

KENDRIYA VIDYALAYA SANGATHAN
केन्द्रीय विद्यालय संगठन



CLASS: XII

CHEMISTRY

HIGHER ORDER THINKING SKILLS

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KENDRIYA VIDYALAYA SANGATHAN
BANGALORE REGION

QUESTION BANK
HIGHER ORDER THINKING SKILLS
CLASS XII - CHEMISTRY

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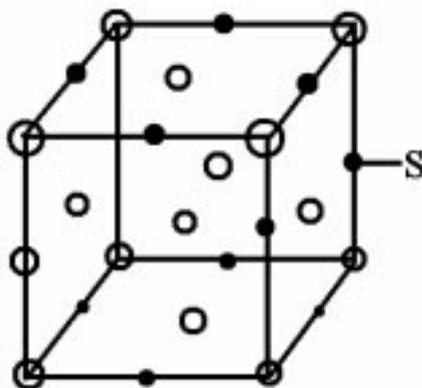
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UNIT - 1

THE SOLID STATE

1-Mark Questions

- 1) In the normal spinel structure, the oxide ions are arranged in CCP pattern. The Zn^{2+} ions occupy one eighth of the tetrahedral holes and one half of the octahedral voids are occupied by Al^{3+} . Give the formula of the spinel.
- 2) Metallic gold crystallizes in FCC lattice. How many nearest neighbours do each gold atom has?
- 3) When a crystal of NaCl is heated in sodium vapour, it acquires a yellow colour. The yellow colour is due to non stoichiometric defect. Name the defect.
- 4) In the face centered cubic arrangement of A and B atoms where A atoms are at the corner of the unit cell and B atoms at the face centres. One of the A atom is missing from one corner in the unit cell. What is the simplest formula of the compound?
- 5) For the structure given below identify the site marked as S.



- 6) In BCC lattice, what are the numbers of the nearest and next nearest neighbours?
- 7) What type of magnetism is shown by the substance whose magnetic moments are aligned as given below:



- 8) A solid 'X' conducts electricity in solid state as well as in molten state. Its conductance decreases with increase in temperature. Identify the solid X.
- 9) 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 Marks Questions

- 10) A compound AB crystallizes in BCC lattice with unit cell edge length of 480Pm. If the radius of B is 225Pm. Calculate the radius of A⁺.
Hint:

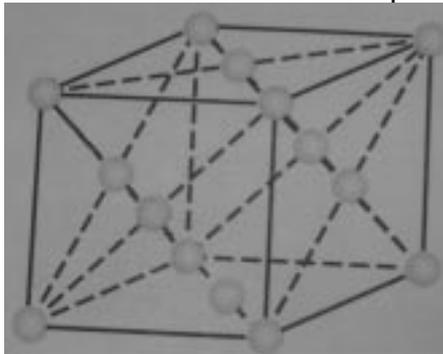
$$\text{For BCC structure: } 2(r_A+r_B) = \sqrt{3} a$$

- 11) In the close packing arrangement of atoms does a face centred atom touch the face centred atom of an adjacent face? Give reason for your answer.
- 12) Identify the crystal systems which have the following crystallographic dimensions:

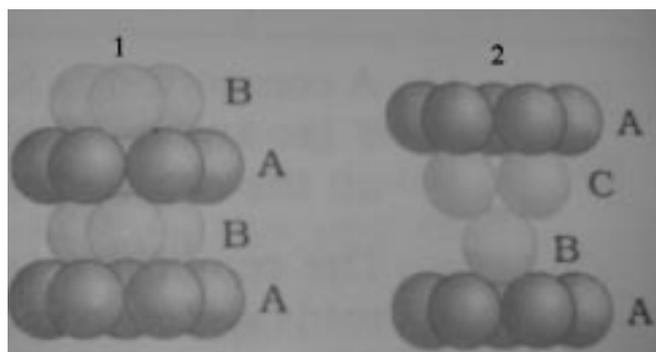
$$a \neq b \neq c \quad \alpha = \beta = \gamma = 90^\circ$$

$$a = b \neq c \quad \alpha = \beta = 90^\circ \quad \gamma = 120^\circ$$

- 13) Identify the unit cell and calculate the number of atoms per unit cell.



- 14)



- 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.

- 15) The composition of a sample of wustite is $\text{Fe}_{0.93}\text{O}_{1.00}$. What percentage of Fe is present as Fe(III)?
- 16) Iron changes its crystal structure from body centred to cubic close packed structure when heated to 916°C . Calculate the ratio of the density of the BCC crystal to that of CCP crystal. Assume that the metallic radius of the atom does not change.
Hint:
Volume same, so ratio of density is also same
i.e. $d(\text{bcc})/d(\text{ccp})$
- 17) A compound forms hexagonal close packed structure. What is the total number of voids in 0.5 mol of it? How many of these are tetrahedral voids?
- 18) The electrical conductivity of Zinc oxide increases on heating. Give reason.
- 19) Both the ionic solids NaF and MgO have the same number of electrons and about the same inter nuclear distances. But the melting point of NaF is 992°C and that of MgO is 2642°C . Give plausible reason for this observation.
Hint:- charge of ions and lattice enthalpy.
- 20) The concentration of cation vacancies in NaCl crystal doped with CdCl_2 is found to be $6.02 \times 10^{16} \text{ mol}^{-1}$. What is the concentration of CdCl_2 added to it?

3 Marks Questions

- 21) Calcium crystallizes in a face centred cubic unit cell with $a=0.556\text{nm}$. Calculate the density if
- It contains 0.1% Frenkel defects.
 - It contains 0.1% Schottky defects.

Hint:

Frenkel defect does not affect density.

$$d = zM/a^3N_A$$

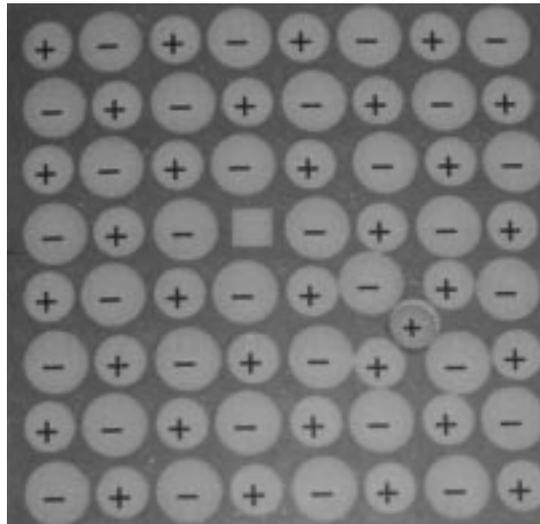
Schottky defect reduces the density by 0.1%, assuming that volume remains constant.

$$d' = d(1 - 0.1/100)$$

$$d' = 0.999d$$

- 22) You are given marbles of diameter 10mm. They are to be placed such that their centres are lying in a square bound by four lines each of length 40mm. What will be the arrangements of the marbles in a plane so that maximum number of marbles can be placed inside the area? Sketch the diagram and calculate the number of spheres per unit area.

23)



- i. Name the defect shown in the figure.
 - ii. How does it affect the density of the solid?
 - iii. Name a solid which shows this defect.
- 24) In the mineral, spinel, having the formula $MgAl_2O_4$, oxide ions are arranged in the cubic close packing. Mg^{2+} ions occupy the tetrahedral voids while Al^{3+} ions occupy the octahedral voids.
- (i) What is the percentage of tetrahedral voids occupied by Mg^{2+} ions?
 - (ii) What is the percentage of octahedral voids occupied by Al^{3+} ions?
- 25) Metallic magnesium has a hexagonal close packed structure and has a density 1.74 g cm^{-3} . Assuming magnesium atoms to be spherical, calculate the radius of magnesium atom. (Atomic mass of Magnesium = 24.3).
- Hints: Consider 1 cm^3 Mg and calculate mass of 1 cm^3 of Mg. Then calculate the No: of atoms in that much mass of Mg. Calculate the volume occupied by the Mg Atoms and that occupied by 1 Mg atom. Then using the formula $\frac{4}{3}\pi r^3$ radius of Mg, r can be calculated

UNIT - 2

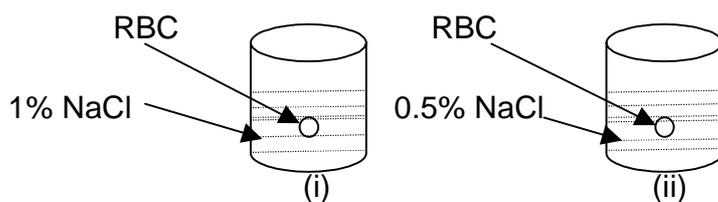
SOLUTIONS

1 Marks Questions

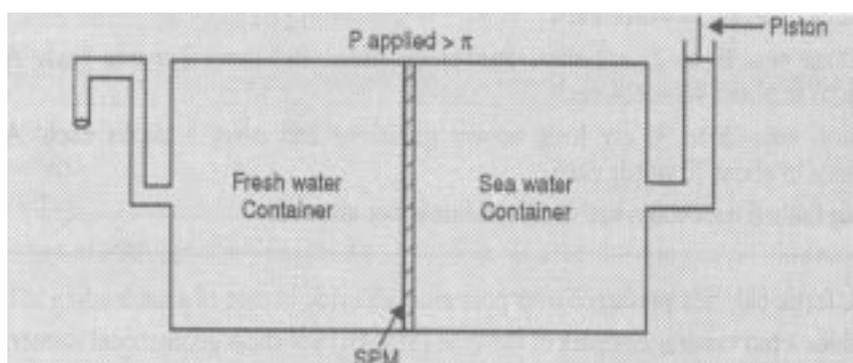
1. A 500 gm of toothpaste sample has 0.2 g of fluoride concentration. What is the concentration of fluoride in terms of ppm level?
2. Two liquids A and B boil at 135°C and 185°C respectively. Which of them has a higher vapour pressure at 80°C ?
3. Write the possible structural arrangement of a mixture of chloroform and acetone to form a solution.
4. What is Van't Hoff's factor for a compound which undergoes tetramerization in an organic solvent?
5. Aquatic species are more comfortable in cold waters rather than in warm water. Give reason.

2 marks questions

6. RBC's are placed in the given solutions as in figure (i) and (ii). What happens to RBC in test tube (i) and test tube (ii).



7. Given below is the sketch of a plant carrying out a process.



- (i) Name the process occurring in the above plant.
- (ii) To which container does the net flow of the solvent takes place?
- (iii) Name one SPM which can be used in this plant.
- (iv) Give one practical use of the plant.
8. A solution of sucrose (Molar mass 342 g mol^{-1}) is prepared by dissolving 68.4 g in 1000 g of water. What is the
- (i) Vapour pressure of the solution at 293k .
- (ii) Osmotic pressure at 293k .
- (iii) Boiling point of the solution.
- (iv) Freezing point of the solution.

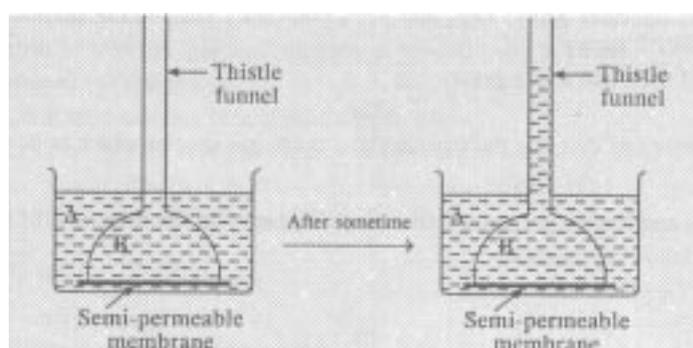
The vapour pressure of the water at 293k is 0.023atm . $k_b=0.52\text{k kg mol}^{-1}$ & $k_f=1.86\text{k kg mol}^{-1}$. Assume the solution to behave ideally.

9. Why calculations based on colligative properties of solutions sometimes do gives abnormal molecular mass values for solute? What are the nature of the abnormalities. 2g of $\text{C}_6\text{H}_5\text{COOH}$ dissolved in 25g of benzene shows a depression in freezing point equal to 1.62k . Molal depression constant for benzene is 4.9k kg mol^{-1} . What is the Percentage(%) of association of acid, if it forms a dimer in solution?
10. Assuming complete dissociation, calculate the freezing point of a solution prepared by dissolving 6 g of glaubers salt ($\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$) in 0.100 kg of H_2O . Given $k_f = 1.86\text{k kg mol}^{-1}$ Atomic mass of $\text{H}_2\text{O} : 18$, $\text{Na} : 23$, $\text{S} : 32$, $\text{O} : 16$, $\text{H} : 1$ all in amu units.

3 Marks Questions

11. A) Addition of Hgl_2 to aq. KI solution shows an increase in the vapour pressure why?
- B) A person suffering from high blood pressure is advised to take minimum quantity of common salt. Give reason.

12. A) Why the vapour pressure of a solution of glucose in water lower than that of water?
- B) 0.1 molal solution of glucose and NaCl respectively. Which one will have higher boiling point?
13. H_2S , a toxic gas with rotten egg like smell is used for qualitative analysis. If the solubility of H_2S in water at STP is 0.195 m, calculate Henry's law constant ($k_H=282 \text{ bar}$)
14. Examine the following illustrations and answer the following questions



- 1) Identify the liquid A (pure water or sugar solution).
 - 2) Identify the liquid B (pure water or sugar solution).
 - 3) Why the level of liquid in thistle funnel has risen after sometime?
 - 4) Name the phenomenon involved in this experiment and define it.
15. A storage battery contains a solution of H_2SO_4 38% by weight. At this concentration van't Hoff factor is 2.50. At what temperature will the battery contents freeze?
- (k_f for water = 1.86 kJ/ mol)
16. Following are the graphs for the vapour pressure of two component system as a function of composition. Answer the following questions.

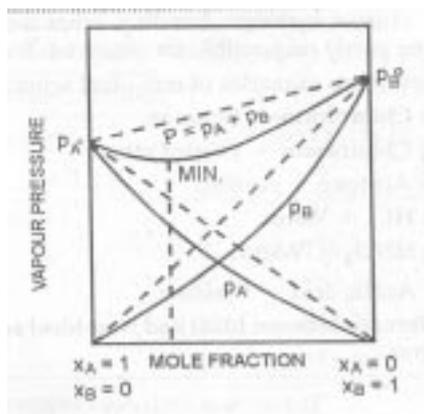


Fig (a)

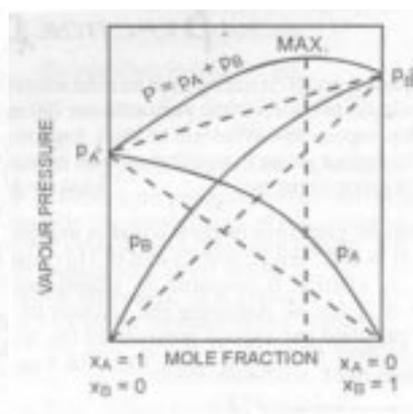


Fig. (b)

- (i) What type of deviation is shown in fig.(a) and (b)?
 - (ii) Give one example of solutions showing deviations in fig (a) (b).
 - (iii) What change in the volume and temperature is observed in solutions of this type?
17. How does osmotic pressure depend on temperature and atmospheric pressure, what is the molar concentration of solute particles in the human blood, if the osmotic pressure is 7.2 atm at the body temperature of 37⁰C?
 18. The vapour pressure of dilute aqueous solution of glucose (C₆H₁₂O₆) is 750 mm of mercury at 373K. Calculate
 - 1) Molality
 - 2) Mole fraction of the solute

5 Marks Questions

19. The elements A and B form purely covalent compounds having molecular formulae AB₂ and AB₄. When dissolved in 20g of benzene, 1g of AB₂ lowers the freezing point by 2.3K, whereas 1g of AB₄ lowers it by 1.3K. the molal depression constant for benzene is 5.1 K kg/mol, calculate the atomic mass of A and atomic mass of B. **(A=25.59, B=42.64)**
20. a) Why constant boiling mixtures behave like a single component when subjected to distillation.

b) What type of Azeotropic mixtures are formed by the following solution

i) H_2O and HCl ii) H_2O and $\text{C}_2\text{H}_5\text{OH}$

c) Give one practical application of depression of freezing point?

d) A Solid solution is formed between two substances. One whose particles are very large and the other particles are very small. What type of solid solution is this likely to be?

e) Write the Raoult's Law for each component of a binary solution and show that the total vapour pressure of the solution may be expressed as $P = P^0_A + (P^0_B - P^0_A) X_B$

21. Vapour pressure of pure benzene at a certain temperature is 640 mm Hg. A non-volatile non-electrolyte solid weighing 2.175g is added to 39.0 of benzene. The vapour pressure of solution is 600 mm Hg. What is the molecular mass of solid substance? **(65.9g mol⁻¹)**
22. The degree of dissociation of $\text{Ca}(\text{NO}_3)_2$ in dilute solution aqueous solution containing 7.0g of the solute per 100g of water at 100^o C is 70 percent. If the vapour pressure of water at 100^o C is 760mm, calculate the vapour pressure of the solution. **(746.02mm)**
23. What mass of a non-volatile solute urea (NH_2CONH_2) need to be dissolved in 100g of water in order to decrease the vapour pressure of water by 25%? also calculate the molality of the solution. **(18.52m)**
24. 8.0575×10^{-2} kg of Glauber's salt is dissolved in water to obtain 1 dm³ of a solution of density 1077.2 kg m⁻³. Calculate the molarity, molality & mole fraction of Na_2SO_4 in the solution. **(0.2508m, 0.0045, 0.25M)**
25. To 500 cm³ of water 3.0 X 10⁻³ kg of acetic acid is added. If 23% of acetic acid is dissociated, what will be the depression in freezing point? K_f and density of water are 1.86 K kg mol⁻¹ & 0.997 g cm⁻³ respectively. **(0.229K)**

UNIT - 3
ELECTROCHEMISTRY

2 Marks Questions

- 1 How many faraday of charge is required for conversion of $C_6H_5NO_2$ into $C_6H_5NH_2$?
- 2 Explain why Zn dissolves in dil. HCl to liberate $H_2(g)$ but from conc. H_2SO_4 , the gas evolved is SO_2 .
- 3 Cu does not dissolve in HCl but dissolves in nitric acid. Explain why?
- 4 Fluorine has a low electron gain enthalpy compared to chlorine, yet it is a more powerful oxidant. Explain why?
- 5 If Zn^{2+}/Zn electrode is diluted 100 times, then what will be the change in emf?
- 6 You are acquainted with the construction and working of a lead-storage battery. Give the plausible reasons for these facts:
 1. There is only a single compartment unlike other electrochemical cells.
 2. Replacement of water is necessary for maintenance.
- 7 For what concentration of $Ag^+(aq.)$, will the emf of given cell be zero at $25^\circ C$, if the concentration of $Cu(s) | Cu^{2+}(0.1M) || Ag^+(aq.) | Ag(s)$?
Given, $E^0_{Ag^+/Ag} = 0.80V$; $E^0_{Cu^{2+}/Cu} = 0.34V$.
- 8 In a small town along the costal area, it is observed that iron objects rust easily. Being an industrial town, it also faces air pollution problem. Identify any 4 factors which are contributing to rusting phenomenon.
- 9 Iodine(I_2) and Bromine(Br_2) are added to a solution containing iodide(I^-) and bromide ions(Br^-). What reaction would occur if the concentration of each species is 1M? The electrode potentials are $E^0_{I_2/I^-} = 0.54V$ and $E^0_{Br_2/Br^-} = 1.08V$

3 Marks Questions

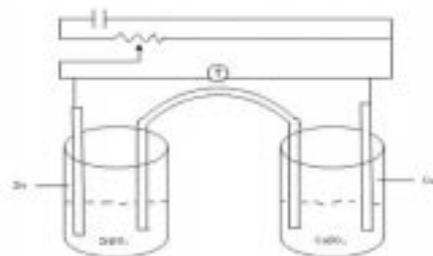
- 10 In an industrial plant, aluminium is produced by electrolysis of alumina dissolved in cryolite. This takes a current of 20000A. If the current efficiency is 90%, how much Al will be produced per day?
 \longrightarrow
- 11 In an experiment 0.04 F was passed through 400 mL of 1M soln. of NaCl. What would be pH of the soln. after electrolysis.
- 12 Estimate the minimum P.D. needed to reduce Al_2O_3 at 500 0 C. The free energy change for the decomposition reaction is 960 kJ.
 $2/3 \text{Al}_2\text{O}_3 \quad 4/3 \text{Al} + \text{O}_2; \quad \Delta G = 960 \text{ kJ}$
13. A cell with N/50 KCl soln. offered a resistance of 550 ohms at 298 K. The specific conductance of N/50 KCl at 298 K is $0.002768 \text{ ohm}^{-1}\text{cm}^{-1}$. When the cell is filled with N/10 ZnSO_4 soln, it offered a resistance of 72.18 ohms at 298 K. Find the cell constant and molar conductance of ZnSO_4 soln. at 298K.
14. Which of the following has larger molar conductance:
 a. 0.08 M soln. having conductivity equal to $2 \times 10^{-2} \text{ ohm}^{-1}\text{cm}^{-1}$.
 b. 0.10 M soln. having resistivity equal to 5.8 ohm cm.
15. The K_{sp} of AgCl at 298 K is 1×10^{-10} . Calculate electrode potential of Ag electrode immersed in 1 M KCl soln..
 [Given: $E^0 \text{Ag}^+/\text{Ag} = 0.799 \text{ V}$]
16. Tarnished siver contains Ag_2S . Can this tarnish be removed by immersing the tarnished silverware in an Al pan containing an inert electrolyte soln. such as NaCl?
 Given that standard electrode potentials for half reactions are:
 $\text{Ag}_2\text{S}(\text{s}) + 2\text{e}^- \quad 2\text{Ag}(\text{s}) + \text{S}^{2-}(\text{aq.})$ is -0.71 V
 $\text{Al}^{3+}(\text{aq.}) + 3\text{e}^- \quad \text{Al}(\text{s})$ is -1.66 V.

5 Marks Questions

- 17 Observe the diagram carefully and answer the questions below:

An external opposite potential is applied such that it exceeds the cell potential.

- Is this an electrochemical cell or electrolytic cell?
- Which substance gets dissolved?
- Which substance gets deposited and where?
- Write half cell reactions.
- Is the needle in the voltmeter correctly marked?



- 18 2 beakers A and B contain 1 M ZnSO_4 solution. To A, Strip of Mg is dipped, while in B, A zinc rod is put. If both are connected to a standard hydrogen electrode, which cell would show a deflection? Explain with suitable reason.
- 19 The standard electrode potentials of different electrodes are given as
 $E^{\circ}_{\text{Co}^{3+}/\text{Co}^{2+}} = 1.81 \text{ V}$, $E^{\circ}_{\text{Al}^{3+}/\text{Al}} = -1.66 \text{ V}$, $E^{\circ}_{\text{Fe}^{2+}/\text{Fe}} = -0.44 \text{ V}$,
 $E^{\circ}_{\text{Br}_2/\text{Br}^-} = 1.01 \text{ V}$
- Identify all the possible combination for construction of a feasible electrochemical cell?
 - Write their electrochemical cell representation.
 - Calculate the emf in each case.
- 20
- During electrolysis of NaOH, Cl_2 and H_2 while for molten NaCl only Na metal and Cl_2 gas are obtained. Explain these observations with suitable eqn.
 - Electrolysis of conc. and dil. sulphuric acid are different. Explain with eqn.
- 21 An Aq. solution of AuCl_3 was electrolysed with a current of 0.5A until 1.20g of Au had been deposited on the cathode. At another electrode in series with this, the only reaction was evolution of O_2 . Find—
- The no. of moles
 - The volume at NTP
 - The mass of O_2 liberated
 - the no. of coulombs passed through the solution and
 - the duration of electrolysis

UNIT – 4

CHEMICAL KINETICS

1 Mark Questions

1. If rate law is; $\text{rate} = [A]^{3/2} [B]^{-1}$, determine the order.
2. A gas decomposition of AB follows the rate law; $\text{rate} = K[AB]^{3/4}$. Write units of K.
3. State any one condition under which a bimolecular reaction may be kinetically of first order.
4. In some cases, it is found that a large number of colliding molecules have energy more than threshold energy, yet the reaction is slow. Why?
5. Variation of concentration of a reactant with time for a given reaction is shown below. What is its order of reaction?

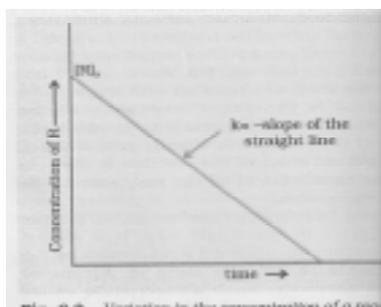
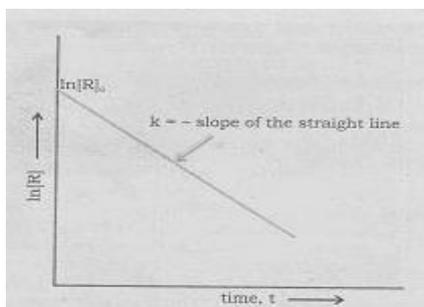


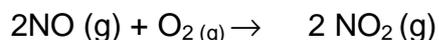
Fig. 4.2 Variation in the concentration of a reactant

6. Variation of concentration of a reactant, $\ln[R]$ with time for a given reaction is shown below. What is its order of reaction?



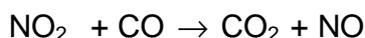
2 / 3 Mark Questions

7. The kinetics of the reaction: $A + 2B \rightarrow \text{Products}$; obeys the rate equation $\text{Rate} = k [A]^x [B]^y$. For it, find
 - a) Order of the reaction
 - b) Apparent molecularity of reaction
 - c) Order of reaction when B is in large excess.
8. Following reaction takes place in one step

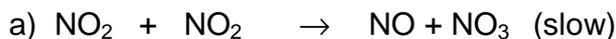


How will the rate of above reaction change if the volume of the reaction vessel is diminished to one third of its original volume? Will there be any change in order of reaction with the reduced volume?

9. For the reaction



Mechanism of reaction is

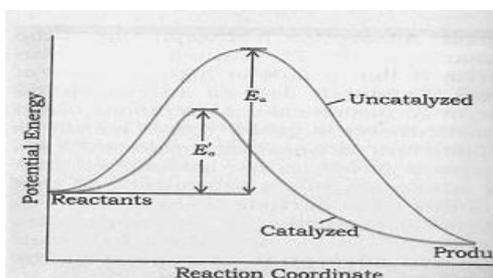


Write its rate law.

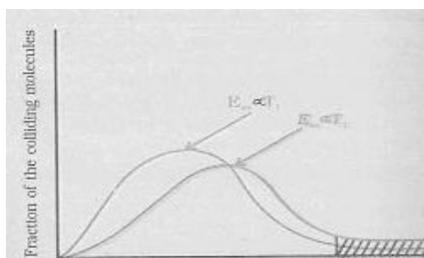
10. The activation energy of a first order reaction is 30 kJ/mol at 298K. The activation energy for the same reaction in the presence of a catalyst is 24 kJ/mol at 298K. How many times the reaction rate has changed in the presence of a catalyst?
11. A reaction is carried out at two different initial concentrations of a reactant. The initial concentrations are 1 mol L^{-1} and 2 mol L^{-1} . The half-life values obtained were 20 minutes and 40 minutes respectively. What is the order of reaction?
12. In the Arrhenius equation for a certain reaction, the value of A and E_a are $4 \times 10^{13} \text{ s}^{-1}$ and 98.6 kJ mol^{-1} respectively. If the reaction is of first order; at what temperature will its half life period be ten minutes?
13. The time required for 10% completion of a first order reaction at 298 K is equal to that required for its 25% completion at 308K. If the pre-exponential factor for the reaction is $3.56 \times 10^9 \text{ sec}^{-1}$, calculate its rate constants at 318K and also the energy of activation.

5 Mark Questions

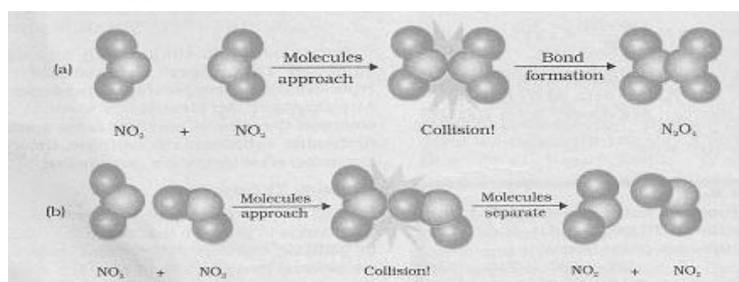
14. Following is a graph between reaction co-ordinate and potential energy. Explain how a catalyst influence the reaction.



15. In a given graph, if 'E' is the activation energy for a given reaction, explain how temperature influences the rate of reaction.



16. In the following figure, orientations of reaction molecules are shown. Explain the influence of orientation of molecules in a chemical reaction?

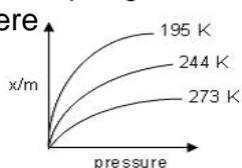


UNIT-5

SURFACE CHEMISTRY

2 Marks Questions

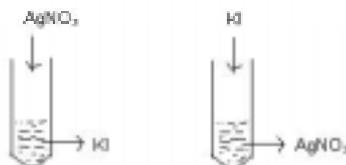
- 1 Explain how activated charcoal adsorbs organic dye.
2. A graph between $\log(x/m)$ and $\log p$ is a straight line at angle of 45° with intercept on the y-axis ($\log k$) equal to 0.301. Calculate the amount of the gas adsorbed per gram of the adsorbent under a pressure of 0.4 Atmosphere



- 3 Adsorption is always exothermic in nature. Comment.
- 4 Critical temperatures of N_2 , CO , CH_4 are 126, 134, and 110 K respectively. Arrange them in increasing order of adsorption on the surface of activated charcoal?
- 5 Consider the adsorption isotherms given below and interpret the variation in the extent of adsorption (x/m) when:
 - (i) Temperature increases at constant pressure.
 - (ii) Pressure increases at constant temperature
- 6 If the flocculation values of $NaCl$ and $AlCl_3$ are respectively 52 and 0.093, compare their coagulating powers.
7. Explain how soap solution stabilizes an emulsion of oil in water?
- 8 What happens when a freshly precipitated $Fe(OH)_3$ is shaken with little dil. $FeCl_3$ solution? Explain with possible reactions.
- 9 A methanol poisoned patient is treated by giving intravenous infusion of dil. ethanol. Explain.
[Hint: Influence of inhibitors]
- 10 How does a 'collector' separate the ore from gangue in the froth floatation process?

3 Marks Questions

- 11 A colloidal solution of AgI is prepared by 2 different methods as shown:



- (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.
- 12 SnO_2 forms a positively charged colloidal sol in the acidic medium and negatively charged sol in basic medium. Explain.
- 13 1 g of charcoal adsorbs 100 ml of 0.5 M CH_3COOH to form a monolayer and thereby the molarity of acetic acid is reduced to 0.49 M. Calculate the surface area of the charcoal adsorbed by each molecule of acetic acid. Surface area of charcoal = $3.01 \times 10^2 \text{ m}^2/\text{g}$.
- 14 To 100 ml of M/2 oxalic acid solution 2 g of active charcoal is added. After adsorption the strength of solution is reduced to M/4. Calculate the acid adsorbed by 1 g of charcoal.
- 15 Explain why:
- (i) At sunset an orange colour develops in the sky.
- (ii) Bleeding due to a small cut can be stopped by rubbing alum.
- Activated charcoal is used in gas masks used by coal miners.

UNIT - 6

GENERAL PRINCIPLES AND PROCESS OF ISOLATION OF ELEMENTS

1 Mark questions

1. During metallurgical process, in the extraction of metal, flux is added. Why?
2. 'Reduction of a metal oxide is easier if the metal formed is in liquid state at the temperature of reduction. Why?
3. Although thermodynamically feasible, in practice, magnesium metal is not used for the reduction of alumina in the metallurgy of aluminium. Why?
4. Can Mg reduce Al_2O_3 and Al reduces MgO? State the conditions required for this reduction process.

2/3 Marks Questions

5. At a site, low grade copper ores are available and zinc and iron scraps are also available. Which of the two scraps would be more suitable for reducing the leached copper ore and why?
6. The value of $\Delta_f G^\circ$ for formation of Cr_2O_3 is -540 kJ mol^{-1} and that of Al_2O_3 is -827 kJ mol^{-1} . Is the reduction of Cr_2O_3 possible with Al?
7. Why is zinc not extracted from zinc oxide through reduction using CO?
8. Cinnabar (HgS) and Galena (PbS) on roasting often give their respective metals but Zinc blende (ZnS) does not. Why?
9. The choice of a reducing agent in a particular case depends upon thermodynamic factor. How far do you agree with this statement? Explain?
10. "The extraction of Ag by leaching with NaCN involves both oxidation and reduction". Explain?
11. Out of C and CO which is a better reducing agent at 673 K?

UNIT-7

p- BLOCK ELEMENTS

1 Mark Questions

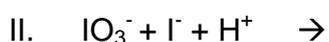
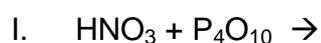
1. Which amongst the following is the strongest oxidizing agent?

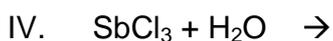
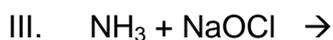


2. A student wanted to draw his school building on a glass sheet, which acid he should use?
3. Nitrogen and P give negative ions, while As, Sb and Bi do not. Why?
4. Sea weeds are the sources of which halogen?
5. When NaBr is heated with conc H_2SO_4 , Br_2 is produced but when NaCl is heated with conc H_2SO_4 , HCl is produced. Why?
6. Which oxo-acid of Phosphorus contains P-P linkage?
7. Out of HClO_3 and HClO_4 , which has lower Pka value and why?
8. Name the acidic hydride of N_2 ?
9. State the difference between the nature of Pi bonds in H_3PO_3 and HNO_3 molecules?
10. Name the gas liberated when Ammonium Nitrate is strongly heated.
11. Give one disproportionation reaction of H_3PO_3 .

2 Mark Questions

12. Oxides of Nitrogen have open chain structure, while those of Phosphorous have closed chain or cage structures. Why is it so?
13. Complete the following :





14. Calculate the amount of 0.1 M NaOH solution required to neutralize the solution produced by dissolving 1.1 g of P_4O_6 in water.
15. Explain giving reason. Nitrogen exists as a diatomic molecule whereas Phosphorous exists as tetra atomic molecule.
16. Name the hydrogen halide which is liquid at room temperature and why?
17. Which oxide of sulphur is capable of acting as oxidizing as well as reducing agent? Why?
18. $(\text{SiH}_3)_3\text{N}$ is a weaker base than $(\text{CH}_3)_3\text{N}$. Give reason.
19. CN^- ion is known but CP^- not known. Give reason.
20. Explain giving reason. NF_3 is an exothermic compound but NCl_3 is an endothermic compound.
21. Which halogen will produce O_2 and O_3 as passed through water?
22. Nitrogen forms a large no. of oxides than Phosphorous. Explain.

3 marks question

23. Account for the following
- Chlorine water has both oxidizing and bleaching properties.
 - H_3PO_2 and H_3PO_3 act as good reducing agents while H_3PO_4 doesn't.
24. An organic compound A gives a brick red flame on performing flame test. The compound gives the following tests also
- It gives smell of chlorine when placed in moist air.
 - If KI and CH_3COOH are added to the solution of the compound a violet colour is observed.
- Identify the compound and write the chemical reactions for the steps (I) and (II).

25. Give reasons for each of the following observations

- I. Only higher members of the group 18 of the periodic table are expected to form compounds.
- II. NO_2 readily forms a dimer whereas ClO_2 doesn't.

26. Give reasons for the following observations

- I. SF_6 is used as gaseous electrical insulators.
- II. S exhibit greater tendency for catenation than selenium.
- III. The electron gain enthalpy value of F_2 is less negative than chlorine.

27. Bleaching of flowers by Cl_2 is permanent, by SO_2 it is temporary. Explain?

28. Hydrogen halides are covalent compounds but their aqueous solutions can conduct electric current. Explain.

29. Which of the halogens (except At)

- I. Forms the weakest acid?
- II. Has the largest atom?
- III. Has the minimum ionization enthalpy?
- IV. Has the maximum electron affinity?

30. Knowing the electron gain enthalpy values for $\text{O} \rightarrow \text{O}^-$ and $\text{O} \rightarrow \text{O}^{2-}$ as

-141 KJ/mol and 702 KJ/mol respectively, how can you account for the formation of a large no. of oxides having O^{2-} species and not O^- (clue: Lattice Enthalpy).

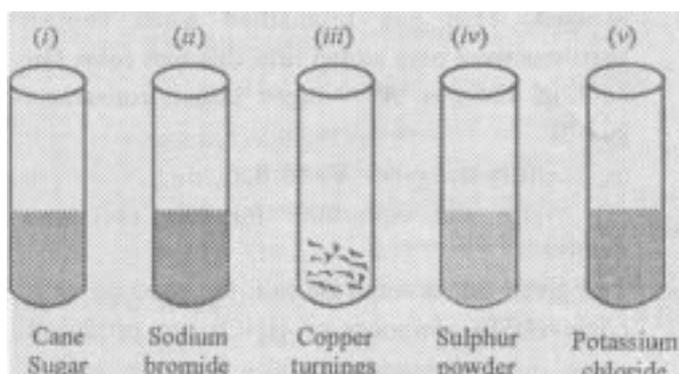
31. What happens when SO_2 is passed through an aq. Solution of Fe (III) salt. Give equation.

5 Marks Question

32. 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 colourless, pungent smelling gas. This gas when passed through acidified KMnO_4 solution, decolourizes 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 acidified KMnO_4 solution and for conversion of 'C' to 'D'.

33. 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.

34. When conc. sulphuric acid was added to an unknown salt present in a test tube, a brown gas (A) was evolved. This gas intensified when copper turnings were also added into this tube. On cooling, the gas 'A' changed into a colourless gas 'B'.

- (a) Identify the gases A and B.
- (b) Write the equations for the reactions involved.

35. 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 'A' forms 'D' which hydrolyses to compound 'E'. Identify compounds 'A' to 'E'.
36. A colourless inorganic salt (A) decomposes completely at about 25°C to give only two products, (B) and (C), leaving no residue. The oxide (C) is a liquid at room temperature and neutral to moist litmus paper while the gas (B) is a neutral oxide. White phosphorus burns in excess of (B) to produce a strong white dehydrating agent. Write balanced equations for the reactions involved in the above process.

Gradual addition of KI to $\text{Bi}(\text{NO}_3)_3$ solution initially produces a dark brown precipitate which dissolves in excess of KI to give a clear yellow solution. Write chemical equations for the a

UNIT - 8
THE d- and f- BLOCK ELEMENTS

1 Mark Questions

1. Ce^{4+} has a noble gas electronic configuration, but it is used as an oxidizing agent in volumetric analysis. Give reason.
2. State why Fluorine stabilizes higher oxidation states?
3. CrO_4^{2-} is a strong oxidizing agent while MnO_4^{2-} is not. Why?
4. Why is Cu_2Cl_2 colourless and CuCl_2 coloured?
5. Which is stronger base $\text{La}(\text{OH})_3$ or $\text{Lu}(\text{OH})_3$? Why?
6. It is found that Ce^{4+} is a good oxidizing agent whereas Sm^{2+} is a good reducing agent. State the reason for this difference.
7. Actinoid contraction is greater from element to element than lanthanoid contraction. Why?
8. Mn^{2+} is more stable than Mn^{3+} . Give the reason?
9. Observe the following equation and identify the phenomenon that takes place:
$$3\text{MnO}_4^{2-} + 4\text{H}^+ \longrightarrow 2\text{MnO}_4^- + \text{MnO}_2 + 2\text{H}_2\text{O}$$
10. $\text{Cr}_2\text{O}_7^{2-} \rightleftharpoons 2\text{CrO}_4^{2-}$
How does this equilibrium can be shifted to right?

2 Marks Questions

11. An yellow translucent solution is obtained on passing H_2S gas through an acidified solution of KMnO_4 . Identify the solution and write the balanced chemical equation.
12. Electronic configuration of $\text{Cu}(\text{I})$ is $[\text{Xe}]3\text{d}^{10}$ and that of $\text{Cu}(\text{II})$ is $[\text{Xe}]3\text{d}^9$. Which is more stable in aqueous solution? Why?
13. Electronic configuration of four metals A, B and C are give below:

A: $1\text{S}^2 \quad 2\text{S}^2 \quad 2\text{P}^6 \quad 3\text{S}^2 \quad 3\text{P}^6 \quad 4\text{S}^1 \quad 3\text{d}^{10}$
B: $1\text{S}^2 \quad 2\text{S}^2 \quad 2\text{P}^6 \quad 3\text{S}^2 \quad 3\text{P}^6 \quad 4\text{S}^2 \quad 3\text{d}^{10}$
C: $1\text{S}^2 \quad 2\text{S}^2 \quad 2\text{P}^6 \quad 3\text{S}^2 \quad 3\text{P}^6 \quad 4\text{S}^2 \quad 3\text{d}^5$

Identify the transition metals among them.
14. Zr (4d series) and Hf (5d series) have similar radii and have similar physical and chemical properties. Explain why?

15. In a given series the difference in the ionization enthalpies between any two successive d block elements is very much less than that in case of s and p block elements. Give the explanation.

16. Cu^+ is unstable in aqueous solution and disproportionate as



Why does Cu^+ disproportionate in aqueous solution?

17. Observe the following reaction:



(i) Identify the role of Fe^{3+} in this reaction

(ii) Which property of Fe is used up here.

18. Among the oxides of Chromium CrO_3 is acidic, Cr_2O_3 is amphoteric and CrO is basic. State reasons for these observations.

19. For the first row of transition metals the E^\ominus values are

Elements	V	Cr	Mn	Fe	Co	Ni	Cu
$E^\ominus(\text{M}^{2+}/\text{M})$ in volts	-1.18	-0.91	-1.18	-0.44	-0.28	-0.25	+0.34

Observe the values and write the reasons for irregularities.

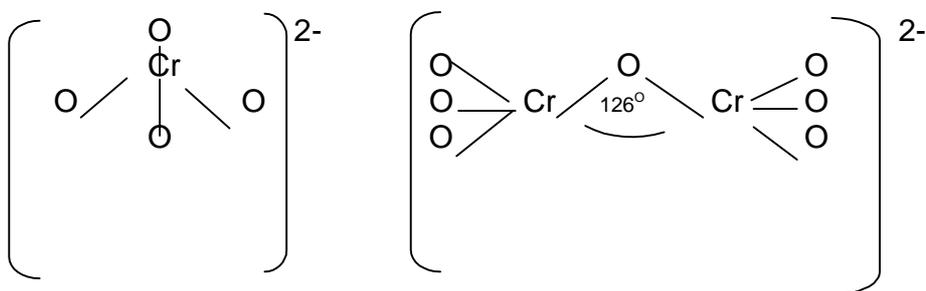
20. Give reasons for the following:

(i) Mn^{2+} is more stable than Mn^{3+}

(ii) The colour of CuCr_2O_7 in water is green.

3 Marks Questions

21. The structure of chromate ion and dichromate ion are given below;



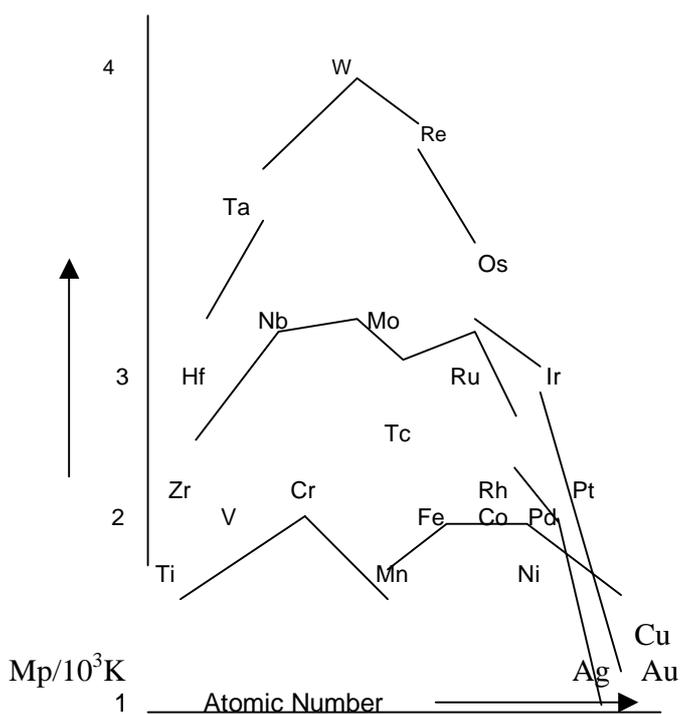
They are interconvertible in aqueous solution depending upon P^{H} of the solution. Give the possible reason for this phenomenon along with the balanced chemical equations.

22. When an orange coloured crystalline compound 'A' was heated with common salt and concentrated H_2SO_4 , an orange red coloured gas 'B' was evolved. The gas 'B' on passing through NaOH solution gave a yellow solution C

(i) Identify A, B and C.

(ii) Write balanced chemical equation involved in the reactions.

23. Observe the following graph and answer the questions given below:



(i) Why melting point of transition elements generally increases towards middle in each series.

(ii) Why Mn and Tc in 3d and 4d series respectively have low values of melting points.

(Hint: d^5 – stable electronic configuration; electrons held tightly by nucleus; delocalization is less and metallic bond is weak)

(iii) Why the last members of each series show low values of melting points?

24. Elements	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn
$\Delta_f H^\ominus_{II}$	1235	1309	1414	1592	1509	1561	1644	1752	1988	1734
$\Delta_f H^\ominus_{III}$	2393	2657	2833	2990	3266	2962	3243	3462	3556	3829

Observe the table and give plausible reasons for the following trends:

- The second ionization enthalpy values of Cr and Cu are unusually high.
- The second ionization enthalpy of Zn is comparatively low.
- The third ionization enthalpy of Mn and Zn are unusually high.

25. Observe the following table and explain the statements given below:

Elements	Ti	V	Cr	Mn	Fe	Co
$E^\ominus(M^{3+}/M^{2+})$ in volts	-0.37	-0.26	-0.41	1.57	0.77	1.97

- Mn has high E^\ominus value.
- Comparatively low E^\ominus value of V.
- Comparatively low E^\ominus value of Fe.

26. A mixed oxide of iron and chromium $FeOCr_2O_3$ is fused with Sodium Carbonate in presence of air to form a yellow coloured compound (A). On acidification the compound (A) forms an orange coloured compound (B) which is a strong oxidizing agent.

- Identify the compounds (A) and (B)
- Write balanced chemical equations for each step.

5 Marks Questions

27. (a) A blackish brown coloured solid (A) when fused with alkali metal hydroxides in presence of air produces a dark green compound (B), which on electrolytic oxidation in alkaline medium gives a dark purple compound (C). Identify (A), (B) and (C) and write balanced chemical equations for the reactions involved.

(b) What happens when an acidic solution of the green coloured compound (B) is allowed to stand for some time? Give the equation of the reaction involved. What is this type of reaction called?

(Hint: MnO_4^{2-} changes to MnO_4^-)

28. (A) reacts with H_2SO_4 to form purple coloured solution (B) which reacts with KI to form colourless compound (C). The colour of (B) disappears with acidic solution of $FeSO_4$. With concentrated H_2SO_4 (B) forms (D) which can decompose to give a black compound (E) and O_2 . Identify (A) to (E) and write equations for the reactions involved.

UNIT - 9

CO-ORDINATION COMPOUNDS

1 Mark Questions

1. Write the IUPAC name of the complex $\text{Na}_3[\text{Cr}(\text{OH})_2\text{F}_4]$.
2. Write the IUPAC name of $[\text{CO}(\text{en})_2\text{Cl}(\text{ONO})]^+$
3. Which of these cannot act as ligand and why: NH_3 , H_2O , CO , CH_4 . Give reason?
4. NH_3 is strong ligand NH_4^+ ion is not, why?
5. Which of the two is more stable $\text{K}_4[\text{Fe}(\text{CN})_6]$ or $\text{K}_3[\text{Fe}(\text{CN})_6]$.

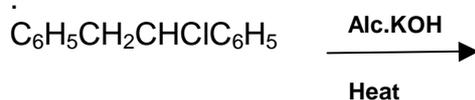
2 / 3 Mark Questions

1. 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. How is stability of co-ordination compounds determined in aqueous solution? Select a complex formation reaction and write an expression for the stability constant of the complex. Mention the factors affecting stability of complexes.
3. Why do tetrahedral complex not show geometrical isomerism?
4. 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)
 $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ (Dark green colour, with 1 Chloride ion/ unit formula)
5. Aqueous copper sulphate solution (blue in colour) gives:
 - a. a green precipitate with aqueous potassium fluoride
 - b. a bright green solution with aqueous potassium chloride. Explain these experimental results.
6. Identify complexes with different geometries depending upon the type of hybridization.
(a) $[\text{Co}(\text{NH}_3)_6]^{3+}$ (b) $[\text{CoF}_6]^{3-}$
7. One mole of complex compound $\text{Co}(\text{NH}_3)_5\text{Cl}_3$ gives 3 moles of ions on dissolution in water. One mole of same complex reacts with 2 moles of $\text{AgCl}(\text{s})$. What is the structure of the complex and write its formula.
8. When an aqueous solution of Nickel (II) chloride is mixed with ethane-1,2 diamine(en) in the molar ratios en : Ni=1:1, 2:1 and 3:1, the green coloured solution finally turns violet. Explain the chemical reactions based on the data provided.

UNIT - 10
HALOALKANES AND HALOARENES

1 Iodoform gives the precipitate with AgNO_3 on heating while chloroform does not. Give reasons

2 The following reaction give 2 products.
Write their structures



[hint: the 2 are geometrical isomers]

3 Predict the products of the following reactions:

a. HCl with $\text{CH}_3\text{CCl}=\text{CH}_2$

b. HBr with $\text{CH}_3\text{CH}=\text{C}(\text{CH}_3)_2$

4 Monochlorination of ethane to ethyl chloride is more practical than chlorination of n-pentane. Give reasons

5 An optically active compound having molecular formula $\text{C}_7\text{H}_{15}\text{Br}$ reacts with aq. KOH to give racemic mixture of products. Write the mechanism involved in the reaction.
[hint: a carbocation being planar, allows attack of nucleophile from either direction.]

6 a. Which of the following 2 compounds would react faster by $\text{S}_{\text{N}}2$ pathway:- 1-bromobutane or 2-bromobutane and why?

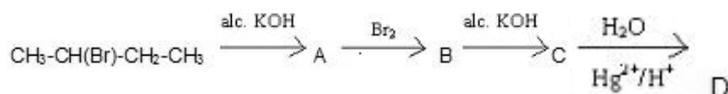
b. Allyl chloride is more reactive than n-propyl chloride towards nucleophilic substitution reaction. Explain why?

c. Haloalkanes react with KCN to give alkyl cyanides as main product while with AgCN , they form isocyanide as the main product. Give reasons.

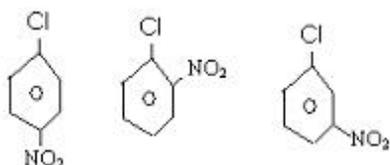
7 In each of the following pairs of organic compounds, identify the compound which will undergo $\text{S}_{\text{N}}1$ reaction faster. Also give reason with related structures.



- 8 p-nitrobenzene undergoes nucleophilic substitution faster than chlorobenzene. Explain giving the resonating structures as well.
- 9 the structural formulas of the organic compounds. A, B, C, D in the following sequence of reactions



- 10 Rearrange the following in order of increasing ease of dehydrohalogenation: $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$, $\text{CH}_3\text{CHClCH}_3$, $\text{CH}_3\text{CCl}(\text{CH}_3)_2$. Give reasons.
- 11 Write formulae for structural and geometrical isomers of $\text{C}_3\text{H}_4\text{Cl}_2$. [HINT: total 7 structures]
- 12 When toluene is chlorinated:
 a. in presence of sunlight
 b. in dark, in the presence of lewis acid, two separate compounds are obtained. Explain with suitable mechanism.
- 13 Predict the order of reactivity of the following compounds in $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ reactions, giving reasons-
 a. $\text{C}_6\text{H}_5\text{CH}_2\text{Br}$, $\text{C}_6\text{H}_5\text{CH}(\text{C}_6\text{H}_5)\text{Br}$, $\text{C}_6\text{H}_5\text{CH}(\text{CH}_3)\text{Br}$, $\text{C}_6\text{H}_5\text{C}(\text{CH}_3)(\text{C}_6\text{H}_5)\text{Br}$
 The 4 isomeric bromobutanes
- 14 Arrange the following isomeric substituted haloarenes in ascending order of their reactivity towards NaOH to form corresponding substituted phenols.



- 15 Arrange the following halocompounds in decreasing order of reactivity towards $\text{S}_{\text{N}}1$ nucleophilic substitution reaction, Vinyl chloride, Benzyl chlorides, iso propyl bromide.

UNIT-11

ALCOHOLS, PHENOLS & ETHERS

1 Marks Questions

1. Write the IUPAC name of the product formed by the catalytic reduction of Butanal.
2. How can you prepare Phenol from Aminobenzene.
3. Para-amino phenol is less acidic than phenol. Give reason.
4. Arrange the following alcohols in the order of increasing reactivity towards Lucas reagent:
2-butanol, 1-butanol, 2-methyl-2-propanol.
5. Which bond of alcohol is cleaved during its reaction with carboxylic acid?
6. Which structural isomer of butanol cannot be dehydrogenated by copper at 573K?

2 Marks Questions

7. Anisole reacts with HI to give phenol and methyl iodide and not iodobenzene and methylalcohol. Give reason.
8. Write the equations of the reactions which takes place when
 - I. Thionyl chloride is treated with 2-propanol.
 - II. Cumene hydroperoxide is treated with dil. H_2SO_4 .
9. Why is that the phenol is acidic and hexanol is neutral towards a solution of NaOH.
10. Out of benzene and phenol which is more easily nitrated and why?
11. A) di-tert-butyl ether cannot be made by Williamson's synthesis. Explain why?
B) name the carbocation formed when 3,3 di-2-butanol is treated with dilute acid.
12. Write the steps involved in the mechanism of acid catalysed hydration of propene.

13. Give a chemical test to distinguish between the following pairs of compounds

- I. Phenol and cyclohexanol.
- II. Propan-2-ol and benzylalcohol.

3 Marks Questions

14. An organic compound (A) having molecular formula C_6H_6O gives a characteristic colour with aqueous $FeCl_3$ solution (A) on treatment with CO_2 and $NaOH$ at 400 K under high pressure gives (B) which on acidification gives a compound (C). C reacts with acetyl chloride to give (D), which is a popular Pain Killer. Deduce the structures of (A), (B), (C) and (D).

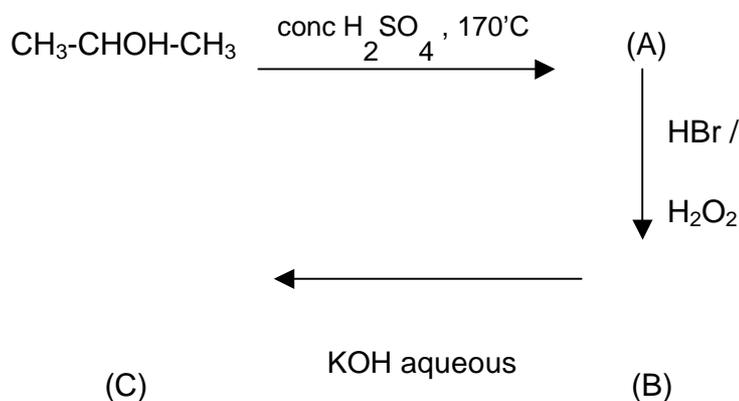
15. Write the chemical equations and reaction conditions for the conversion of

- I. Phenol to salicylaldehyde.
- II. Methanol to ethanol
- III. Anisole to 4-methoxyacetophenone

16. Name the reagents for the following

- I. Oxidation of primary alcohol to aldehyde.
- II. Oxidation of primary alcohol to carboxylic acid.
- III. Dehydration of propan-2-ol to propene.
- IV. Reduction of butan-2-one to butan-2-ol.

17. Complete the following reaction

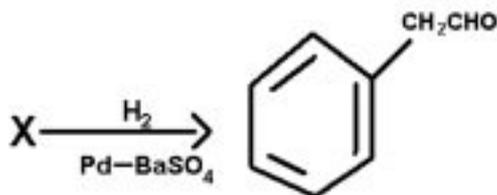


18. Compound (A) reacts with $SOCl_2$ to give compound (B). B reacts with Mg to form Grignard reagent which is treated with acetone and the product is hydrolyzed to give 2-methylbutan-2-ol. What are A and B compounds?

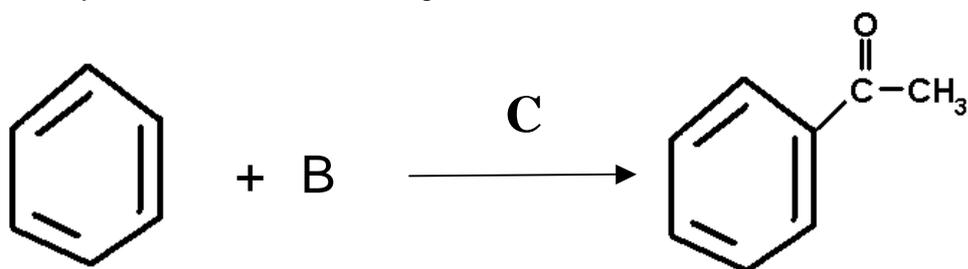
UNIT-12
ALDEHYDES KETONES AND CARBOXYLIC ACIDS

1-Mark Questions

1) Identify X.

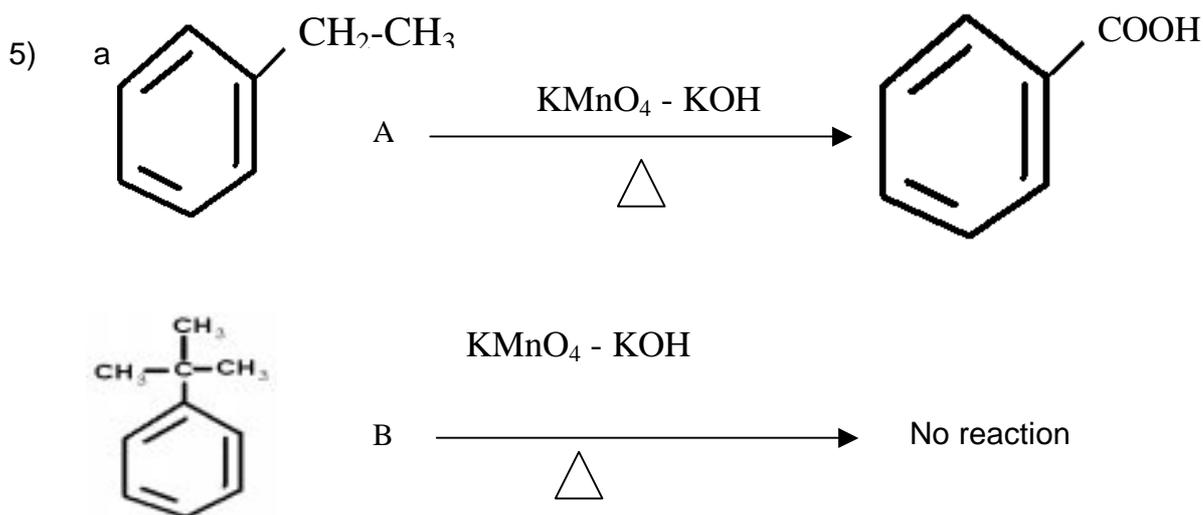


2) Identify B and C in the following reaction.



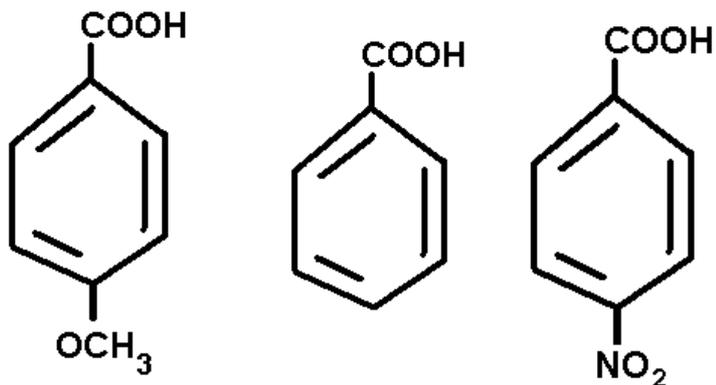
3) Arrange the following compounds in the increasing order of their boiling points. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$, $\text{CH}_3\text{OCH}_2\text{CH}_3$, $\text{CH}_3\text{CH}_2\text{CHO}$, CH_3COCH_3 , $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$

4) Propanal is more reactive than propanone. Give the reason.

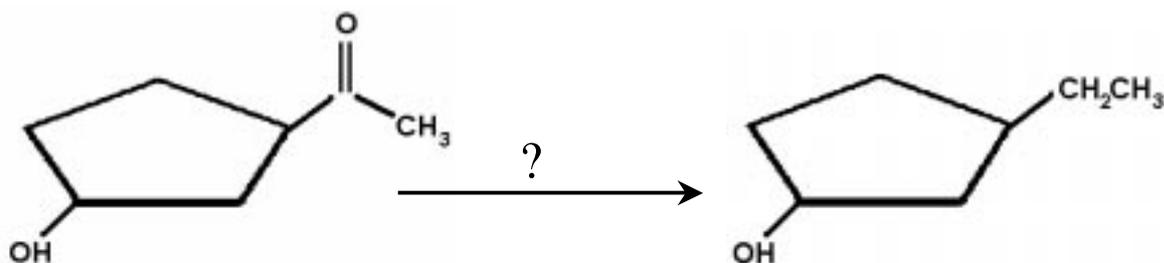


Observe the reactions and state why the compound A is oxidized whereas compound B is not oxidized by alkaline KMnO_4 ?

6) Which one among the following is the strongest acid?

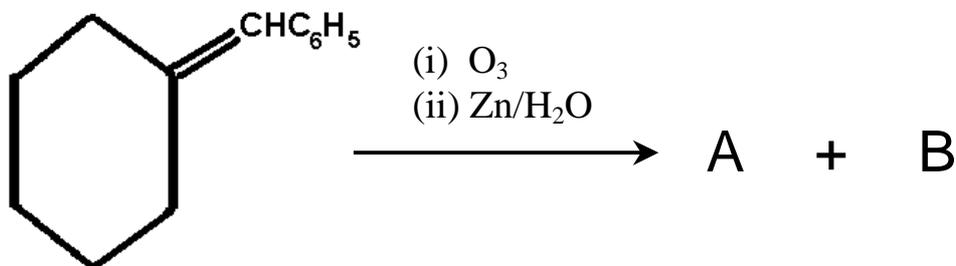


7) Identify the reagent used in the following conversion.



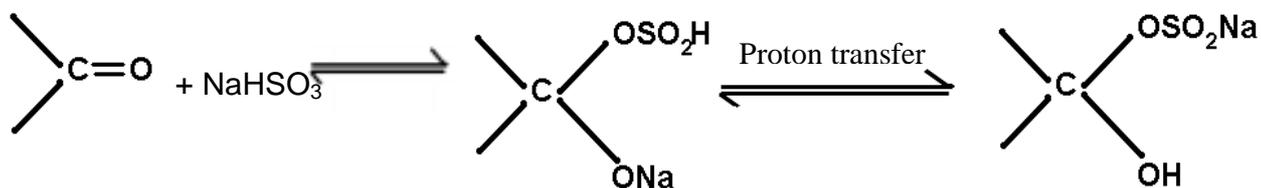
8) Fluorine is more electronegative than Chlorine even then P-Fluorobenzoic acid is weaker acid than P-Chlorobenzoic acid. State the plausible reason for this.

9) Identify A and B in the following reaction:



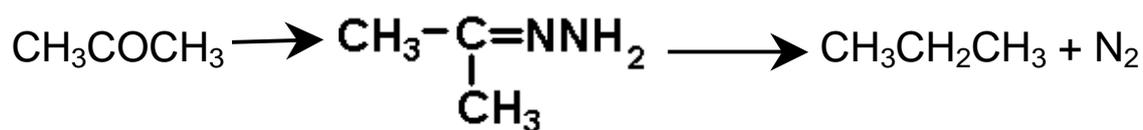
2- Mark Questions

10) For the reaction:



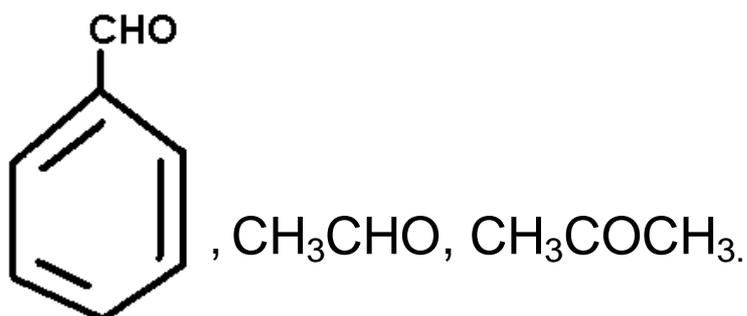
The position of equilibrium lies largely to the right hand side for most Aldehydes and to the left for most ketones. Find out the reason.

11) Identify the following named reactions and write the reagents used:

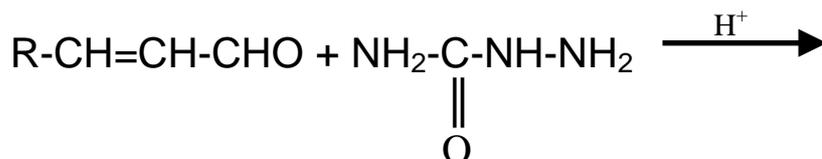
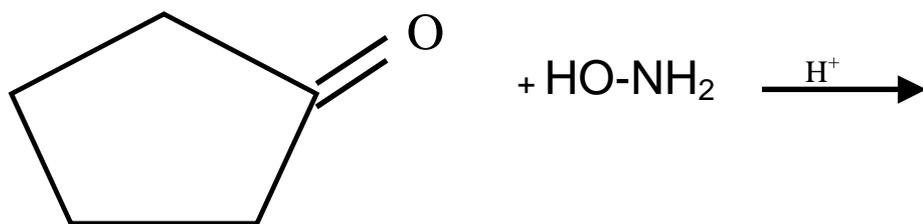


12) Aldol condensation of a ketone in presence of dilute alkali gives 4-Hydroxy -4-methylpentan-2-one. Write the structure of ketone and its IUPAC name.

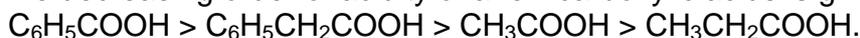
13) Which among the following compounds give Cannizzaro reaction and state the reason?



14) Predict the products of the following reactions:



15) The decreasing order of acidity of a few carboxylic acids is given below:



Explain plausible reason for the order of acidity followed.

16) An organic compound A, Molecular Formula $\text{C}_9\text{H}_{10}\text{O}$ forms 2,4 DNP derivative, reduces Tollens reagent and undergoes Cannizaros reaction. On vigorous oxidation it gives 1,2-benzene dicarboxylic acids. Identify A.

(Hint: An aldehyde which do not contain α hydrogen atom.)

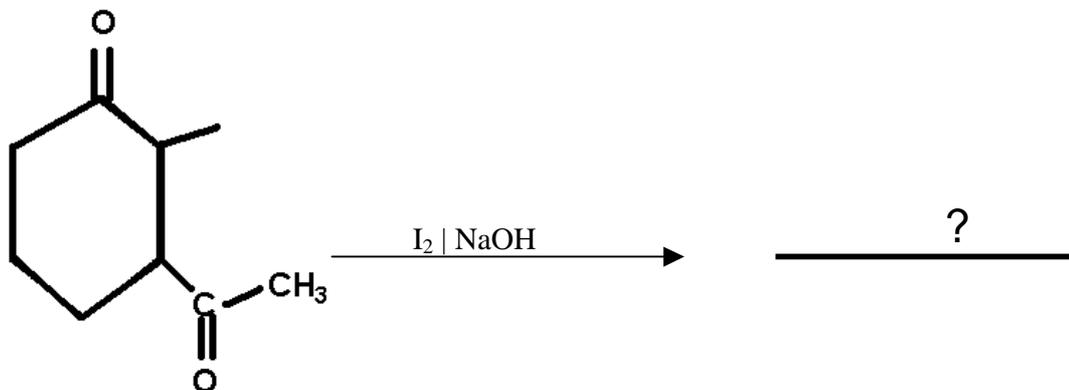
17) Do the following conversion using suitable reagents not more than two steps:

- Ethanol to 3-Hydroxy butanal.
- Bromobenzene to 1-phenyl ethanol.

18) Compound A $\text{C}_4\text{H}_8\text{Cl}_2$ is hydrolysed to a compound B $\text{C}_4\text{H}_8\text{O}$ which form an oxime with NH_2OH and give negative Tollens test. What are the structures of A and B. Write balanced chemical equations for the reactions involved.

(Hint: A is a gemdihalide and B is a ketone)

19) Write the structure of the product and name the reaction.



20) Give reasons for the following:

i) Iodoform is obtained when methyl ketones react with hypoiodite but not with iodide.
(Hint: Hypoiodite ion being stronger base than iodide ion, can easily remove acidic hydrogen atom.)

ii) Hydrazones of aldehydes and ketones are not prepared in highly acidic medium.
(Hint: In strong acidic medium N of reagent gets protonated to get an electrophile which cannot react.)

21) Both $\text{C}=\text{C}$ and $\text{C}=\text{O}$ give addition reactions. How do the addition reactions differ in both the cases and explain why?

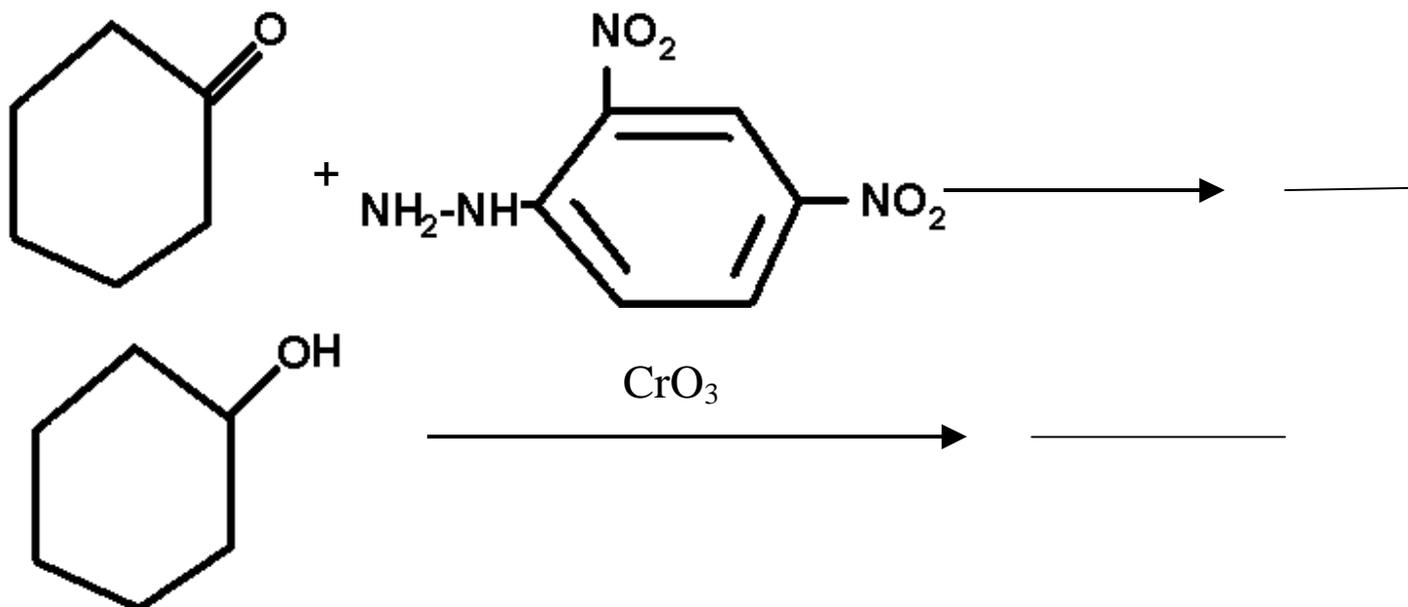
Hint: $\text{C}=\text{C}$ Formed between two similar atoms having same electronegativity.

$\text{C}=\text{O}$ Formed between two different atoms with different electronegativities.

22) Benzaldehyde gives positive test with Tollens reagent but not with Fehlings solution. State the reason.

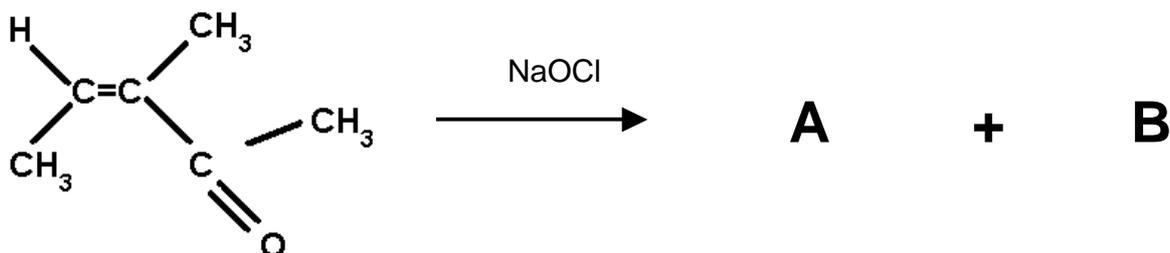
Hint: +R effect increases electron density on carbonyl group and C-H become strong.
 $\text{Ag}(\text{NH}_3)_2^+$ is a stronger oxidizing agent than Cu^{2+} + tartarate + base.

23) Write the structures of the products in the following reactions:



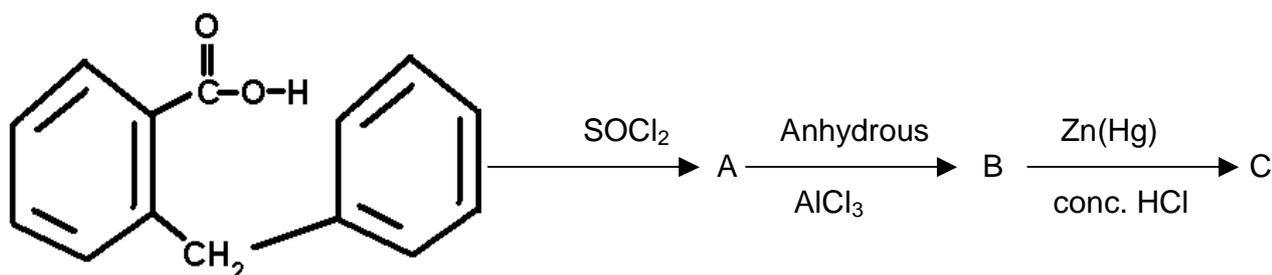
3-Mark Questions

24)



- Write the structures of A and B.
- Identify any two important features of this reaction.
(Hint: - Structural characteristics of compounds giving haloform reaction.)

25)



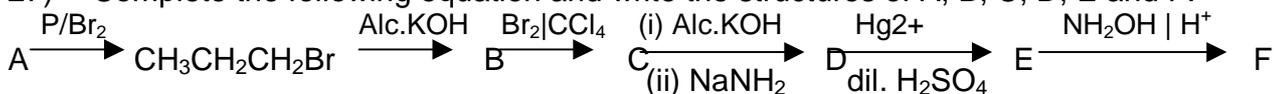
Write the structures of A, B and C.

- 26) Compound X, containing Chlorine on treatment with strong ammonia gives a solid Y which is free from Chlorine. Y on analysis gives C=49.31%, H=9.59% and N=19.18% and reacts with Br_2 and caustic soda to give a basic compound Z. Z reacts with HNO_2 to give ethanol. Suggest structures for X, Y and Z.

Hint:

Calculate the empirical formula of the compound. Y reacts with Br_2 and alkali indicates that it is amide.

- 27) Complete the following equation and write the structures of A, B, C, D, E and F.



- 28) A compound X (C_2H_4O) on oxidation gives Y ($C_2H_4O_2$). X undergoes haloform reaction. On treatment with HCN, X forms a product Z which on hydrolysis gives 2-hydroxy propanoic acid.
- Write down the structures of X and Y.
 - Name the product when X reacts with dil. NaOH.
 - Write down the equations for the reactions involved.

Hint: - X is an aldehyde since it has general formula $C_nH_{2n}O$ and has only two carbon atoms.

5- Mark Questions

- 29) An alkene (A with molecular formula C_7H_{14}) on ozonolysis yields an aldehyde. The aldehyde is easily oxidized to an acid (B). When B is treated with Bromine in presence of Phosphorous it yields a compound (C) which on hydrolysis gives a hydroxy acid (D). This acid can also be obtained from acetone by the reaction with hydrogen cyanide followed by hydrolysis. Identify A, B, C and D and write the chemical equations for the reactions involved.
- 30) Five isomeric para-di- substituted aromatic compounds, A to E with molecular formula $C_8H_8O_2$ were given for identification. Based on the following observations give the structures of the compounds:

Both A and B form silver mirror with Tollens reagent, also B gives a positive test with $FeCl_3$.

C gives positive Iodoform test.

D is readily extracted in aqueous $NaHCO_3$ solution.

E on acid hydrolysis gives 1,4-dihydroxy benzene.

Hint: A and B contain CHO groups since they've shown positive Tollens test. B has phenolic group as it reacts with $FeCl_3$ solution. C should have $-CH_3CO$ group. D should have $-COOH$ group. E should be p-hydroxy phenyl vinyl ether.

UNIT – 13

AMINES

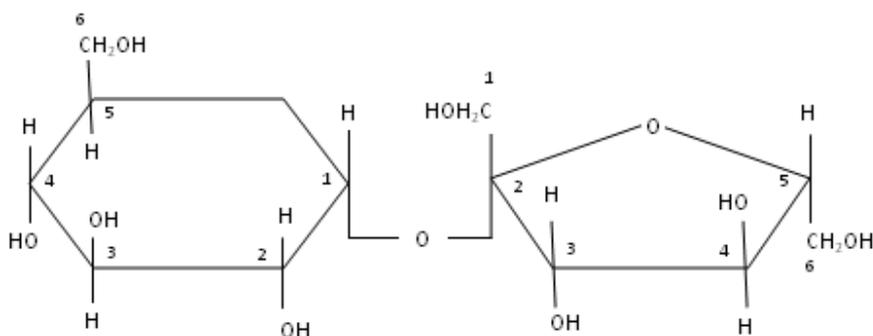
1 / 2 / 3 Marks Questions

1. Arrange the following in order of decreasing basic strength
 - (a) Ethyl amine, Ammonia, Triethyl amine
 - (b) Aniline, p- Nitroaniline , p- Toluidine
2. Amine group in aniline is ortho and para directing. Why does then aniline on nitration give substantial amount of m-nitroaniline
3. Primary amines have higher boiling points than tertiary amines. Why?
4. 'Amide are more acidic than amines'. Why?
5. Arrange the following amines in the ascending order of basic strength giving reason- EtNH_2 , Et_2NH , Et_3N , in aqueous solution?
6. Explain the role of mineral acid in the reaction of a carbonyl compound with KCN (aq)?
7. Why is acetonitrile preferred as a solvent for running organic reaction?
8. Why aniline is acetylated first to prepare mono bromo derivative?
9. Ammonolysis of alkyl halide does not give a corresponding amine in pure state. Explain?
11. Explain why methyl bromide reacts with KCN go give mostly methyl cyanide but it reacts with AgCN to give mostly methyl isocyanide.
12. Why is necessary to maintain the temperature between 273 K and 278 K during diazotization?
13. Why does silver chloride dissolve in aqueous methyl amine solution?
14. How can the following conversion be carried out :-
 - (a) p-toluidine to 2- bromo-4- methylanline
 - (b) Aniline to iodobenzene
 - (c) Aniline to benzonitrile

UNIT-14
BIOMOLECULES

1 Mark Question

- 1 How many chiral centres are there in D-(-)-Fructose?
- 2 Where does the water present in the egg go after boiling the egg?
- 3 Why do monosaccharides form cyclic structures?
- 4 Name the α -amino acids obtained when tripeptide(Gly-Ala-Leu) is hydrolysed.
- 5 Explain how curdling of milk occurs. What structural changes take place?
- 6 Drugs which are proteins such as insulin cannot be taken by mouth but must be injected. Why?
- 7 .Amino acids show amphoteric behavior. Explain
- 8 In alkaline solution, an amino acid contains 2 basic groups – NH_2 and COO^- , which is more basic? If acid is added to the solution, what will happen?
- 9 In a quite acidic solution, the AA contains 2 acidic groups- NH_3^+ and COOH , which is more acidic? If a base is added to the solution, what will happen?
- 10 Sucrose is dextrorotary. Its structure is given as:



- a. What happens when sucrose solution is treated with tollen's reagent and why?
- b. Its aqueous solution exhibits a change in rotation . Why?

- 11 Starch forms an emulsion rather than solution with water. Explain.
- 12 The melting points and solubility in water of amino acids are generally higher than that of corresponding lab acids. Explain.
- 13 Activation energy for acid hydrolysis of sucrose is 6.22 kJ mol^{-1} while it is only 2.15 kJ mol^{-1} when hydrolysed by enzyme sucrose.
 - a) Write the mechanism of the enzyme catalysed reaction
 - b) Also depict the progress of reaction against energy in both cases, diagrammatically.
- 14 When DNA is hydrolysed, there is a definite relation among the quantities of different bases obtained. But for hydrolysis of RNA, it is not so. What does this suggest about the structure of DNA and RNA?
- 15 Identify and explain the various forces which stabilize protein structure.

UNIT - 15

POLYMERS

1 Mark Questions

1. Arrange the following polymers in the increasing order of their intermolecular forces. Also classify them as addition and condensation polymers: Nylon 66, Buna-S, Polythene
2. Give name and structure of reagent used for initiating a free radical chain reaction?
3. Why is cationic polymerisation preferred in case of Vinylic monomers containing electron donating groups?
4. Arrange the following in the increasing order of their intermolecular forces Nylon – 66, Buna-S, Polythene.

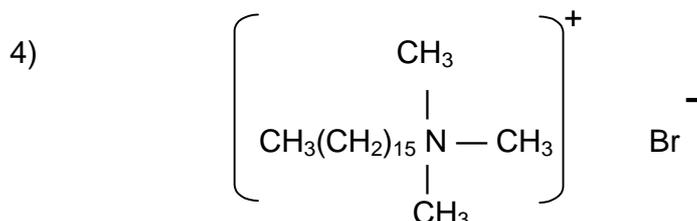
2 / 3 Marks Questions

1. State the significance of numbers in the polymer name nylon –6 and nylon – 66.
2. What are linear polymer and branched chain polymers. How do these differ from cross-linked polymers?
3. Write the difference between polyacrylates and polyesters.
4. Differentiate between chain growth and step growth polymerization.
5. Write the structure of a reagent used for initiating a free radical chain reaction.
6. Will you prefer to polymerize acrylonitrile under anionic or cationic polymerization?
7. How does the presence of CCl_4 influence the course of vinyl free radical polymerization?
8. Why does styrene undergo anionic polymerization easily?
9. How vulcanization does changes the character of natural rubber?

UNIT -16
CHEMISTRY IN EVERYDAY LIFE

1 Mark Question

- 1) Which among the following is a semi synthetic modification of penicillin
Erythromycin, ampicillin, tetracycline, ofloxacin.
- 2) Substances produced wholly or partly by chemical synthesis, which in low concentrations inhibits the growth or destroys microorganisms by intervening in their metabolic processes. Identify the substance.
- 3) Drugs are classified as
- | | | |
|------------------|---|--------------|
| Aspirin | – | analgesic |
| Chlordiazepoxide | – | tranquilizer |
| Penicillin | – | antibiotic |
- Mention on what basis the above classification is done?



Identify the type of detergent given in the above structure.

- 5) Which of the following drug combinations is not correct and state why?
- | | | |
|-----------------|---|----------------------------|
| Chloramphenicol | – | broad spectrum antibiotic. |
| Equanil | – | sedative. |
| Phenacetin | – | antipyretic. |
| Bithional | – | tranquilizer. |

2 Mark Questions

6) Analysis of water in a place shows that the water contains Magnesium Chloride. The people in that place are advised to use detergents for washing clothes. Why?

7) Pick out the odd one from the following and mention why?

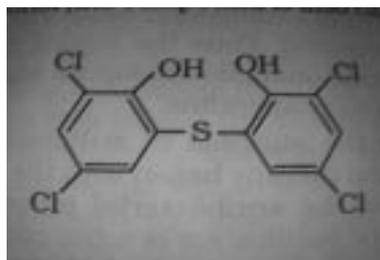
Erythromycin, penicillin, tetracycline, chloramphenicol

8) Antiallergics and antacids are antihistamines. Can antiallergics be used to reduce the acidity of the stomach? Give plausible reason for your answer.

9) Following drugs are used as analgesics. One among them is different from others. Identify it and state the reason.

Morphine, Heroin, Aspirin, Codeine.

10)



- i. Identify the compound.
- ii. What is its use?

11) Birth control pills essentially contain a mixture of synthetic estrogen and progesterone. What are estrogen and progesterone? Why are they used in birth control pills?

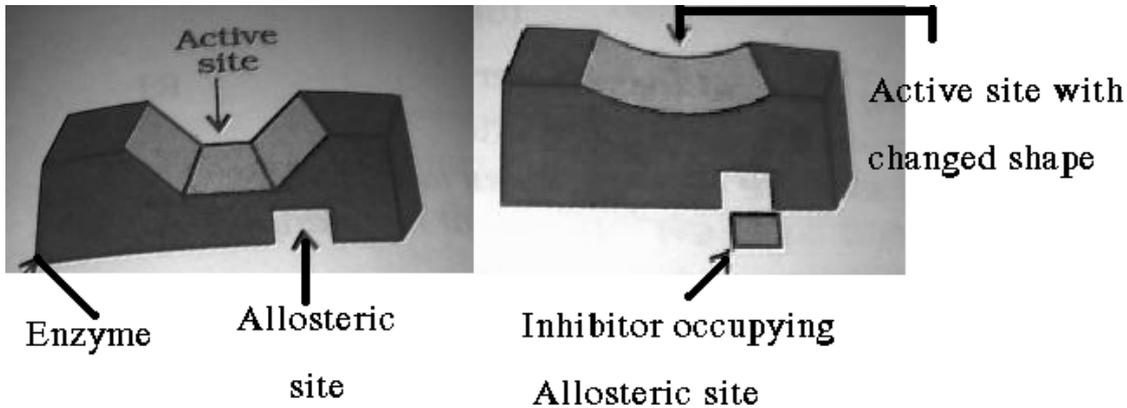
12) Sodium and Potassium soaps are only used for cleaning purposes. Why?

13) Detergents containing unbranched chains are more preferable than those containing branched chains. State the reason.

14) Low level of noradrenalin is the cause of depression. Suggest drugs to cure this problem?

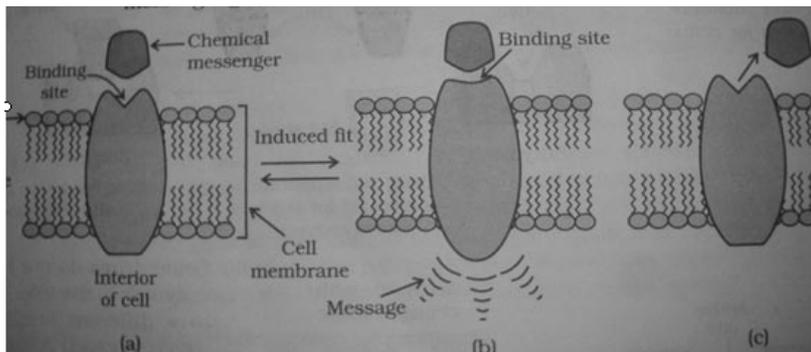
3 Mark Questions

15) Observe the diagram and answer the questions given below:



- i. Name the drug target.
- ii. What is meant by allosteric site?
- iii. Mention the role of inhibitors.

16) Observe and identify the steps a, b, c from the diagram given below:



17) Sodium hydrogen carbonate and ranitidine are used as antacids. Which one is a better choice? Why?

18) Identify the following substances:

- i. It is about 550 times as sweet as cane sugar and excreted from body in urine unchanged.
- ii. It is 100 times as sweet as cane sugar and its use is limited to cold food and soft drinks as it is unstable at cooking temperature.
- iii. It is a trichloro derivative of Sucrose and it is stable at room temperature.