is a better reducing agent than Fe^{2+} despite the half filled stability of Fe^{3+} Why?

13 Which transition metal exhibit only one oxidation state. Why?

14.For M^{2+}/M and M^{3+}/M^{2+} systems E^0 values of some metals are given below.

Cr^{2+}/Cr	- 0.9V	Cr^{3+}/Cr^{2+}	- 0.4V
Mn^{2+}/Mn	- 1.2V	Mn^{3+}/Mn^{2+}	+ 1.5V
Fe^{2+}/Fe	- 0.4V	Fe^{3+}/Fe^{2+}	+ 0.8V

Use the data to comment upon:

a) Stability of Fe^{3+} in acid solution when compared to Cr^{3+} and Mn^{3+}

b) ease with which iron can be oxidized as compared to chromium and manganese.

15. Outer electronic configuration of elements a) X= $4f^1\ 5d^1\ 6s^2$ b) Y=$4f^7\ 5d^0\ 6s^2$ Determine the a) atomic numbers of X and Y b) Stable oxidation states of X and Y.c) Which is an oxidizing agent and which is a reducing agent? Why?

16.Outer electronic configuration of element X is $5f^7\ 6d^0\ 7s^2$ Determine the atomic number of the element. What is the stable oxidation state of this element?

17.Draw the structures of a) manganate ion b) permanganate ion c) chromate ion and d) dichromate ion.

18. What is disproportination reaction? Give the reaction involving disproportination of a) Cu^+ ion b) MnO_4^{2-} ion.

19. Discuss the general properties of transition metals with reference to a) electronic configuration b) atomic radius b) ionization enthalpy c) oxidation state d) magnetic behavior e) colored compounds f) complex formation g) catalytic behavior h) interstitial compounds i) alloy formation j) electrode potential(M^{2+}/M and M^{3+}/M^{2+}k)stability of higher oxidation state

20. What are transition metals? Which three elements are not considered as transition metals though they are kept in d block? In which way the electronic configuration of transition element differ from non transition elements?

21. Compare the stability of +2 oxidation state of the elements with electronic configurations $3d^6 4s^2$, $3d^5 4s^2$ and $3d^3 4s^2$.

22. A colored compound A when fused with alkali gives a green colored compound B. B on Electrolysis gives a purple colored compound C. Identify the compounds. Write the reactions involved. Also write the equation of the reaction involved in the disproportination reaction of B in acid medium.

23. Determine the number of unpaired electrons in Mn^{2+} ion. Calculate the magnetic moment in Bohr maneton unit.

24. Which transition element exhibit only one oxidation state? Why?

25. An element X has atomic number 58 and another element Y has atomic number 95.
a) Give the ground state electronic configuration of X and Y.
b) Give their stable oxidation state. c) Is X an oxidizing or reducing agent? Why?
d) Is Yan oxidizing or reducing agent? Why?

26. In which way the variation in oxidation state of transition metal differ from representative elements?

Chapter-9-Coordination compounds-3Marks

1.Write IUPAC names of the following compounds
a)$[Co(NH_3)_5Cl]Cl_2$ b) $[Cr(NH_3)_6]^{3+}$ c) $[Ni(NH_3)_6]Cl_2$ d) $[CoCl(NO_2)(NH_3)_4]Cl$
e) $[Co(en)_2(ONO)_2]Cl$ f) $[Cr(NH_3)_5(H_2O)]^{3+}$ g) $K_3[Co(C_2O_4)_3]$ h) $Na_3[Cr(OH)_2F_4]$
i) $[Co(NH_3)_6][Cr(CN)_6]$ j)$[Pt(NH_3)_2Cl(NH_2CH_3)]Cl$ k) $[Ni(CO)_4]$ l) $[CrCl_3(Py)_3]$

2. Write the IUPAC name of ionization isomer of $[Co(NH_3)_5Br]SO_4$

3. Write the IUPAC name of linkage isomer of $[Co(en)_2(ONO)_2]Cl$

4. Write the formula of the following coordination compounds:
   a) Tris (ethane-1,2-diamine)cobalt(III)sulphate b) Amminebromidochloridonitrito-N-platinate(II) c) Pottasiumtetrachloridopalladate(II) d) Tetrahydroxozincate

5. Explain the following with suitable examples a) coordination entity b)ligand c) coordination number d) coordination polyhedron e) homoleptic f) heterolrptic

6. What is meant by unidentate, bidentate and ambidentate ligands? Give two examples each.

7. Give an example of hexadentate ligand.

8. Explain chelation with a suitable example.

9. Write the IUPAC name and indicate the oxidation state,electronic configuration and coordination number of the central metal in the complex $[Co(NH_3)_5Cl]Cl_2$
   Also give the primary and secondary valency of the metal. Give the stereochemistry and magnetic moment of this complex.

10. Mention the limitations of valence bond theory.

11. Using valence bond theory, predict the structure and the magnetic behavior of the below given complexes:
    a) $[Fe(CN)_6]^{4-}$ b) $[Fe(CN)_6]^{3-}$ c) $[NiCl_4]^{2-}$ d) $[Ni(CN)_4]^{2-}$ e) $[Cr(NH_3)_6]^{3+}$
    f) $[Co(NH_3)_6]^{3+}$ g) $[Ni(CO)_4]$ h) $[Fe(CO)_5]$ i) $[MnCl_4]^{2-}$ j) $[CoF_6]^{3-}$ k) $[Co(en)_3]^{3+}$
    m) $[Co(C_2O_4)_3]^{3-}$ n) $[Mn(CN)_6]^{3-}$ o) $[Ni(NH_3)_6]^{3+}$ p) $[Fe(H_2O)_6]^{3+}$ q) $[Mn(CN)_6]^{4-}$
    r) $[FeF_6]^{3-}$ s) $[MnCl_6]^{3-}$ t) $[MnBr_4]^{2-}$

12. Name two properties of central metal ion which enables it to form stable complex entities.

13. A coordination compound has the formula $CoCl_3.4NH_3$. It does not liberate ammonia but gives precipitate of AgCl with $AgNO_3$ solution. Give the structural formula and IUPAC name of the complex.

14. Account for the following:
    a) $[Fe(CN)_6]^{4-}$ is diamagnetic while $[Fe(CN)_6]^{3-}$ is paramagnetic.
    b) $[NiCl_4]^{2}$ is tetrahedral while $[Ni(CN)_4]^{2-}$ is square planar.
    c) Hydrated copper sulphate is colored while anhydrous copper sulphate is colorless.
    d) $[Ti(H_2O)_6]^{3+}$ become colorless on heating.

e) $[Ni(H_2O)_6]^{2+}$ is green while $[Ni(CN)_4]^{2-}$ is colorless.
f) $[Fe(CN)_6]^{4-}$ and $[Fe(H_2O)_6]^{2+}$ show different colors in aqueous solution..
g) $[Cr(NH_3)_6]^{3+}$ is paramagnetic while$[Ni(CN)_4]^{2-}$ is diamagnetic.
h) Tetrahedral complex do not exhibit geometrical isomerism.

15. What is the difference between inner orbital and outer orbital complexes? Illustrate with one example each.

16. How the given factor affect the stability of complex a) charge on cation b) nature of ligand.

17. Illustrate the following with an example each:
a) linkage isomerism b) ionization isomerism c)coordination isomerism d) hydrate isomerism e) geometrical isomerism f) optical isomerism

18. Draw the geometrical isomers of $[Co(NH_3)_3(NO_2)_3]$ and label them.

19. Give a chemical test to distinguish between $[Co(NH_3)_5Cl]SO_4$ and$[Co(NH_3)_5SO_4]Cl$
What type of isomerism does they exhibit?

20. Draw the structure of optical isomers of a)$[Co(en)_3]^{3+}$ b) $[Cr(C_2O_4)_3]^{3-}$ c) $[PtCl_2(en)_2]^{2+}$
d) $[Cr(NH_3)_2Cl_2(en)]^{+}$

21. Draw the structure of all the isomers (geometrical and optical) of $[CoCl_2(en)_2]^{+}$
b) $[Co(NH_3)_2Cl_2(en)]^{+}$ c) $[Co(NH_3)Cl(en)_2]^{2+}$

22. A metal ion M^{n+} having d^4 configuration combine with three didentate ligand to form a complex compound. Assuming $\Delta_0 > P$
i) Draw the diagram showing d orbital splitting during this complex formation.
ii) Write the electronic configuration of the valence electron of the metal M^{n+} ion in terms of t_{2g} and e_g.
iii) What type of hybridisation will M^{n+} ion have?
iv) Draw the structure of isomers exhibited by this complex.

23. Draw the figure to show the d orbital splitting in tetrahedral complex.

24. Mention the limitations of crystal field theory.

25. What is spectrochemical series? Explain the difference between strong and weak ligand.

26. Calculate the overall complex dissociation constant of the complex $[Cu(NH_3)_4]^{2+}$
β_4 for the complex is $2x10^{13}$.

27. The spin only magnetic moment of the complex$[MnBr_4]^{2-}$ is 5.9B.M. Predict the geometry of the complex.

28. Calculate the spin only magnetic moment of the complex a) $[Fe(CN)_6]^{4-}$ b) $[CoF_6]^{3-}$
29. Aqueous copper sulphate gives green precipitate with KF(aq) but bright green solution with KCl(aq). Explain these results.

30. What is the coordination entity formed when excess of KCN is ttreated with aqueous copper sulphate. Why is that no precipitate of copper sulphide is formed when H_2S is passed through this solution?

31. Give one application each of coordination compounds in a) analytical chemistry b) biological system c) medicine d)extraction of metal/metallurgy e) estimation of hardness of water.

32. Draw the structures of a) $[Ni(CO)]_4$ b) $[Fe(CO)]_5$ c)[$Cr(CO)]_6$ d) $[Mn_2(CO)]_{10}$ e) $[Co_2(CO)]_8$. Explain the bonding in metal carbonyls.

Chapter-10-Haloalkanes and Haloarenes-4 Marks

1. Give one example each of a) Markwonikov's addition. b) Kharasch effect. c) Sand Meyer reaction d) Diazotisation reaction e) Finkelstein reaction f) Swarts reaction. g) Wurtz reaction h) Wurtz Fittig reaction i) Fittig reaction j) Friediel craft's acylation reaction of chloro benzene k) Friediel craft's alkylation reaction. of chloro benzene. l) nitration of chloro benzene. m) sulphonation of chloro benzene. n) Dehydro halogenation (β elimination reaction) o) Zatsev rule. p) chlorination of chloro benzene.

2. Explain the classification of halo alkanes based on a) number of halogen atoms. b) compounds having sp^3 C-X bond c) compounds having sp^2 C-X bond d) dihalides. Give one example each and their IUPAC names.

3. Account for the following:
   1) Halo alkanes have higher boiling point than the corresponding parent alkane.
   2) Boiling point of halo alkanes RI>RBr>RCl> RF
   3) Boiling point of 1-Bromo butane >2-Bromo butane> 1-Bromo- 2-methyl propane> 2-Bromo- 2-methyl propane.
   4) Melting point of p-Dichlo benzene is higher than its ortho and meta isomer.
   5) Halo alkanes are polar in nature but sparingly soluble in water.
   6) Iodo alkane can not be prepared by the reaction of alcohol with KI and sulphuric acid. Phosphoric acid is used in place of sulphuric acid.
   7) Order of reactivity of alcohol with HX is tert alcohol> sec alcohol > primary alcohol..
   8) Halo arenes can not be prepared by treating phenol with HX or NaX in the presence of sulphuric acid.
   9) Iodination of benzene is carried out in the presence of HIO_3 or HNO_3.
   10) Propane on chlorination gives 2-chloro propane as a major product and not 1-chloro propane.
   11) Kharasch effect is possible only with HBr and not with HCl and HI.
   12) Alcohol reacts with thionyl chloride to give pure halo alkane.
   13) Finkelstein reaction of halo alkane is carried out in the presence of dry acetone.
   14) Order of reactivity of halo alkanes as per substitution bimolecular nucleophilic is primary halide > secondary halide>tertiary halide.

15) Order of reaction as per substitution unimolecular is tertiary halide>secondary halide >primary halide.
16) Benzylic halides and allylic halides are more reactive towards nucleophile than halo alkanes.
17) Chloro ethene is less reactive towards nucleophile than chloro ethane.
18) Halo arenes are less reactive towards nucleophile than halo alkanes.
19) S_N^1 mechanism is ruled out in the reaction of halo arenes with nucleophile.
20) Electron with drawing groups like NO_2 at ortho and para position with respect to halogen facilitates nucleophillic substitution reaction.
21) Electron with drawing groups like NO_2 at meta position with respect to halogen has no effect on nucleophillic substitution reaction.
22) Halo arenes are less reactive towards electrophile than benzene.
23) Although chlorine atom has electron with drawing effect electrophillic substitution occur at ortho and para position.
24) Order of reactivity of alkyl halide RI>RBr>RCl>RF
25) Halo alkanes react with KCN to give alkyl cyanide as a major product while it gives alkyl isocyanide as a major product with AgCN.
26) Halo alkanes give nitrito alkane with KNO_2 while nitro alkane with $AgNO_2$.
27) CH_3I undergoes S_N^2 reaction faster than CH_3Cl.

4. Explain the following with suitable examples: a) chiral and chirality b) enantiomers c) racemic mixture d) retention of configuration e) inversion of configuration.

5. Mention the differences between S_N^1 and S_N^2 mechanism of halo alkane.

6. Give the products and explain the mechanisms of the following reactions:
   a) $CH_3\,CH_2\,Br + OH^- \longrightarrow$

   b) $(CH_3)_3C\text{-}Br + OH^- \longrightarrow$
   c) n-BuBr + KOH $\longrightarrow$

7. Carry out the following conversions:
   1. Propene to a) Propan-1-ol b) Propan-2-ol
   2. Ethanol to but-1-yne
   3. 1-Bromo propane to 2-Bromo propane and vice versa.
   4. Toluene to benzyl alcohol.
   5. Benzene to a) 4-bromonitro benzene b) 3-bromonitro benzene.
   6. Benzyl alcohol to 2-phenyl ethanoic acid.
   7. Ethanol to a) Propane nitrle b) Ethyl isocyanide.
   8. Aniline a) Chloro benzene b) Bromo benzene c) Iodo benzene.
   9. 2-Chloro butane to 3,4- dimethylhexane.

10. 2-Methyl-1-propene to 2-chloro-2-methylpropane.
11. Ethyl chloride to propanoic acid.
12. But-1-ene to n-butyl iodide.
13. 2-chloropropane to propan-1-ol
14. Isopropyl alcohol to iodoform.
15. Chloro benzene to a) p-nitro phenol b) p-chloronitro benzene c) p-chloro methyl benzene. d) p- chloro acetophenone. e) p-chloro benzene sulphonic acid f) 1,4-Dichloro benzene. g) biphenyl.
16. Chloroethane to butane.
17. tert-butyl bromide to isobutyl bromide.
18. Aniline to phenylisocyanide.
19. Propene to a) 2,3-dimethyl butane b) n-hexane.
20. Tert-butyl bromide to 2-methyl prop-1-ene.

8. What happens when
   a) n-butyl chloride is treated with alcoholic KOH.
   b) bromobenzene is treated with Mg in the presence of dry ether.
   c) chlorobenzene is subjected to hydrolysis.
   d) ethyl chloride is treated with aqueous KOH.
   e) methyl bromide is treated with Na in the presence of dry ether.
   f) methyl chloride is treated with a)KCN b)AgCN c)KNO_2 d)$AgNO_2$

9. Write the structure of the major organic product in each of the following reactions:

a) $CH_3CH_2Cl + NaI \xrightarrow[heat]{acetone}$

b) $(CH_3)_3\,C\text{-}Br + KOH \xrightarrow[heat]{ethanol}$

c) $CH_3CH_2Br + KCN \xrightarrow{ethanol}$

d) $C_6H_5ONa + CH_3Br \longrightarrow$

e) $CH_3CH_2OH + SOCl_2 \longrightarrow$

f) $CH_3\,CH{=}CH_2 + HBr \xrightarrow{peroxide}$

g) $CH_3\,CH{=}CH_2 + HBr \longrightarrow$

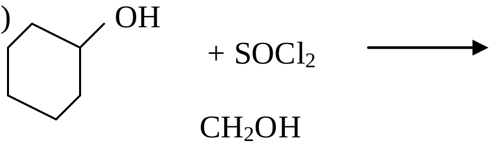
h) $(CH_3)_2C{=}CH_2 + HBr \longrightarrow$

i) $CH_3CH{=}C(CH_3)_2 + HBr \longrightarrow$

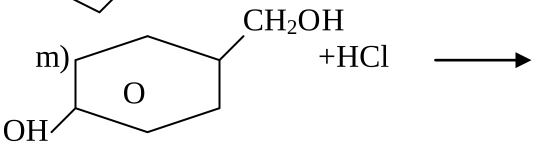
j) $CH_3CH_2CH_2OH + SOCl_2 \longrightarrow$

k) $CH_3CH_2Br + NaI \longrightarrow$

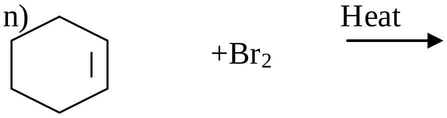
l)



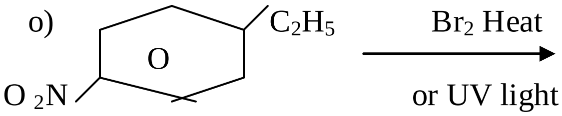
m)



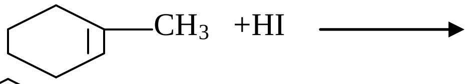
n)



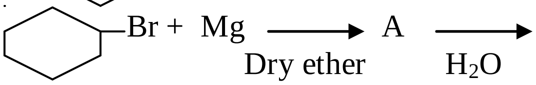
o)



p)



q)



r) $RBr + Mg \xrightarrow[\text{Dry ether}]{} A \xrightarrow[D_2O]{} CH_3CH(D)CH_3$

s) $(CH_3)_3C\text{-}C(CH_3)_3 \xleftarrow[\text{Na/ether}]{} RX \xrightarrow[\text{Mg/ether}]{} A \xrightarrow[H_2O]{} B$

10. Arrange the compounds of each set in order of decreasing reactivity towards a) S_N2 displacement. b) S_N1 displacement.
    a) 2-bromo-2-methylbutane, 1-bromopentane, 2-bromo pentane
    b) 1-bromo-3-methylbutane, 2-bromo-2-methylbutane,3-bromo-2-methylbutane
    c) 1-bromo butane, 1-bromo-2-methyl propane, 1-bromo-2-phenyl propane.
    d) Methyl chloride, Methyl bromide and Methyl iodide.

11. Primary halide A(C_4H_9Br) with alcoholic KOH gives a compound B. B on treatment with HBr gives C which is an isomer of A. A on treatment with Na in dry ether gives a compound D which is different from when n-butyl bromide is

reacted with Na in dry ether. Give the structural formula of A. Write the equations of the reactions involved.

12. An alkyl halide $C_7H_{15}Br$ is optically active. It reacts with KOH solution to give racemic mixture. Explain the mechanism of the reaction.

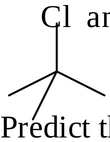
13. Distinguish chemically between a) CH_3Cl, CH_3Br, CH_3I b) Chloro benzene and chloro methane c) chloro benzene and benzyl chloride d) $CHCl_3$ and CCl_4

14. Primary alkyl halide A (C_4H_9Br) react with alcoholic KOH to give B.B reacts with HBr to give C which is an isomer of A. When A is treated with sodium in dry ether it gives a compound D C_8H_{18} which is different from the compound when n-butyl bromide is treated with sodium. Give the structural formula of A and complete the reaction.

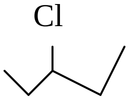
15. Which alkyl halide from the following pairs would you expect to react more rapidly by S_N^2 Mechanism? Explain your answer.
a) 1-Bromo butane and 2-Bromo butane. b) 2-Bromo butane and 2-Bromo-2-methyl propane.
c) Cyclo hexyl chloro methane and chloro cyclo hexane.d) Iodo butane and chloro butane.

16. Which alkyl halide from the following pairs would you expect to react more rapidly by S_N^1 Mechanism? Explain your answer.

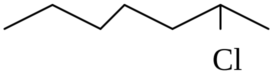
a)



and



b)



and

17. Predict the order of reactivity of the following compounds in S_N^1 and S_N^2 mechanism.
a) $C_6H_5CH_2Br$ b) $C_6H_5CH(C_6H_5)Br$ c) $C_6H_5CH(CH_3)Br$ d) $C_6H_5(CH_3)(C_6H_5)Br$. Explain your answer.

18. Arrange the following in the increasing order of boiling point.
a) Bromomethane, Bromoform, Chloromethane and Dibromomethane.
b) 1-Chloropropane, 1-Chlorobutane and isopropyl chloride.

19. Among the isomeric alkanes C_5H_{12}, identify the one that on photochemical chlorination yields a) A single monochloride molecule b) Three isomeric monochloride molecules
c) Four isomeric monochlorides.

Chapter-11-Alcohols,Phenols and ethers-4Marks

1. Write the equations of the following named reactions:
   a) Hydro boration b) williamson's synthesis
   c) cumene phenol process d) Kolbe's reaction e) Riemier Tiemann reaction

2. Explain Lucas test with suitable examples

3. Distinguish chemically between the following pairs of organic compounds
   a)Phenol and methanol b) methanol and ethanol c) propan-1-ol and propan-2-ol d) pentan-3-ol and 2-Methyl butan 2-ol

4. Account for the following:
   - a) COH bond angle in alcohol is less than tetrahedral angle of 109.5^0
   - b) COC bond angle in ether is more than tetrahedral angle of 109.5^0
   - c) C-O bond length in phenol is less than that of alcohol.
   - d) Phenol has lower dipole moment than alcohol.
   - e) Phenol under goes electrophillic substitution at ortho and para position.
   - f) Alcohol acts as a bronsted acid as well as bronsted base.
   - g) Phenol is more acidic than alcohol.
   - h) Acidity of alcohol is primary alcohol>sec alcohol>tert alcohol.
   - i) Basicity of alcohol is tert alcohol> sec alcohol>primary alcohol.
   - j) In Williamson's synthesis sec and tert halide can not be used.
   - k) para nitro phenol is less steam volatile than ortho nitro phenol.
   - l) Presence of nitro group at ortho and para position makes phenol more acidic.
   - m) Alcohols and phenols have higher boiling point.
   - n) Boiling point of alcohol is higher than its isomeric ether.
   - o) Boiling point of glycerol>ethylene glycol> ethanol.
   - p) Grignard reagent is a versatile reagent in organic chemistry.
   - q) Cresol is less acidic than phenol.
   - r) In esterification reaction, water is removed as soon as it is formed.
   - s) Order of reactivity of HX with alcohol is HI>HBr>HCl>HF
   - t) Alcohol reacts with $SOCl_2$ to give pure halo alkane.
   - u) Ease of dehydration of alcohol is tert alcohol> sec alcohol>primary alcohol.
   - v) Phenol and anisole undergoes bromination reaction even in the absence of halogen carrier.
   - w) Methyl phenyl ether reacts with HI to give phenol and methyl iodide and not methanol and iodo benzene.
   - x) Methoxy ethane reacts with HI to give methyl iodide and ethanol and not ethyl iodide and methanol.
   - y) Tert butyl methyl ether reacts with HI to give tert butyl iodide and methanol and not not methyl iodide and tert butyl alcohol.
   - z) Anisole undergoes electrophillic substitution at ortho and para position.
   - aa) Boiling point of butan-1-ol is higher than tert butyl alcohol.
   - bb) Alcohol, phenol and ether are soluble in water.
   - cc) In the reaction between acid chloride and alcohol a small amount of pyridine is added.
   - dd) Alcohol behaves as nucleophile as well as electrophile.
   - ee) Water is a stronger acid than alcohol.
5. Carry out the following conversions:

a) Ethanal to ethanol.
b) Acetone to propan-2-ol.

c) Ethanoic acid to ethanol.
d) Ethene to ethanol.
e) Propene to propan-2-ol.
f) Methanal to ethanol.
g) Methanal to benzyl alcohol.
h) Ethanal to propan-2-ol.
i) Acetone to 2-methyl propan-2-ol.
j) But-1-ene to butan-1-ol.
k) But-2-ene to butan-2-ol.
l) Chloro benzene to phenol.
m) Aniline to phenol.
n) Benzene to phenol.
o) Ethanol to ethyl ethanoate.
p) Ethanol to ethene.
q) Ethanol to ethanal.
r) Tert butyl alcohol to 2-methyl prop-1-ene.
s) Propan-2-ol to acetone.
t) Phenol to i) phenyl ethanoate. ii)2-Acetoxy benzoic acid. iii) ortho and para nitro phenol. iv) 2,4,6-trinitro phenol v) para bromo phenol vi) 2,4,6- tri bromo phenol vii) salicylic acid vii) salicylaldehyde viii) anisole ix) phenatole x) benzene xi) benzo quinone.
u) Ethyl iodide to diethyl ether
v) Methyl bromide to 2 methoxy 2 methyl propane.
w) Benzyl chloride to benzyl alcohol
x) Ethyl magnesium chloride to propan-1-ol
y) Cumene to phenol
z) Anisole to i) phenol ii) ortho and para hydroxyl aceto phenone iii) para bromo anisole iv) ortho and para methyl anisole v) ortho and para methoxy aceto phenone vi) ortho and para nitro anisole vii) Ethene to ethane-1,2-diol

6. Explain the mechanism of the following reactions:

a) $CH_2{=}\,CH_2 + H_2O \longrightarrow CH_3CH_2OH$

b) $CH_3CH_2OH \xrightarrow[443K]{} CH_2{=}\,CH_2 + H_2O$

c) $CH_3CH_2OH \xrightarrow{413K} CH_3CH_2OCH_2CH_3$

d) Explain the mechanisms of the reactions in which alcohol acts as a) nucleophile

b) electrophile

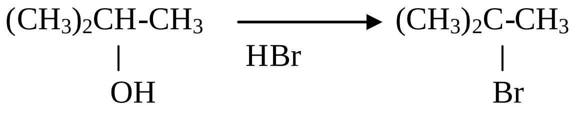
7. How is ethanol prepared from a) ethene b) cane sugar? Mention 2 uses of ethanol.

8. How is methanol commercially? Mention 2 uses of the same.

9. How is phenol prepared commercially? Mention 2 uses of the same.

10. An organic compound A react with NaOH under drastic condition to give B. B reacts with Br_2(aq) to give C.C on zinc dust distillation gives 1,3,5-Tribromo benzene. Identify the compounds and write the equations of the reactions involved.

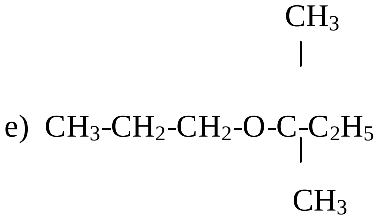
11. Give the mechanism for the reaction



$$(CH_3)_2\underset{\underset{OH}{|}}{CH}-CH_3 \xrightarrow[HBr]{} (CH_3)_2\underset{\underset{Br}{|}}{C}-CH_3$$

12. Write the equations of the following reactions:
    a) Friedel-Craft's alkylation of anisole.
    b) Friedel-Craft's acylation of anisole.
    c) Nitration of anisole.
    d) Bromination of anisole in ethanoic acid medium.
    e) Oxidation of Propan-1-ol with alkaline $KMnO_4$ solution
    f) Phenol with Br_2 in CS_2
    g) Phenol with dilute HNO_3
    h) Phenol with chloroform in the presence of aqueous NaOH.

13. Write the equation of reaction of HI with
    a) 1-Propoxy propane b) Methoxy benzene c) benzyl ethyl ether.
    d) $CH_3-CH_2-CH(CH_3)-CH_2OCH_2-CH_3$ e) $C_6H_5CH_2OC_6H_5$



e) $CH_3-CH_2-CH_2-O-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-C_2H_5$

14. Name the reagent used in the following reactions:
    a) Oxidation of primary alcohol to carboxylic acid.
    b) Oxidation of primary alcohol to aldehyde.
    c) Bromination of phenol to 2,4,6-Tribromophenol.

d) Benzyl alcohol to benzoic acid.
e) Dehydration of Propan-2-ol to propene.
f) Butan-2-one to Butan-2-ol.

15. You are given benzene, concentrated sulphuric acid and NaOH. Write the equation involved in the preparation of phenol using these reagents.

16. Give the products of the following reactions:

a) $CH_3\text{-}CH_2\text{-}CH_2\text{-}OCH_3 + HBr \longrightarrow$

b) $C_6H_5OC_2H_5 + HBr \longrightarrow$

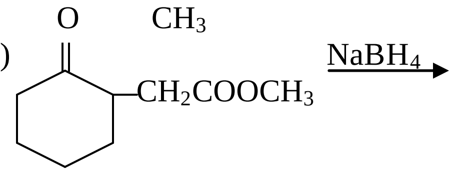
c) $(CH_3)_3COC_2H_5 + HI \longrightarrow$

d) $C_6H_5OC_2H_5 \xrightarrow[\text{conc } HNO_3 + \text{conc } H_2SO_4]{}$

e) $CH_3CH{=}CH_2 \xrightarrow[H_3O^+]{}$

f) $CH_3\text{-}CH_2\text{-}\underset{\overset{|}{CH_3}}{CH}\text{-}CHO \xrightarrow[NaBH_4]{}$

g)



17. Give the structure and IUPAC names of the products expected from the following reactions:
a) Catalytic reduction of butanal
b) Hydration of propene in the presence of dilute sulphuric acid.
c) Reaction of propanone with methyl magnesium bromide followed by hydrolysis.

18. The following is not the appropriate reaction for the preparation of tert-butyl ethyl ether.

$C_2H_5ONa + (CH_3)_3C\text{-}Cl \longrightarrow (CH_3)_3COC_2H_5$

a) What would be the major product for this reaction ?
b) Write the reaction for the preparation of tert-butyl ethyl ether.

19. Give the structure of the product you would expect when each of the following alcohol react with i) HBr ii) $SOCl_2$ iii) $ZnCl_2$+HCl
a) Butan-1-ol b) 2-Methylbutan-2-ol

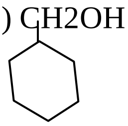
20. Predict the major product in the acid catalysed dehydration of a) butan-1-ol
b) 1-Methylcyclohexanol.

21. Draw the resonance structures of phenoxide ion of ortho and para nitrophenols.

22. Write the structure of major products formed in the following reactions:
    - a) Mono nitration of 3-methylphenol.
    - b) Dinitration of 3-methylphenol.
    - c) Mononitration of phenyl methanoate.

23. How are the following alcohols prepared by the reaction of Grignard reagent with HCHO?

a) $(CH_3)_2CHCH_2OH$ b) CH2OH



24. Arrange the following compounds in the order of properties mentioned:
    - a) Pentan-1-ol, Pentan-2-ol, ethanol, Propan-1-ol and methanol.(increasing order of boiling point.
    - b) Pentan-1-ol, n-butane, Pentanal and ethoxyethane.(increasing order of boiling point.)
    - c) Propan-1-ol, 2,4,6-Trinitrophenol, 3-Nitrophenol, 3,5-Dinitrophenol, Phenol and 4-Methylphenol(increasing order of acidity)

.

Chapter-12-Aldehyde,Ketone and Carboxylic acid.- 6 Marks

1. Write equations for the following named reactions:
   a) Nucleophillic addition reaction. b) clemensen reduction. c) wolf kishner reduction.
   d) aldol condensation. e) crossed aldol condensation f) cannizaro reaction.
   g) Rosenmund's reduction. h) kolbe's electrolysis i) Stephen reaction. j) Etard reaction. k) decarboxylation. l) acylation. m) schotten baumann reaction.
   n) Friediel craft's acylation. o) esterification. p) Gattermann- Koch reaction.
   q) Hell Volhard Zelensky reaction.

2. Explain a) Fehling's test b) Tollen's reagent test with suitable examples.

3. Distinguish chemically between the following pairs of organic compounds:
   a) Methanal and ethanal. b) ethanal and propanone. c) pentan-2-one and pentan-3-one.
   d) aceto phenone and benzo phenone. e) formic acid and acetic acid.
   . f) benzoic acid and ethyl benzoate. g) phenol and benzoic acid.h) ethanal and propanal. i) propanal and diethyl ether. j) benzaldehyde and acetophenone.
   k) ethanal and propanone

4. Account for the following:
   a) Aldehyde and ketone are polar in nature.
   b) Aldehyde and ketones have higher boiling point than hydro carbons of comparable molar mass.
   c) Aldehyde and ketones have lower boiling point than alcohols of comparable molar mass.
   d) Ketone has higher boiling point than aldehyde of comparable molar mass.
   e) Oxidation of primary alcohol to aldehyde is carried out using PCC as an oxidizing agent.

f) Rosenmund's reduction of acid chloride to aldehyde is carried out using quinoline and sulphur.
g) Aldehyde is more reactive than ketone towards nucleophile.
h) Butanone is less reactive than propanone.
i) 2,2,6-Tri methyl cyclo hexanone is less reactive towards nucleophile than cyclo hexanone.
j) Para nitro benzaldehyde is more reactive towards nucleophile than benzaldehyde.
k) Para methyl benzaldehyde is less reactive towards nucleophile than benzaldehyde.
m) Reaction of aldehyde with alcohol to give acetal is carried out in the presence of HCl(g).
n) Formaldehyde and benzaldehyde undergoes cannizaro reaction and not aldol condensation.
o) Acetaldehyde undergoes aldol condensation and not cannizaro reaction.
p) Aromatic aldehyde and ketones undergoes electrophillic substitution at meta position.
q) Carboxylic acid do not show the reactions of aldehyde and ketone though it has >C=O group.
r) Carboxylic acid has higher boilimg point than aldehyde, ketone and alcohol of comparable molar mass.
s) In semi carbazide, only one NH_2 group is involved in the formation of semi carbazone.
) Aldehyde, ketone and carboxylic acid are soluble in water.
u) In oxidation of primary alcohol to carboxylic acid is not carried out using acidified potassium dichromate.
v) Carboxylic acid is more acidic than alcohol.
w) Carboxylic acid is more acidic than phenol.
x) Acidity of $CCl_3COOH>CHCl_2COOH>CH_2ClCOOH>CH_3COOH$.
y) Acidity of $FCH_2COOH>ClCH_2COOH>BrCH_2COOH>I\ CH_2COOH$.
z) α chloro propanoic acid is more acidic than β chloro propanoic acid.
aa) Acetic acid is less acidic than formic acid.
bb) Pure acid halide is prepared by the reaction of carboxylic acid with thionyl chloride.
cc) Carbon in carbonyl group of aldehyde and ketone acts as Lewis acid(electrophile) while oxygen acts as Lewis base (nucleophile).
dd) Benzoic acid does not undergo Friediel craft alkylation reaction.

5.. How is a) HCHO b) CH_3CHO c) C_6H_5CHO prepared commercially? Mention two uses of each.

6. How is a) HCOOH b)CH_3COOH c)C_6H_5COOH prepared commercially? Mention two uses of each.

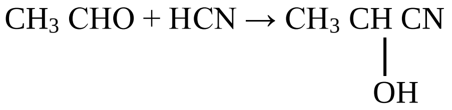
7. Carry out the following conversions:
   a) Ethanol to ethanal.
   b) Methanol to methanal.
   c) Propan-2-ol to propanone.
   d) Methanal to i) ethanol ii) benzyl alcohol.

e) Ethanal to i) propan-2-ol ii) acetone.
f) Acetone to i) tert butyl alcohol ii) 2-Methyl prop-1-ene.
g) Benzaldehyde to i)α- hydroxy phenyl acetic acid ii) 3-phenyl propan-1-ol iii)1-phenyl ethanol. iv) benzyl alcohol and sodium benzoate. v) cinnamaldehyde. vi) 1,3-Diphenyl prop- 2-en-1-one vii) benzo phenone viii) m-nitro benzaldehyde ix) benzal acetophenone.
h) Butan-1-ol to butanal.
i) Cyclo hex-2-en-1-ol to cyclo hex-2-en 1-one.
j) Pentan-3-en-2-ol to pent-3-en-2-one.
k) But-2-ene to ethanal
l) Para nitro toluene to para nitro benzaldehyde.
m) Ethanal to butan-2-one.
n) Ethanal to butane- 1,3- diol.
o) Ethanal to but-2-enal
p) Ethanal to but-2-enoic acid.
q) Ethanal to butan-1-ol
r) Ethanal to butanoic acid.
s) Propanone to propene.
t) Propanal to butanone.
u) Ethanal to 2-hydroxy butanal.
v) Benzaldehyde to benzo phenone.
w) Benzoic acid to benzaldehyde.
x) Propanoic acid to propenoic acid.
y) Benzene to m-nitro aceto phenone.
z) Bromo benzene to 1-phenyl ethanol.
aa) Benzoic acid to m- nitro benzoic acid.
bb) Benzoic acid to benzyl amine.
cc) Para nitro benzoic acid to para nitro aniline.
dd) Hexanoic acid to hexane nitrle.
ee) Hexanoic acid to 1-amino pentane.
ff) Hept-1-ene to heptanal
gg) Hept-1-ene to hexanal.
hh) Hept-1-ene to heptanoic acid.
ii) Hept-1-ene to hexanoic acid.
jj) Ethene to ethanal.
kk) Propene to acetone.
ll) 2, 3- dimethyl but-2-ene to acetone.
mm) Ethanal to lactic acid.
nn) Ethanal to ethane.
oo) Ethanal to Ethanoic acid.
pp) Acetone to 4-hydroxy-4-methyl pentan-2-one.

qq) Benzaldehyde to benzyl alcohol and sodium benzoate.
rr) Methanal to methanol and sodium methanoate.
ss) Toluene to benzaldehyde.
tt) Ethyl benzene to benzoic acid.
uu) But-2-ene to ethanoic acid.
vv) Ethane nitrle to ethanoic acid.
ww) Methyl magnesium bromide to ethanoic acid.
xx) Para methyl aceto phenone to benzene-1,4- dicarboxylic acid.
yy) Cyclo hexene to hexane-1,6-dicarboxylic acid.
zz) Ethanoic acid to ethanol.
aaa) Propanoic acid to α- chloro propanoic acid.
bbb) Methanol to Ethanoic acid.
ccc) Benzoic acid to m-nitro benzoic acid.
ddd) Benzoic acid to m-bromo benzoic acid.
eee) Acetyl chloride to acetaldehyde.
fff) Benzoyl chloride to benzaldehyde.
mmm) Benzene to aceto phenone.
nnn) Benzene to benzo phenone.
ooo) Ethanoic acid to ethanoyl chloride.
sss) Ethanoic acid to ethanoic anhydride.
ttt) Ethanoic acid to ethyl ethanoate.
a) Ethanoic acid to ethanamine.
b) Hexane nitrle to 1-amino pentane.
c) Benzoic acid to benzo phenone.
d) Benzoic acid toi) aceto phenone. ii) benzaldehyde iii) benzophenone
e) Benzene to methyl benzoate.
f) Benzene to m- nitro benzoic acid.
g) Benzene to p- nitro benzoic acid.
h) Benzene to p- nitro benzaldehyde.
i) Benzene to phenyl acetic acid.
j) Ethanoyl chloride to propanone.
k) Benzene to benzaldehyde
l) Ethane nitrile to i) ethanal ii) propanal
m) vinyl cyanide to prop2-enal
n) p-fluoro toluene to p-fluoro benzaldehyde.
o) cyclo hexanol to cycloheanone.
p) Hexan-1-ol to hexanal
q) Butan-1-ol to butanoic acid.
r) Benzyl alcohol to phenyl ethanoic acid.
s) 3-nitro bromo benzene to 3-nitro benzoic acid
t) 4- methyl acetophenone to benzene-1,4-dicarboxylic acid.

u) Butanal to butanoic acid.
v) Ethyl butanoate to ethanoic acid.
w) cyclo hexane to Hexane-1,6-dicarboxylic acid.
x) Benzene-1,4-dicarboxylic acid to pthalimide

8. Explain the mechanism of the following reaction:



$$CH_3CHO + HCN \rightarrow CH_3\underset{\displaystyle OH}{\underset{|}{C}}H\,CN$$

9. An organic compound A(C_8H_8O) gives orange red precipitate with 2,4-DNP reagent. It responds to iodoform test. It does not respond to Tollen's reagent test. It does not decolorise bromine water. A on oxidation using CrO_3 give B. Identify the compounds and write thw equations of the reactions involved.

10. An organic compound $C_9H_{10}O$ forms 2,4-DNP derivative, reduces Tollen's reagent and Undergoes cannizaro reaction. On vigorous oxidation it gives Benzene-1,2-dicarboxylic acid. Identify the compound.

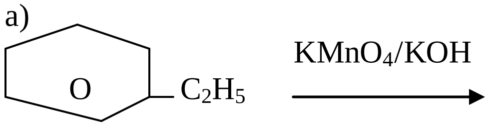
11. An organic compound contain 69.77% C and 11.63% H and the remaining O. Molecular mass of the compound is 86 u. It does not reduce Tollen's reagent, gives positive iodoform test and respond to sodium bisulphate test. On oxidation it gives acetic acid and propanoic acid. Give the structure of the organic compound.

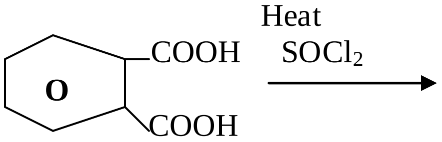
12. Arrange the following in the increasing order of property mentioned:
   a) Acetaldehyde, Acetone, Di-tert-butyl ketone, Methyl tert-butyl ketone(reactivity with HCN)

b) 2-Bromo butanoic acid, 3-Bromo butanoic acid, Butanoic acid, 3-Methyl propanoic acid (acid strength)
c) Benzoic acid, 4-Nitro benzoic acid, 3,4-Dinitro benzoic acid, 4-Methoxy benzoic acid (acid strength)
d) Ethanal, Propanal, Propanone, Butanone(increasing order of reactivity towards nucleophile)
e) Benzaldehyde, p-Tolualdehyde, p-Nitro benzaldehyde, Acetophenone(increasing order of reactivity towards nucleophile)
f) Butanal, Butanol, Ethoxy ethane and Butane (increasing order of boilimg point)

13. Complete each synthesis by giving missing starting material, reactant or product.

a)

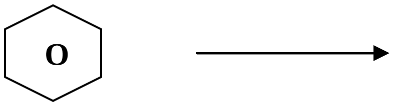


b) 

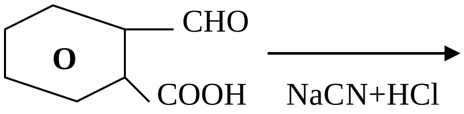
c) $C_6H_5CHO + NH_2CONHNH_2 \longrightarrow$

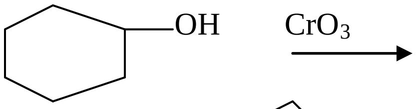
d) $C_6H_5CHO + CH_3CH_2CHO \longrightarrow$

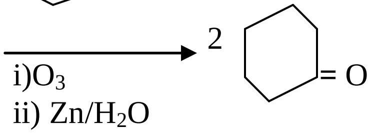
e) $CH_3COCH_2COOC_2H_5 \xrightarrow[\text{i) NaBH}_4\text{ ii)H}^+]{\text{Dil NaOH}}$

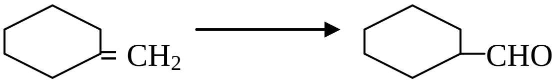
f) 

$C_6H_5COC_6H5$

g) 

h) 

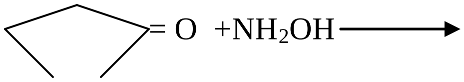
i) 

j) 

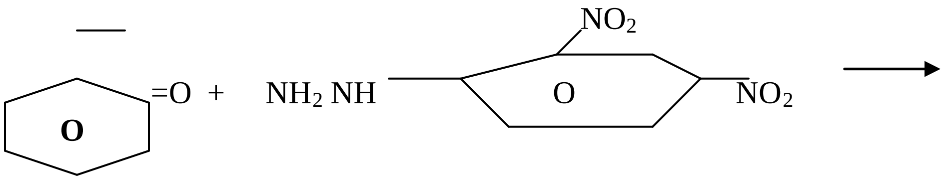
14. Which acid of each pair would you expect to be stronger?
    a) Ethanoicacid and fluoro ethanoic acid b) Fluoro ethanoic acid and chloro ethanoic acid
    c) 4- Fluoro butanoic acid and 3-Fluoro butanoic acid d) p-Trifluoro benzoic acid and p-Methyl benzoic acid.
15. Arrange the following in the increasing order of boiling point:
    Ethanal, Ethanol, Ethoxy ethane and Propane

16. Predict the product formed when cyclohexanecarbaldehyde reacts with
    a) $PhMgBr+H_3O^+$ b) Tollens'reagent c) Semicarbazide and weak acid d) excess ethanol and acid. e) Zinc amalgam and dilute HCl

17. Give the products of the following reactions:

a) 

b)



c) $RCH{=}CHO + NH_2CONHNH_2 \xrightarrow[H^+]{}$

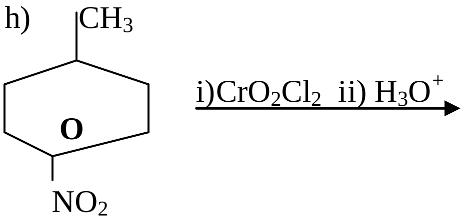
d) $C_6H_5COCH_3 + C_2H_5NH_2 \xrightarrow[H^+]{}$

e) $C_6H_6 + C_2H_5COCl \xrightarrow[\text{Anhydr.}AlCl_3/CS_2]{}$

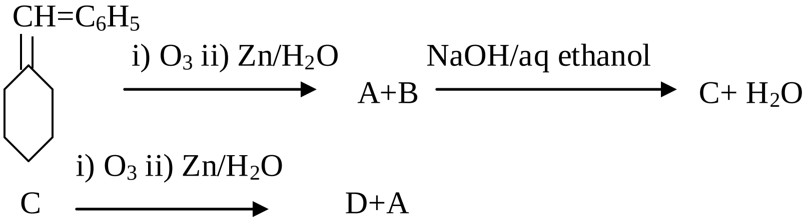
f) $(C_6H_5CH_2)_2Cd + 2\ CH_3COCl \longrightarrow$

g) $CH_3\text{-}C{\equiv}CH \xrightarrow[Hg^{2+}, H_2SO_4]{}$

h)



18. Identify the compounds A,B,C and D in the following reactions:



Chapter-13-Amines-4 Marks

1. Give one example each of the following named reactions:
   a) Sand meyer reaction b) Gabriel pthalimide synthesis. C) Coupling reaction d) Diazotisation reaction.e) Gatterman reaction f) Hoffmann bromamide reaction

2. Explain the following tests with suitable examples:
   a) Carbylamine test b) Hinsberg test.

3. Account for the following:
   a) Methyl chloride reacts with $AgNO_2$ to give nitro methane as a major product where as it gives nitrito methane as a major product with KNO_2
   b) C-N bond in aniline is shorter than in aliphatic amines.
   c) In ammonalysis of halo alkane , primary amine is the only product when large excess of ammonia is used while quaternary ammonium salt is the only product when halo alkane is in excess.
   d) Primary and sec amines have higher boiling point than tert amine.
   e) Amines have lower boiling point than alcohol of comparable molar mass.
   f) Amines are soluble in water. Solubility of amines p.amines>sec amines>tert amines.
   g) Amines are less soluble in water than alcohol.
   h) Basicity of amines in aqueous solution is sec amine>tert amine>p.amine.
   i) Basicity of amines in vapor phase tert amine>sec amine>p.amine.
   j) Aniline is a weaker base than aliphatic amine.
   k) Electron repelling group at ortho and para position increases the basicity while electron with drawing group at ortho and para position decreases the density of aniline.
   l) Ammonalysis of halo alkane is carried out in the presence of a base.
   m) Unlike alkylation of amines acylation stops after first styep.
   n) Tert amines do not react with acid derivatives.
   o) Aniline undergoes bromination even in the absence of halogen carrier.
   p) Nitration of aniline gives 47% meta nitro aniline.
   q) P-toluidine is more basic than aniline.
   r) Amines are less acidic than alcohol.
   s) Halo alkane reacts with KCN to give alkyl cyanide as a major product while it gives alkyl isocyanide as a major product with AgCN.
   t) Aniline do not undergo Friedel craft's reaction.
   u) Aniline can't be prepared by Gabriel pthalimide synthesis.
   v) ArN_2X is more stable than RN_2X at lower temperature.
   w) Aniline is a weaker base than ammonia.
   x) Order of basicity $(C_2H_5)_2NH>(C_2H_5)_3N > C_2H_5NH_2>NH_3$
   y) Order of basicity $(CH_3)_2NH>CH_3NH_2>(CH_3)_3N>NH_3$

Z) Bromination of aniline after acylation gives only para bromo aniline.
aa) Sandmeyer reaction is prefered over Gatterman reaction to prepare halo arenes from aniline.
bb) Ethyl amine is soluble in water but not aniline.
cc) Aqueous solution of methyl amine with ferric chloride solution gives brown precipitate of ferric hydroxide..
dd) Gabriel pthalimide synthesis is prefered to prepare primary amine.
ee) p-nitro aniline is less basic than aniline.

4. Carry out the following conversions:

a) Ethanoyl chloride to i) ethanamine. ii) N-methyl amino ethane.
b) Ethanoyl chloride methanamide
c) Methanamine to i) N-methyl ethanamide. ii) methyl iso cyanide.
d) Dimethyl amine to N,N dimethyl amine.
e) Ethane nitrle to i) ethanoic acid. ii) methyl ethanoate. iii) acetone. iv) ethanamine.
f) Benzo nitrile to i) benzoic acid ii) aniline
g)Aniline to i) chloro benzene. ii) bromo benzene. iii) flouro benzene iv) iodo benzene .v) phenol vi) benzene. vii) benzoic acid. viii) para hydroxyl azo benzene. ix) para amino azo benzene. x) Nitro benzene xi) 1,3,5-tribromo benzene xii) p-bromo aniline xii) 2,4,6-tribromo aniline xiii) benzyl alcohol
h) 4-nitro toluene to 2-bromo benzoic acid.
i) 3-methyl aniline to 3-nitro toluene.
j) Ethanoic acid to a) ethanamine b) methanamine
k) Methanol to ethanoic acid.
l) Ethanamine to methanamine
m) Methanamine to ethanamine.
n) Nitro methane to dimethyl amine.
o) Propanoic acid to ethanoic acid.
p) Ethanoic acid to propanoic acid.
q) Nitro benzene to benzoic acid.
r) Benzene to m-bromo phenol.
s) Benzoic acid to aniline.
t) Aniline to 2,4,6- tribromo fluorobenzene
u) Benzyl chloride to 2-phenyl ethanamine.
v) Chloro benzene to p-chloro aniline.
w) Benzamide to toluene

6. Distinguish chemically between a) Methyl amine and aniline b) methyl

amine and dimethyl amine. c) Aniline and benzyl amine d) Aniline and N-methyl aniline. e) dimethyl amine and trimethyl amine.

7. An organic compound A on reaction with NaOH and Br_2 gives B. B on diazotization gives C. C when warmed with water gives D. D gives violet coloration with neutral ferric chloride solution. Identify the compounds and write the equations of the reactions involved.

8. Give equation for the following reactions:
   a) ethanolic NH_3 with C_2H_5Cl b) ammonalysis of benzyl chloride followed by reaction with 2 moles of methyl chloride. c) sulphonation of aniline d) reaction of aniline with acetic anhydride. e) reaction of aniline with aqueous bromine.

9. Give the structure of A,B and C in the following reactions:

a) $C_2H_5I \xrightarrow{NaCN} A \xrightarrow[\text{partial hydrolysis}]{OH^-} B \xrightarrow[Br_2]{NaOH}$

b) $C_6H_5N_2Cl \xrightarrow{CuCN} A \xrightarrow{H_3O^+} B \xrightarrow{NH_3} C$

c) $C_2H_5Br + KCN \xrightarrow{} A \xrightarrow[LiAlH_4]{} B \xrightarrow[HNO_2,\ 273K]{} C$

d) $C_6H_5NO_2 \xrightarrow[Fe/HCl]{} A \xrightarrow[NaNO_2+HCl\ \ 273K]{} B \xrightarrow[H_3O^+]{} C$

e) $CH_3COOH+NH_3 \xrightarrow[Heat]{} A \xrightarrow[NaOBr]{} B \xrightarrow[NaNO_2+HCl,\ 273K]{} C$

f) $C_6H_5NO_2 \xrightarrow[Fe/HCl]{} A \xrightarrow[NaNO_2+HCl,\ 273K]{} B \xrightarrow[C_6H_5OH]{} C$

10. An organic compound A on heating with aqueous ammonia forms B. B on treatment with Br_2 and KOH gives C of molecular formula C_6H_7N. Give the structure of the compounds A,B and C. Write IUPAC name of the each compound.

11. Give the equations of the reactions involved when aniline is reacted with
    a) $CHCl_3$+KOH b) Conc sulphuric acid c) aqueous bromine d) acetic anhydride

12. Give the equation of the reaction involved when benzene diazonium chloride is treated with
    a) $H_3PO_2+H_2O$ b) i)HBF_4 followed by $NaNO_2$/Cu Δ

13. Arrange the following:
    a) increasing order of pK_b values- $C_2H_5NH_2$, $(C_2H_5)_2NH$, $C_6H_5NHCH_3$, $C_6H_5NH_2$

b) increasing order of basic strength

(i) $C_6H_5NH_2$, $C_6H_5N(CH_3)_2$, $(C_2H_5)_2NH$,CH_3NH_2

(ii) Aniline, para nitro aniline, para toluidine

(iii) Aniline, N-Methyl aniline, benzyl amine

(iv) Aniline, methyl amine, dimethyl amine, trimethyl amine, benzyl amine

(iv) Aniline, ethyl amine, diethyl amine, triethyl amine.

c) decreasing order of basic strength in gas phase

$C_2H_5NH_2$, $(C_2H_5)_2NH$, $(C_2H_5)_3N$, NH_3

d) increasing order of boiling point- C_2H_5OH, $(CH_3)_2NH$,$C_2H_5NH_2$

e) increasing order of solubility in water- Aniline, ethyl amine, Diethyl amine

14. Write the reaction of final alkylation product with excess of ethyl iodide in the presence of Sodium carbonate solution.

15. Write the chemical reaction of aniline with benzoyl chloride and give the IUPAC name of the product formed.

Chapter-14-Biomolecules-4Marks

1. Mention the function of carbohydrates in plants.
2 How are carbohydrates classified? Give one example each.
3. Fructose is a ketohexose but it is a reducing sugar. Why?
4. What are monosaccharides? Give two examples.
5. Write the equations of the reactions involved when glucose is reacted with a) acetic anhydride b) HI c) Hydroxylamine d) HCN e) Br_2(aq) f) concentrated HNO_3. Write the significance of each reaction.
6. Enumerate the reactions of glucose which can not be explained by open structures.
7. Draw the Howarth structures of a) α-D-(+) glucopyranose b) β-D-(+) glucopyranose c) α-D-(-) fructo furanose d) β-D-(-) fruco furanose
8. Draw the Howarth structure of a) sucrose b) maltose c) lactose. Classify them as reducing or Non reducing sugar. Justify your answer.
9. Explain the terms a) muta rotation b) anomers.
10. Distinguish between a) starch and cellulose b) amylose and amylo pectin c) starch and Glycogen.
11. Give the hydrolysis products of a) sucrose b) lactose c) maltose. d) DNA containing thymine
12. What is invert sugar? Why is it called so?
13. What are anomers? Draw the anomers of glucose. Are they enantiomers?
14. Classify the following as monosaccharides and disaccharides:
    a) ribose b) 2-Deoxy ribose c) sucrose d)galactose e) lactose f) maltose g) fructose
15. Explain glycosidic linkage with an example.
16. Explain the following with respect to protein a) primary structure of protein b) secondary Structure of protein c) tert structure of protein d) quaternary structure of protein e) native

state of protein f) denaturation of protein g) zwitter ion

17. Explain peptide linkage with an example.
18. Mention the type of bonding in a) α helix structure b) β sheet structure c) cross links of polypeptide chain d) DNA
19. Name the forces which stabilize secondary and tert structure of protein.
20. Distinguish between a) α helix and β sheet structure b) fibrous and globular protein.
    c) primary and secondary structure of protein d) nucleoside and nucleotide
21. Account for the following;
    a) Amino acids are more soluble and has higher melting point than halo acids.
    b) Amino acids behave like salts rather than amines or carboxylic acids
    c) Amino acids are amphoteric
    d) On electrolysis amino acids migrate towards cathode in acid solution and anode in alkaline solution.
    e) Mono amino mono carboxylic acid has two pk values.
    f) Amino acids are optically active.
    g) on boiling egg it becomes hard
22. Name and give the structure of amino acid which is optically inactive.
23. What are essential and non essential amino acids? Give two examples each.
24. What are enzymes? Explain the mechanism of enzyme catalysed reaction.
25. What are coenzymes? Give two examples.
26. What are vitamins? How are they classified?
27. Mention the sources of vitamin a) A b) C c) D d) E e) K f)B_1 g) B_2h) B_6 i) B_{12}. Name the diseases caused due to the deficiency of each vitamin.
28. Vitamin C can be taken regularly but not vitamin A Why?
29. What are nucleic acids? Mention the functions of nucleic acids.
30. Show the formation of a dinucleotide with an example.
31. Mention the differences between DNA and RNA.
32. Two strands of DNA are not identical but complementary. Explain this statement.
33. What are different types of RNA present in the cell.
34. Explain the terms a) transcription b) translation
35. What is the effect of denaturation of protein?
36. Where does the water present in egg go after boiling?
37. Base sequence in a DNA strand is ATTGCCA
    Give the base sequence a) in its complementary strand b) messenger RNA
38. When RNA is hydrolysed there is no relationship among the quantities of different base obtained. What does this fact suggest about the structure of RNA?
39. Draw the structures of sugars present in DNA and RNA.

Chapter-15- Polymers-3 Marks

1. Explain the terms a) monomer b) polymer c) polymerization
2. What are homo polymers and co polymers? Give 2 examples each.
3. Arrange the following in the increasing order of molecular forces:
   a) Nylon 66 b) polythene c) Buna-S-rubber
4. How are polymers classified on the basis of their structure? Give 2 examples each.
5. What do you mean by addition and condensation polymers? Give 2 examples each.
6. What are a) natural polymers b) semi synthetic polymers c) synthetic polymers? Give one example each.
7. What are biodegradable polymers? Give an example of biodegradable a) polyester b) poly amide.
8. What are poly esters? Give two examples.

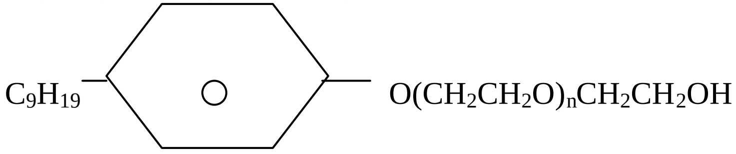
9. What are poly amides? Give two examples.
10. Give differences between a) thermoplastic and thermo setting plastic
    b) Nylon 6 and Nylon 66 c) Novolac and Bakelite d) Buna-S and Buna-N rubber.
11. Explain the mechanism of polymerization of ethene.
12. How is a) Low density polythene b) High density polythene prepared? Mention their properties and give two uses of each.
13. Name and give the structures of monomers of a) polythene b) poly propene c) PVC
    d) Poly acrylo nitrile e) Teflon f) Dacron (Terelene) g) Glyptal h) Nylon 6 i) Bakelite
    j) Nylon 66 k) Poly styrene l) Natural rubber m) Neoprene n) Buna-N rubber
    o) Buna-S-rubber p) Novolac
14. Write the equation of the reaction involved in the preparation of
    a) polythene b) poly propene c) PVC
    d) Poly acrylo nitrile e) Teflon f) Dacron (Terelene) g) Glyptal h) Nylon 6 i) Bakelite
    j) Nylon 66 k) Poly styrene l) Natural rubber m) Neoprene n) Buna-N rubber
    o) Buna-S-rubber p) Novolac q) Nylon-2 Nylon-6 r) PHBV s) Melamine formaldehyde resin. Classify them as i) addition or condensation polymer ii) homo polymer or co polymer. Give two uses of each.
15. What do you mean by vulcanization of natural rubber? What is the purpose of vulcanization?
16. Draw the structure of natural rubber.
17. How does the presence of double bond influence the structure and reactivity of rubber?
18. Is $-(\text{NH-CH-CO})-_n$ homo polymer or co polymer?
19. Identify the monomer present in the polymer $-(\text{CO-(CH}_2)_6\text{-NH-(CH}_2)_6\text{-NH-})_n$

Chapter-16- Chemistry in everyday life-3 Marks

1. Explain the terms a) Drugs b) Medicine c) Chemo therapy d) Target molecule e) Drug target
2. How are drugs classified?
3. How does enzyme act as drug target?
4. Explain the following terms with respect to drug enzyme interaction a) enzyme inhibitor b) competitive inhibitor c) allosteric site.
5. How do receptors act as drug target?

6. Explain the following term with respect to respect to receptor as drug target a) antagonist b) agonist.
7. What are antacids? Give two examples.
8. Metal hydroxides are better antacids than hydrogen carbonates. Why?
9. Ranitidine and cimitidine are better antacids than metal hydroxides and hydrogen carbonates. Why?
10. Give two examples of antihistamine which are anti allergic.
11. While antacids and anti allergic drugs interfere with the function of antihistamine, why they do not with the function of each other?
12. What are tranquilisers? Give two examples.
13. Why should not we take medicine with out consulting doctor?
14. Low level of noradrenaline is the cause for depression. What type of drug is needed to cure this problem? Name two such drugs. How do they react?
15. Name two tranquilisers suitable for relieving tension.
16. Name the tranquiliser used in controlling depression and hyper tension.
17. What are barbiturates? Give two examples.
18. Which among the following are tranquilisers?
    Ranitidine, valium, serotonin, and cimetidine.
19. What are analgesics? How are they classified? Give two examples each.
20. How does aspirin act as analgesic?
21. How does aspirin prevent heart attack?
22. Why should we avoid using narcotics as analgesic?
23. Morphine narcotics are referred as opiates. Why?
24. Mention chief uses of narcotic analgesic.
25. What are anti microbial drugs?
26. What are antibiotics? Give two examples.
27. What do you mean by bactericidal and bacteriostatic? Give three examples each.
28. What are a) broad spectrum antibiotics b) narrow spectrum antibiotics c) narrow spectrum antibiotics? Give two examples each.
29. Name the antibiotic developed by Paul Ehrlich for the treatment of syphills.
30. Name the antibiotic which leads to the discovery of sulpha drugs.
31. What are sulpha drugs? Give two examples.
32. Name the antibiotic used to cure a) typhoid b) tuberculosis.
33. Classify the following as broad spectrum, narrow spectrum or limited spectrum antibiotics:
    Penicillin-G, ampicillin, amoxicillin, chloramphenicol, vancomycin and ofloxacin.
34. Name the antibiotic which is toxic towards certain strain of cancer cells.
35. What are antiseptics? Give two examples.
36. What are disinfectants? Give two examples.
37. How do antiseptic differ from disinfectant?
38. Name the substance which is used as antiseptic as well as disinfectant.
39. Mention the constituents of Dettol.

40. Name the antiseptic added to soap.
41. What is tincture of iodine?
42. Classify the following as antiseptic or disinfectant:
    Furacin, soframycin, tincture of iodine, iodoform, boric acid, 0.1% phenol, 1% phenol, 0.2 ppm, Cl_2 and very low concentration of SO_2.
43. What are antifertility drugs? Give one example each of a) synthetic progesterone b) estrogen derivative which are used as antifertility drug.
44. What are the main categories of food additives?
45. Name the artificial sweetening agent used by diabetic patient.
46. Why is aspartame limited to cold food and drinks?
47. What problem arises in using alitame as a sweetening agent?
48. Why do we need artificial sweetening agent?
49. What is the advantage of sucralose as a artificial sweetening agent?
50. What are food preservatives? Give two examples.
51. What are soaps? Give the equation of the reaction involved in the preparation of soap.
52. How is a) Toilet soap b) Transparent soap prepared?
53. Which chemical is added to shaving soap to prevent rapid drying?
54. Name the gum added to make shaving soap.
55. Name the chemicals added to laundry soap.
56. Name the a) scouring agent b) builder added to soap. Mention the function of each.
57. Why does soap not work in hard water?
58. What are detergents? Mention the advantage and disadvantage of soap over detergent.
59. How are detergents classified? Give one example each. Mention the use of each.
60. Write the equation of the reaction involved in the preparation of a) non ionic detergent b) anionic detergent.
61. What are biodegradable and non biodegradable detergents? Give one example each.
62. If water contain calcium bicarbonate, out of soap and detergent which one will you use to clean clothes?
63. Label the hydrophilic and hydrophobic part present in the following compounds:
    a) $CH_3(CH_2)_{10}CH_2OSO_3Na$ b) $CH_3(CH_2)_{15}\ N(CH_3)_3Br$
    c) $CH_3(CH_2)_{10}COO(CH_2CH_2O)_nCH_2\ CH_2OH$

    d) 

64. Give one important use of each of the following:
    i) terfenadine ii) chlordiazepoxide iii) Morphine iv) dysidazirine v) Norethindrone.

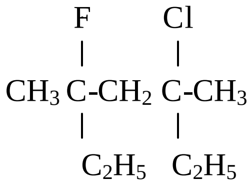
IUPAC Nomeclature

I) Write the IUPAC names of the following compounds.

a) n- butyl chloride b) iso butyl chloride c) secondary butyl chloride d) tertiary butyl chloride. e) ethylidene chloride f) ethylene di chloride f) vinyl chloride.

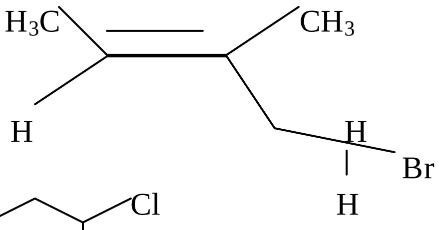
g) p- Cl $C_6H_4\,CH_2\,CH\,(CH_3)_2$ h) m- Cl $C_6H_4\,CH_2C\,(CH_3)_3$ i)($CCl_3)_3\,CCl$

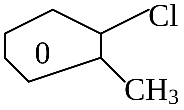
j) o- $BrC_6H_4\,CH(\,CH_3)\,CH_2\,CH_3$ k) CH_3-C (p-Cl $C_6H_4)_2\,CH(Br)\,CH_3$

l)


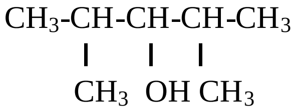
$CH_3\underset{C_2H_5}{\overset{F}{C}}-CH_2\underset{C_2H_5}{\overset{Cl}{C}}-CH_3$

m) $CH_3CH{=}CH-CH_2CH_2Br$

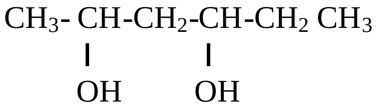
n)


o) C_6H_5Cl p) $C_6H_5CH_2Cl$ p)


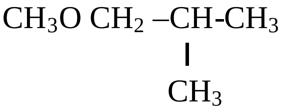
II) Write the IUPAC names of the following compounds

1)


$CH_3-\underset{CH_3}{CH}-\underset{OH}{CH}-\underset{CH_3}{CH}-CH_3$

2)


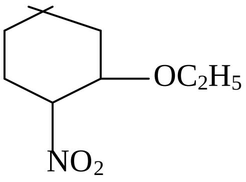
$CH_3-\underset{OH}{CH}-CH_2-\underset{OH}{CH}-CH_2\,CH_3$

3) Glycerol 4) ethylene glycol 5)


$CH_3O\,CH_2-\underset{CH_3}{CH}-CH_3$

6) $CH_3O\,CH_2\,CH_2O\,CH_3$ 7) $C_6H_5O\,CH_2CH_3$ 8) $C_6H_5OCH_3$

9) $C_6H_5O\,C_7H_{15}$



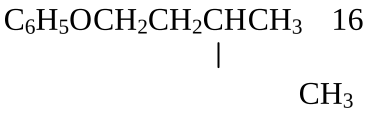
10)


$CH_3\,CH_2\,\underset{|}{CH}\,\underset{|}{CH}\,CH(CH_3)_2$

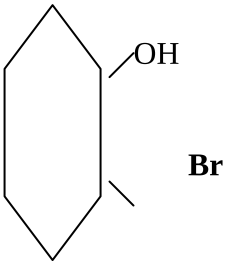
CH$_2$Cl   CH$_2$OH

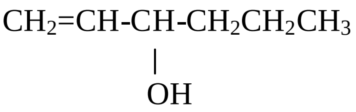
11)p-OHC$_6$H$_4$OH   12. (CH$_3$)$_3$COC$_2$H$_5$ 13. C$_6$H$_5$OCH$_3$

14) C$_6$H$_5$O(CH$_2$)$_6$CH$_3$

15) 

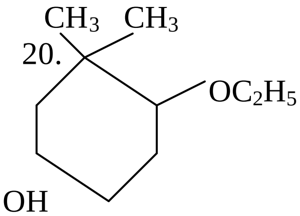
$$C_6H_5OCH_2CH_2\underset{\underset{CH_3}{|}}{C}HCH_3$$

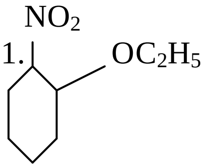
16. 

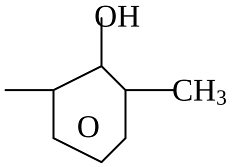
17. 

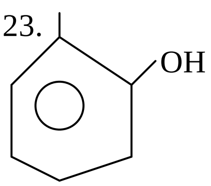
$$CH_2{=}CH\text{-}\underset{\underset{OH}{|}}{C}H\text{-}CH_2CH_2CH_3$$

18. (CH$_3$)$_2$C=C(Br)-CH$_2$OH   19.CH$_3$-O-CH$_2$-CH(CH$_3$)$_2$

20. 

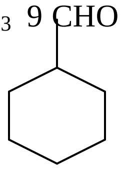
21. 

22. 

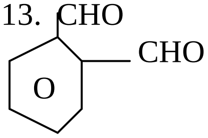
23. 

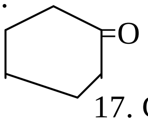
III) Write the IUPAC names of the following compounds.

1. HCHO 2. CH$_3$CHO 3. C$_6$H$_5$CHO 4. CH$_3$COCH$_3$ 5. C$_6$H$_5$COCH$_3$ 6.C$_6$H$_5$COC$_6$H$_5$

7. C$_6$H$_5$COCH$_2$CH$_3$ 8. CH$_3$COCH$_2$COCH$_3$ 9 

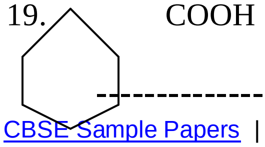
12. CH$_2$=CH-CHO

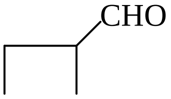
13. 

14. 

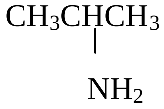
15. CHO- CH$_2$-CH(CHO)-CH$_2$-CHO

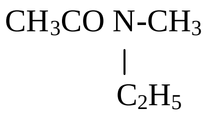
16. HCOOH   17. CH$_3$COOH   18. C$_6$H$_5$COOH

19. 

20. 

IV) Write the IUPAC names of the following compounds:

1. $CH_3CH_2CH_2NH_2$ 2.  $CH_3CH(NH_2)CH_3$ 3. $C_6H_5NH_2$ 4.  $CH_3CH_2CH_2N(CH_3)(C_2H_5)$

5. $NH_2CH_2CH=CH_2$ 6. $NH_2(CH_2)_6NH_2$ 7.  $CH_3CON(CH_3)(C_2H_5)$ 8. $(CH_3)_2NH$

9. $C_6H_5N(CH_3)_2$

10. CHO-CH(CHO)CH_2CHO 11. COOH-CH(COOH)CH_2COOH

Roll Number | | | | | | | |

Code No: 056/ISG/

Model Paper 1

Time allowed: 3 hrs **XII –CHEMISTRY(Theory)** **M.Marks: 70**

***General Instructions*:**

1. **Answer all the questions.**
2. **Question number 1 to 8 carry 1 mark each. Answer them in one word or one sentence each.**
3. **Question number 9to 18 carry 2 marks each. Answer them in 30 words each.**
4. **Question number 19 to 27 carry 3 marks each. Answer it in about 40 words each.**
5. **Question number 28 to 30 carry 5 marks each. Answer them in about 70 words each.**
6. **Use of calculator not permitted. Use of log table permitted**

1. How does molar conductivity of a strong electrolyte vary with the dilution of electrolyte solution? 1

2. Describe electrophoresis briefly. 1

3. H_3PO_4 is triprotic acid while H_3PO_3 is diprotic. Why? 1

4. Calculate the number of tetrahedral voids and octahedral voids in an unit cell of FCC. 1

5. Write the IUPAC name of the compound:
CH_3COCH_2COOH 1

6. Give one example of Swartz reaction. 1

7. Mention two functions of nucleic acid. 1

8. Mention the monomers of the polymer Dacron. 1

9. Account for the following: 2
a) Mountain climbers sometimes get symptoms of a condition known as anoxia.
b) Calcium chloride is added to clear the roads covered by snow.

10. Write the equations of the reactions involved at each electrode when an aqueous solution of dilute H_2SO_4 is electrolysed using Pt electrode. 2

11. Resistance of 0.01M CH_3COOH solution is 2220 ohm. Cell constant is 0.366 cm^{-1}.Calculate the degree of dissociation and dissociation constant of CH_3COOH at this concentration. Given Λ^0 HCl, NaCl, CH_3COONa are 425,128 and 96 scm^2 $mole^{-1}$ respectively. 2

12. Complete the following ionic equations: 2
i) $Cr_2O_7^{2-} + Fe^{2+} + H^+ \longrightarrow$
ii) $MnO_4^- + C_2O_4^{2-} + H^+ \longrightarrow$

13. Account for the following: 2
a) Phosphorus shows marked tendency for catenation while nitrogen shows little tendency for catenation.
b) Oxygen has lesser negative value of electron gain enthalpy than Sulphur.

14. Give one example each of 2
a) Williamson's synthesis
b) Reimer-Tiemann reaction.

15. Carry out the following conversions: 2
a) Phenol to para bromobenzene..
b) Ethanal to Acetone

16. Identify the compounds A,B,C and D in the following reaction. 2

$$A \xrightarrow[\text{NaOBr}]{} B \xrightarrow[\text{NaNO}_2\text{+HCl}\ 273\text{-}278\text{K}]{} C \xrightarrow[H_3O^+]{} D \xrightarrow[\text{Zn dust}]{} C_6H_6$$

17. Give one example each of 2

a) Gabriel Pthalimide synthesis.
b) Sand Meyer reaction.

OR

Distinguish chemically between
a) Dimethlamine and Trimethylamine.
b) Methanamine and Dimethlamine.

18. Write the equation of the reaction involved in the preparation of Buna-S-rubber. 2

19. Calculate the density of unit cell of NaCl. Given molar mass of NaCl=58.5u. Distance between Na^+ and Cl^- is 281pm. Avagadro number=$6x10^{23}$ $mole^-$. What type of defect does NaCl exhibit If the actual density is 1.95 g/cm^3 3

20. The vapour pressures of pure liquids A and B are 450 and 700 mm Hg respectively at 350K. Find 3 the
nposition of liquid mixture if the total pressure is 600 mm Hg. Also find the composition in vapour phase.

21 a) $Cr_2O_3 + 2Al \longrightarrow Al_2O_3+2Cr$ $\Delta G^0 = - 421$ KJ/mole is thermodynamically feasible as is apparent from negative value of ΔG^0. Why does it not occur at room temperature? 3
b) Write the reactions involved in the extraction of Fe from heamatite ore.

22. a) Give four differences between lyophilic sol and lyophobic sol. 3
b) Which is more effective in stopping bleeding? $FeCl_3$ or KCl Why?

23. Using valence bond theory explain the structure and magnetic behavior of $[Fe(CN)_6]^{4-}$ 3
(Atomic number of Fe=26)

24. An alkyl halide $C_7H_{15}Br$ is optically active. It reacts with KOH solution to give racemic mixture. Explain the mechanism of the reaction. 3

25. Account for the following: 3
a) Transition metals form complexes easily.
b) First ionization enthalpy of early actinoids are lesser than that of early lanthanoids.
c) Of the d^4 species Cr^{2+} is reducing while Mn^{3+} is oxidizing.

26. What happens when D-Glucose is treated with 3

a) HI b) HNO_3 c) Acetic anhydride. Explain the significance of each reaction.

OR

Draw the Howarth structure of sucrose. Is it a reducing or non reducing sugar? Justify your answer.

27. a) While antacids and anti allergic drugs interfere with the function of antihistamine, why they do not with the function of each other? 3

b) What are cationic detergents? Give one example of cationic detergent. Mention one use of cationic detergents.

28 a) Derive the expression for the half life of a zero order reaction. 5

b) . $A+5B+6C \longrightarrow 3L+3M$

Experiment	(A)M	(B)M	(C)M	Rate M/minute
1.	0.02	0.02	0.02	00208
2.	0.01	0.02	0.02	0.00104
3	0.02	0.04	0.02	0.00416
4	0.02	0.02	0.04	0.00832

Determine the order with respect to each reactant. Find K .Calculate the initial rate when concentration of each reactant is 0.01M.Find the initial rate of change in concentrations of B and L

OR

a) Mention the factors which affect the rate of a reaction.

b) The following data were obtained during the first order decomposition of SO_2Cl_2 at constant volume

$SO_2Cl_2(g) \longrightarrow SO_2(g) + Cl_2(g)$

Experiment	Time(sec)	Total pressure(atm)
1	0	0.5
2	100	0.6

Calculate the rate when total pressure is 0.65 atmospheres.

29 a) Account for the following: 5

i) 2,2,6-Trimethylcyclohexanone is less reactive towards nucleophile than cyclohexanone.

ii) Formaldehyde and benzaldehyde undergoes cannizaro reaction.

b) Carry out the following conversions:

i) Benzoic acid to m-nitrobenzoic acid.

ii) Benzoyl chloride to benzaldehyde.

iii) Acetic acid to acetone.

OR

a) An organic compound contain 69.77% Carbon and 11.63% Hydrogen and the remaining Oxygen. Molecular mass of the compound is 86 u. It does not reduce Tollen's reagent, gives positive iodoform test and respond to sodium bisulphate test. On oxidation it gives acetic acid and propanoic acid. Give the structure of the organic compound.

b) Give one example each of i) Decarboxylation b) HVZ reaction

30 a) Draw the structures of i) $XeOF_4$ ii) $HClO_4$ iii) ClF_3 5

b) Complete the following reactions;

i) $O_3+H_2O+I^- \longrightarrow$

ii) $XeF_6+KF \longrightarrow$

OR

a) Account for the following:

i) P_4 is more reactive than N_2

ii) Xe forms compounds with fluorine and oxygen.

iii) All the five bonds in PCl_5 are not equivalent.

b) Draw the structures of i) SF_4 ii) $H_2S_2O_7$