

KENDRIYA VIDYALAYA SANGATHAN

**HIGHER ORDER THINKING
SKILLS**

**CLASS - XII
SUBJECT: CHEMISTRY
2009 – 2010**

VENUE: ZIET, MYSORE

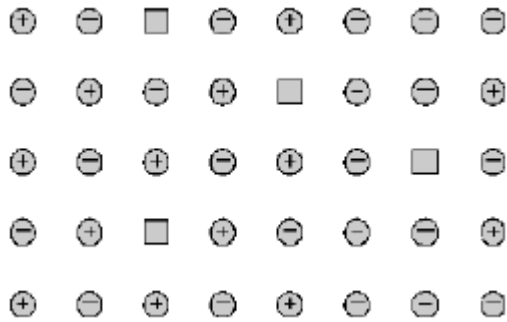
CHAPTER:1, THE SOLID STATE

1 - MARK QUESTIONS

1. What is the number of unit cells in 936 u of sodium chloride ? 1
2. MgO has NaCl structure , what is the coordination number of both ions. 1
3. What type of substances would make better permanent magnets, Ferromagnetic or Ferrimagnetic. 1
4. In corundum, oxide ions are arranged in hcp arrangement and the aluminium ions occupy $\frac{2}{3}$ of the octahedral voids. What is the formula of corundum ? 1
5. A compound contains two types of atoms - X and Y. It crystallises in a cubic lattice with atom X at the corners of the unit cell and atoms Y at the body centre. What is the simplest possible formula of this compound? 1
6. Name the type of point defect that occurs in a crystal of zinc sulphide. 1
7. How many octahedral voids are there in 0.5 mole of a compound having cubic close packed structure? 1

2 - MARKS QUESTIONS

8. If the atoms of an element have the radius r , then in a primitive cubic unit cell, Calculate
 - (a) the length of the face diagonal.
 - (b) the length of the body diagonal. 2
9. A metal crystallises into two cubic phases, face-centered cubic(FCC) and body-centred cubic(BCC) whose unit cell lengths are 3.5 and 3.0 Å respectively. Calculate the ratio of the densities of FCC and BCC. 2
10. What happens when
 - a) CsCl crystal is heated
 - b) Pressure is applied on NaCl crystal. 2
11. ZnO crystal appears yellow on heating. Discuss. 2
12. Crystals containing F-centres are generally paramagnetic. Discuss. 2
13. Examine the illustration of a portion of the defective crystal given below and answer the following questions.



- (i) What are these type of vacancy defects called?
(ii) How is the density of a crystal affected by these defects?
(iii) Name one ionic compound which can show this type of defect in the crystalline state

(iv) How is the stoichiometry of the compound affected? 2

14. In an ionic compound the anion (N^-) form cubic close type of packing. While the cation (M^+) ions occupy one third of the tetrahedral voids. Deduce the empirical formula of the compound and the coordination number of (M^+) ions. 2.

15. Iron crystallizes in bcc structure. Calculate the radius of Fe atom if edge length of unit cell is 286pm. 2

16.. Xe crystallizes in fcc structure and edge of the unit cell is 620pm calculate nearest neighbour distance. 2

17. A metal (atomic mass=50) has a bcc structure. The density of metal is 5.96 g cm^3 . Find the volume of the cell. 2

18. In Chromium (III) Chloride, $CrCl_3$, chloride ions have cubic close packed arrangement and Cr (III) ions are present in the octahedral holes. What is the fraction of octahedral holes occupied? What is the fraction of total number of holes occupied? 2

19.

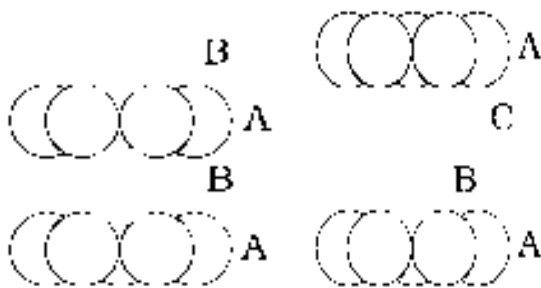


Fig. 1

Fig 2

- a. What are the types of close packing shown in figure 1 and 2?
- b. Write one example for each type of close packing in metals. 2
20. Cation vacancies in some crystals make them good catalysts. Explain 2
21. Noble Gases and metals crystallize with closed packed structure, yet the melting point of noble gas crystals are very low. Explain. 2
22. In a face centred cubic(fcc) crystal lattice, edge length is 4.0pm.find the diameter of the largest sphere which can be filled into the interstitial void without distortion of the lattice. 2
- 23.A metallic element crystallizes into a lattice containing sequence of layers of ABABAB.....(Any packing of spheres leaves out voids in the lattice). What percentage by volume of this lattice has empty space? 2

3 - MARKS QUESTIONS

24. In a face-centred cubic (fcc) crystal lattice, edge length is 400pm. Find the diameter of the greatest sphere which can be fitted into the interstitial void without distortion of the lattice. 3
25. KF has NaCl structure. What is the distance between K^+ and F^- in KF if density is 2.48 gm/c.c 3
26. The density of CsBr is 4.4gm/c.c. the unit cell edge length is 400pm.calculate inter ionic distance in CsBr. 3
- 27..An element X with an atomic mass of 60g/mol has density of 6.23g cm^{-3} . If the edge length of its cubic unit cell is 400 pm, identify the type of cubic unit cell. Calculate the radius of an atom of this element.
28. The metal calcium crystallizes in a fcc unit cell with cell edge 0.556 nm. Calculate the density of metal if
- i) it contains 0.2% of Frenkel defects
- ii) it contains 0.1% of Schottky defects. 3

CHAPTER:2, SOLUTIONS

1 - MARK QUESTIONS

1. Why a person suffering from high blood pressure is advised to take minimum quantity of common salt ? 1
2. What happens to vapour pressure of water, if a table spoon of glucose is added to it ? 1
3. Equimolar solutions of glucose and sodium chloride are not isotonic. Why ? 1
4. Two liquids A and B boil at 145 °C and 190 °C respectively. Which of them has a higher vapour pressure at 80 °C. 1
5. Semipermeable membrane of cupric ferrocyanide is not used for studying osmosis in non aqueous solutions. Why ? 1
6. Why is camphor preferred as a solvent in the determination of ΔT_f ? 1
7. Addition of HgI_2 to aq KI solution shows an increase in the vapour pressure. Why ? 1

2 - MARKS QUESTIONS

8. Arrange the following in the order of increasing i. boiling points and ii. freezing points
a. 1M aq acetic acid b. 1M aq NaCl c. 1M aq Na_2SO_4 d. 1M aq AlCl_3 2
9. Calculate the number of moles of methanol in 5 L in its 2m solution, if the density of the solution is 0.981 kgL^{-1} 2
10. Calculate the amount of ice that will separate out on cooling a solution containing 50 g of ethylene glycol in 200 g of water to $-9.3 \text{ }^\circ\text{C}$. 2
11. The temperature at a hill station is $-10 \text{ }^\circ\text{C}$. Will it be suitable to add ethylene glycol to water in the radiator sol that the solution is 30 % by mass. Why ? 2
12. A 45 % solution of sucrose is isotonic with 3 % solution of an unknown substance. Calculate the molecular mass of the unknown substance. 2
13. An electrolyte AB is 50 % ionized in aq solution. Calculate the freezing point of 1m aq solution. 2

3 - MARKS QUESTIONS

14. 75.2 g of phenol is dissolved in solvent of $K_f = 14$. If the depression in freezing point is 7K, find the % of phenol that dimerises ? 3
15. A solution of 3.8 g Sulphur in CS_2 (boiling point $46.3\text{ }^\circ\text{C}$) boils at $46.66\text{ }^\circ\text{C}$. What is the formula of Sulphur molecule in this solution. K_b for $CS_2 = 2.40\text{ kg mol}^{-1}$ 3
16. An aqueous solution of 1.248 g of Barium chloride (molar mass = 208.34 g mol^{-1}) in 100 g of water is found to boil at $100.0832\text{ }^\circ\text{C}$. Calculate the degree of dissociation of $BaCl_2$. K_b of water = $0.52\text{ K kg mol}^{-1}$ 3
17. The storage battery contains a solution of sulphuric acid 38 % by mass. At this concentration vant Hoff factor is 2.50. At what temperature will the battery condense freeze ? K_f for water = $1.86\text{ K kg mol}^{-1}$ 3

CHAPTER:3, ELECTROCHEMISTRY

1 - MARK QUESTIONS

1. 1F of electricity deposits 1 mole of Na from the molten salt, but 1/3 mol of Al from an aluminium salt. Why ? 1
2. What is the role of $ZnCl_2$ in the dry cell ? 1
3. Why blocks of Mg are often strapped to the steel hulls of ocean going ships ? 1
4. Which of the Li^+ and Na^+ have the greater mobility in aq solution ? Why ? 1
5. Corrosion of motor cars is of greater problem in winter when salts are spread on roads to melt ice and snow. Why ? 2

2 - MARKS QUESTIONS

6. Which will have greater molar conductivity and why ?
- a. 1 mole KCl dissolved in 200 cc of the solution
- b. 1 mole KCl dissolved in 500 cc of the solution. 2
7. Why is Li best reducing agent where as Fluorine is best oxidizing agent ? 2
8. Equilibrium constant is related to E°_{cell} but not to E_{cell} . Explain. 2
9. Why sodium metal is not obtained at cathode when aq NaCl is electrolysed with Pt electrodes but obtained when molten NaCl is electrolysed ? 2
10. Zn rod weighing 25 g was kept in 100 mL of 1M copper sulphate solution. After certain time interval, the molarity of Cu^{2+} was found to be 0.8 M. What is the molarity of SO_4^{2-} in the resulting solution and what should be the mass of Zn rod after cleaning and drying ? 2

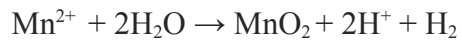
3 - MARKS QUESTIONS

11. A cell contains two hydrogen electrodes. The negative electrode is in contact with a solution of 10^{-6} M H^+ ions. The emf of the cell is 0.118 V at 298 K. Calculate the concentration of the H^+ ions at the positive electrode. 3
12. Crude copper containing Fe and Ag as contaminations was subjected to electro refining by using a current of 175 A for 6.434 min. The mass of anode was found to decrease by 22.260 g, while that of cathode was increased by 22.011 g. Estimate the % of copper, iron and silver in crude copper. 3

13. Zinc electrode is constituted at 298 K by placing Zn rod in 0.1 M aq solution of zinc sulphate which is 95 % dissociated at this concentration. What will be the electrode potential of the electrode given that $E^{\theta}_{Zn^{2+}/Zn} = -0.76$ V. 3

14. At what pH will hydrogen electrode at 298 K show an electrode potential of -0.118 V, when Hydrogen gas is bubbled at 1 atm pressure ? 3

15. Electrolysis of the solution of $MnSO_4$ in aq sulphuric acid is a method for the preparation of MnO_2 as per the chemical reaction



Passing a current of 27 A for 24 Hrs gives 1 kg of MnO_2 . What is the current efficiency ? What are the reactions occurring at anode and cathode ? 3

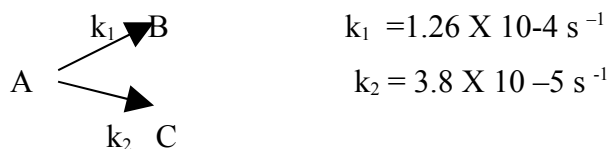
CHAPTER:4, CHEMICAL KINETICS

1 - MARK QUESTIONS

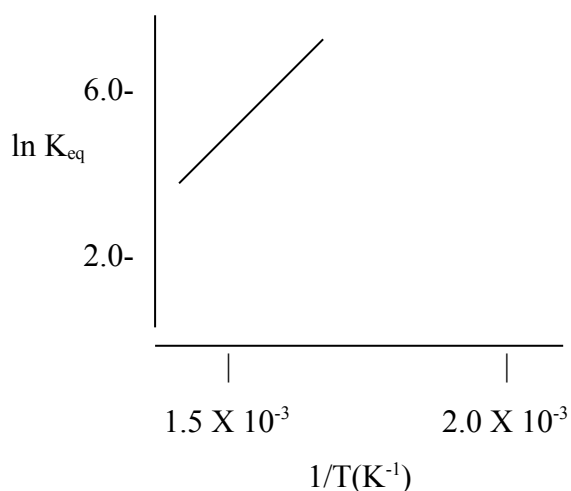
1. The half life period of two samples are 0.1 and 0.4 seconds. Their initial concentrations are 200 and 50 mol L⁻¹ respectively. What is the order of reaction? 1
2. What is the ratio of $t_{3/4} : t_{1/2}$ for a first order reaction ? 1
3. Higher molecularity reactions (viz. molecularity, 4 and above) are very rare. Why? 1
4. Consider the reaction $2A + B \rightarrow$ Products. When concentration of B alone was doubled, half life time does not change. When conc. of A alone doubled, the rate increases by two times. What are the units of K and what is the order of reaction? 1
5. How is half life time related to initial conc. for a second order reaction? 1
6. The rate of reaction is given by $K = P.Z.e^{-E_a/RT}$. Name the factor which is to be decreased to bring an increase in the rate of reaction. 1
7. For a second order reaction $2A \rightarrow$ Product, a plot $t_{1/2}$ vs $\log a$ (a = initial conc.), what does the intercept represent? 1

2 - MARKS QUESTIONS

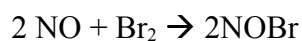
8. A substance undergoes first order decomposition. The decomposition follows two parallel first order reaction as $A \rightarrow B + C$



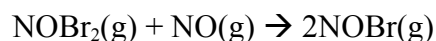
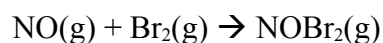
- Find out the % distribution of B and C. 2
9. A systematic plot of $\ln K_{eq}$ versus $1/T$ for a reaction has been shown below:
Prove that this reaction is exothermic.



10. Proposed mechanism for below given reaction :



is as follows



Find out the order w.r.t. NO (g)

2

11. The rate for a reaction between the substance A and B is given by

$$\text{Rate} = k[\text{A}]^n [\text{B}]^m$$

On doubling the conc. of A and halving the conc. of B, find out the ratio of new rate to that of earlier rate of reaction .

2

12. The following rate data was obtained for first order thermal decomposition of

SO_2Cl_2 at constant volume

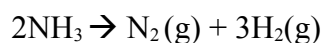


S.No.	Experiment	Time in sec	Total pressure(atm)
1	1	0	0.5
2	2	100	0.6

Calculate the reaction rate when total pressure is 0.56 atm.

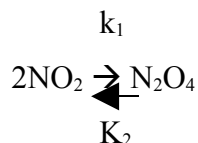
2

13. Decomposition of NH_3 (g) on surface of catalyst



Under low pressure follows first order kinetics while at high pressure it is zero order reaction. Why? 2

14. In the reversible reaction



Find out the rate of disappearance of NO_2 2

3 - MARKS QUESTIONS

15. For the reaction, the energy of activation is 75KJ / mol. When a catalyst is added the reaction its energy of activation is lowered to 20KJ / mol. What is the effect of catalyst on the rate of reaction at 20°C. 3

16. The gas phase decomposition of CH_3OCH_3 follows first order kinetics



The reaction is carried out in a constant volume container at 500° C and has $t_{1/2} = 14.5$ min. Initially only dimethyl ether is present at a pressure of 0.40 atm. What is the total pressure of the system after 12 min? Assume ideal behavior. 3

17. A heterogenous reaction is carried out at 500 K. If the same reaction is carried out in the presence of catalyst at the same rate, the temperature requires is 400 K, calculate the activation energy of the reaction if the catalyst lowers the activation barrier by 20 KJ/mol. 3

18. 50% of the original amount of a reactant was added to the reaction mixture after 40 min. What % of the total amount will be present after 60 min, given that half life period of the reaction is 20 min. 3

19. The activation energy for the reaction :

$2\text{HI}(\text{g}) \rightarrow \text{H}_2(\text{g}) + \text{I}_2(\text{g})$ is 209.5KJ/mol at 581 K. Calculate the fraction of molecule of reactants having energy equal to or greater than activation energy. 3

CHAPTER:5, SURFACE CHEMISTRY

1 - MARK QUESTIONS

1. Why is it necessary to remove carbon monoxide when ammonia is obtained from Haber's process? 1
2. How does BF_3 act as a catalyst in industrial process? 1
3. The conductance of an emulsion increases on adding common salt. What type of emulsion is it? 1
4. Gelatin is generally added to ice-creams. Why? 1
5. What is syneresis or weeping of gels? 1
6. Most effective electrolyte causing the coagulation of negatively charged As_2S_3 solution is a) MgCl_2 b) KCl c) $\text{K}_3[\text{Fe}(\text{CN})_4]$ d) Na_2SO_4 1
7. Silicate garden is developed by setting of colored ions in the void of silicates. It is a case of -----, 1
8. What is purple of casius? 1

2 - MARKS QUESTIONS

9. Which of the following has minimum coagulating value? Why? 2
a) NaCl b) BaCl_2 c) $\text{Al}_2(\text{SO}_4)_3$ d) KCl
10. Critical temperatures of N_2 , CO and CH_4 is 126, 134 and 190 K respectively. Arrange them in increasing order of adsorption on the surface of charcoal. Give reason. 2
11. The layer of fat in the pans used for manufacturing soaps can be removed by adding boiling washing soda solution. How will you account for it? 2
12. Why artificial rain can be caused by throwing common salt on the clouds? Explain. 2
13. Explain the curdling of milk when it is sour. 2

3 - MARKS QUESTIONS

14. In order to coagulate a fixed amount of As_2S_3 sol how will NaCl , MgCl_2 and AlCl_3 vary in their activity? Explain with the help of related rule. 3

15. A colloidal solution of AgI is prepared by two different methods. (A) AgNO₃ solution is added to excess KI solution. (B) KI solution is added to excess AgNO₃ solution. What is the charge on the Ag I colloidal particles in the two cases. Explain.

3

16. To the aqueous solution of a salt taken in a tube, a few drops of blue litmus solution were added. Ammonia solution was added dropwise to the red solution formed till it regained its blue color. The solution was then heated for sometime and the tube was left undisturbed. A blue mass was seen floating in colourless solution. How will you account for this? Identify the tentative salt.

3

17. The volume of nitrogen gas (measured at STP) required to cover a sample of silica gel with a mono-molecular layer is 129cm³/g of gel. Calculate the surface area per gram of the gel if each nitrogen molecule occupies 16.2×10^{-20} m².

3

**CHAPTER:6, GENERAL PRINCIPLES AND PROCESSES OF
ISOLATION OF ELEMENTS**

1 - MARK QUESTIONS

1. Name an ore having two different metal ions. 1
2. What are the oxidation states of iron in Fe_3O_4 ? 1
3. What is Self-Electronation? 1
4. Which Substance is added to molten iron to remove sulphur impurity? 1
5. What is “18:8 stainless steel”? 1
6. Why copper matte is put into silica lined converter? 1

2 - MARKS QUESTIONS

7. What is the difference between reverberatory furnace & blast furnace. 2
8. How does NaCN act as a depressant in preventing zinc from forming the froth?
Explain 2
9. Why thermite process is not used for obtaining aluminum from bauxite. 2

3 - MARKS QUESTIONS

10. What is the criterion for choosing a method of reduction? Explain with Ellingham’s diagram, by taking at least 2 examples. 3
11. Give the reducing technique of a covalent metal compound, by giving all necessary equations. 3
12. What is red mud in the metallurgy of aluminum? And explain all the steps involved in the concentration of ore of aluminium with necessary equations. 3
13. The extraction of gold by leaching with NaCN involves both oxidation and reduction. Justify giving equations. 3
14. Cinnabar and Galena on roasting often give their respective metals but Zincblende does not. Explain. 3
15. Explain the following
 - i. Carbon reduction process is not applied for reducing aluminium oxide to aluminium.

ii. Aq Sodium chloride cannot be used for the isolation of sodium by electrolytic reduction method.

iii. Thermite process is quite useful for repairing the broken parts of machines.

3

16. Why reduction of metal oxide easier if the metal is formed in the liquid state at the temperature of reduction ?

3

CHAPTER:7, p – BLOCK ELEMENTS

1 - MARK QUESTIONS

1. PCl_3 fumes in moist air. Why? 1
2. Oxides of P, As, Sb exist as dimers (P_4O_6 , P_4O_{10} , As_4O_6 , and As_4O_{10}). Why? 1
3. P_4O_{10} is used as dehydrating agent. Why? 1
4. Oxygen and sulphur exhibit -2 oxidation state where as others (Se, Te) exhibit $+2$ oxidation states. 1
5. Chemical methods are not practicable for the preparation of Fluorine. 1
6. Why H_2SO_4 is not used for the preparation of HBr from NaBr 1
7. Iodine forms I_3^- ion but F_2 does not form F_3^- ion. Why? 1
8. NH_3 has a higher proton affinity than PH_3 . Explain 1
9. Bleaching of flowers by chlorine is permanent while that by sulphur dioxide is temporary. Why? 1
10. Why does chlorine water loses its yellow colour on standing? 1

2 - MARKS QUESTIONS

11. Oxides of Nitrogen have open chain structure while those of phosphorous have closed chain or cage structure. Why is it so? Illustrate with one structural example for each type of oxide or the oxides of phosphorous have cage structure but not open ones. 2
12. When a moist blue litmus paper is dipped in a solution of hypochlorous acid, it first turns red and then latter gets decolorized. Why? 2
13. Iodine is liberated when KI is added to a solution of Cu^{2+} ions but Cl_2 is not liberated when KCl is added to a solution of Cu^{2+} ions. Why? Explain. 2
14. State the reasons
 - i. ClF_3 exists but FCl_3 does not
 - ii. BH_4^- and NH_4^+ are isoloble 2
15. Why is it important to add KF in HF and exclude moisture during electrolysis of HF for the preparation of Fluorine ? 2
16. Why SO_2 is a better reducing agent in alkaline medium as compared to that in acidic medium ? Explain. 2

3 - MARKS QUESTIONS

17. Account for the following:

- (i) Chlorine water has both oxidizing and bleaching properties
- (ii) H_3PO_2 and H_3PO_3 act as good reducing agents while H_3PO_4 does not.
- (iii) On adding of ozone gas to KI solution, violet vapours are obtained 3

18. A translucent white waxy solid (A) on heating in an inert atmosphere is converted into its allotropic form (B). Allotrope (A) on reaction with very dilute aqueous KOH liberates a highly poisonous gas (C) having rotten fish smell. With excess of chlorine (C) forms (D) which hydrolyses to compound (E). Identify A to E

3

19. An element 'A' exists as a yellow solid in standard state. It forms a volatile hydride 'B' which is a foul smelling gas and is extensively used in qualitative analysis of salts. When treated with oxygen, 'B' forms an oxide 'C' which is a colourless, pungent smelling gas. This gas when passed through acidified KMnO_4 solution, decolorizes it, 'C' gets oxidized to another oxide 'D' in the presence of a heterogeneous catalyst. Identify A, B, C, D and also give the chemical equation of reaction of 'C' with KMnO_4 solution and for conversion of 'C' to 'D'. 3

20. Element A burns in nitrogen to give an ionic compound B. The compound B reacts with water to give C and D. A solution of C becomes milky on bubbling carbon dioxide. Identify A, B, C and D. And write the balanced equations. 3

CHAPTER:8, THE d & f BLOCK ELEMENTS

1 - MARK QUESTIONS

1. Why is that orange solution of $K_2Cr_2O_7$ turns yellow on adding NaOH ? 1
2. Arrange CrO, CrO_3 and Cr_2O_3 in increasing order of acidic strength.
1
3. Why does Ti^{4+} ion show diamagnetic nature?
1
4. Which metal in the first series of transition metal exhibits +1 oxidation state most frequently and why? 1
5. Which element of the first transition series shows the highest number of oxidation states? 1
- 9.. $K_2[PtCl_6]$ is a well known compound, Where as the corresponding Ni compound is not known. State a reason for it. 1
10. Why does vanadium pentoxide act as a catalyst? 1
11. Why hydrated $CuSO_4$ is blue while its anhydrous form is colourless.
1
12. Why is HCl not used to acidify a permanganate solution in volumetric estimation of Fe^{2+} and oxalate ion. 1

2 - MARKS QUESTIONS

13. Why is copper (I) sulphate diamagnetic and Copper (II) Sulphate paramagnetic ? Explain. 2
14. $HgCl_2$, $SnCl_2$, cannot exist together in an aqueous solution. Why? 2
15. Describe giving reason which one of the following pairs has the property indicated and why?
 - (a) Fe or Cu has higher melting point
 - (b) Co^{2+} or Ni^{2+} has lower magnetic moment 2
16. Give reason:
 - (a) Transition metals sometimes exhibit very low oxidation states such as +1 and 0
 - (b) Sc shows only +3 oxidation state 2
17. Why $Hg(I)$ ion exist as Hg_2^{2+} ion while $Cu(1)$ ion exist as Cu^{1+} . Explain. 2

18. A serious accident took place in a laboratory when a student tried to dissolve KMnO_4 in conc. Sulphuric acid instead of dil. Sulphuric acid. What went wrong ? Explain. 2

3 - MARKS QUESTIONS

14. An aqueous blue coloured solution of a transition metal sulphate reacts with H_2S in acidic medium to give a black precipitate (A) Which is insoluble in warm aqueous solution of KOH . The blue solution on treatment with KI in weakly acidic medium turns yellow and produces a white precipitate (B). Identify the transition metal ion; write the chemical reaction involved in the formation of A and B. 3

15. An aqueous solution of a compound (A) is acidic towards litmus and (A) sublimes at about 300°C . (A) on treatment with an excess of NH_4SCN gives a red coloured compound (B) and on treatment with a solution of $\text{K}_4(\text{Fe}(\text{CN})_6)$ gives a blue coloured compound (C). (A) on heating with excess of $\text{K}_2\text{Cr}_2\text{O}_7$ in the presence of concentrated H_2SO_4 evolves deep red vapour of (D). On passing the vapours of (D) into a solution of NaOH and then adding the solutions of acetic acid and lead acetate a yellow precipitate of compound (E) is obtained. Identify A to E and give chemical equations involved. 3

16. When a white crystalline compound X is heated with $\text{K}_2\text{Cr}_2\text{O}_7$ and conc. H_2SO_4 , a reddish brown gas A is evolved. On passing A into caustic soda solution, a yellow coloured solution of B is obtained. Neutralizing the solution B with acetic acid and on subsequent addition of lead acetate, yellow ppt. C is obtained. When X is heated with NaOH solution, a colorless gas is evolved and on passing the gas into K_2HgI_4 solution, a reddish brown ppt. D is obtained. Identify A, B, C, D and X. write the equations of the reactions involved. 3

20. A metal oxide of iron and chromium is fused with sodium carbonate in the presence of air to form a yellow colour compound A. on acidification, the compound A forms an orange coloured compound B which is a strong oxidizing agents. Identify the compounds A and B and write balanced equations for each step. 3

21. State the reasons for the following:

- i. Mercury is transported in iron containers.
- ii. $\text{Ce}(\text{III})$ is readily oxidized to $\text{Ce}(\text{IV})$

iii. Actinoids have a stronger tendency to form complexes than lanthanoids

3

CHAPTER:9, COORDINATION COMPOUNDS

1 - MARK QUESTIONS

1. Why do tetrahedral complex not show geometrical isomerism? 1
2. Why does the colour changes on heating $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ 1
3. $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ is strongly paramagnetic whereas $[\text{Fe}(\text{CN})_6]^{3-}$ is weakly paramagnetic. Explain. 1
4. What happens when potassium ferrocyanide solution is added to a ferric salt solution? 1

2 - MARKS QUESTIONS

5. A coordination compound has a formula $(\text{CoCl}_3 \cdot 4\text{NH}_3)$. It does not liberate NH_3 but precipitates chloride ion as AgCl . Give the IUPAC name of the complex and write its structural formula. 2
6. Write the correct formula for the following co-ordination compounds.
 $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ (Violet, with 3 Chloride ions/ Unit formula)
 $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ (Light green colour with 2 Chloride ions/ unit formula)
2
7. Give the electronic configuration of the d-orbitals of Ti in $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ ion in an octahedral crystal field. 2
8. Co(II) is stable in aqueous solution but in the presence of strong ligands and air, it can get oxidized to Co(III). (Atomic Number of cobalt is 27). Explain. 2
9. Give a chemical test to distinguish between $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$ and $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4\text{Br}$. Name the type of isomerism exhibited by these compounds. 2
10. What is the coordination entity formed when excess of aqueous KCN is added to an aqueous solution of copper sulphate? Why is that no precipitate of copper sulphate is obtained when H_2S (g) is passed through this solution? 2

3 - MARKS QUESTIONS

11. . Aqueous copper sulphate solution (blue in colour) gives a green precipitate with aqueous potassium fluoride, a bright green solution with aqueous potassium chloride.

Explain these experimental results. 3

12. A metal complex having the composition $\text{Cr}(\text{NH}_4)\text{Cl}_2\text{Br}$ has been isolated in two forms, A and B. The form A reacts with AgNO_3 solution to give a white precipitate readily soluble in dilute aqueous ammonia whereas B give a pale yellow precipitate soluble in concentrated ammonia solution. Write the formulae of A and B and write their IUPAC names. 3

13. Explain the following

- All octahedral complexes of Ni^{2+} must be outer orbital complexes.
- NH_4^+ ion does not form any complex
- $(\text{SCN})^{-1}$ ion is involved in linkage isomerism in co-ordination compounds.

3

14. A metal ion M^{n+} having d^4 valence electronic configuration combines with three didentate ligands to form complexes. Assuming $\Delta_o > P$

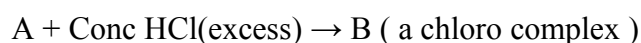
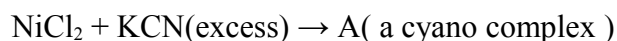
Draw the diagram showing d orbital splitting during this complex formation

Write the electronic configuration of the valence electrons of the metal M^{n+} ion in terms of t_{2g} and e_g .

What type of the hybridization will M^{n+} ion have?

Name the type of isomerism exhibited by this complex. 3

15. The coordination no. of Ni^{2+} is 4.



- Write IUPAC name of A and B
- Predict the magnetic nature of A and B
- Write hybridization of Ni in A and B

3

16. Explain the following

i. $\text{Cu}(\text{OH})_2$ is soluble in ammonium hydroxide but not in sodium hydroxide solution.

ii. EDTA is used to cure lead poisoning

iii. Blue coloured solution of $[\text{CoCl}_4^{2-}]$ changes to pink on reaction with HgCl_2

3

CHAPTER:10, HALOALKANES AND HALOARENES

1 - MARK QUESTIONS

1. Identify the most reactive among the given compounds.
a. $\text{H}_2\text{C} = \text{CH}-\text{Cl}$ b. $\text{CH}_3\text{CH}_2\text{Cl}$ c. $\text{H}_2\text{C} = \text{CHCH}_2\text{Cl}$ d. $\text{C}_6\text{H}_5\text{Cl}$ 1
2. What is the main product formed when 2-bromopentane is heated with potassium ethoxide and ethanol ? 1
3. In presence of peroxide HCl and HI do not give antimarkovnikov's addition to alkenes. Why ? 1
4. Arrange the following in the order of increasing ease of dehydrohalogenation.
i. $\text{CH}_3\text{CH}_2\text{Cl}$ ii. $\text{CH}_3\text{CHClCH}_3$ iii. $\text{CH}_3\text{CCl}(\text{CH}_3)_2$ 1
5. Which is the better nucleophile. Bromide ion or Iodide ion. Why ? 1
6. A hydrocarbon C_5H_{12} gives only one monochlorination product. Identify it. 1
7. Which isomer of $\text{C}_4\text{H}_9\text{Br}$ have lowest boiling point ? 1

2 - MARKS QUESTIONS

8. How to convert i. 2-methyl propane to isobutyl bromide
ii. 2-iodopropane to 1-iodopropane 2
9. Grignard reagent cannot be prepared from $\text{BrCH}_2\text{C}\equiv\text{CH}$. Explain why ?
2
10. Wurtz reaction fails incase of tertiary butyl halide. Why ? 2
11. Write down the structures of A and B
$$\text{PhC}\equiv\text{CH} \xrightarrow{\text{NaNH}_2, \text{MeI}} \text{A} \xrightarrow{\text{Na/NH}_3} \text{B}$$
 2
12. How can you distinguish between the following pair
a. $\text{CH}_3-\text{CH}=\text{CHBr}$ & $\text{H}_2\text{C}=\text{CH}-\text{CH}_2\text{Br}$
b. 1,1-dichloroethane & 1,2 - dichloroethane 2

13. RCl is hydrolysed to ROH slowly, but the reaction is rapid if a catalytic amount of KI is added to the reaction mixture. Explain.

2

3 - MARKS QUESTIONS

14. Predict the order of reactivity of the following compounds in S_N^1 and S_N^2 reactions
- Four isomeric bromobutanes
 - Benzyl iodide, benzyl chloride, benzyl bromide.
 - CH_3Cl , CH_3Br , CH_3CH_2Cl , $(CH_3)_2CHCl$ 3

15. Arrange the following in the increasing order of boiling point and state the reason for the order.
- $CH_3CH_2CH_2CH_2Br$, $(CH_3)_3CBr$, $(CH_3)_2CHCH_2Br$
 - 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene
 - $CH_3CH_2CH_2Br$, $CH_3CH_2CH_2Cl$, $CH_3CH_2CH_2I$ 3

16. State the reasons for the following
- Iodoform is obtained by the reaction of acetone with Hypiodite but not with iodide ion
 - Trichloromethane is stored in dark coloured bottles.
 - Haloarenes are insoluble in water but soluble in benzene.

3

17. An alkyl halide X of formula $C_6H_{13}Cl$ on treatment with potassium tertiary butoxide gives two isomeric alkenes Y and Z (C_6H_{12}). Both alkenes on hydrogenation give 2,3-dimethylbutane. Predict the structures of X, Y and Z. Write chemical equations involved. 3

18. A Grignard reagent A and a haloalkane B react together to give C. Compound C on heating with KOH gives a mixture of two geometrical isomers D and E of which D predominates. C and E have same molecular formula and C gives 1-bromo-3-phenylpropane on reaction with HBr in presence of peroxide. Give the structures of A, B and C and configurations of D and E with reasons. 3

CHAPTER:11, ALCOHOLS, PHENOLS AND ETHERS

1 - MARK QUESTIONS

1. What is the main product obtained when vapors of t-butyl alcohol are passed over copper at 300°C ? 1
2. Phenol has smaller dipole moment than methanol. Why ? 1
3. Write the structure of phenetole and give its IUPAC name 1
4. Why are Grignard reagents soluble in ether but not in benzene ? 1
5. Arrange the following compounds in the increasing order of acid strength.
Propan-1-ol, 2,4,6-trinitrophenol, 3-nitrophenol, 3,5-dinitrophenol 1
6. Di-tert butyl ether cannot be made by Williamson's synthesis. Why ? 1
7. Arrange the following alcohols in the order of increasing reactivity towards Lucas reagent
2-butanol, 1-butanol, 2-methyl-2-propanol 1
8. Alcohols acts as weak bases. Why? 1
9. Name the phenol with molecular formula C_7H_8O which on treatment with Br_2 water readily gives a ppt. of $C_7H_5OBr_3$? 1
10. Phenol is acidic but does not react with $NaHCO_3$ solution? 1
11. Victor Meyer's test is carried out for an alcohol which gives blue
Colouration, identify type of this alcohol? 1
12. How many ether metamers are represented by $C_4H_{10}O$? 1
13. Arrange the following in increasing order of basicity: $H_2O, OH^-, CH_3OH, CH_3O^-$

- 1
14. Predict the product when sodium ethoxide and ethyl bromide are heated ? 1
15. Name the products obtain when anisole is treated with HI ? 1
16. Diethyl ether does not react with sodium .Why? 1
17. Suggest a reason for the large difference in the boiling points of butanol and butanal, although they have same solubility in water. 1
18. Which is stronger acid –Phenol or cresol? Why? 1

2 - MARKS QUESTIONS

19. Explain the following
- (a) Cyclohexanol is more soluble in water than 1-Hexanol..
- (b) Propane 1,3-diol is more soluble in the water than propan-1-ol. 2
20. Give the major products that are formed by heating each of following ethers with HI
- i. $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_2\text{-O-CH}_2\text{CH}_3$
- ii. $\text{CH}_3\text{CH}_2\text{CH}_2\text{-O-C}(\text{CH}_3)_2\text{CH}_2\text{CH}_3$ 2
21. Which alcohol with formula $\text{C}_4\text{H}_{10}\text{O}$ cannot be prepared by hydrogenation of aldehyde or ketone. Can you obtain this alcohol from corresponding alkyl halide. If possible write the equation. 2
22. Arrange the following in order of increasing boiling points. State reason.
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$, $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$,
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$ 2
23. Ethers are cleaved by acids not by bases. Why ? 2

3 - MARKS QUESTIONS

24. How is tert-butyl alcohol obtained from acetone ? 3
- 25.(a) Why pcc cannot oxidise methanol to methanoic acid and while KMnO_4 can ?

- (b) Why is reaction of alcohol/phenol with acid chloride in the presence of pyridine? 3
26. How can we produce nitro benzene from phenol? 3
27. Which out of sodium and anhydrous calcium chloride be used for the dehydration of alcohols? Give reason. 3
28. Predict the products of the following reactions
- Tetrahydrofuran + HBr (2 mol) →
 - Tertiary butyl bromide + sodium methoxide →
 - 2-methoxy-2-phenylpropane + HI (1 mol) → 3
- 29.(a) Why is preparation of ethers by acid catalysed dehydration of 2° and 3° alcohols not a suitable method?
- (b) Why is sulphuric acid not used during reaction of alcohol with KI?
- © How will you account for the following:
- Ethers possess a net dipole moment even if they are symmetrical in structure? 3
30. Identify X, Y and Z.
- $$\text{C}_3\text{H}_7\text{OH} + \text{Conc H}_2\text{SO}_4 \xrightarrow{430-450 \text{ K}} \text{X} \xrightarrow{\text{Br}_2} \text{Y} \xrightarrow{\text{Excess Alc KOH}} \text{Z}$$
- 31.a. R—Cl is hydrolysed to R—OH slowly but the reaction is rapid if a catalytic amount of KI is added to the reaction mixture.
- b. What is formed if cyclopentanone is reduced with H₂ /Pt. Give equation for the reaction. 3
32. The treatment of alkyl chlorides with aq KOH leads to the formation of alcohols but in presence of alcoholic KOH, alkenes are the major products. Explain. 3

CHAPTER:12, ALDEHYDE KETONES AND CARBOXYLIC ACIDS

1 - MARK QUESTIONS

1. How are formalin and trioxane related to methanal? 1
2. Name the aldehyde which does not give Fehling's soln. test. 1
3. What makes acetic acid a stronger acid than phenol ? 1
4. Why HCOOH does not give HVZ (Hell Volhand Zelinsky) reaction but CH₃COOH does ?
5. Why pcc cannot oxidise methanol to methanoic acid and while KMnO₄ can ? 1
6. Would you expect benzaldehyde to be more reactive or less reactive in nucleophilic addition reaction than propanal ? Explain. 1

2 - MARKS QUESTIONS

7. Which of the following is difficult to oxidize ? Why ?
HCHO, CH₃COCH₃, CH₃CHO 2
8. Arrange the following in the decreasing order of reactivity towards nucleophilic addition. State the reason.
Ethanal, Propanone, Butanone, methanal 2
9. Name the reagents you will use to bring about the following conversions.
- a. Ethane nitrile to ethanal

- b. But-2-ene to ethanal 2
10. Explain why
- a. ditertiary butyl ketone doesnot give precipitate with sodium bisulphate where as acetone does.
- b. dialkyl cadmium is considered superior to grignard reagent for the preparation of a ketone from an acid chloride. 2
11. An aldehyde with molecular formula $C_5H_{10}O$ on treatment with 50% sodium hydroxide gives sodium salt of an acid along with neopentyl alcohol. Suggest the structure of the aldehyde and write the chemical equation of the reaction involved. 2

3 - MARKS QUESTIONS

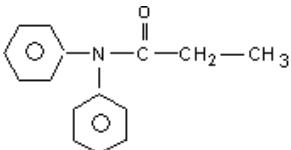
12. An unknown aldehyde A on reacting with alkali gives a β -hydroxy aldehyde, which loses water to form an unsaturated aldehyde 2-butenal. Another aldehyde B undergoes disproportionation on reaction in the presence of concentrated alkali to form products C and D. C is an aryl alcohol with the formula C_7H_8O .
- i. Identify A and B
- ii. Write the sequence of the reaction involved
- iii. Name the product when B reacts with Zn/Hg and HCl 3
13. Two isomeric compounds A and B of the same formula $C_{11}H_{13}OCl$. Both are unsaturated and yield the same compound C on catalytic hydrogenation and produce 4-chloro-3-ethoxybenzoic acid on vigorous oxidation. B exist as geometrical isomers D and E but not A. Give the structure of A to E with proper reasoning. 3
14. Account for the following
- a. Highly branched carboxylic acids are less acidic than unbranched acids
- b. Carboxylic acids does not form oximes or hydrazones
- c. In laboratory preparation of acetaldehyde by oxidation of ethanol, acetaldehyde should be distilled out continuously. 3
15. How can you bring about following conversions
- i. 4-methyl acetophenone to benzene-1,4-dicarboxylic acid
- ii. cyclohexene to hexane-1,6-dioic acid.
- iii. 3-nitrobromobenzene to 3-nitrobenzoic acid 3
16. An organic compound A of molecular formula, C_5H_8 when treated with sodium in liquid ammonia followed by reaction with normal propyl iodide yields B C_8H_{14} . A gives a ketone C $C_5H_{10}O$, when treated with dil. H_2SO_4 in presence of Hg^{2+} ions. B on

oxidation with alkaline KMnO_4 gives two isomeric acids D and E $\text{C}_4\text{H}_8\text{O}_2$. Give structures of A to E with proper reasoning. 3

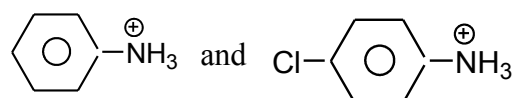
CHAPTER:13, AMINES

1 - MARK QUESTIONS

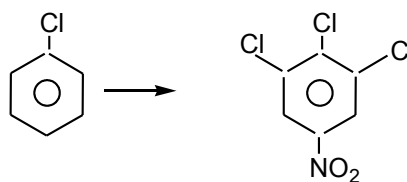
1. Direct nitration of aniline is not carried out. Why?

2. Write the IUPAC name of 

3. Which is more acidic and why?



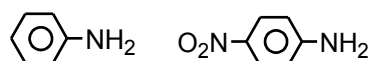
4. How will you convert?



5. Out of normal butyl amine and isobutylamine which is more basic in aq solution ?

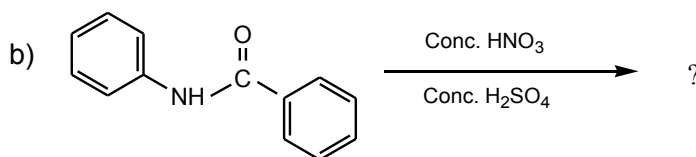
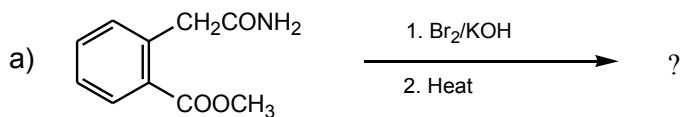
2 - MARKS QUESTIONS

6. Arrange the following amines in the increasing order of basicity with proper justification:





7. Complete the following:-



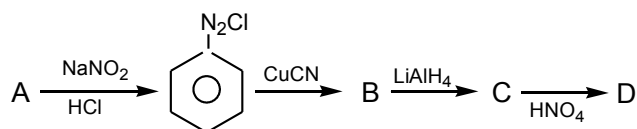
8. Which has higher boiling point and why?

- a) ethylamine and ethanol
- b) ethylamine and ethanoic acid

9. Convert:-

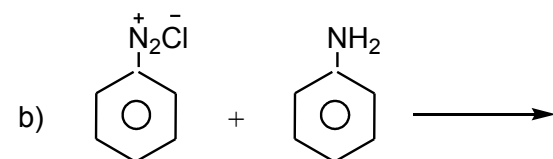
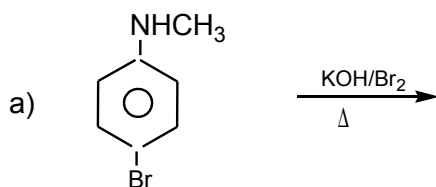
- a) Aniline to benzylamine
- b) Nitrobenzene to m-nitrophenol

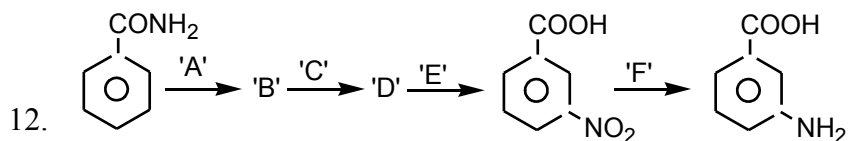
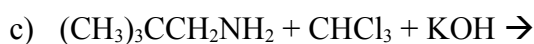
10. Identify A, B, C & D



3 - MARKS QUESTIONS

11. Write the main product and name the following reactions:-





Identify A to E

13. How will you achieve the following conversions.

- Aniline to nitrobenzene
- nitrobenzene to p-bromoaniline
- Ethylamine to ethylecyanide

14. A compound 'X' having molecular formula $\text{C}_4\text{H}_9\text{NO}$ reacts with Br_2 in presence of KOH to give another compound Y. The compound Y reacts with HNO_2 to form isopropylalcohol and N_2 gas. Identify the compound X and Y and write the reactions involved.

15. There is solution of p-hydroxybenzoic acid and p-aminobenzoic acid. Discuss one method by which we can separate them and also write down the confirmatory tests of the functional groups.

5 - MARKS QUESTIONS

16. Compound 'X' containing Chlorine, on treatment with strong ammonia gives a solid Y which is free from chlorine. Y analysed as C = 49.31%, H = 9.59 and N = 19.18% and molar mass 73 g mol^{-1} and reacts with Br_2 and caustic soda to give a basic compound Z, which reacts with HNO_2 to give ethanol. Suggest the structures for X, Y and Z and write the reactions involved.

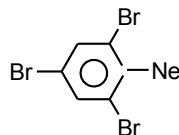
17. Account for the following:-

- Only primary amines are produced by Gabriel phthalimide synthesis.
- Primary amines have higher boiling point than isomeric tertiary amines.
- 2° and 3° amines do not give carbylamine reaction.
- $\text{p}K_b$ value of aliphatic amine is lower than that of aromatic amines.
- Reactivity of $-\text{NH}_2$ group gets reduced in acetanilide.

18. a. Write structures and IUPAC names of

- The amide which gives 2-methylpropanamine by Hofmann bromamide reaction.

ii) The amine which is converted to



by carbylamine reaction.

(b) Condensation of aniline and benzaldehyde gives compound A that is hydrogenated to compound B. Identify A and B and write the reaction involved.

19. a) How will you distinguish between following pair of compounds by a suitable chemical test.

- i) Benzamide and ethanamide
- ii) Ethylcyanide and ethylisocyanide.

b) How will you convert:-

- i) $(\text{CH}_3)_3\text{CCH}_2\text{Cl}$ to $(\text{CH}_3)_3\text{CCH}_2\text{N}(\text{NO})\text{CH}_3$
- ii) Toluene to m- bromotoluene
- iii) Ethanamine to methanol

20. An organic compound 'A' having molecular formula $\text{C}_4\text{H}_8\text{O}$ on treatment with phosphorous and iodine gives a compound B. The compound B on further treatment with KCN and subsequent reduction gives 'C'. C on treatment with nitrous acid to give another compound D which responds to iodoform test. 'D' reacts with NH_3 in presence of Al_2O_3 to give E. Identify A to E and write all the reactions involved.

CHAPTER:14, BIOMOLECULES

1 - MARK QUESTIONS

1. Where does, the water present in the egg, go after boiling the egg?
2. Name a water soluble vitamin which is a powerful antioxidant.
3. Name only aminoacid in which the α amino group is secondary but not primary.
4. Name a monosaccharide with D configuration which is laevo rotatory

2- MARKS QUESTIONS

5. Fructose contains a keto group, but still it reduces Tollens reagent. Explain
6. Under what conditions does each protein take a shape that is energetically most stable. Explain.
7. Why is cellulose in our diet not nourishing but is nourishing in grazing animals ?
8. B complex is often prescribed vitamin. What is complex about it ? What is its usefulness ?

3- MARKS QUESTIONS

9. How do you explain the absence of aldehyde group in the pentacetate of D-glucose. Justify with equations.
10. Sucrose does not reduce AgNO_3 but when pretreated with dil. Acid it does reduce. Why explain with equations.
11. Give reasons for the following.

i. Amino acids have relatively higher melting point as compared to corresponding halo acids.

ii. On electrolysis in acidic solution amino acids migrate towards cathode while in alkaline solution these migrate towards anode.

iii. Why a few amino acids are acidic, a few basic and a few neutral.

12.a) Write about the following on protein synthesis.

i. Name the location where protein synthesis occurs.

ii. How do 64 codons code for only 20 Amino Acids.

iii. Which of the two bases of the codon are more important for coding?

13.a) Which forces are responsible for the stability of α helix? Why is it named as 3.6₁₃ helix?

b) State the significance of primary & secondary structure of proteins.

14.a) What will be the sequence of bases on mRNA molecule synthesized on the following stand of DNA? TATCTACCTGGA.

b) Two samples of DNA, A and B have melting temperatures 340 and 350K respectively. Can you draw any conclusion from these data regarding their base content?

c) In E.Coli DNA, the AT/GC ratio is 0.93. if the number of adenine in the DNA sample is 465,000 calculate the number of moles of guanine present.

15.i) Despite having an aldehyde group Glucose does not give 2,4-DNP test. What does this indicate?

ii) Glucose and fructose give the same osazone. Why? Explain.

16. In aq solution of glucose consists mainly of an equilibrium mixture of α -D(+) glucose $[\alpha]_D = + 112^\circ$ and β -D(+)glucose $[\alpha]_D = + 18.7^\circ$. The specific rotation of equilibrium mixture is $+ 52.7^\circ$. Find the % composition of the equilibrium mixture.

CHAPTER:15, POLYMERS

1 - MARK QUESTIONS

1. Which polymer is used for the controlled release of drugs in our body ? What is its advantage ?
2. How can you make a polyamide biodegradable ?
3. Linking in benzene rings through – CH₂ – in bakelite is always at ortho and para positions Why ?
4. Name the elastomer you will prefer to use for the manufacture of oil seals. Why ?
5. Can a copolymer be addition polymer ? If so give one example.

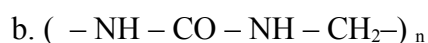
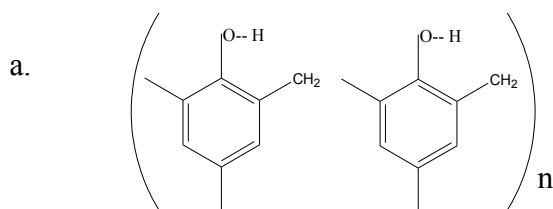
2 - MARKS QUESTIONS

6. Differentiate between the following pairs of polymers based on the property mentioned against each
 - i. Novolac and Bakelite (structure)
 - ii. Buna-S and Terylene (intermolecular forces)
7. Polymers of same monomer are used to manufacture carrybags as well as water storing tanks. Identify the polymers and explain the differences in their structures and properties.
8. In what way PHBV and Nylon-2-nylon-6 are different from Nylon-66 and polyester. List out differences.
9. With same starting materials we can get two different polymers i. used in paints/lacquers ii. Thermosetting plastics. Identify the starting materials and list out the structural differences between the two polymers.

3 - MARKS QUESTIONS

10. What is latex? Which polymer is derived from latex? How the properties of polymer can be improved ?

11. Identify the monomers in following Polymeric structures



12. How does the presence of double bonds in rubber molecules influence their structure and reactivity?

13. Describe the free-radical mechanism for the polymerization of ethene? What reagents can be used as initiator in this mechanism?

14. Classify the following polymers on the basis of inter molecular forces. Justify your classification.

PVC, Nylon, Bakelite, Buna-s

15. Answer the following –

i. Which material is used as substitute for wool in making commercial fibers as orlon or acrilan?

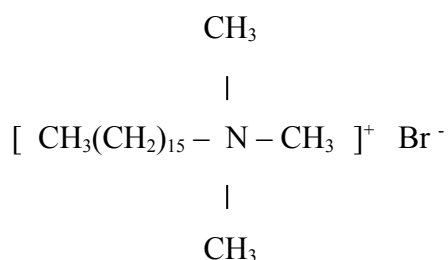
ii. What are the conditions required for preparation of High density polythene.

iii. Name and give the preparation of the polymer used for making unbreakable crockery.

CHAPTER:15, POLYMERS

1 - MARK QUESTIONS

1. How does aspirin help in removing pain?
2. Baby soaps are soft soaps, write its chemical constituents.
3. Write the use of chloro-xyleneol.
4. A child when dropped his soap into a bathing tub, the soap did not sink but was floating. Suggest the method of manufacturing of the soap.
5. A patient tested to have gram positive bacterial infection. What type of antibiotic the physician might have prescribed to the patient? Justify.
6. All residents of a village are found to suffer from an unknown disease. What type of antibiotic may be administered to the sufferers.
7. Write the application of following molecule in daily life



8. What problem arises in using alitame as artificial sweetener?
9. Why detergents are not biodegradable?
10. Why cationic detergents have limited use?

2 – MARKS QUESTIONS

11. Pick up the odd one among the following on the basis of medicinal properties mentioning the reason.

- a. Luminal, seconal, phenacetin, equanil.
 - b. Chloroxylenol, phenol, chloroamphenicol, bithional.
12. Write the type and name of the detergent used in hair conditioner.
13. How can you overcome the problem of premature ageing by specific intake of food items. Name some food items that slows down the ageing process. Explain how they act ?
- 14.a) Why aspartame cannot be used in cooked foods ?
- b) Which type of people take artificial sweetening agents and why?
- 15.a.Soframycine is an antiseptic and not disinfectant. Give reason.
- b.If water contains dissolved calcium bicarbonate, out of soaps or detergents, which one will you choose for cleaning clothes?
- 16.a.Boric acid is a weak antiseptic than tincture of iodine. Give reason.
- b. Tincture of iodine is preferred over iodoform as antiseptic. Why?

3 – MARKS QUESTIONS

17. Low level of noradrenaline is the cause of depression. What type of drugs are needed to cure this problem? Name two drugs.
18. While antacids and antiallergic drugs interfere with the function of histamines, why do these not interfere with the function of each other? Explain.
19. Account for the following
- i. Aspirin drug prevents heart attacks
 - ii. Diabetic patients are advised to take artificial sweeteners instead of natural sweeteners.
 - iii. Detergents are nonbiodegradable while soaps are biodegradable.
20. How synthetic progesterone derivatives act as antifertility drugs. Explain and mention two commonly available drugs in the market.

HINTS: CHAPTER:1

1. 4
15. 123.8pm
16. 438pm
17. 2.786×10^{-23} c.c
25. .268.8 pm
26. 346.4pm
27. fcc, 141.4 pm
28. i) 1.5463 g cm^{-3} ii) 1.5448 g cm^{-3}

HINTS: CHAPTER:2

9. 9.22 mol kg^{-1}
10. 38.7 g
12. 256.5 g mol^{-1}
13. 270.21 K
14. 75 %
16. 83 %
17. 243.92

HINTS: CHAPTER:3

10. mass of Zn rod = 23.725 g, molarity of SO_4^{2-} remains same
12. % of Cu, Fe, Ag are 98.88, 0.831, 0.289 respectively
12. - 0.79 V
14. 1.9966
15. 95 %

HINTS: CHAPTER:4

1. When the initial conc. become $\frac{1}{4}$, half life becomes 4 times. Order of reaction is 2.
- 2: 2:1
- 3: Molecules of reactants collide simultaneously and go to products. The probability of colliding 4 or 5 species simultaneously is very rare.
4. The half life is independent of conc. of B. This means the reaction is of first order w.r.t. B and w.r.t. A also it is first order and overall order is second.
- 5: $t_{1/2} \propto (\text{conc.})^{1-n}$ $n=2$
 $t_{1/2} \propto (\text{conc.})^{-1}$ or

$$t_{1/2} \propto 1/(\text{conc.})$$

6. Energy of activation (Ea)

$$7. t_{1/2} = 1/k \cdot 1/[A_0]$$

$$\log t_{1/2} = -\log K - \log [A_0]$$

$$\text{Intercept} = t_{1/2}$$

8. B = 76.8% C = 23.2%

$$\text{Percentage of formation of B} = K_1/K_1 + K_2 \times 100$$

9. $\log K_2/K_1 = \Delta H/2.303R (1/T_1 - 1/T_2)$

$$\log 6/2 = \Delta H/2.303R (1.5 \times 10^{-3} - 2.0 \times 10^{-3})$$

ΔH comes negative. Hence exothermic

10. Rate = K [NOBr₂] [NO]

$$\text{But } [\text{NOBr}_2]/[\text{NO}][\text{Br}_2] = K$$

$$\text{Or } [\text{NOBr}_2] = K[\text{NO}][\text{Br}_2]$$

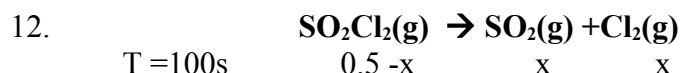
Substituting values of [NOBr₂] in rate law

$$\text{Rate} = K'[\text{NO}]^2[\text{Br}_2]$$

11. Earlier rate R = K[A]ⁿ[B]^m

$$\text{Now rate } R_1 = K[2A]^n[B/2]^m$$

$$R_1/R = 2^{n-m}$$



$$T = 100\text{s} \quad \begin{array}{ccc} 0.5 - x & x & x \end{array}$$

$$0.5 - x + x + x = 0.60$$

$$x = 0.10$$

$$K = 2.303/100 \log 0.5/0.4 = 2.23 \times 10^{-3} \text{ s}^{-1}$$

Similarly k can be calculated when

$$0.5 - x + x + x = 0.65$$

13. In heterogeneous catalysis molecules of NH₃ are absorbed on surface. Under lower conc. the surface of catalyst is not completely occupied. When pressure is high the surface is completely occupied and further increase in pressure (conc.) does not affect the rate.

14. Rate of reaction = -1/2 d[NO₂]/dt

$$= K_1 [\text{NO}_2]^2 - K_2 [\text{N}_2\text{O}_4]$$

therefore rate of disappearance of NO₂

$$= -d[\text{NO}_2]/dt = 2K_1 [\text{NO}_2]^2 - 2K_2 [\text{N}_2\text{O}_4]$$

15. $\log K = \log A - E_a/2.303RT$

$$\log K' = \log A - E_a'/2.303RT$$

$$\log K = \log A - E_a/2.303RT$$

$$\log K'/K = E_a - E_a'/2.303RT = 9.8037$$

$$\text{Or } K'/K = 6.36 \times 10^9$$

$$\text{UR catalysed / UR uncatalysed} = K'/K = 6.4 \times 10^9$$

16. $K = 0.693/t_{1/2}$

$$(a-x) \propto (0.40 - P) \text{ atm.}$$

$$K = 2.303/12 \log 0.40/0.40 - P$$

$$P \text{ calculated} = 0.1745 \text{ atm}$$

$$\text{Total pressure} = 0.4 - P + P + P + P = 0.749 \text{ atm}$$

17. $K = Ae^{-E_a/RT}$

$$E_a, \text{ absence of catalyst} = x \text{ KJ/mol}$$

$$E_a, \text{ presence of catalyst} = (x-20) \text{ KJ/mol}$$

At 500K

$$K = Ae^{-x/R.500} \quad (1)$$

At 400

$$K = Ae^{-(x-20)/R.400} \quad (2)$$

Divide 1 by 2, we get

$$X = 100 \text{ KJ/mol}$$

$$E_a = 100 \text{ KJ/mol}$$

18. 40 min = 2 half lives

$$\text{Amount present after 40 min} = a/4$$

$$\text{Amount added} = a/2$$

$$\text{Total amount after 40 min} = a/4 + a/2 = 3a/4$$

$$\text{After 60 min from start, amount left} = 3a/8$$

$$\text{Total amount taken} = a + a/2 = 3a/2$$

$$\text{Hence \%} = 3a/8 \div 3a/2 \times 100 = 25\%$$

19. Fraction of molecules having energy equal to or greater than activation energy

$$X = n/N = e^{-E_a/RT}$$

$$\ln X = -E_a/RT$$

$$\log X = -E_a/2.303RT$$

$$= 209.5 \times 10^3 / 2.303 \times 8.314 \times 581$$

$$= -18.8323$$

$$X = 1.471 \times 10^{-19}$$

HINTS: CHAPTER:5

1. Carbon monoxide acts as a poison for the catalyst used in the manufacture of ammonia by Haber's process. Hence it is necessary to remove it.
2. BF_3 acts as a strong Lewis acid and hence used as catalyst in industrial processes.
3. Oil in water type of emulsion.
4. Ice-cream is an emulsion of milk or cream in water i.e. oil in water type. Gelatin is added to act as an emulsifier.
5. On allowing a gel to stand for a long time it shrinks and loses all its liquid content. The shrinking of gel is called syneresis or weeping.
6. $\text{K}_3[(\text{Fe}(\text{CN})_6)]$
7. Adsorption
8. It is the colloidal solution of gold.
17. 22400 cm^3 of N_2 at STP contains $= 6.022 \times 10^{23}$ molecules
- 129 cm^3 of N_2 at STP contains $= \frac{6.022 \times 10^{23} \times 129}{22400}$
- $= 3.468 \times 10^{21}$ molecules.

$$\text{Area occupied by a single molecule} = 16.2 \times 10^{-20} \text{ m}^2$$

Area occupied by 3.468×10^{21} molecules of N_2

$$=(16.2 \times 10^{-20}) \times (3.468 \times 10^{21}) \text{ m}^2$$

$$=561.8 \text{ m}^2$$

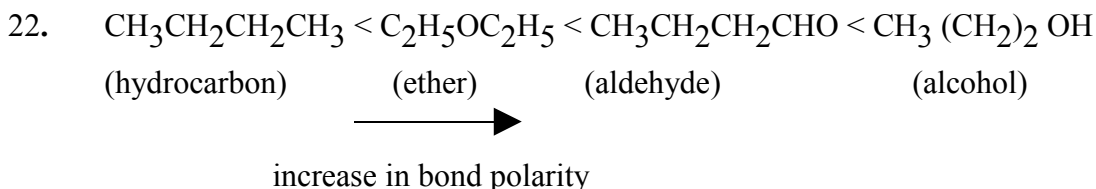
Therefore surface area per gram of gel = 561.8 m^2

HINTS: CHAPTER: 11

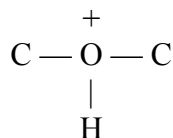
1. Isobutylene (2-Methyl propane)
2. Due to electron-withdrawing effect of the benzene ring, the C — O bond in phenol is less polar but in case of methanol due to electron-donating effect of — CH_3 group, C — O bond is more polar.
4. Grignard reagents form co-ordination complexes with ether but not benzene since the former has lone pair of electrons but the latter does not.
6. Since tert-butyl bromide being 3°-alkyl halide prefers to undergo elimination rather than substitution ether.
8. The oxygen atom of the hydroxyl group has two lone pairs of electrons. Therefore alcohols accept a proton from strong mineral acid to form oxonium ions. Hence act as weak bases.
9. m- cresol
10. Phenol is a weaker acid than carbonic acid (H_2CO_3) and does not liberate CO_2 from $NaHCO_3$.
11. Secondary aliphatic alcohol
12. 3
13. $H_2O < CH_3OH < OH^- < CH_3O^-$ (Since stronger base displaces a weaker base from its compound, CH_3O^- is stronger base.)
14. Diethyl ether (Ethoxy ethane).
15. Phenol and methyl iodide .
16. Diethyl ether does not contain an active hydrogen attached to oxygen like in alcohols and phenol.
17. The b. pt. of butanol is higher than that of butanal because butanol has strong intermolecular H-bonding while butanal has weak dipole-dipole interaction
18. Cresol are less acidic than phenol. Electron releasing groups such as alkyl groups in General do not favour the formation of phenoxide ion resulting in decrease in acid Strength.
- 19.
- (a) The alkyl group in cyclohexanol is more compact than the alkyl group in

Hexanol-1. The -OH group of cyclohexanol is more exposed and is more available for Hydrogen bonding with water. Hence, Cyclohexanol is more soluble in water than hexanol-1.

(b) In Propane 1,3-diol, there are two -OH groups present which increase the no. of H bonds between water and the diol. Hence Propane 1,3-diol is more soluble in water than propan-1-ol. .

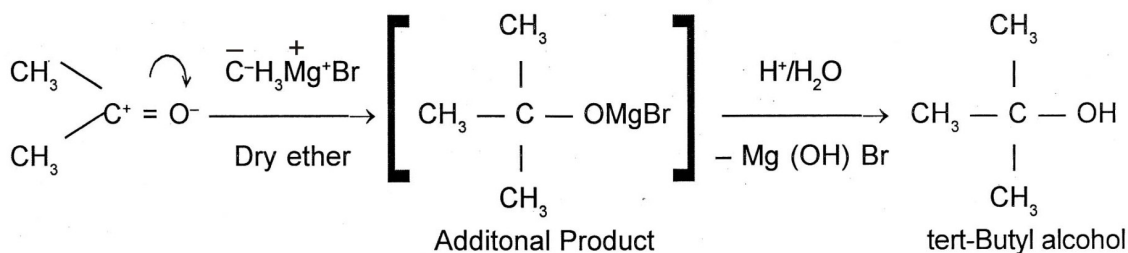


23. The C — O — C bond in ethers like the C — OH bond in alcohols is quite strong. In order to weaken it, the oxygen atom must be protonated. A subsequent nucleophile attack by a strong nucleophile such as Br⁻ as I⁻ ion on the less hindered carbon atom of the protonated :



bond brings about the cleavage of ethers to form an alcohol and an alkyl halide. The acids only can provide the H⁺ ion required for protonation of O atom of ether and therefore only acids can bring about the cleavage of ethers and not bases

24

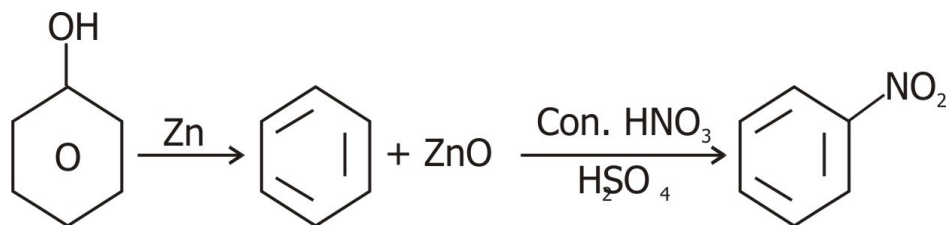


25.(a) This is because pcc is a mild oxidising agent and can oxidise methanol to methanal only while KMnO₄ being strong oxidising agent oxidises it to methanoic acid.

25.(b) Because esterification rxn is reversible and presence of base (pyridine) neutralises HCl produced during reaction thus promoting forward reaction

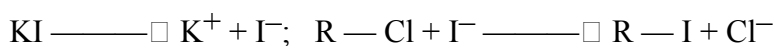
26. (I) First convert phenol to benzene by heating with Zn dust.

(II) Nitration of benzene with conc. nitric acid in presence of conc. sulphuric acid.



30(b) Because by products of the reaction, i. e., SO_2 and HCl being gases escape into atmosphere leaving behind pure alkyl chloride.

31. Iodide ion is a powerful nucleophile and hence reacts rapidly with RCl to form RI .



Further I^- is a better leaving group than Cl^- ion, therefore, RI is more rapidly hydrolysed than RCl to form ROH .



32. In aq. solution, KOH is almost completely ionised to give OH^- ions which being a strong nucleophile brings about a substitution reaction to form alcohols. Further in aq. solution, OH^- ions are highly solvated (hydrated).

This solution reduces the basic character of OH^- ions which fail to abstract a hydrogen from the \square -carbon of the alkyl halide to form an alkene.

However an alcoholic solution of KOH contains alkoxide (RO^-) ions which being a much stronger base than OH^- ions preferentially abstracts a hydrogen from the \square -carbon of the alkyl halide to form alkene.

HINTS: CHAPTER:12

1. Formalin is 40% aqueous solution of methanal whereas trioxane is trimer of methanal

2. Benzaldehyde does not give Fehling soln. test.

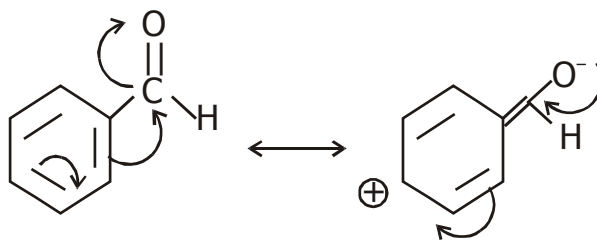
(Aromatic aldehydes do not give this test.)

3. Greater resonance stabilization of acetate ion over phenoxide ion

4. CH_3COOH contains α hydrogens and hence give HVZ reaction but HCOOH does not contain α -hydrogen and hence does not give HVZ reaction.

5. This is because pcc is a mild oxidising agent and can oxidise methanol to methanal only. While KMnO_4 being strong oxidising agent oxidises it to methanoic acid.

6. C-atom of carbonyl group of benzaldehyde is less electrophilic than C-atom of carbonyl group in propanal. Polarity of carbonyl group in benzaldehyde reduced due to resonance making it less reactive in nucleophilic addition reactions.



There is no such resonance effect in propanal and so the polarity of carbonyl group in it is more than in benzaldehyde. This makes propanal more reactive than benzaldehyde.
