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KENDRIYA VIDYALAYA SANGATHAN
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STUDY MATERIAL
कक्षा बाहरवीं
CLASS XII
रसायन विज्ञान
CHEMISTRY
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चंडीगढ़ संभाग

CHANDIGARH REGION

STUDY MATERIAL FOR HIGH ACHIEVERS OF CLASS XII

CHEMISTRY

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Salient features of this Study Material

- This study material is in the form of Question Bank comprising of solved questions from each chapter of the syllabus.
- It is a collection of a number of challenging questions based on High Order Thinking Skill of students.
- It aims at providing help to very high scorer students who may miss 100 out of 100 because of not being exposed to new type of questions, being used to only conventional types of questions and not paying attention towards the topics which are given in the reference books and syllabus of Computer Science as per CBSE guidelines.
- It contains guidelines, hints and solutions for really challenging questions and topics.
- It contains a number of fresh/new questions (solved), which shall increase the confidence level of the students when they will solve them as per CBSE guidelines.
- Such kind of questions shall draw the attention of both the students and the teachers, and will help all of us in achieving the aim of 100% result with healthy PI.

“Things work out best for those who make the best of how things work out.”

ALL THE BEST TO OUR DEAR STUDENTS.....

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UNIT 1
SOLUTIONS

OBJECTIVE QUESTIONS (01 MARK)

1. Which of the following aqueous solutions should have the highest boiling point?

- a. 1.0 M NaOH
- b. 1.0 M Na₂SO₄
- c. 1.0 M NH₄NO₃
- d. 1.0 M KNO₃

2. The values of Van't Hoff factors for KCl, NaCl and K₂SO₄, respectively, are_____.

- a. 2, 2 and 2
- b. 2, 2 and 3
- c. 1, 1 and 2
- d. 1, 1 and 1

3. K_H value for Ar(g), CO₂ (g), HCHO (g) and CH₄ (g) are 40.39, 1.67, 1.83×10^{-5} and 0.413 respectively.

Arrange these gases in the order of their increasing solubility.

- a. HCHO < CH₄ < CO₂ < Ar
- b. HCHO < CO₂ < CH₄ < Ar
- c. Ar < CO₂ < CH₄ < HCHO
- d. Ar < CH₄ < CO₂ < HCHO

4. On dissolving sugar in water at room temperature solution feels cool to touch.

Under which of the following cases dissolution of sugar will be most rapid?

- a. Sugar crystals in cold water.
- b. Sugar crystals in hot water.
- c. Powdered sugar in cold water.
- d. Powdered sugar in hot water.

5. Maximum amount of a solid solute that can be dissolved in a specified amount of a given liquid solvent does not depend upon _____.

- a. Temperature
- b. Nature of solute
- c. Pressure
- d. Nature of solvent

6. The molecular weight of benzoic acid in benzene as determined by depression in freezing point method corresponds to :

- a. Ionisation of benzoic acid
- b. Dimerisation of benzoic acid
- c. Trimerisation of benzoic acid
- d. Solvation of benzoic acid

7. The hard shell of an egg was dissolved in HCl. The egg was then placed in a concentrated solution of NaCl. What will happen?

- a. The egg will shrink.
- b. The egg will swell.
- c. The egg will become harder.
- d. No visible change noticed.

8. How many grams of 70% concentrated Nitric acid solution is used to prepare 250 mL of 2.0M HNO₃?

- a. 45 g b. 90.0 g c. 70.0 g d. 54.0 g

9. Dipole induced dipole interactions are present in which of the following pairs?

- a. Water and ethanol
- b. Cl₂ and CCl₄
- c. HCl and Iodine molecules.
- d. SiF₄ and He atoms

10. The molarity of solutions obtained by mixing 750 mL of 0.5M HCl with 250 mL of 2M HCl will be:

- a. 0.02M b. 0.01M c. 0.001M d. 0.1M

11. Which one of the following electrolytes has the same value of Van't Hoff factor as that of $\text{Al}_2(\text{SO}_4)_3$, assuming complete dissociation?

- a. K_2SO_4 b. $\text{K}_3[\text{Fe}(\text{CN})_6]$ c. $\text{Al}(\text{NO}_3)_3$ d. $\text{K}_4[\text{Fe}(\text{CN})_6]$

12. Which of the following is dependent on temperature?

- a. Molarity b. Mole fraction c. Mass percentage d. Molality

13. If the molality of the solution is doubled. The value of molal depression constant (k_f) will be:

- a. Halved b. Tripled c. Unchanged d. Doubled

14. Which of the following liquid pairs show a positive deviation from Raoult's law?

- a. Water and HCl
b. Benzene and Methanol
c. Water and Nitric acid
d. Acetone and Chloroform

15. A solution of Sucrose (M. M. 342 g mol^{-1}) has been prepared by dissolving 68.5 g of sucrose in 1000 g of water. The freezing point of solution obtained will be:

- a. -0.372°C b. -0.52°C c. $+0.372^\circ\text{C}$ d. -0.57°C

16. An unripe mango placed in the solution of concentrated NaCl to prepare pickle, shrinks due to :

- a. It gains water due to reverse osmosis
b. It loses water due to reverse osmosis
c. It gains water due to osmosis
d. It loses water due to osmosis

ASSERTION REASON TYPE QUESTIONS

In the questions 17-20 a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- (i) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(ii) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(iii) Assertion is correct statement but reason is wrong statement.
(iv) Assertion and reason both are incorrect statements.
(v) Assertion is wrong statement but reason is correct statement.

17. **Assertion** : Molarity of a solution in liquid state changes with temperature.

Reason : The volume of a solution changes with change in temperature.

18.Assertion :When methyl alcohol is added to water, boiling point of water increases.

Reason :When a volatile solute is added to a volatile solvent elevation in boiling point is observed.

19.Assertion :When NaCl is added to water a depression in freezing point is observed.

Reason :The lowering of vapour pressure of a solution causes depression in the freezing point.

20.Assertion :When a solution is separated from the pure solvent by a semi-permeable membrane, the solvent molecules pass through it from pure solvent side to the solution side.

Reason :Diffusion of solvent occurs from a region of high concentration solution to a region of low concentration solution.

SHORT ANSWER QUESTIONS (02 MARKS)

1. A sample of 100 g red ink contains 0.4 % red pigment. Calculate the concentration of the pigment in ppm.
2. How much molecular mass of NaCl is obtained experimentally by using colligative property?
3. A 1.2% solution of NaCl is isotonic with 7.2% solution of glucose. Calculate the Van't Hoff factor for NaCl.
4. Freezing point of solution containing 50 cm³ of ethylene glycol in 50 g of water is found to be -34°C. Assuming ideal behavior, calculate the density of Ethylene glycol.
5. Calculate the mass of a non-volatile solute (MM 40g mol⁻¹) which should be dissolved in 114 g of octane to reduce the vapour pressure to 80%?

SHORT ANSWER QUESTIONS (03 MARKS)

1. Two liquids A and B are mixed to form ideal solution. In solution, component A and B are present in composition 30 mol percent and 70 mol percent respectively. In the vapour state, component A and B are present in 40 mol percent and 60 mol percent respectively. Calculate the ratio of the vapour pressure of pure liquid A and Pure liquid B.S
2. A car is participating in Himalayan car Rally. The temperature of the valley is -6°C. what amount of Ethylene glycol should be added to water in car radiator, to prevent its freezing. The radiator contains 6 kg water. Due to sudden thunderstorm, the temperature of the valley was further lowered to -8°C. what amount of ice will be separate out? K_f for water is 1.86K kg mol⁻¹.
3. A decimolar solution of potassium ferrocyanide has 50% dissociation at 300°C. Calculate the osmotic pressure of the solution.
4. The solution of a non-volatile solute in water freezes at -0.30°C. The vapour

pressure of the pure water at 298 K is 23.51 mmHg, K_f for water is $1.86 \text{ K kg mol}^{-1}$. Calculate the vapour pressure of this solution at 298K.

5. What volume of 95 % sulphuric acid (density = 1.85 g/cc) and what mass of water must be taken to prepare 100 cc of 15% solution of sulphuric acid? (density = 1.10 g/cc)

LONG ANSWER QUESTIONS (05 MARKS)

1. a. When 2.56 g of sulphur was dissolved in 100 g of CS_2 , the freezing point is lowered by 0.383 K. calculate the molecular formula of the sulphur.

(K_f for $\text{CS}_2 = 3.83 \text{ K kg mol}^{-1}$, atomic mass of sulphur is 32 g mol^{-1})

b. Blood cells are isotonic with 0.9%, sodium chloride solution. What happens if we place the blood cells in a solutions containing.

- (i) 1.2% sodium chloride solution
- (ii) 0.4% sodium chloride solution

2. a. What is Van't Hoff factor? What type of values can it have if in forming the solution, if the solute molecules undergo:

- (i) Association
- (ii) Dissociation

b. How many mL of 0.1 M HCl solution are required to react completely with 1g of mixture of Na_2CO_3 and NaHCO_3 containing equimolar amounts in both? Molar mass of Na_2CO_3 and NaHCO_3 are 106 g mol^{-1} and 84 g mol^{-1} respectively.)

3. a. The vapour pressure of Benzene and Toulene at 293 K are 75 mmHg and and 22 mmHg respectively. 23.4 g of benzene and 64.4 g of toluene are mixed. If the two form an ideal solution, calculate the mole fraction of benzene in the vapour phase assuming that vapour pressure are in the equilibrium with the liquid mixture at this temperature.

b. What is meant by positive and negative deviations from Raoult's law and how is the sign of ΔH solution related to positive and negative deviations from Raoult's law.

ELECTROCHEMISTRY

MULTIPLE CHOICE QUESTIONS

Q1. In a lead storage battery, the electrolyte H_2SO_4 solution is

- a. 38%
- b. 62%
- c. 80%
- d. 48%

Q2. The emf produced by a voltage cell is

- a. Electrode potential
- b. Reduction potential
- c. Cell potential
- d. Oxidation potential

Q3. The reaction in a galvanic cell is

- a. Spontaneous

- b. Non- spontaneous
- c. Disproportionation
- d. Combination

Q4. Which one of the following metals cannot be obtained by electrolysis of aqueous solution of its salt.

- a. Ag
- b. Mg
- c. Cu
- d. Cr

Q5. Which one of the following is not a good conductor of electricity?

- a. CH₃COONa
- b. C₂H₅OH
- c. NaCl
- d. KOH

Q6. The cell constant of a conductivity cell

- a. Changes with change in concentration of electrolyte
- b. Changes with the nature of electrolyte
- c. Changes with change in temperature of electrolyte
- d. Remains constant for a cell.

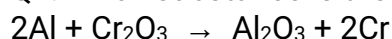
Q7. $\Lambda^{\circ}m(\text{NH}_4\text{OH})$ is equal to

- a. $\Lambda^{\circ}m(\text{NH}_4\text{OH}) + \Lambda^{\circ}m(\text{NH}_4\text{Cl}) - \Lambda^{\circ}m(\text{HCl})$
- b. $\Lambda^{\circ}m(\text{NH}_4\text{Cl}) + \Lambda^{\circ}m(\text{NaOH}) - \Lambda^{\circ}m(\text{NaCl})$
- c. $\Lambda^{\circ}m(\text{NH}_4\text{Cl}) + \Lambda^{\circ}m(\text{NaCl}) - \Lambda^{\circ}m(\text{NaOH})$
- d. $\Lambda^{\circ}m(\text{NaOH}) + \Lambda^{\circ}m(\text{NaCl}) - \Lambda^{\circ}m(\text{NH}_4\text{Cl})$

Q8. When aqueous solution of NaCl is electrolysed

- a. Cl₂ is evolved at cathode.
- b. H₂ is evolved at cathode.
- c. Na is deposited at cathode.
- d. Na appears at anode.

Q9. Which substance is the reducing agent in the following reaction:



- a. Al
- b. Cr₂O₃
- c. Al₂O₃
- d. Cr

Q10. What changes are observed in the specific conductance and molar conductance respectively on diluting the electrolytic solution?

- a. Both increase
- b. Both decrease
- c. Decrease and increase
- d. Increase and decrease

Q11. The number of moles of MnO₄⁻ reduced to Mn²⁺ by the addition of 7.5 mole electrons in MnO₄⁻ is

- a. 2.5
- b. 5

- c. 1.5
- d. 7.5

Q12. For which of the following compounds, the graph of molar conductivity and (molarity)^{1/2} is obtained a straight line?

- a. CsCl
- b. NH₄OH
- c. CH₃COOH
- d. All of the above.

Q13. The limiting molar conductivities Λ° for NaCl, KBr and KCl are 126, 152 and 150 Scm^2

mol^{-1} respectively. The Λ° for NaBr is

- a. 278 $\text{Scm}^2\text{mol}^{-1}$
- b. 176 $\text{Scm}^2\text{mol}^{-1}$
- c. 128 $\text{Scm}^2\text{mol}^{-1}$
- d. 302 $\text{Scm}^2\text{mol}^{-1}$

Q14. $E^\circ\text{Sn}^{4+}/\text{Sn}^{+2} = 0.15 \text{ V}$, $E^\circ\text{Cr}^{+3}/\text{Cr}^{+2} = -0.74 \text{ V}$

These two couples in their standard state are connected to make a cell. The value of $E^\circ\text{cell}$ will be

- a. 1.83 V
- b. 1.10V
- c. 0.89
- d. 0.18V

Fill in the blanks.

Q1. The SI unit for molar conductivity is _____

Q2. The electrolyte used in a mercury cell is a paste of KOH and _____

Q3. A galvanic cell directly converts _____ energy into electrical energy.

Q4. With the increase in concentration of H⁺ ions, the process of corrosion will _____.

Q5. The molar conductivity of a strong electrolyte _____ with the increase in concentration of electrolyte.

Q6. When the concentration of all species is unity, the electrode potential is known as _____ electrode potential.

Q7. In an electrochemical cell, at _____ there will be no flow of electrons.

Q8. The conductivity of an electrolyte is _____ proportional to cell constant.

Q9. The conductivity of an electrolytic solution _____ with the increase in concentration of electrolyte.

Q10. Standard Hydrogen Electrode can be used to calculate _____ of any electrode.

Q11. The transfer of _____ in an electrochemical cell takes place from anode to cathode.

Q12. $\lambda^\circ_{\text{mCa}^{+2}} = 119 \text{ Scm}^2 \text{ mol}^{-1}$ and $\lambda^\circ_{\text{mCl}^-} = 76.3 \text{ Scm}^2 \text{ mol}^{-1}$ the $\lambda^\circ_{\text{mCaCl}_2}$ is _____.

Q13. Nernst equation can be used to calculate the value of E_{cell} at different _____ and temperature.

Q14. In Leclanche dry cell, the cathode is _____.

Q15. The value of electrode potential _____ with increase in concentration of

electrolyte.

Q16. In an electrochemical cell when $E_{\text{ext}} > 1.1\text{V}$, then it starts functioning as _____ cell.

Q17. Electrical conductance of a metal _____ with increase in temperature.

Q18. $E^\circ_{\text{Cr}^{3+}/\text{Cr}} = -0.74\text{V}$ and $E^\circ_{\text{Cd}^{2+}/\text{Cd}} = -0.40\text{V}$, the value of $E^\circ_{\text{cell}} =$ _____.

Q19. The quantity of charge required for the reduction of Al^{3+} to Al is _____ C.

Q20. $E^\circ_{1/2\text{F}_2/\text{F}^-} = 2.87\text{V}$ and $E^\circ_{1/2\text{I}_2/\text{I}^-} = 0.54\text{V}$, the stronger oxidizing agent will be _____.

True False:

1. Lead is used as electrode material mainly for cathodes.
2. The quantity of electricity required to liberate 1 equivalent of any primary product is called 1 Faraday.
3. The flow of current through an electrolyte is due to the movement of electrons
4. The electronic conductivity increases with the increase in temperature.
5. The electrolytic conductivity increases with the increase in temperature.
6. Fuel cell is a device which converts electrical energy of a fuel directly into chemical energy.
7. The reduction potential of F_2 is highest.
8. All electrochemical cells produce electrical energy.
9. At infinite dilution of an electrolyte, the ionic conductivity of cations and anions are independent of each other
10. 2 Faraday of charge will produce 23grams of sodium at cathode.

MATCH THE FOLLOWINGS:

COLUMN A	COLUMN B
1. ΔG is + ve	a. λ_m λ°_m
2. Electrochemical cell	b. $E_{\text{cell}} > E_{\text{ext}}$.
3. Conductivity	c. Reaction is non - spontaneous
4. molar conductivity	d. $0.059 \log K_c/n$
5. Degree of dissociation (α)	e. Siemen/meter
6. Dissociation constant (k)	f. $\frac{C \alpha^2}{1-\alpha}$

7. Lead storage battery	g. moist paste of NH_4Cl and ZnCl_2
8. Lechlanche cell	h. 38% H_2SO_4
9. E°_{cell}	i. Siemen m^2/mol
10. $\lambda_{\text{m}^\circ} \text{CaCl}_2$	j. $\lambda^\circ \text{Ca}^{2+} + 2 \lambda^\circ \text{Cl}^-$

TWO MARKS

- The standard redⁿ potential for Cu^{+2}/Cu is 0.34 v calculate The reduction potential at pH = 14 . for the above couple K_{sp} of $\text{Cu}(\text{OH})_2$ is 1.0×10^{-19} .
- State Faraday's first law of electrolysis. How much charge in terms of Faraday is required for the reduction of 1 mol of Cu^{2+} to Cu?
- The conductivity of a 0.20 M solution of KCl at 298 K is 0.025 S cm^{-1} . Calculate its molar conductivity.
- Define conductivity and molar conductivity for the solution of an electrolyte. How do they vary when the concentration of electrolyte in the solution increases?
- How many moles of electrons are required to:
 - Reduce 10mol of MnO_4^- to Mn^{+2}
 - To produce 1g of Al from molten Al_2O_3 .

THREE MARKS

- An unknown metal M displaces Ni from NiCl_2 solution but it don't displace Mn from MnCl_2 solution. Arrange metal M, Ni & Mn in correct order of reducing power.
- Give reasons
 - Salt bridge is not needed in lead storage battery.
 - Blocks of Mg are often strapped to the ocean going ships.
 - We cannot store CuSO_4 in Fe Vessel.
- How many moles of electrons are required to
 - Reduce 1 mol of MnO_4^- to MnO^{+2}
 - Produce 10.0 g of Al from molten Al_2O_3
 - To produce 50 g of Al when reaction is $\text{Al}^{+3} + 3\text{e}^- \rightarrow \text{Al}$
- Determine the values of K_c and G° for the following reaction.

$$\text{Ni(s)} + 2\text{Ag}^+(\text{aq}) \rightarrow \text{Ni}^{+2}(\text{aq}) + 2\text{Ag(s)}$$
 When $E^\circ_{\text{Ni}^{+2}/\text{Ni}} = -0.25\text{V}$
 $E^\circ_{\text{Ag}^+/\text{Ag}} = -0.80\text{V}$
- The resistance of 0.5 M CH_3COOH solution is 100 ohm. The cell constant is 0.035 cm^{-1} . Calculate molar conductivity of solution.

FIVE MARKS

1. A) Two metals A and B have electrode potential values of -0.25V and 0.80V respectively. Which of these will liberate hydrogen gas from dilute H_2SO_4 ?
- b) Which out of 0.1M HCl and 0.1M NaCl , do you expect have greater Λ_m° and why?
- c) Three iron sheets have been coated separately with three metals A, B, C whose standard electrode potentials are given below :

	A	B	C	Iron
E° value	-0.46V	-0.66V	-0.20V	-0.44V

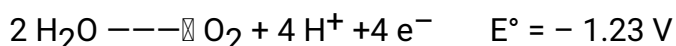
Identify in which rusting will take place faster when coating is damaged.

2. a) Iron and nickel are used to make electrochemical cell by using a salt bridge to join a half cell containing $1\text{M Fe}^{2+}(\text{aq})$ in which a strip of iron has been immersed to a second half cell which contains $1\text{M Ni}^{2+}(\text{aq})$ in which a strip of Ni has been immersed? A voltmeter is connected between the two metal strips :

$$E^\circ_{\text{Fe}^{2+}/\text{Fe}} = -0.44\text{V} \quad E^\circ_{\text{Ni}^{2+}/\text{Ni}} = -0.25\text{V}$$

- (i) Write the name of the cathode and anode.
- (ii) Write the half reactions involved?
- b) In a cell reaction, the equilibrium constant K is less than one. Is E° for the cell positive or negative?

3. a) Given that :



Explain why CO^{3+} is not stable in aqueous solution?

- b) What will be the value of K of $E^\circ_{\text{cell}} = 0$?

Unit 3 Chemical Kinetics

One Mark Question

1. The activation energy for a reaction at the temperature $T\text{K}$ was found to be $2.303\text{RT J mol}^{-1}$. The ratio of the rate constant to Arrhenius factor is ____.

- A. 10^{-1}
 B. 10^{-2}
 C. 2×10^{-3}
 D. 2×10^{-2}
2. For several reactions an increase in temperature from 300 K to 310 increase the rate increase approximately by
 A. 3.3 %
 B. 100 %
 C. 10 %
 D. 1000%
3. Fraction of molecules with energy equal to or greater than activation energy is equal to
 A. E_a/RT
 B. $e^{-E_a/RT}$
 C. $E_a/2.303RT$
 D. $-E_a/2.303RT$
4. Collision theory assumes that the rate of a reaction depends on _____.
 A. the energy of collisions.
 B. the orientation of colliding molecules.
 C. the energy of collisions and the orientation of colliding molecules.
 D. the change in energy between the products and the reactants.
5. The steps in a reaction mechanism are as follows. Which species is acting as a catalyst?
 Step 1: $\text{Ag}^+(\text{aq}) + \text{Ce}^{4+}(\text{aq}) \rightarrow \text{Ag}^{2+}(\text{aq}) + \text{Ce}^{3+}(\text{aq})$
 Step 2: $\text{Tl}^+(\text{aq}) + \text{Ag}^{2+}(\text{aq}) \rightarrow \text{Tl}^{2+}(\text{aq}) + \text{Ag}^+(\text{aq})$
 Step 3: $\text{Tl}^{2+}(\text{aq}) + \text{Ce}^{4+}(\text{aq}) \rightarrow \text{Tl}^{3+}(\text{aq}) + \text{Ce}^{3+}(\text{aq})$
 A. Ag^+
 B. Ag^{2+}
 C. Tl^+
 D. Tl^{3+}
 c. Ce^{3+}

Assertion Reason type question

- (A) Both assertion and reason are correct statements, and reason is the correct explanation of the assertion.
 (B) Both assertion and reason are correct statements, but reason is not the correct explanation of the assertion.
 (C) Assertion is correct, but reason is wrong statement.
 (D) Assertion is wrong, but reason is correct statement.

6. **Assertion:** The rate of reaction is normally accelerated by the presence of a catalyst

Reason : The presence of a catalyst make the value of ΔG more negative

7. **Assertion:** Order and molecularity of a reaction are always equal.

Reason : Complex reaction takes place in steps and slowest step determines the reaction order.

8. Rate of reaction for a zero order reaction is equal to

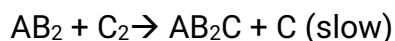
9. The rate of a reaction is found to double when the concentration of one reactant is quadrupled. The order of the reaction with respect to this reactant is _____

10. A reaction proceeds with a uniform rate through out. What is order of Reacton?

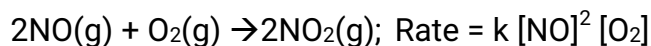
11. Rate constant of a reaction is $3 \times 10^{-1} \text{ hr}^{-1}$. What is order of reaction?

Two Mark Questions

12. Write the rate law and order for the following reaction :

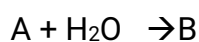


13. For the reaction in a closed vessel :



If the volume of the reaction vessel is doubled, how would it affect the rate of the reaction?

14. For the elementary step of a chemical reaction :



$$\text{rate} = [A]^1$$

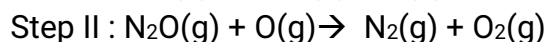
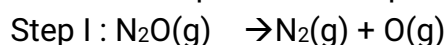
What is the (i) Molecularity and (ii) Order of the reaction.

15. For a reaction, the activation energy is zero. What is the value of rate constant at 300 K if $K = 1.6 \times 10^6 \text{ s}^{-1}$ at 280 K.

16. The slope of the line in the graph of $\log K$ is for a reaction is $- 5841 \text{ K}$. Calculate E_a for the reaction .

Three Mark Questions

17. Gaseous phase decomposition of N_2O is given below.



(a) Write a chemical equation for overall reaction.

(b) Identify the reaction intermediate.

(c) What is the molecularity of each of the elementary reaction?

18. What is the rate law for the reaction $2A + 2B + 2C \rightarrow \text{products}$

EXP NO	Initial [A]	Initial [B]	Initial [C]	rate

1	0.273	0.763	0.400	3.0
2	0.819	.763	0.400	9.0
3	0.273	1.526	0.400	12.0
4	0.273	0.763	.800	6.0

19. What percentage of a material will persist after 80 minutes if it's half life is 20 minutes?

20. For the hydrolysis of methyl acetate in aqueous solution, the following results were obtained :

t/s	0	30	60
[CH ₃ COOCH ₃]/mol L ⁻¹	0.60	0.30	0.15

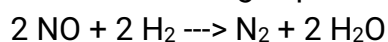
Show that it follows pseudo first order reaction, as the concentration of water remains constant.

21. Consider the reaction: $4\text{PH}_3(\text{g}) \rightarrow \text{P}_4(\text{g}) + 6\text{H}_2(\text{g})$ If in a certain experiment, over a specific time period, 0.0048 moles of PH₃ are consumed in a 2.0 L container each second of reaction, what are the rates of production of P₄ and H₂, respectively?

Five Mark Question

22. A cook finds that it takes 30 minutes to boil potatoes at 100°C in an open sauce pan and only 12 minutes to boil them in a pressure cooker at 110°C. Estimate the activation energy for cooking potatoes, which involves the conversion of cellulose into starch. Remember that there is an inverse relationship between time and the rate constant.

23. The following experimental data were obtained for the reaction;



Initial Rate/10 ⁻⁵	[NO]/10 ⁻² M	[H ₂]/10 ⁻² M
0.60	0.50	0.20
2.40	1.00	0.20
0.30	0.25	0.40

a) Write a rate law in agreement with the data. b)

What is the value of the rate constant?

c) What is the new rate when [NO] = 3x10⁻² M and [H₂] = 1.2x10⁻² M?

24. At 1000°C, cyclobutane (C₄H₈) decomposes in a first-order reaction, with the

very high rate constant of 87 s^{-1} , to two molecules of ethylene (C_2H_4).

(a) If the initial C_4H_8 concentration is 2.00 M, what is the concentration after 0.010 s?

(b) What fraction of C_4H_8 has decomposed in this time?

UNIT 4-SURFACE CHEMISTRY

- Q1 Which of the following statement is not correct regarding physical adsorption?
- it is not specific
 - it forms monomolecular layers
 - it has low heat of adsorption
 - it is reversible
- Q 2. Which of the following is adsorbed by charcoal to maximum extent ?
- N_2
 - CO_2
 - Cl_2
 - O_2
- Q3. An example of micelle is
- Sodium stearate
 - gold gel
 - solution of NaCl
 - Ruby glass
- Q4 Alum helps in purifying water by
- forming silicone complex with clay particles.
 - sulphate part which combines with dirt and removes it.
 - Aluminium which coagulates the mud particles.
 - making mud water soluble.
- Q5 The disease kalaazar is caused by
- colloidal antimony
 - milk of magnesia
 - argyrols
 - colloidal gold

fill in the blanks

- Q6 At high concentration of soap in water, soap behaves as-----.
- Q7 The lyophobic colloid is protected by -----.
- Q8 The term sorption stands for-----.
- Q9 The physical adsorption of gases may change to chemical adsorption with-----.
- Q10 At equilibrium position in the process of adsorption ΔH is -----.

Asserterion Reason Type Questions

The question given below consist of an assertion and reason. Use the following key to choose appropriate answer

a) If both assertion and reason are correct and reason is correct explanation of the

assertion

b) if both assertion and reason are correct but reason is not the correct explanation of the assertion .

c) If assertion is correct but reason is incorrect.

d) if assertion is incorrect but reason is correct.

e) if both assertion and reason both are incorrect.

Q11 Assertion : physical adsorption of molecules on the surface requires activation energy.

Reason: because the bonds of adsorbed molecules are broken.2

Q12 Assertion : activity of enzymes is pH dependent.

Reason: change of PH affects the solubility of the enzyme in water.

Q13 Assertion: small quantity of soap is required to prepare a stable emulsion.

Reason: Soaps lower the interfacial between the oil and water.

Q14 ASSERTION: sea water looks blue.

Reason: due to scattering of light by colloidal particles in sea water.

Q15 Assertion: the conversion of fresh precipitate to colloidal state is called peptization.

Reason : it is caused by addition of common ions .

TWO MARKS QUESTIONS-

Q1 What is adsorption isotherm? Describe Freundlich adsorption isotherm at intermediate pressure.

Q2 Define :- a zeta potential

b) CMC.

Q3 Out of BaCl_2 and KCl which is more effective in causing coagulation of negatively charged sol .give reason.

Q4 What happens when dialysis is prolonged?

Q5 What is colloidion?

THREE MARKS QUESTIONS

Q1 Explain the following observations-

a) Ferric hydroxide sol gets coagulated on addition of sodium chloride solution.

b) Cottrell's smoke precipitator is fitted at the mouth of chimney us

Q2 what are the differences between multimolecular, macromolecular and associated colloids?

Q3 what happens when—

a) a freshly prepared precipitate of $\text{Fe}(\text{OH})_3$ is shaken with small amount of FeCl_3 solution.

b) electric current is passed through colloidal sol..

c) an emulsion is centrifuged.

Q4 Define

a) Micelles

b) Peptization

c) desorption.

Q 5 Differentiate between homogenous and heterogenous catalysis with one example of each.

GENERAL PRINCIPLES AND PROCESS OF ISOLATION OF ELEMENTS

PART -I

ONE MARKS QUESTIONS

MULTIPLE CHOICE QUESTIONS

1. The method used for refining of iron is called
 - (a) Bessemerisation
 - (b) Electrolysis
 - (c) Cupellation
 - (d) Liquation
2. The metal oxide which cannot be reduced to metal by carbon is
 - (a) ZnO
 - (b) Fe₂O₃
 - (c) PbO
 - (d) Al₂O₃
3. Native silver metal forms a water soluble complex with a dilute aqueous solution of NaCN in the presence of
 - (a) Nitrogen
 - (b) Oxygen
 - (c) Carbon dioxide
 - (d) Argon
4. In the context of the Hall- Heroult process for the extraction of Al, which of the following statements is false?
 - (a) Al³⁺ is reduced at the cathode to form Al.
 - (b) Na₃AlF₆ serves as the electrolyte
 - (c) CO and CO₂ are produced in the process.
 - (d) Al₂O₃ is mixed with CaF₂ which lowers the melting point of the mixture and brings conductivity.
5. Name the reagent that is used in leaching of gold:
 - (a) Carbon
 - (b) Sodium cyanide
 - (c) Carbon monoxide
 - (d) Iodine

PART -(II)

COMPREHENSION

A and B are two ores of copper. A undergoes calcination to form solid, $\text{CO}_2(\text{g})$ and H_2O . B undergoes roasting to form a solid and a gas C which turns acidified orange $\text{K}_2\text{Cr}_2\text{O}_7$ to green solution.

B also reacts with dil HCl to form a solid and gas D which turns lead acetate solution black and also react with C to form colloidal sulphur in the presence of moisture.

Choose the correct answer:

- The copper ores A and B are respectively
 - Carbonate and hydroxide
 - Carbonate and oxide
 - Carbonate and sulphide
 - Sulphide and carbonate
- The gas (C) act as
 - Oxidising agent
 - Reducing agent
 - Both (a) and (b)
 - Fluxing agent
- The nature of gas (D) and hybridisation of central atom is respectively
 - Weakly acidic, sp^3
 - Strongly acidic, sp^3
 - Weakly acidic, sp^2
 - Strongly acidic, sp^2

PART -III

Each question has five choices 1,2,3,4 and 5 out of which only one is correct.

(1) Assertion is True, Reason is True, Reason is a correct explanation for Assertion.

(2) Assertion is True, Reason is True, Reason is NOT a correct explanation for Assertion.

(3) Assertion is True, Reason is False.

(4) Assertion is False, Reason is True.

(5) Both Statements are False.

- ASSERTION:** Nickel can be purified by Mond Process.

REASON : $\text{Ni}(\text{CO})_4$ is a volatile compound which decomposes at 460 K to give pure Ni.

- ASSERTION :** Hydrometallurgy involves dissolving the ore in a suitable reagent followed by precipitation by a more electropositive metal.

REASON : Copper is extracted by hydrometallurgy.

- ASSERTION :** Oxide and carbonate ores are concentrated by froth floatation process.

REASON : In froth floatation pine oil is used because it preferentially wets the ore particles.

- ASSERTION :** Gold and platinum occur in native state.

REASON : Gold and platinum are expensive metals.

5. **ASSERTION** : Titanium can be purified by Van Arkel process.

REASON : Titanium form volatile TiI_4 unstable compound.

PART-IV

Match the conversions in column 1 with the type(s) of reaction(s) given in Column II

COLUMN I

1. $PbS \rightarrow PbO$
2. $CaCO_3 \rightarrow CaO$
3. $ZnS \rightarrow Zn$
4. $Cu_2S \rightarrow Cu$

COLUMN II

- a. Roasting
- b. Calcination
- c. Carbon Reduction
- d. Self Reduction

PART- V

TWO MARKS QUESTION

1. (a) Write the overall reaction taking place in the process used for the electrolysis of alumina by Hall- Heroult process.
(b) Why can't aluminium be reduced by carbon ?
2. What is cupellation and Kroll process?
3. Galena (PbS) and Cinnabar (HgS) on roasting often give their respective metals but zinc blende (ZnS) does not . Explain
4. In the metallurgy of copper partial roasting of sulphide ore is done . Why?
5. Why is the graphite rods in the extraction of aluminium from molten Al_2O_3 have to be replaced from time to time.

PART -VI

THREE MARKS QUESTION

1. (a) Why is sulphide ore of copper heated in a furnace after mixing with silica?
(b) Why are sulphide ores converted to oxide before reduction?
2. What is main difference between ?
(a) Cupellation and poling
(b) Hydrometallurgy and pyrometallurgy
(c) Leaching and Levigation
3. Explain the following

- (a) Chalcocite is roasted and not calcined during recovery of copper.
- (b) Magnesium oxide is used for lining in steel making furnace.
- (c) Excess of carbon is added to zinc metallurgy.
4. The native silver forms a water soluble compound (B) with dilute aqueous solution of NaCN in the presence of a gas (A). The silver metal is obtained by the addition of a metal (C) to (B) and complex (D) is formed as a by product . Write the structures of (C) and (D) and identify (A) and (B) in the following sequence –
- $$\text{Ag} + \text{NaCN} + [\text{A}] + \text{H}_2\text{O} \rightarrow [\text{B}] + \text{OH}^- + \text{Na}^+$$
- $$[\text{C}] + [\text{B}] \rightarrow [\text{D}] + \text{Ag}$$
5. (a) Why is the reduction of a metal oxide easier if metal formed is in liquid state at the temperature of reduction?
- (b) Name the elements present in anode mud during refining of copper. Why does it contain such elements?
- (c) Zinc is used but not copper for the recovery of metallic silver from the complex $[\text{Ag}(\text{CN})_2]^-$, although electrode potentials of both zinc and copper are less than that of Ag. Explain why?

PART -VII

FIVE MARKS QUESTION

1. (a) Why copper matte is put in silica lined converter?
- (b) The value of $\Delta_f G^\circ$ for Cr_2O_3 is -540kJ/mole & that of Al_2O_3 is -827kJ/mole . Is the reduction of Cr_2O_3 possible with aluminium?
- (c) Gold dissolves in aqua regia but silver remains insoluble . Explain.
3. A sulphide ore 'A' On roasting leaves a residue (B) which on reacting with HCl forms a water soluble compound (C). Addition of KI to the solution of (C), another solution (D) is formed. A brown precipitate (E) is formed when ammonia is passed into an alkaline solution of (D). Identify (A) to (E).

p- BLOCK ELEMENTS

PART -1

ONE MARKS QUESTIONS

Each question has five choices 1,2,3,4 and 5 out of which only one is correct.

(6) Assertion is True , Reason is True , Reason is a correct explanation for Assertion.

(7) Assertion is True , Reason is True , Reason is NOT a correct explanation for Assertion.

(8) Assertion is True , Reason is False .

(9) Assertion is False , Reason is True .

(10) Both Statements are False.

- Assertion :** Chlorine and Sulphur dioxide both are bleaching agents.
Reason : The bleaching action of chlorine and sulphur dioxide is performed through the process of oxidation.
- Assertion :** Noble gases have very low boiling points.
Reason : Noble gases being monoatomic have no interatomic forces except weak dispersion forces.
- Assertion :** Sulphur exhibits paramagnetic behaviour in vapour state.
Reason : In vapour state sulphur partly exists as S_2 molecules which has two unpaired electrons in antibonding π^* Orbitals.
- Assertion :** Ozone is a stronger oxidising agent in acidic medium.
Reason : $O_3 + H^+ + 2e^- \rightarrow O_2 + H_2O$; SRP = + 2.07V
 $O_3 + H_2O + 2e^- \rightarrow O_2 + OH^-$; SRP = + 1.24V
- Assertion :** At room temperature oxygen exists as a diatomic gas, where as sulphur exists as solid.
Reason : The catenated -O-O-O- are less stable as compared to O=O molecules.

PART-2

MULTIPLE CHOICE QUESTION

1. Which of the following is not oxidised by O_3 ?
(A) KI (B) $KMnO_4$ (C) K_2MnO_4 (D) $FeSO_4$
2. The set with correct order of acidity is :
(A) $HClO < HClO_2 < HClO_3 < HClO_4$
(B) $HClO_4 < HClO_3 < HClO_2 < HClO$
(C) $HClO < HClO_4 < HClO_3 < HClO_2$
(D) $HClO_4 < HClO_2 < HClO_3 < HClO$
3. A gas 'X' is passed through water to form a saturated solution . The aqueous solution on treatment with silver nitrate gives a white precipitate. The saturated aqueous solution also dissolves magnesium ribbon with evolution of a colourless gas 'Y' . Identify 'X' and 'Y' .
(A) $X = CO_2$, $Y = Cl_2$
(B) $X = Cl_2$, $Y = CO_2$
(C) $X = Cl_2$, $Y = H_2$
(D) $X = H_2$, $Y = Cl_2$
4. Which among the following is the most reactive
(A) Cl_2 (B) Br_2 (C) I_2 (D) ICl
5. XeF_4 on partial hydrolysis produces :
(A) XeF_2 (B) $XeOF_2$ (C) $XeOF_4$ (D) XeO_3

PART - 3

PARAGRAPH

The noble gases have closed -shell electronic configuration and are monoatomic gases under normal conditions. The low boiling points of the lighter noble gases are due to weak dispersion forces between the atoms and the absence of other interatomic interactions.

The direct reaction of Xenon with fluorine leads to a series of compounds with oxidation number +2 , +4 and +6. XeF_4 reacts violently with water to give XeO_3 . The compounds of xenon exhibit rich stereochemistry and their geometries can be deduced considering the total number of electron pairs in the valence shell.

1. Argon is used in arc welding because of its :
(A) Low reactivity with metals
(B) ability to lower the melting point of metal
(C) flammability
(D) high calorific value
2. The structure of XeO_3 is
(A) Linear

- (B) Planar
- (C) Pyramidal
- (D) T- shaped

3. XeF_4 and XeF_6 are expected to be:
- (A) Oxidizing
 - (B) Reducing
 - (C) Unreactive
 - (D) Strongly basic

PART- 4

Match the items of Columns I and II and mark the correct option.

Column I	Column II
(A) H_2SO_4	(1) Highest electron gain enthalpy
(B) CCl_3NO_2	(2) Chalcogen
(C) Cl_2	(3) Tear gas
(D) Sulphur	(4) Storage batteries

- (i) A (4) B (3) C (1) D (2)
- (ii) A (3) B (4) C (1) D (2)
- (iii) A (4) B (1) C (2) D (3)
- (iv) A (2) B (1) C (3) D (4)

PART -V

TWO MARKS QUESTIONS

1. Give appropriate reasons for each of the following:
 - (a) Addition of Cl_2 to KI solution gives it a brown colour but excess of Cl_2 turns it colourless.
 - (b) Perchloric acid is a stronger acid than sulphuric acid.

2. (a) When HCl reacts with finely powdered iron , it forms ferrous chloride and not ferric chloride. Why?
 (b) Chlorine water turns blue litmus red but solution becomes colourless after sometime.

3. Xenon has closed shell configuration but is known to give compounds with fluorine.

4. O_3 is a powerful oxidising agent . Write equation to represent oxidation of
 - (a) I^- to I_2 in acidic medium
 - (b) Sulphur to sulphuric acid in the presence of moisture

- 5.(a) Give reason to explain why ClF_3 exists but FCl_3 does not exist.
 (b) SF_6 is known but SCl_6 is not. Why?

PART-VI

THREE MARKS QUESTIONS

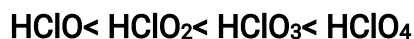
- (a) In the preparation of H_2SO_4 by Contact Process, why is SO_3 not absorbed directly in water to form H_2SO_4 ?
(b) What do you understand by tailing of mercury ?
(c) Explain why the stability of oxoacids of chlorine increases in the order given below:
 $\text{HClO} < \text{HClO}_2 < \text{HClO}_3 < \text{HClO}_4$.
- (a) Why anhydrous HF liquid is not electrolysed alone to get F_2 ?
(b) Fluorine cannot be prepared from fluorides by chemical oxidation.
(c) Fluorine does not form F_3^- ion .
- Write chemical equations for the following processes
(a) Chlorine react with a hot concentrated solution of sodium hydroxide
(b) $\text{SO}_3 + \text{H}_2\text{SO}_4 \rightarrow$
(c) PtF_6 and Xenon are mixed together
- (a) Does the Hydrolysis of XeF_6 lead to redox reaction ?
(b) Explain why the liquid oxygen sticks to the magnet pole but liquid nitrogen does not?
(c) On heating rhombic sulphur it melts but viscosity of liquid increases up to 200°C and beyond that it decreases why ?
- Predict the shape and asked angle (90o or more or less) in each of the following cases :
(i) SO_3^{2-} and the angle O-S-O
(ii) ClF_3 and the angle F-Cl-F
(iii) XeF_2 and the angle F-Xe-F

PART- VII

FIVE MARKS QUESTIONS

- 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 a oxide 'C' which is colourless and pungent smelling gas. The gas when passed through acidified KMnO_4 Solution , decolourises it. 'C' gets oxidised to another oxide 'D' in the presence of heterogeneous catalyst . Identify A,B,C,D and also give the chemical equations of reaction of 'C' with acidified KMnO_4 solution and for conversion of 'C' in to 'D'.
- An aqueous solution of gas 'A' gave the following reactions:
 - It decolourised an acidified KMnO_4 solution
 - On boiling with H_2O_2 followed by cooling and then adding an aqueous solution of BaCl_2 , a white ppt insoluble in dilute HCl was obtained
 - On passing H_2S through the solution of the gas , white turbidity was obtained . Identify the gas and give equations for steps (i) , (ii) and (iii).
-

- a. Explain why the stability of oxoacids of chlorine increases in the order given below



- b. Explain why ozone is thermodynamically less stable than oxygen.

Unit 7

d and f Block elements

I. Objective type questions:

- Which of the following has the maximum number of unpaired electrons?
a. Mg^{2+} b. Ti^{3+} c. V^{3+} d. Fe^{2+}
- Transition metals. Despite high E° oxidation, are poor reducing agents, the incorrect reason is:
 - High heat of vaporization
 - high ionization enthalpies
 - low heat of hydration
 - complex forming nature
- Lanthanoids belongs to:
 - 3rd group and 7th period
 - 3rd group and 6th period
 - 4th group and 7th period
 - 3rd group and 5th period
- Titanium shows the magnetic moment of 1.73 B. M. in its compound. What is

the oxidation state of Ti in the compound:

- a. +1 b. +4 c. +3 d. +2

5. the product of oxidation of I⁻ with MnO₄⁻ in alkaline medium is:

- a. IO₃⁻ b. I₂ c. IO⁻ d. IO₄⁻

6. In the following change KMnO₄ → MnO₂, the oxidation state of manganese changes from:

- a. +5 → +2 b. +7 → +4 c. +7 → +5 d. +3 → +7

7. Which of the following is not an Actinoid:

- a. Curium b. Californium c. Uranium d. Terbium

8. Why HCl is not used to make the medium acidic in oxidation reactions of KMnO₄ in acidic medium?

- a. Both HCl and KMnO₄ acts as oxidizing agents.
b. KMnO₄ oxidises HCl to Cl₂ which also is an oxidizing agent.
c. KMnO₄ is a weaker oxidizing agent
d. KMnO₄ acts as a reducing agent in the presence of HCl

9. Which of the following reactions are disproportionation reaction:

- i. $2\text{Cu}^+ \rightarrow \text{Cu}^{2+} + \text{Cu}$
ii. $3\text{MnO}_4^{2-} + 4\text{H}^+ \rightarrow 2\text{MnO}_4^- + \text{MnO}_2 + 2\text{H}_2\text{O}$
iii. $2\text{KMnO}_4 \rightarrow \text{K}_2\text{MnO}_4 + \text{MnO}_2 + \text{O}_2$
iv. $2\text{MnO}_4^{2-} + 3\text{Mn}^{2+} + 2\text{H}_2\text{O} \rightarrow 3\text{MnO}_2 + 4\text{H}^+$
a. i, ii b. i, ii, iii c. ii, iii, iv d. i, iv

10. Highest oxidation state of Mn in fluoride is +4 (MnF₄) but highest oxidation state in oxides is +7 (Mn₂O₇) because:

- a. Fluorine is more electronegative than oxygen
b. Fluorine does not possess d orbitals
c. Fluorine stabilizes lower oxidation state
d. In covalent compounds Fluorine can form single bond only while oxygen forms double bond.

Questions 11 to 15 given below consist of an Assertion(A) and the Reason (R). Use the following key to choose the appropriate answer:

- a) If both (A) and (R) are correct and (R) is the correct explanation of (A).

- b) If both (A) and (R) are correct and (R) is not the correct explanation of (A).
- c) If (A) is incorrect but (R) is correct.
- d) If both (A) and (R) are incorrect.
11. (A) Copper(II) iodide is not known.
(R) Cu^{2+} oxidizes I^- to iodine
12. (A) Separation of Zr and Hf is difficult
(R) Zr and Hf lie in the same group of the periodic table.
13. (A) Actinoids form relatively less stable compounds as compared to Lanthanoids.
(R) Actinoids can utilize their 5f orbitals alongwith 6d orbitals in bonding but lanthanoids do not use their 4f orbitals for bonding.
14. (A) Cu cannot liberate Hydrogen gas from acids.
(R) Because it has positive electrode potential.
15. (A) The highest oxidation state of Osmium is +8.
(R) Osmium is a 5-d block element.
16. Write the formula of oxoanion of Chromium in which it shows oxidation number to its group number.
17. Complete and balance the following chemical equations:
$$\text{Cr}_2\text{O}_7^{2-} + \text{H}^+ + \text{I}^- \rightarrow$$
18. Why enthalpy of atomization is lowest for zinc in 3d series of transition elements?
19. Calculate the magnetic moment of a divalent ion in aqueous solution if its atomic number is 25.
20. Which Lanthanoid is used as Scavenger of oxygen and sulphur in many metals?

II. Short Answer Questions (02 Marks)

1. Give reasons for the following:
- Cobalt (II) is very stable in aqueous solutions but easily gets oxidized in the presence of strong ligands.
 - Actinoids exhibit greater range of oxidation states than Lanthanoids.
2. Complete and balance the following equations:
- $\text{Cr}_2\text{O}_7^{2-} + \text{Fe}^{2+} + \text{H}^+ \rightarrow$
 - $\text{MnO}_4^- + \text{C}_2\text{O}_4^{2-} + \text{H}^+ \rightarrow$

3. Why it is not advisable to mix KMnO_4 with conc. H_2SO_4 ?
4. What happens when H_2S is passed into potassium dichromate in acidic medium?
Give the equation?
5. What is the gas liberated when:
 - a. Crystals of potassium permanganate is heated to 513K ?
 - b. Acidified potassium permanganate is treated with oxalate ion at 333K?
6. How does the neutral or faintly alkaline potassium permanganate solution react with
 - (a) Iodide (b) thiosulphite ion? Write the ionic equations for the reactions.

Short Answer Questions (03 Marks)

1. Explain the following observations:
 - a. In general the atomic radii of transition elements decrease with atomic number in a given series.
 - b. The $E^\circ_{\text{M}^{2+}/\text{M}}$ for copper is positive (+0.34V). it is the only metal in the first series showing this type of behavior.
 - c. The E° value for $\text{Mn}^{3+}/\text{Mn}^{2+}$ couple is much more positive than $\text{Cr}^{3+}/\text{Cr}^{2+}$ or $\text{Fe}^{3+}/\text{Fe}^{2+}$ couple.
2. Account for the following observations:
 - a. All Scandium salts are white in colour while Titanium salts are coloured.
 - b. Zinc is not regarded as transition element.
 - c. Actinoids show irregularities in their electronic configurations.
3. Describe with an example each of the oxidizing action of permanganate ion in alkaline and acidic medium. What acid and alkali is usually used?
4. Write equations for the following:
 - a. Manganate to permanganate
 - b. Permanganate to Manganese (II)
 - c. Chromate to Dichromate
5. What may be the possible oxidation states of transition metals with the following
 - d – electronic configuration in the ground state of their atoms:
 $3d^34s^2, 3d^54s^2, 3d^64s^2$

Indicate the relative stability of oxidation states in each case.

LONG ANSWER TYPE QUESTIONS (05 MARKS)

1. When an orange coloured crystalline compound 'A' was heated with common salt and concentrated sulphuric acid, an orange red coloured gas 'B' was evolved. The gas 'B' on passing through NaOH solution gave a yellow solution 'C'. The solution on reacting with an aqueous solution of lead acetate gave a yellow precipitate. When H_2O_2 is added to an acidic solution of 'A', a blue peroxo species CrO_5 is formed.

(i) Name the crystalline compound 'A'.

(ii) What is the gas 'B'?

(iii) What is the yellow solution 'C'?

(iv) Write the reaction of 'A' with H_2O_2 in acidic medium to give CrO_5 .

2. A blackish brown coloured solid 'A' when fused with alkali metal hydroxides in the presence of air, produces dark green coloured compound 'B' which on electrolytic oxidation in alkaline medium gives a dark purple coloured compound 'C'. Identify A, B and C. Write the reactions involved.

3. a. How is the variability of oxidation states of transition metals different from that of the p-block elements?

b. Out of Cu^+ and Cu^{2+} , which ion is unstable in aqueous solution and why?

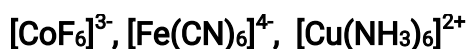
c. Orange colour of dichromate ion changes to yellow when treated with an alkali. Why?

d. Chemistry of Actinoids is complicated as compared to that of Lanthanoids. Give two reasons.

- Q17. When a co-ordination compound $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ is mixed with AgNO_3 , 2 moles of AgCl are precipitated per mole of the compound. Write
- Structural formula of the complex.
 - IUPAC name of the complex.
- Q18. Explain why $[\text{Co}(\text{NH}_3)_6]^{3+}$ is an inner orbital complex whereas $[\text{Ni}(\text{NH}_3)_6]^{2+}$ is an outer orbital complex. (At. No. Co = 27, Ni = 28)
- Q19. How is the stability of a co-ordination compound in solution decided? How is the dissociation constant of a complex defined?
- Q20. $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ is strongly paramagnetic whereas $[\text{Fe}(\text{CN})_6]^{3-}$ is weakly paramagnetic. Explain.
(At. No. Fe = 26)

THREE MARKS QUESTIONS

- Q21. Compare the following complexes with respect to their shape, magnetic behaviour and the hybrid orbitals involved:
- $[\text{CoF}_4]^{2-}$
 - $[\text{Cr}(\text{H}_2\text{O})_2(\text{C}_2\text{O}_4)_2]^-$
 - $[\text{Ni}(\text{CO})_4]$
- (Atomic Number : Co = 27, Cr = 24, Ni = 28)
- Q22. Giving a suitable example for each, explain the following :
- Crystal field splitting
 - Linkage isomerism
 - Ambidentate ligand
- Q23. Explain the following:
- Low spin octahedral complexes of nickel are not known.
 - The π - complexes are known for transition elements only.
 - CO is a stronger ligand than NH_3 for many metals.
- Q24. (i) What type of isomerism is shown by the complex $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$?
- (ii) Why a solution of $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ is green while a solution of $[\text{Ni}(\text{CN})_4]^{2-}$ is colourless? (Atomic No. of Ni = 28)
- (iii) Write the IUPAC name of the following complex: $[\text{Co}(\text{NH}_3)_5(\text{Co}_3)]\text{Cl}$.
- Q25. (i) What type of isomerism is shown by the complex $[\text{Co}(\text{NH}_3)_5(\text{SCN})]^{2+}$?
- (ii) Why is $[\text{NiCl}_4]^{2-}$ paramagnetic while $[\text{Ni}(\text{CN})_4]^{2-}$ is diamagnetic? (Atomic number of Ni = 28)
- (iii) Why are low spin tetrahedral complexes rarely observed?
- Q26. Give the electronic configuration of the following complexes on the basis of Crystal Field Theory.



Unit 9 HALOALKANES AND HALOARENES

(MULTIPLE CHOICE QUESTIONS)

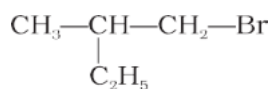
1) Identify the following compounds as primary halide:

- (a) 1-Bromobut-2-ene
- (b) 4-Bromopent-2-ene
- (c) 2-Bromo-2-methylpropane
- (d) 1-chloro-2,2-dimethylpropane

2.) Which of the following compounds are gem-dihalides ?

- (a) Ethylidene chloride
- (b) Ethylene dichloride
- (c) Methyl chloride
- (d) Benzyl chloride

3) Which is the correct IUPAC name for



- (a) 1-Bromo-2-ethylpropane (b) 1-Bromo-2-ethyl-2-methylethane
(c) 1-Bromo-2-methylbutane (d) 2-Methyl-1-bromobutane

4) What should be the correct IUPAC name for Diethylbromomethane?

- (a) 1-Bromo-1,1-diethylmethane (b) 3-Bromopentane
(c) 1-Bromo-1-ethylpropane (d) 1-Bromopentane

5) Which of the following are secondary bromides?

- (a) $\text{CH}_3\text{CH}_2\text{Br}$ (b) $(\text{CH}_3)_3\text{CCH}_2\text{Br}$ (c) $\text{CH}_3\text{CH}(\text{Br})\text{CH}_2\text{CH}_3$ (d) $(\text{CH}_3)_2\text{CBrCH}_2\text{CH}_3$

7.) 1,1 Dichloropropane on hydrolysis gives

- a) Propanone
b) Propanal
c) Ethanal
d) 1,1-propandiol

8.) Among the following, the molecule with the highest dipole moment is :

- a) CH_3Cl b) CH_2Cl_2 c) CHCl_3 d) CCl_4

9.) Which of the following represents Freon?

- a) Ethylene dichloride
b) Ethylidene dichloride
c) Tetrafluoro ethylene
d) Dichlorodifluoromethane

One word answer type QUESTIONS

1. Write the IUPAC names of $(\text{CH}_3)_3\text{CCH}_2\text{Cl}$

2. Which of the following undergoes $\text{S}_\text{N}1$ faster: 2-chlorobutane OR 1-chlorobutane

3. Arrange each set of compounds in order of increasing boiling points.

(i) Bromomethane, (ii) Bromoform, (iii) Chloromethane, (iv) Dibromomethane.

4. Write the product formed when toluene is chlorinated in presence of sunlight.

5. Write the product formed when n-butyl chloride is treated with alcoholic KOH?

6. Which is a better nucleophile, a bromide ion or an iodide ion?

7. Which has higher dipole moment, Chlorobenzene or Cyclohexyl chloride?

8. Draw the structure of DDT.

9. Expand BHC

10. How many centres of chirality are present in 3-Bromopent-1-ene.

True /False

1. A racemic mixture is optically active.
2. A carbon which is attached to four different group is called achiral carbon
3. Iodoform has antiseptic properties.
4. A beam of light which has vibration in only one plane is called plane polarized light.
5. An equimolar mixture of a pair of enantiomers is called racemic mixture.
6. $\text{CH}_3\text{CH}=\text{CHCH}_2\text{Br}$ is 1- Bromobut-2-ene and classify is allylic halide.
7. When ethyl chloride is treated with aq. KOH ethene is major product.
8. The superimposable mirror images of stereoisomers are called enantiomers.
9. Out of chlorobenzene and cyclohexyl chloride, cyclohexylchloride has high dipole moment.
10. Tert Butyl Chloride reacts with aqueous sodium hydroxide by SN_1 mechanism.
11. p-dichlorobenzene have higher m.p than o- and m- isomer due to +R effect.
12. C-X bond length in halobenzene is smaller than C-X bond length in $\text{CH}_3\text{-X}$
13. Out of CHCl_3 & CH_2Cl_2 dichloro methane has high dipole moment.
14. Out of a bromide ion and an iodide ion, bromide ion is better nucleophile.

MATCH THE FOLLOWINGS:

Column A	Column B
1.Sandmeyer's reaction	a. $\text{C}_6\text{H}_5\text{MgBr}$
2.Fittig reaction	b. $\text{NaI} + \text{dry acetone}$
3.Finkelstein reaction	c. Na^+ Dry ether
4.Grignard's reagent	d. $\text{HCl} + \text{andyd. ZnCl}_2$
5. Allyl halide	e. $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_3$
6.Lucas test	f. SN^1
7. $\text{CH}_3\text{CHBrCH}_2\text{CH}_3 + \text{KOH}(\text{alc}) \rightarrow \text{CH}_3\text{CH}=\text{CHCH}_3$	g. $\text{CH}_3-\text{CH}=\text{CH}-\text{CH}_2-\text{Cl}$

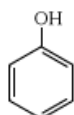
8. $(\text{CH}_3)_3\text{CBr}$	h. SN^2
9. CH_3Br	i. $\text{Cu}_2\text{Cl}_2 + \text{HCl}$
10. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}(\text{Br})\text{CH}_3 + \text{alc KOH}$	j. Saytzeff's rule.

2 Mark Questions

- Q 1. An Alkyl halide X, of formula $\text{C}_6\text{H}_{13}\text{Cl}$ on treatment with potassium tertiary butoxide gives isomeric alkenes Y and Z (C_6H_{12}). Both alkenes on hydrogenation give 2,3-dimethylbutane. Predict the structures of X, Y and Z.
- Q 2. Haloalkanes undergo substitution reactions while haloarenes undergo electrophilic substitution reactions, Explain.
- Q 3. How do polar solvents help in the first step in $\text{S}_{\text{N}}1$ mechanism?

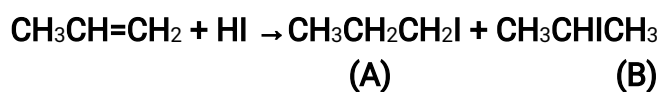
3 Mark Questions

- Q 1. Which of the following compounds (a) and (b) will not react with a mixture of NaBr and H_2SO_4 ? Explain Why?
- a. $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$



b.

- Q 2. Which of the products will be major product in the reaction given below? Explain

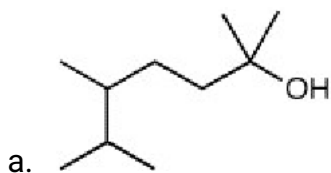


- Q 3. Give reasons
- $\text{C}-\text{Cl}$ bond length in chlorobenzene is shorter than $\text{C}-\text{Cl}$ bond length in CH_3-Cl
 - The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.
 - $\text{S}_{\text{N}}1$ reactions are accompanied by racemization in optically active alkyl halides.

Unit 10 ALCOHOL , PHENOL AND ETHER

ONE MARK

- Bond angle of ethers is slightly greater than tetrahedral bond angle. Explain.
- Ethers made of similar kind of polar bonds (symmetric) also possess some net dipole moment. Explain.
- Which of the following will NOT convert 1-butanol into 1-chlorobutane in one step?
 - SOCl_2
 - PCl_3
 - HCl
 - CCl_4
- Which is the correct IUPAC name for the following compound?



- 4-Isopropyl-1,1-dimethyl-1-pentanol
 - 5-Isopropyl-1,1-dimethyl-2-hexanol
 - 1,1,4,5-Tetramethyl-1-hexanol
 - 2,5,6-Trimethyl-2-heptanol
- Products obtained when HI reacts with isopropyl methyl ether at 373 K are
 - isopropyl iodide and methyl alcohol
 - isopropyl alcohol and methyl iodide
 - isopropyl iodide and water
 - methyl iodide and water
 - Which among the following compounds will give a secondary alcohol on reacting with Grignard reagent followed by acid hydrolysis?
I. HCHO II. $\text{C}_2\text{H}_5\text{CHO}$ III. CH_3COCH_3 IV. RCOOC_2H_5 Select the correct answer using the code given below:
(a) Only II (b) Only III (c) II and IV (d) III and IV
 - An unknown alcohol is treated with the "Lucas reagent" to determine whether the alcohol is primary, secondary or tertiary. Which alcohol reacts fastest and what mechanism?

- a. tertiary alcohol by S_N2
 - b. secondary alcohol by S_N1
 - c. tertiary alcohol by S_N1
 - d. secondary alcohol by S_N2
8. Name the compound which is also known as carbolic acid.
 9. 1% ethanol should be added to chloroform sample while storing. Why?
 10. Suggest a reason for the large difference in the boiling points of butanol and Butanal, although they have same solubility in water.

TWO MARK

11. Why are Grignard reagents soluble in ether but not in benzene?
12. The reaction of alcohols with carboxylic acid or anhydrides to form esters conc. H_2SO_4 is added, and the reaction with alcohol and acid chloride base like pyridine is used. Explain.
13. The usual halogenations of Benzene takes place of in presence of Lewis acid catalyst like $AlCl_3$, where as phenol can directly react with Bromine? Explain?
14. Phenol react with bromine in the presence of carbon disulphide gives monobromophenol whereas with water gives tribromophenol. Explain.
15. Explain the dehydration of a secondary alcohol with equation. OR How is isopropyl alcohol converted to propene by dehydration reaction?

THREE MARK

16. Dehydration of alcohols to alkenes is always carried out with conc. H_2SO_4 and not with conc. HCl or HNO_3 . Why?
17. Illustrate with examples the limitation of Williamson synthesis for the preparation of certain type of ethers.
18. A compound A ($C_4H_{10}O$) is found to be soluble in concentrated sulphuric acid. (A) does not react with sodium metal or potassium permanganate. When (A) is heated with excess of HI , it gives a single alkyl halide. Deduce the structure of compound (A) and its IUPAC name and explain its reaction involved with HI .
19. An organic compound (A) on treatment with $CHCl_3$ and KOH gives two compounds B and C. Both B and C give the same product (D) when distilled with zinc dust. Oxidation of D gives E having molecular formula $C_7H_6O_2$. The sodium salt of E on heating with soda-lime gives F which may also be obtained by distilling A with zinc dust. Identify A to F
20. Etherial solution of an organic compound 'A' when heated with magnesium gave 'B'. 'B' on treatment with ethanal followed by acid hydrolysis gave 2-propanol. Identify the compound 'A' and B. What is 'B' known as?

FIVE MARK

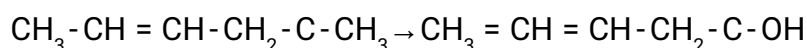
21. An alcohol A ($C_4H_{10}O$) on oxidation with acidified potassium dichromate gives carboxylic acid B ($C_4H_8O_2$). Compound A when dehydrated with conc. H_2SO_4 at 443 K gives compound C. Treatment of C with aqueous H_2SO_4 gives compound D. ($C_4H_{10}O$) which is an isomer of A. Compound D is resistant to oxidation but compound A can be easily oxidized. Identify A, B, C and D and write their structures. Name the isomerism present in A and D.
22. An organic compound A having molecular formula C_6H_6O gives a characteristic colour with aqueous $FeCl_3$. When A is treated with $NaOH$ and CO_2 at 400 K under pressure compound B is obtained. Compound B on acidification gives compound C which reacts with acetyl chloride to form D, which is a popular pain killer. Deduce the structure of A, B, C and D. What is the popular name of Drug D?
23. An ether A ($C_5H_{12}O$) when heated with excess of hot concentrated HI produced two alkyl halides which on hydrolysis form compounds B and C. Oxidation of B gives an acid D whereas oxidation of C gave a ketone E. Deduce the structures of A, B, C, D and E.

Unit 11 Aldehyde Ketones and Carboxylic acids

Q.1 Through which of the following reactions number of carbon atoms can be increased in the chain?

- (a) Grignard reaction (b) Cannizzaro's reaction
(c) Rosenmund Reductions (d) HVZ reaction

Q.2 Which is the most suitable reagent for the following conversion?

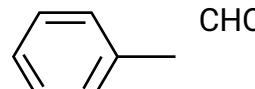

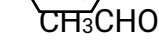


- (a) Tollens reagent (b) Benzoyl peroxide
(c) I₂ and NaOH solution (d) Sn and NaOH solution

Q.3 The correct order of increasing acidic strength is

- (a) Phenol < Ethanol < Chloroacetic acid < Acetic acid
(b) Ethanol < Phenol < Chloroacetic acid < Acetic acid
(c) Ethanol < Phenol < Acetic acid < Dichloroacetic acid
(d) Chloroacetic acid < Acetic acid < Phenol < Ethanol

Q4. Cannizzaro's reaction is not given by

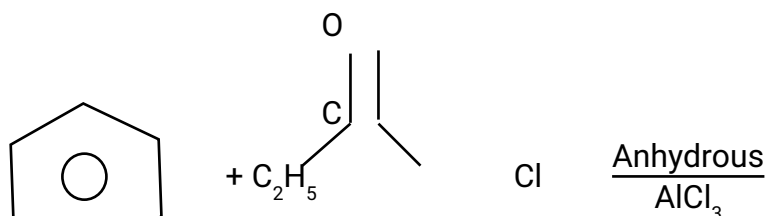
- (a)  (b) 
(c)  (d) 

Q5. $\text{CH}_3 - \text{C} \equiv \text{CH} \xrightarrow[1\% \text{HgSO}_4]{40\% \text{H}_2\text{SO}_4} \text{A} \xrightarrow{\text{Isomerisation}} \text{CH}_3 - \text{C} - \text{CH}_3$

Structure of 'A' and type of isomerism in the above reaction are respectively

- (a) prop - 1 - en - 2 - ol, metamerism
(b) prop - 1 - en - 1 - ol, tautomerism
(c) prop - 2 - en - 2 - ol, geometrical isomerism
(d) prop - 1 - en - 2 - ol, tautomerism

Q6. Write the structure of the product formed in the following reaction:



Q7. Arrange the following compound groups in the increasing order of their

property indicated:

Propanol, Propane, Propanal (boiling point)

Q8. Carboxylic acids do not give characteristic reactions of carbonyl group.

Explain why?

Q9. Aldehydes form red ppt with Fehling solution of _____
(ethylene)

Q10. The question given below consists of an Assertion and Reason. Use the following key to choose the appropriate answer.

(a) If both the assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

(b) If both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.

(c) If assertion is CORRECT but, reason is INCORRECT.

(d) If assertion is INCORRECT but, reason is CORRECT.

(e) If both assertion and reason are INCORRECT.

1. **Assertion:** Pentan – 2 – one can be distinguished from pentan – 3 – one by iodoformtest.

Reason: Former is methyl ketone while the latter is not.

2. **Assertion:** In methanol, all the four atoms are in the same plane

Reason: The carbon atom in methanol is sp^2 hybridized

3. **Assertion:** Benzaldehyde is more reactive than prannal towards nucleophilic addition reactions.

Reason: Benzaldehyde is less stericallyhindered

4. **Assertion:** Acetaldehyde undergoes aldol condensation with dil. NaOH.

Reason: Aldehydes which do not contain α – hydrogen undergo aldol condensation.

5. Acetaldehyde can be reduced to ethane in the presence of $LiAlH_4$.
(TRUE/FALSE)

Two marks questions:

Q11. Di – tert – butylketone does not give precipitate with $NaHSO_3$ whereas acetone does. Explain.

Q12. Give a chemical test to distinguish between Formaldehyde and Acetaldehyde.

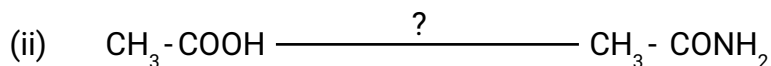
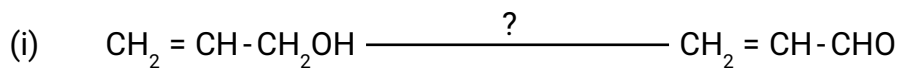
Q13. Fluorine is more electronegative than chlorine but p–florobenzoic acid is a weaker acid than p–chlorobenzoic acid. Explain.

Q.14. Arrange the following compounds in increasing order of their property as indicated:

(i) CH_3COCH_3 , $C_6H_5COCH_3$, CH_3CHO (reactivity towards nucleophilic addition reaction)

(ii) $Cl-CH_2-COOH$, $F-CH_2-COOH$, CH_3-COOH (acidic character)

Q15. Write the reagents required in the following reactions:



Three marks question:

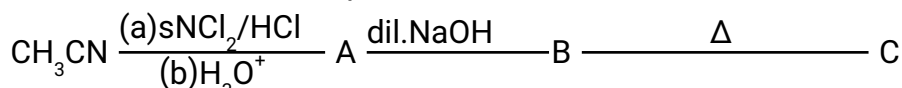
Q16. Do the following conversions in not more than two steps:

(i) Benzoic acid to benzaldehyde

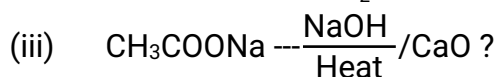
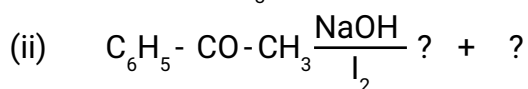
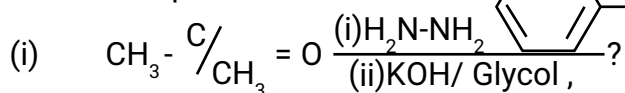
(ii) Ethyl benzene to Benzoic acid

(iii) Propanone to Propene

Q17. Write structures of compounds A, B and C in each of the following reactions:

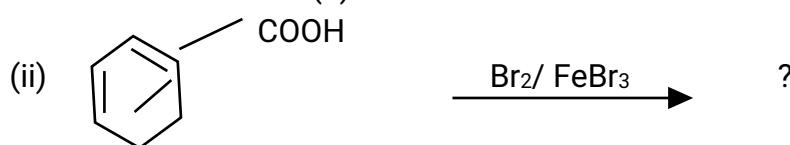
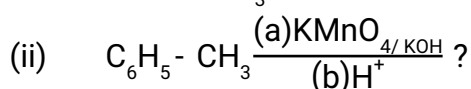
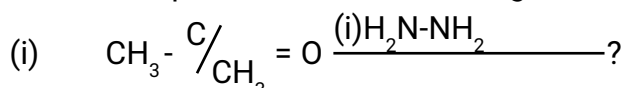


Q18. Predict the products of the following reactions:



Q19. An organic compound A, $\text{C}_6\text{H}_{10}\text{O}$, on reaction with CH_3MgBr followed by acid treatment given compound B. The compound B on ozonolysis gives compound C, which in presence of a base gives 1 - acetyl cyclopentene, D. The compound B on reaction with HBr gives compound E. Write the structures of A, B, C, D and E. Show how D is formed from C.

Q20. Predict the products of the following reactions:



Five marks questions:

- Q21. (a) Illustrate the following name reactions by giving example:
(i) Cannizzaro's reaction (ii) Clemmensen reduction
- (b) An organic compound A contains 69.77% carbon, 11.63% hydrogen and rest oxygen. The molecular mass of the compound is 86. It does not reduce Tollen's reagent but forms an addition compound with sodium hydrogen sulphite and gives positive iodoform test. On vigorous oxidation it gives ethanoic and propanoic acids. Derive the possible structure of compound A.
- Q22. (a) Arrange the following compounds in an increasing order of their indicated property:
(i) Benzoic Acid, 4 – Nitrobenzoic acid, 3,4-Dinitrobenzoic acid, 4 – Methoxybenzoic acid (acid strength)
(ii) $\text{CH}_3\text{CH}_2\text{CH}(\text{Br})\text{COOH}$, $\text{CH}_3\text{CH}(\text{Br})\text{CH}_2\text{COOH}$, $(\text{CH}_3)_2\text{CHCOOH}$,
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$ (acid strength)
- (b) How would you bring about the following conversions:
(i) Propanone to Propene (ii) Benzoic acid to Benzaldehyde
(iii) Bromobenzene to 1 – phenylethanol
- Q23. (a) Write chemical equation to illustrate the following name bearing reactions:
(i) Aldol Condensation (ii) Hell – Volhard – Zelinsky reaction
- (b) Give chemical tests to distinguish between the following pairs of compounds:
(i) Propanal and Propanone (iii) Acetophenone and Benzophenone
(iii) Phenol and Benzoic Acid.
- Q24. (a) How will you convert:
(i) Benzene to acetophenone (ii) Propanone to 2 – Methylpropan – 2 – ol
- (b) Give reasons:
(i) Electrophilic substitution in benzoic acid takes place at meta position.
(ii) Carboxylic acids are higher boiling liquids than aldehydes, ketones and alcohols of comparable molecular masses.
(iii) Propanol is more reactive than propanone in nucleophilic addition reactions.

Unit 12

Organic compounds Containing Nitrogen

I. Objective Type Questions

1. The total numbers of structural isomers possible for an amine with molecular formula $C_4H_{11}N$ is:
 - a) 4
 - b) 8
 - c) 5
 - d) 7
- 2) Which of the following compounds is most basic?
 - a) Aniline
 - b) Cyclohexylamine
 - c) *O*-Nitroaniline
 - d) *P*-Methoxyaniline
- 3) In aqueous solution strongest base among the following is:
 - a) $C_6H_5NH_2$
 - b) CH_3NH_2
 - c) $(CH_3)_2NH$
 - d) $(CH_3)_3N$
- 4) Which of the following reaction is appropriate for converting acetamide to methanamine:
 - a) Hoffman Bromamide reaction
 - b) Stephan's reaction
 - c) Gabriel phthalamide reaction
 - d) Carbylamine reaction
- 5) Benzylamine is stronger base than aniline because:
 - a) The lone pair of electrons on nitrogen atom in benzylamine is delocalized.
 - b) The lone pair of electrons on the nitrogen atom in aniline is delocalized.

c) The lone pair of electrons on the nitrogen atom in Aniline is not involved in resonance.

d) Benzylamine has higher molecular mass than Aniline.

6) Hinsberg's reagent is

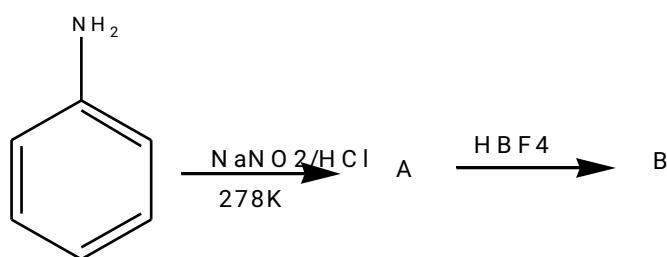
a) $(\text{COOC}_2\text{H}_5)_2$

b) $\text{C}_6\text{H}_5\text{SO}_2\text{Cl}$

c) $\text{C}_6\text{H}_5\text{SO}_2\text{NH}_2$

d) $\text{CH}_3\text{COCH}_2\text{COOC}_2\text{H}_5$

7) In a Chemical reaction:



The compound A and B respectively are

a) Nitrobenzene and Chlorobenzene

b) Nitrobenzene and Fluorobenzene

c) Benzenediazonium Chloride and Fluorobenzene

d) Phenol and Benzene

8) Consider the basic strength of amines in aqueous solution, which one has smallest pK_a value:

a) $(\text{CH}_3)_3\text{N}$

b) $\text{C}_6\text{H}_5\text{NH}_2$

c) $(\text{CH}_3)_2\text{NH}$

d) CH_3NH_2

9) In the Hoffman bromamide reaction the number of moles of NaOH and Br_2 used per mole of amine produced are:

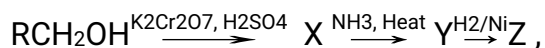
a) One mole of NaOH and one mole of Br_2

b) Four mole of NaOH and two moles of Br_2

c) Two moles of NaOH and two moles of Br_2

d) Four moles of NaOH and one mole of Br_2

10) In the reaction :



Z is

- a) $\text{RCH}_2\text{CH}_2\text{NH}_2$
- b) RCH_2NH_2
- c) $\text{RCH}_2\text{CONH}_2$
- d) RNH_2

Questions 11 to 15 given below consist of an Assertion(A) and the Reason (R). use the following key to choose the appropriate answer:

- a) If both (A) and (R) are correct and (R) is the correct explanation of (A).
- b) If both (A) and (R) are correct and (R) is not the correct explanation of (A).
- c) If (A) is correct but (R) is incorrect.
- d) If (A) is incorrect but (R) is correct.
- e) If both (A) and (R) are incorrect.

11)(A) In a strongly acidic solution, aniline becomes more reactive towards electrophilic substitutions.

(R) The amino group being completely protonated in strongly acidic solutions, the lone pair of electrons on the nitrogen is no longer available for resonance.

12) (A) Hinsberg test is used in the separation of 1°, 2°, and 3° amines.

(R) Benzene sulphonyl chloride is used as Hinsberg reagent.

13) (A) Amines are more basic than esters and ethers.

(R) Nitrogen is less electronegative than oxygen. It is in the better position to accommodate the positive charge on the proton.

14) (A) Aniline is less basic than aliphatic amines.

(R) Electron pair at $-\text{NH}_2$ group of Aniline is delocalized due to mesomeric effect.

15) (A) Benzamide on treatment with NaOH and Br_2 gives Aniline.

(R) Hoffmann's Bromamide reaction is a degradation reaction.

II. Short Answer type questions (02 marks)

- 1) Give the chemical tests to distinguish between the following pairs of compounds:
 - a) Methylamine and Dimethylamine

- b) Aniline and N-methylaniline
- 2) Complete the following reaction equations:
- a) $C_6H_5N_2Cl + H_3PO_2 + H_2O \rightarrow$
- b) $C_6H_5NH_2 + Br_2(aq) \rightarrow$
- 3) How are the following conversions carried out:
- a) Aniline to p-hydroxyazobenzene
- b) Ethanoic acid to methanamine
- 4) What is the role of HNO_3 in the nitrating mixture used for nitration of benzene?
- 5) Give the possible explanation for each of the following:
- a) Why amines are less acidic than alcohols of comparable molecular mass?
- b) Why are aliphatic amines are stronger bases than aromatic amines?

III. Short Answer type questions (03 marks)

- 1) Arrange the following:
- a) In decreasing order of pK_b values:
 $C_2H_5NH_2$, $C_6H_5NHCH_3$, $(C_2H_5)_2NH$ and $C_6H_5NH_2$
- b) In increasing order of boiling point:
 C_2H_5OH , $(CH_3)_2NH$, $C_2H_5NH_2$
- c) In increasing order of solubility in water:
 $C_2H_5NH_2$, $(C_2H_5)_2NH$, $C_6H_5NH_2$
- 2) Accomplish the following conversions:
- a) Benzyl chloride to 2-phenyl Ethanamine
- b) Chlorobenzene to p-chloroaniline
- c) Aniline to p-bromoaniline
- 3) Give the structures of A, B, and C in the following reactions:
- a) $CH_3COOH \xrightarrow{NH_3} A \xrightarrow{Br_2, KOH} B \xrightarrow{CHCl_3, alc. KOH} C$
- b) $C_6H_5N_2^+BF_4^- \xrightarrow{-NaNO_2, Cu} A \xrightarrow{Fe, HCl} B \xrightarrow{CH_3COCl, Pyridine} C$

Answer 3. a. A- Ethanamide, B- Methanamine, C- Methyl isocyanide

b. A- Nitrobenzene, B- Aniline, C- N-Phenylacetamide or Acetanilide

- 4) Write the names and structures of the major products in the following reactions:

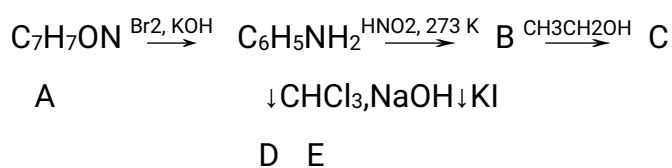
- a. $C_6H_5NH_2 + C_6H_5COCl \xrightarrow{\text{alkali}}$
- b. $C_6H_5N(CH_3)_2 + HNO_2 \rightarrow$
- c. 2,4-Dinitroaniline $\xrightarrow{\text{i. } HNO_2, \text{ ii Anisole}}$

- 5) What happens when

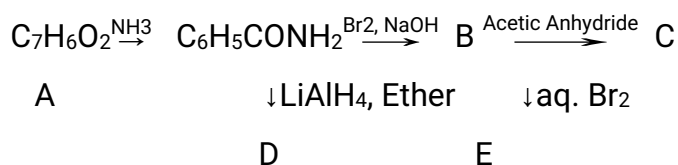
- Aniline is heated with conc. Sulphuric acid at 475 K.
- Aniline is oxidized with potassium dichromate in acidic controlled conditions.
- Aniline reacts with carbonyl chloride.

LONG ANSWER TYPE QUESTIONS (05 MARKS)

1. An aromatic compound A of molecular formula C_7H_7ON undergoes a series of reactions as shown below. Write the structures of A, B, C, D, and E in the following reactions.



2. An aromatic compound A of molecular formula $C_7H_6O_2$ undergoes a series of reactions as shown below. Write the structures of A, B, C, D, and E in the following reactions.



3. How will you bring about the following conversions:

- Nitrobenzene to Benzamide
- Benzaldehyde to cyanobenzene
- Aniline to benzyl alcohol
- Aniline to benzoic acid
- Aniline to phenylhydrazine

Unit 13 BIOMOLECULES

MULTIPLE CHOICE QUESTIONS:

- In both DNA and RNA, heterocyclic base and phosphate ester linkages are at –
 - C₅' and C₂' respectively of the sugar molecule
 - C₂' and C₅' respectively of the sugar molecule
 - C₁' and C₅' respectively of the sugar molecule
 - C₅' and C₁' respectively of the sugar molecule
- The human body does not produce –
 - Enzymes
 - DNA
 - Vitamins
 - Hormones
- During the process of digestion, the proteins present in food materials are hydrolysed to amino acids. The two enzymes involved in the process are
Proteins $\xrightarrow{\text{enzyme (A)}}$ polypeptides
 $\xrightarrow{\text{enzyme (B)}}$ Amino acids
 - invertase and zymase
 - amylase and maltase
 - diastase and lipase
 - pepsin and trypsin
- The pair in which both the species have iron is–
 - nitrogenase, cytochromes
 - carboxypeptidase, haemoglobin
 - haemocyanin, nitrogenase
 - haemoglobin, cytochromes
- The term anomer of glucose refers to –
 - isomers of glucose that differ in configuration at carbons one and four (C-1 and C-4)
 - a mixture of (D) – glucose and (L) –glucose
 - enantiomers of glucose
 - isomers of glucose that differ in configuration at carbon one (C-1)
- The Pyrimidine bases present in DNA are –
 - cytosine and adenine
 - cytosine and guanine
 - cytosine and thymine
 - cytosine and uracil
- Cellulose is a straight chain polysaccharide composed of only –
 - D-glucose units joined by α - glycosidic linkage

- (b) D – glucose units joined by β - glycosidic linkage
 (c) D – galactose units joined by α - glycosidic linkage
 (d) D – galactose units joined by β - glycosidic linkage
8. Which of the following vitamins is water soluble?
 (a) Vitamin E (b) Vitamin K (c) Vitamin A (d) Vitamin B
9. The secondary structure of a protein refers to –
 (a) fixed configuration of the polypeptide backbone
 (b) α -helical backbone
 (c) Hydrophobic interactions
 (d) Sequence of α - amino acids
10. Cellulose is soluble in –
 (a) ammonical cupric hydroxide solution
 (b) organic solvents
 (c) water
 (d) None
11. Antibodies are –
 (a) Carbohydrates (b) Proteins (c) Lipids (d) Enzymes
12. Vitamin A is called –
 (a) Ascorbic acid (b) Retinol (c) Calciferol (d) Tocopherol
13. Which carbohydrate is an essential constituent of plant cells?
 (a) Starch (b) Cellulose (c) Sucrose (d) Vitamins
14. Vitamin B1 is –
 (a) Riboflavin (b) Cobalamin (c) Thiamine (d) Pyridoxine
15. Which statement is incorrect about peptide bond?
 (a) C – N bond length in proteins is longer than usual bond length of C – N bond
 (b) Spectroscopic analysis shows planar structure of – CO – NH – group
 (c) C – N bond length in proteins is smaller than usual bond length of C – N bond
 (d) None of the above
16. The vitamins absorbed from intestine along with fats are –
 (a) A, D (b) A,B (c) A,C (d) D, B
17. The functional group which is found in amino acid is
 (a) – COOH (b) – NH₂ (c) – CH₃ (d) both (a) and (b)
18. Complete hydrolysis of cellulose gives –
 (a) L – glucose (b) D-Fructose (c) D-ribose (d) D-glucose
19. Insulin production and its action in human body are responsible for the level of diabetes.
 This compound belongs to which of the following categories –
 (a) A coenzyme (b) a hormone (c) an enzyme (d) An antibiotic

20. Which base is present in RNA but not in DNA?
(a) Uracil (b) Cytosine (c) Guanine (d) Thymine

Fill in the blanks:

- Q1. Carbohydrates which cannot be further hydrolysed into simpler carbohydrates _____.
- Q2. Deficiency of vitamin _____ causes pernicious anaemia.
- Q3. The hormone that helps in the conversion of glucose to glycogen is _____
- Q4. In structure of amylopectin α -D- glucose units form branching by _____ linkage.
- Q5. Sucrose is invert sugar which on hydrolysis gives α -D glucose and _____.
- Q6. Vitamin C is _____ in water, so cannot store in body.
- Q7. The pH at which amino acid behave as neutral molecule is called _____.
- Q8. During Denaturation of proteins _____ type of structure of proteins remains intact.
- Q9. Stabilization of secondary structure of proteins is due to _____ bonds.
- Q10. In the structure of lactose β -D- galactose and β -D- glucose are linked by _____ carbon atoms.
- Q11. A person is suffering from delaying in blood clotting time probably vitamin _____ is deficient.
- Q12. Amino acids are amphoteric in behaviour due to the formation of _____ ion.
- Q13. Glucose on prolonged heating with _____ indicates that all six carbon atoms are linked in a straight chain.
- Q14. Boiled egg has change in colour and consistency due to _____ of proteins.
- Q15. Vitamin C if exposed for long undergoes _____ due to which stored tomatoes are not considered good.
- Q16. Vitamin B12 is complex molecule in which central metal is _____
- Q17. Stability of double helix structure is due to _____ bond.
- Q18. Absence of aldehyde group in D- glucose pentaacetate can be tested by _____
- Q19. The polysaccharide which is stored in the liver of animals is _____.
- Q20. A _____ ion on testing with blue and red litmus paper does not give any colour change.
- Q21. DNA contains four nitrogenous bases among them _____ is absent in RNA.
- Q22. In peptide bond - NH_2 group of one amino acid reacts with _____ functional group of another amino acid and release water molecule.
- Q23. Deficiency of vitamin _____ causes xerophthalmia .
- Q24. In structure of β -D-deoxyribose sugar one oxygen atom is less as compared to β -D-ribose sugar at carbon number _____

True and False:

- Q1. Vitamin D can be stored in our body.
- Q2. All naturally occurring amino acid have L- configuration.

- Q3. Oligosaccharides are those carbohydrates which on hydrolysis gives more than ten monosaccharide unit.
- Q4. Despite having the aldehyde groups glucose does not give Schiff's test.
- Q5. Glucose is found to exist in two different crystalline form which are α & β .
- Q6. Pyran is hetrocyclic compound which contain three carbon and one oxygen atom.
- Q7. Both the monosaccharide units of sucrose are individually optically inactive.
- Q8. Amylopectin is major component of starch
- Q9. Glycogen is stored food in plants
- Q10. Uracil is base present in RNA but not in DNA

Match the following:

Column A	Column B
1.Sucrose	a.BeriBeri
2.glucose	b.Linkage in Carbohydrates
3.vitamin B1	c.Links to form nucleic acids
4.peptide linkage	d.Rickets
5.Nucleotide	e.Monosaccharide
6. Nucleoside	f. both acid and base
7.vitamin D	g.Linkage in Proteins
8.Glycosidic linkage	h. n-hexane
9.Zwitter ion	i.Non reducing sugar
10.Reaction of glucose and HI	j.A sugar and heterocyclic base combination

One word answer type questions.

- 1) Give an example of pentose sugar.
- 2) What is hydrolysis of sucrose known as?
- 3) Write the chemical name of vitamin B12.
- 4) Name a nitrogenous base not present in RNA.
- 5) Dinucleotide is a obtained by joining two nucleotide together by phosphodiester linkage between which carbon atoms of pentose sugar of nucleotides ?

TWO MARKS

1. (a) Fructose contains a keto group but still it reduces tollens reagent why?
- (b) Hydrolysis of sucrose brings about a change in the sign of rotation why?
2. What is DNA fingerprinting? What are the areas of its application?
3. What is the important of vitamin A and Vitamin D?
4. Give the chemical names of vitamin B2 and vitamin B6?
5. What is the difference between a nucleoside and a nucleotide?

THREE MARKS

- 1 Give reasons:
 - (a) Glucose and fructose give the same osazone.
 - (b) Amino acids are amphoteric in nature
 - (c) Melting and boiling points are higher than the corresponding halo acids.
- 2(a) Describe having an aldehyde group glucose does not give 2,4-DNP test. what does this indicate?
- (b) Draw the Haworth structure of α - D-Glucopyranose.
- (c) What is the significance of D and (+) here?
3. What are complementary bases? If one strand of a DNA has the sequence- ATGCTATTCA – what is the sequence of the basis in the complementary strand?
- 4.(a) Name the location where protein synthesis occurs.
- (b) Which of the two bases of the codon are more important for coding?
5. The K_a and K_b values of α - amino acids are very low. why? And What is the effect of denaturation on the structure of proteins?

FIVE MARKS:

- 1 (A) What are the primary structure of nucleic acids?
- (B) What is the linkage between glucose units of maltose?
- (C) What is animal starch, why is it so called?
- (D) Can a monosaccharide with D-configuration be laevorotary?
- (E) Define mutarotation?
- 2 (A) In what way enzymes differ from ordinary catalysts?
- (B) What do the terms D and L stand for in the name of carbohydrates?
- (C) What are anomers?
- (D) What do the terms t, r and m stand for in the name of RNA?
- (E) Which disease is caused due to deficiency of vitamin B6?
- 3.(a) Write the products of hydrolysis of DNA & RNA.
- (b) Mention two types of nucleic acid & their functions.
- (c) Do the anomers of α -D-glucose have specific rotation of the same magnitude but opposite signs?

Unit 14 POLYMERS

PART-I

ONE MARKS QUESTIONS

1. Which of the following statement is not correct ?
 - (a) Caprolactum is the monomer of nylon-6
 - (b) Terylene is a polyester polymer
 - (c) Phenol formaldehyde resin is known as bakelite
 - (d) The monomer of natural rubber is rubber is butadiene
2. Which of the following is a polymer containing nitrogen
 - (a) Polyvinyl chloride
 - (b) Bakelite
 - (c) Nylon
 - (d) Terylene
3. Nylon threads are made up of
 - (a) Polyvinyl polymer
 - (b) Polyester polymer
 - (c) Polyamide polymer
 - (d) Polyethylene polymer
4. The polymer containing strong intermolecular forces e.g hydrogen bonding is
 - (a) Teflon
 - (b) Nylon 6,6

- (c) Polystyrene
 (d) Natural rubber
5. Bakelite is obtained from phenol by reacting with
 (a) CH_3CHO
 (b) CH_3COCH_3
 (c) HCHO
 (d) $(\text{CH}_2\text{OH})_2$

PART – II

Each question has five choices 1,2,3,4 and 5 out of which only one is correct.

- (11) Assertion is True , Reason is True ,
Reason is a correct explanation for Assertion.
- (12) Assertion is True , Reason is True ,
Reason is NOT a correct explanation for Assertion.
- (13) Assertion is True , Reason is False .
- (14) Assertion is False , Reason is True .
- (15) Both Statements are False.

1. **ASSERTION** : Most of the synthetic polymers are non-biodegradable.
REASON : Polymerisation process induces toxic character in organic molecules
2. **ASSERTION** : Polyamides are best used as fibres because of high tensile strength .
REASON : Strong intermolecular forces (like hydrogen bonding with in polyamides) lead to close packing of chain and increase the crystalline character,hence, provide high tensile strength to polymers.
3. **ASSERTION** : Polytetrafluoroethene is used in making non-stick cookware.
REASON : Fluorine has highest electronegativity
4. **ASSERTION** : For making rubber synthetically , isoprene molecules are polymerised.
REASON : Neoprene (a polymer of chloroprene) is a synthetic rubber
5. **ASSERTION** : Network polymers are thermosetting.
REASON : Network polymers have high molecular mass.

PART -III

COMPREHENSION

Polymers are made up of small molecules called monomers. Polymers which

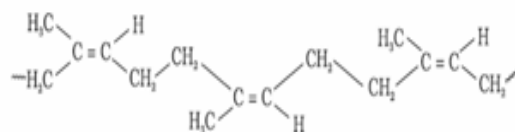
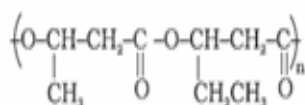
are formed by one type of monomer are called homopolymers and which are formed by different type of monomer are called co-polymers. Natural polymers are biodegradable whereas synthetic polymers may or may not be .Addition or chain growth polymerization involves the repeated addition of monomers to the polymer chain. The monomer are unsaturated compounds and this type of polymerization take place by ionic as well as free radical mechanism. Condensation or step growth polymerization involves a series of condensation reactions between the monomers. Each monomer normally contains two functional groups. Branch chain polymers may be condensation polymers or addition but cross linked polymers are always condensation polymers.

1. Which of these are natural polymers ?
 - (a) Proteins
 - (b) Cellulose
 - (c) Nucleic acid
 - (d) All of these
2. Which one of the following polymers is prepared by condensation polymerization ?
 - (a) Terylene
 - (b) Teflon
 - (c) Styrene
 - (d) Rubber
3. Which one of the following is biodegradable polymer?
 - (a) Nylon-66
 - (b) Glyptal
 - (c) Cellulose
 - (d) PVC
4. Which of the following is a chain growth polymer?
 - (a) Polystyrene
 - (b) PTFE
 - (c) Polybutadiene
 - (d) All of these
5. Total number of lone pairs of electrons in melamine is:
 - (a) 4
 - (b) 6
 - (c) 8
 - (d) 10

PART -IV

TWO MARKS QUESTION

- To have practical application, why are cross links required in rubber?
- Arrange the following polymers in increasing order of their intermolecular forces:
 - Nylon-66, Buna-S, Polythene
 - Nylon-6, Neoprene, Polyvinyl chloride
- Identify the monomers in the following polymeric structure :
 - (a)
 - (b)



- Name the two groups into which polymers are classified on the basis of magnitude of intermolecular forces.
- What is the difference between elastomers and Fibres? Give one example of each.

PART -V

THREE MARKS QUESTIONS

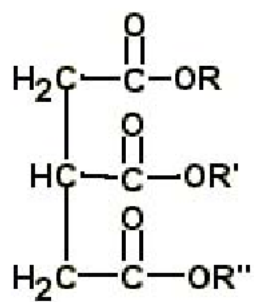
- Define thermosetting and thermoplastic polymers with two examples of each.
- Name a polymer each for the following applications :
 - Insulation of electrical switches
 - Making laminated sheets
 - making carpets, textile fibres
- How does the presence of double bonds in rubber influence their structure and reactivity?
 - What is step growth polymerisation? Explain with an example.
- A monomer of a polymer on ozonolysis gives two moles of CH₂O and one mol of CH₃CHO. Write the structure of monomer and polymer and each step of reaction.
- Can a copolymer be formed in both addition and condensation polymerisation? Explain with examples.
 - How does the presence of double bonds in rubber influence their structure and reactivity?

Unit 15 CHEMISTRY IN EVERYDAY LIFE

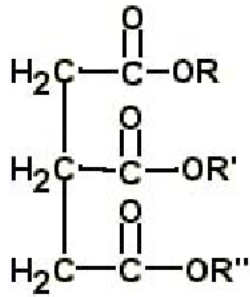
One Mark Question

1. Which of the following represents the structure of a triacylglyceride?

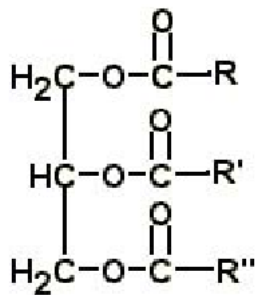
A.



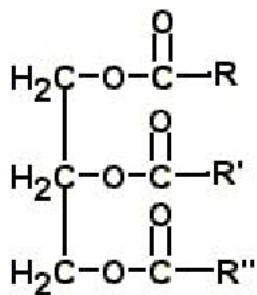
B.



C.



D.



2. Antifertility drugs are
 - A. Steroids
 - B. B. Alkaloids
 - C. Terpenols
 - D. Phenols

3. Which of the following class is used for the treatment of peptic ulcer ?
 - A. Antibiotic
 - B. Hypnotic
 - C. Antihistamine
 - D. Anti inflammatory

4. An ester used as medicine is-
 - A. Ethyl acetate
 - B. Ethyl benzoate
 - C. Methyl salicylate
 - D. Methyl acetate

5. Which of the following tranquilizer is not a derivative of barbituric acid ?
- A. Veronal
 - B. Equanil
 - C. Seconal.
 - D. Luminal
6. The bacteriocidal and bacteriostatic antibiotic are
- A. Penicilin , Ofloxacin
 - B. Erythromycin, tetracycline
 - C. Penicillin, chloramphenicol
 - D. Tetracyclin, Penicilin
7. Which of the following is an anionic detergent?
- A. Sodium lauryl sulphate
 - B. Cetyltrimethyl ammonium bromide
 - C. Glyceryloleate
 - D. Sodium stearate
8. Which of the following is an analgesic?
- A Penicillin
 - B Streptomycin
 - C Chloromycetin
 - D Novalgin
9. Equanil is a
- A artificial sweetener
 - B tranquilizer
 - C antihistamine
 - D antifertility drug
10. The artificial sweetener containing chlorine that has the appearance and taste as that of sugar and is stable at cooking temperature is
- A Aspartame
 - B Saccharin
 - C Sucralose
 - D Alitame
11. The class of drugs used for the treatment of stress is
- A Analgesics
 - B Antiseptic
 - C Antihistamine
 - D Tranquilizers
12. Aspirin is
- A Acetyl salicylic acid
 - B Benzoyl salicylic acid
 - C Chloro benzoic acid
 - D Anthranilic acid
13. 2-Acetoxy benzoic acid is used as
- A Antiseptic
 - B Antidepressant
 - C Antimalarial

- D Antipyretic
14. The role of phosphate in detergent powder is to
 - A Control pH level of the detergent water mixture
 - B Remove Ca^{2+} and Mg^{2+} ions from the water that causes the hardness of water
 - C Provide whiteness to the fabrics
 - D Form solid detergent as phosphate-less detergent are liquid in nature
 15. The oxidant which is used as an antiseptic is
 - A KBrO_3
 - B KMnO_4
 - C CrO_3
 - D KNO_3
 16. Bithional is generally added to the soaps as an additive to function as a/an
 - A Softener
 - B Dryer
 - C Buffering agent
 - D Antiseptic
 17. Which among the following is not an antibiotic?
 - A Erythromycin
 - B Oxytocin
 - C Penicillin
 - D Tetracycline
 18. Tincture of iodine is
 - A alcoholic solution of I_2
 - B solution of I_2 in aqueous KI
 - C aqueous solution of I_2
 - D aqueous solution of KI
 19. Detergents having straight hydrocarbon chains.....
 20. Soapless Soap are.....
 21. Detergent used used as germicide is.....
 22. Detergentsthe surface tension of water.
 23. Antiseptic added to soaps is
 24. First antibiotic discovered is.....
 25.stimulates the secretion of pepsin and hydrochloric acid.

TWO MARK

26. Explain two type antibiotics on the basis of their effect.

THREE MARK

27. Write three functions of Asprin?

28. Low level of noradrenaline is the cause of depression. What type of drugs are needed to cure the problem? How do they work? Name one such drug.

ANSWER KEY

UNIT 1
SOLUTIONS

Objective Type Questions:

1 b	2 b	3 c	4 d	5 c	6 b	7 a	8 a
9 c	10 c	11 d	12 a	13 c	14 b	15 d	16 d
17 a	18 c	19 a	20 c				

Short Answer questions (02) marks

Answer 1. Concentration in ppm = Mass of solute/Mass of solution $\times 10^6$
 $= 0.4/100.4 \times 10^6$
 $= 0.00039 \times 10^6 = 3.9 \times 10^2$ ppm

Answer 2. Observed molecular mass $\alpha 1 / \text{value of colligative property}$
 Colligative property of NaCl will be twice due to the dissociation of NaCl into ions. Hence observed molecular mass will be half of its normal mass (29.25 u).

Answer 3. For isotonic solutions,
 $\pi(\text{NaCl}) = \pi(\text{glucose})$
 $i_1 C_1 RT = i_2 C_2 RT$
 $i_1 C_1 = i_2 C_2$
 $i_1 [w_B \times 1000 / M_B \times V]_1 = i_2 [w_B \times 1000 / M_B \times V]_2$
 $i_1 [1.2 \times 1000 / 58.5 \times 100] = 1 [7.2 \times 1000 / 180 \times 100]$
 $i_1 = 1.95$

Answer 4. We know that
 $\Delta T = K_f \times w_B \times 1000 / M_B \times W_A$
 $34 = 1.86 \times w_B \times 1000 / 62 \times 50$
 $w_B = 56.66$ g
 Density = Mass / Volume
 $= 56.66 \text{ g} / 50 \text{ cc}$
 $= 1.13 \text{ g cm}^{-3}$

Answer 5. $p^{\circ} - p / p^{\circ} = X_A / X_B$ let $p^{\circ} = 100$ mmHg and $p = 80$ mmHg
 $p^{\circ} - p / p^{\circ} = W_B M_A / M_B W_A$
 $20 / 100 = W_B \times 114 / 40 \times 114$
 $W_B = 8$ g

SHORT ANSWER QUESTIONS (03) MARKS

Answer 1. Mole fraction in liquid mixture:
 $X_A = 30/100 = 0.3, X_B = 70/100 = 0.7$
 Mole fraction in vapour phase:
 $Y_A = 40/100 = 0.4, Y_B = 60/100 = 0.6$

Relation between Dalton's law and Rault's Law

$$Y_A \times p = p_A^{\circ} \times X_A$$

$$Y_B \times p = p_B^{\circ} \times X_B$$

Dividing the above equation we get

$$Y_A / Y_B = p_A^{\circ} \times X_A / p_B^{\circ} \times X_B$$

$$= 0.4 \times 0.7 / 0.6 \times 0.3 = 28 / 18 = 14/9$$

Answer 2. We know that $\Delta T = K_f \times W_B \times 1000 / M_B \times W_A$

Case I: Required Ethylene glycol at -6°C

$$6 = 1.86 \times W_B \times 1000 / 62 \times 6000$$

$$W_B = 1200 \text{ g}$$

Case II: Amount of ice separated at -8°C

$$8 = 1.86 \times 1200 \times 1000 / 62 \times W_A$$

$$W_A = 4500 \text{ g (water remaining in the radiator)}$$

$$\text{Amount of ice separated} = 6000 - 4500 = 1500 \text{ g}$$

Answer 3. $A = \% \text{ dissociation} / 100 = 50/100 = 0.5$



Five ions are obtained on complete dissociation, $n = 5$

$$\alpha = i - 1 / n - 1$$

$$0.50 = i - 1 / 5 - 1$$

$$i = 3$$

Osmotic pressure of the solution can be calculated by using following equation:

$$\pi = i CRT$$

$$= 3 \times 0.1 \times 0.082 \times 300 = 7.389 \text{ atm}$$

Answer 4. $\Delta T = K_f m$

$$0.30 = 1.86 \times m$$

$$m = 0.30 / 1.86 = 0.161$$

Mole fraction of the solute can be calculated as:

$$m = x_B \times 1000 / (1 - x_B) \times 18$$

$$x_B = 0.00289$$

From Raoult's law

$$p^\circ - p / p^\circ = x_B$$

$$23.51 - p / 23.51 = 0.00289$$

$$p = 23.442 \text{ mmHg}$$

Answer 5. Molarity of concentrated solution,

$$M_1 = x \times d \times 100 / M_B$$

$$= 95 \times 1.85 \times 10 / 98 = 17.93 \text{ M}$$

Molarity of dilute solution,

$$M_2 = 15 \times 1.10 \times 10 / 98 = 1.68 \text{ M}$$

$$M_1 V_1 = M_2 V_2$$

(Concentrated) (Dilute)

$$V_1 = M_2 V_2 / M_1 = 1.68 \times 100 / 17.93$$

$$V_1 = 9.4 \text{ cc}$$

Mass of water added = Mass of diluted solution - Mass of concentrated solution

$$= (100 \times 1.10) \text{ g} - (9.4 \times 1.85) \text{ g}$$

$$= 92.6 \text{ g}$$

LONG ANSWER QUESTIONS (05 MARKS)

Answer 1. a. $w_B = 2.56 \text{ g}$ and $w_A = 100 \text{ g} = 0.1 \text{ kg}$

$$M_B = k_f \times w_B \times 1000 / \Delta T_f w_A$$
$$= 3.83 \times 2.56 \times 1000 / 0.383 \times 100$$
$$= 256 \text{ g mol}^{-1}$$

Number of atoms present in one molecule of sulphur

$$= \text{molecular mass} / \text{atomic mass} = 256 / 32 = 8 \text{ atoms.}$$

Molecular formula of Sulphur is S_8

- b. (i) RBCs will shrink due to exosmosis.
(ii) RBCs will swell due to endosmosis.

Answer 2. a. Van't Hoff Factor: it is defined as the ratio of experimental value of colligative property to the calculated value of colligative property.

(i) If there is dissociation of the solute in the solution Van't Hoff factor is greater than one. $i > 1$.

(ii) If there is association of the solute in the solution Van't Hoff factor is less than one. $i < 1$.

b. Let the amount of Na_2CO_3 be x in the mixture.

$$\text{Amount of NaHCO}_3 = 1-x$$

$$\text{Moles of Na}_2\text{CO}_3 = x / 106$$

$$\text{Moles of NaHCO}_3 = 1-x / 84$$

Since no. of moles of both are equal

$$x / 106 = 1-x / 84$$

$$84x = 106 - 106x$$

$$x = 0.558$$

$$\text{Moles of Na}_2\text{CO}_3 = 0.558 / 106 = 0.00526$$

$$\text{Moles of NaHCO}_3 = 1-0.558 / 84 = 0.00526$$

1 mol of Na_2CO_3 react with 2 mols of HCl, therefore 0.00526 mols of Na_2CO_3 will react with

2×0.00526 mols of HCl. Similarly 1 mol of NaHCO_3 react with 1 mol of HCl, therefore 0.00526 mol of NaHCO_3 will react with 0.00526 mol of HCl.

So, total no. of moles of HCl required to react with equimolar mixture of Na_2CO_3 and NaHCO_3 is $2 \times 0.00526 + 0.00526 = 0.01578 \text{ mol}$

To calculate volume of 0.1 M HCl corresponding to 0.01578 mol

$$1000 / 0.1 \times 0.01578 = 157.8 \text{ mL}$$

Answer 3. Given : Mass of benzene = 23.4 g

$$\text{Molar mass of benzene} = \text{C}_6\text{H}_6 = 78 \text{ g mol}^{-1}$$

$$\text{Mass of Toulene} = 64.4 \text{ g}$$

$$\text{Molar mass of toluene } \text{C}_6\text{H}_5\text{CH}_3 = 92 \text{ g mol}^{-1}$$

$$\text{Moles of benzene} = 23.4/78 = 0.3 \text{ mole}$$

$$\text{Moles of Toulene} = 64.4/92 = 0.7 \text{ mole}$$

$$\text{Mole fraction of benzene} = 0.3 / 0.3 + 0.7 = 0.3$$

$$\text{Mole fraction of toluene} = 0.7 / 0.3 + 0.7 = 0.7$$

$$\text{Vapour pressure of benzene} = P_B = P \times X_B$$

$$= 0.3 \times 75 = 22.5 \text{ mmHg}$$

Vapour pressure of Toluene = $0.7 \times 22 = 15.4$ mmHg

Total vapour pressure = $22.5 + 15.4 = 37.9$ mmHg

Mole fraction of benzene in vapour phase = $22.5 / 37.9 = 0.59$

b. (i) Positive deviation from Raoult's law: the total vapour pressure for any solution is greater than the corresponding ideal solution of same composition. e.g. solution of ethanol and cyclohexane.

(ii) Negative deviation: the total vapour pressure for any any solution is less than the corresponding ideal solution of same composition. e.g. Chloroform and benzene solution.

For positive deviation $\Delta_{\text{mix}}H = \text{positive}$

For negative deviation $\Delta_{\text{mix}}H = \text{negative}$.

Unit 2 Electrochemistry

ANSWERS:

MCQS:

1. A
2. C
3. A
4. B
5. B
6. D
7. B
8. B
9. d
10. c
11. c
12. a
13. c
14. c

FILL IN THE BLANKS:

1. ($\text{Sm}^2 \text{mol}^{-1}$)
2. ZnO)
3. (Chemical
4. increase
5. decreases
6. Standard
7. equilibrium
8. directly
9. increases
10. EMF
11. electrons
12. $271.6 \text{ S cm}^2 \text{ mol}^{-1}$
13. concentration

14. the graphite carbon rod.
15. increases
16. electrolytic cell
17. decreases
18. 0.34 V
19. 3x 96500C or 3F
20. F₂

TRUE FALSE:

1. F
2. T
3. F
4. F
5. T
6. F
7. T
8. T
9. T
10. F

Match the following:

1	c.
2	b.
3	e.
4	l
5	f.
6	a.
7	h.
8	g.
9	d.
10	j.

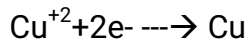
TWO MARKS:

1. pH=14
 $[H^+] = 10^{-14}$
 $[OH^-] = K_w/[H^+] = 10^{-14}/10^{-14} = 1M$
 $Cu(OH)_2 \Rightarrow Cu^{+2} + 2OH^-$
 $K_{sp} = [Cu^{+2}] [OH^-]^2$

$$1 \times 10^{-19} = [\text{Cu}^{+2}](1 \times 1)$$

$$[\text{Cu}^{+2}] = 1 \times 10^{-19}$$

For the cell reaction

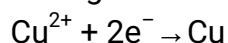


$$E = E^\circ - 0.059/2 \log 1/[\text{Cu}^{+2}]$$

$$= 0.34 - 0.059/2 \times 19$$

$$= -0.22\text{V}$$

Ans2. It states that the amount of chemical reaction which occurs at any electrode during electrolysis by a current is proportional to the quantity of electricity passed through the electrolyte (solution or melt).



Charge required for reduction of 1 mol of $\text{Cu}^{2+} = 2F$.

Ans3.

$$\Lambda_m = \frac{k \times 1000}{c} = \frac{0.025 \text{ S cm}^{-1} \times 1000 \text{ cm}^3 \text{ L}^{-1}}{0.20 \text{ mol L}^{-1}} = 125 \text{ S cm}^2 \text{ mol}^{-1}$$

Ans4: The conductivity of a solution at any given concentration is the conductance of one unit volume of solution kept between two platinum electrodes with unit area of cross section at a distance of unit length.

On increasing the concentration of solution, the number of ions per unit volume of solution increases and thus its conductivity increases.

Molar conductivity (λ_m) of a solution at a given concentration is the conductance of the volume V of solution containing one mole of electrolyte kept between two electrodes with area of cross section A and distance of unit length. Therefore_

$$\Lambda_m = \frac{\kappa A}{l} = \kappa$$

Since $l = 1$ and $A = V$ (volume containing 1 gram mole of electrolyte)

$$\Lambda_m = \kappa V$$

Molar conductivity increases with decrease in concentration. This is because the total volume, V of solution containing one mole of electrolyte also increases. It has been found that decrease in K on dilution of solution is more than compensated by increase in its volume.

Ans 5 i) 50mol of e-

ii) 0.11 mol of e-

THREE MARKS:

1.(i) Oxidation potential of M is more than Ni because M displaces Ni^{2+} from NiCl_2 .

(ii) Oxidation potential of M is less than Mn^{2+} because M cannot displace Mn^{2+} from MnCl_2 . Order of oxidation potential is $\text{Ni} < \text{M} < \text{Mn}$. More the oxidation potential means stronger reducing

power. Correct order of reducing powers is $\text{Mn} > \text{M} > \text{Ni}$

2. (a) half reactions must be separated only if oxidising agent and reducing agents

migrate. In lead storage battery the PbO₂ is oxidizing agent and Pb is reducing agent and end product is same as PbSO₄.

(b) Mg prevents transfer of electrons to steel and also from corrosion.

(c) Fe is more reactive than Cu and displaces Cu from CuSO₄.

3. (i) 5 mol of electron

(ii) 1.11 mol of electron

(iii) 5.55 mol of electron

$$4. \ln K_c = \Delta G^0 / RT \quad \text{and} \quad \Delta G^0 = -nFE^0_{\text{cell}}$$

$$K_c = 3.3 \times 10^{35}$$

5.

$$\text{Electrolytic Conductance} = \frac{1}{R} \times \text{cell constant}$$

$$= \frac{1}{100} \times 0.035$$

$$= 3.5 \times 10^{-4} \text{ ohm}^{-1} \text{ cm}^{-1}$$

$$\text{Molar Conductance} = \frac{1000 \times \text{Electrolytic Conductance}}{\text{Concentration}}$$

$$= \frac{1000 \times 3.5 \times 10^{-4}}{0.5}$$

$$= 7.0 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$$

FIVE MARKS

1 a) Metal – A

b) 1 M HCl will have greater κ_m because H⁺ (aq) being smaller in size than Na⁺ (aq) and have greater mobility.

c) Rusting of iron will take place when coated with metal C as it is placed above iron more than other metal.

2 a) (i) Anode : Fe

Cathode : Ni

(ii) Reaction at anode : Fe → Fe²⁺ + 2 e⁻

Reaction at cathode : Ni²⁺ + 2 e⁻ → Ni

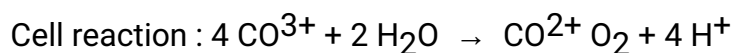
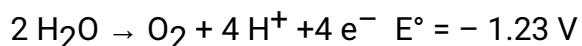
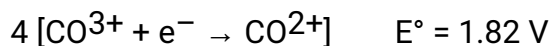
b) For a cell $E^0 = \frac{0.0591}{n} \log K$

$$K < 0 \Rightarrow \log K < 0$$

i.e. $\log K$ is - ve.

Then E°_{cell} will be negative.

3 a) The E°_{cell} can be calculated as :



$$E^\circ_{\text{cell}} = 1.82 \text{ V} - (- 1.23 \text{ V}) = 3.05 \text{ V}$$

Since E°_{cell} is positive, the cell reaction is spontaneous. CO^{3+} ion will take part in the reaction and hence unstable in aqueous solution.

b) (b) If $E^\circ_{\text{cell}} = 9$ then $0 = \frac{0.0591}{n} \log K$

$$\log K = 0 \Rightarrow K = 1$$

Unit 3 Chemical Kinetics

Answer

1. A

2. B

3. B

4. C

5. A

6. C

7. D

8. Rate constant

9. half

10. Zero order

11. First Order

12. Rate = $k [\text{AB}_2] [\text{C}_2]$;

$$\text{Order} = 1 + 1 = 2$$

13. If volume is doubled conc of each reactant will be halved So diminish to 1/8 volume of initial value

14. (i) 2 (ii) 1

$$15. \log \frac{k_2}{k_1} = \frac{E_a}{2.303R} \left[\frac{1}{T_1} - \frac{1}{T_2} \right]$$

$$\log \frac{k_2}{k_1} = 0$$

taking antilog

$$\frac{k_2}{k_1} = 1$$

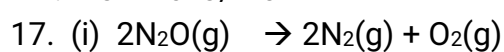
$$K_2 = K_1 = 1.6 \times 10^6 \text{ s}^{-1}$$

$$16. \text{ Slope} = - \frac{E_a}{2.303R}$$

$$E_a = - 2.303 R \times \text{Slope}$$

$$= - 2.303 \times 8.314 \times - 5841$$

$$= 1.118 \times 10^5 \text{ J/mol}$$



(ii) 0

(iii) 1, 2

18. From exp no 1 and 2 $x = 1$

From exp no 1 and 3 $y = 2$

From exp no 1 and 4 $x = 1$

$$\text{rate} = k[\text{A}][\text{B}]^2[\text{C}]$$

$$19. t_{1/2} = \frac{0.693}{k}$$

$$K = \frac{0.693}{20}$$

$$k = \frac{2.303}{t} \log \frac{a}{a-x}$$

$$a-x = 6.25\%$$

20 .

$$k = \frac{2.303}{t} \log \frac{a}{a-x}$$

$$k_1 = \frac{2.303}{30} \log \frac{0.60}{0.30}$$

$$K_1 = 2.303 \times 10^{-2}$$

$$k_2 = \frac{2.303}{60} \log \frac{0.60}{0.15}$$

$$K_2 = 2.303 \times 10^{-2}$$

Both K are same so this is First order reaction

21. rate of disappearance of $\text{PH}_3 = 0.0048/2 \times 4$

$$= 6 \times 10^{-4} \text{ mol/l/s}$$

$$\text{Rate of reaction } r = 4 \times 6 \times 10^{-4} = 24 \times 10^{-4}$$

$$\text{Rate of appearance of } \text{P}_4 = r = 24 \times 10^{-4}$$

$$\text{Rate of appearance of } \text{H}_2 = 6r = 6 \times 24 \times 10^{-4} = 144 \times 10^{-4}$$

22. $t_1 = 30 \text{ min @ } 100^\circ\text{C}$ and $t_2 = 12 \text{ min @ } 110^\circ\text{C}$

$$\log \frac{k_2}{k_1} = \frac{E_a}{2.303 R} \left[\frac{1}{T_1} - \frac{1}{T_2} \right]$$

$$\frac{k_2}{k_1} = \frac{t_1}{t_2}$$

$$E_a = 108,830 \text{ J/mol}$$

23. $\text{rate} = k [\text{NO}_2]^2 [\text{H}_2]$

$$2.4 \times 10^{-5} = k [1 \times 10^{-2} \text{ M}]^2 [0.2 \times 10^{-2} \text{ M}] \quad \text{so, } K = 120$$

$$\text{rate} = (120) (3 \times 10^{-2})^2 (1.2 \times 10^{-2}) = 1.296 \times 10^{-3} \text{ M/s}$$

24. $k = \frac{2.303}{t} \log \frac{a}{a-x}$

$$87 = \frac{2.303}{0.01} \log \frac{2}{a-x}$$

$$a-x = 0.83 \text{ mol/l}$$

$$\text{Fraction} = \frac{0.83}{2} = 0.465$$

Unit 4 SURFACE CHEMISTRY

Answer Key

A1 (b)

A2 (b)

A3 (a)

A4 (c)

A5 (a)

A6 (associated)

A7 (addition of electrolyte)

A8 (adsorption)

A9 (increase)

A10 ($T\Delta S$)

A11 (e)

A12 (b)

A13 (a)

A14 (a)

A15 (b)

A16 The relation between the amount of the substance adsorbed by the adsorbent and the equilibrium gas pressure at constant temperature is called adsorption isotherm.

Freundlich adsorption Isotherm at intermediate pressure

$$x/m = kp^{1/n}$$

taking log

$$\log x/m = \log k + 1/n \log p$$

A17 a) Zeta potential is the potential difference between the fixed layer and the diffused layer of opposite charges.

b) Critical micelle concentration - the formation of micelles takes place only above a particular concentration which is called CMC'

A18 BaCl_2 is preferred in causing coagulation of negatively charged sol as according to Hardy and Schulze rule greater the valency greater will be coagulation power.

Ans4) When dialysis is prolonged the traces of electrolyte which stabilize the colloid are removed completely and this makes it unstable and coagulation takes place.

Ans5) 4% solution of nitrocellulose in a mixture of alcohol and ether is called colloidon.

Three marks questions

Ans1) when NaCl solution is added to ferric hydroxide sol coagulation takes place due to negatively charged Cl^- ions.

b) Smoke coming out of chimney of a factory is colloidal solution of solid carbon particles which are charged in nature. In Cottrell's precipitator the smoke is allowed to pass through series of plates charged to high potential, the charged smoke particles get attracted to charged plates and get precipitated and gases coming out of chimney are free of charged particles and dust particles.

Ans2) Multimolecular colloids - these consist of atoms or molecules of size less than 1 nm for e.g. gold, Sulphur.

Macromolecular colloids - these consist of large molecules generally polymers for e.g. rubber, nylon, starch.

Associated colloids - these consist of aggregates of large number of particles at higher concentration for e.g. soaps.

Ans 3) a. coagulation takes place.

b) electrophoresis takes place.

c) When an emulsion is centrifuged both dispersed phase and dispersion medium separates out for e.g. formation of butter the oil settles down and water comes up.

Ans4) a) Micelles; they are associated colloids showing colloidal behaviour at high concentration and electrolytes at low concentration.

b) Peptization - It is the process of converting freshly prepared ppt into

colloidal particles by shaking with small amount of suitable electrolyte.

c) Desorption – It is process of separation of adsorbent and adsorbate.

Ans5 Homogenous catalysis; In which catalyst is in same phase as that of reactants for e.g hydrolysis of esters.

Heterogenous catalysis; In which catalyst is in different phase than that of reactants for e.g formation of ammonia by Haber's process.

Unit 5 Principles and Processes of Isolation of Elements

ANSWER KEY

PART-I

Ans. 1.a 2.d 3.b 4.b 5.b

PART -II

Ans. 1.c 2.c 3.a

PART – III

Ans. 1.(1) 2.(2) 3.(4) 4. (3) 5.(1)

PART -IV

Ans. 1(a) , 2 (b) , 3 (a,c) , 4(a,d)

PART- V

1. (a) $2\text{Al}_2\text{O}_3 + 3\text{C} \rightarrow 4\text{Al} + 3\text{CO}_2$

(b) Aluminium cannot be reduced by carbon because it is a stronger reducing agent than carbon.

2. **Cupellation:** Cupellation is a method used for refining of those metals which contain impurities of other metals which form volatile oxides. For example, removal of last traces of lead from silver.

Kroll process: The production of Titanium metal at 900K from TiCl_4 by reduction with Mg in argon atmosphere. $\text{TiCl}_4 + 2\text{Mg} \rightarrow \text{Ti (s)} + 2\text{MgCl}_2 (\text{l})$

3. On roasting sulphides are partly converted to their respective oxides. Since the oxides of lead and mercury are unstable, these bring about the reduction of their respective sulphides to the corresponding metals (IN THE PRESENCE OF HEAT).

$\text{PbS} + 2\text{PbO} \rightarrow 3\text{Pb} + \text{SO}_2$

$\text{HgS} + 2\text{HgO} \rightarrow 3\text{Hg} + \text{SO}_2$

However, zinc oxide is stable and it does not reduce ZnS to Zn.

4. Partial roasting of sulphide ore forms some oxide which then reacts with the remaining sulphide ore to form copper metal by self reduction of the oxide and sulphide as:

$2\text{Cu}_2\text{S} + 3\text{O}_2 \rightarrow 2\text{Cu}_2\text{O} + 2\text{SO}_2$

$2\text{Cu}_2\text{S} + 2\text{Cu}_2\text{O} \rightarrow 6\text{Cu} + \text{SO}_2$

Thus, to bring about self reduction process, sulphide ore of copper is partially

roasted to Cu_2O .

5. During the reaction, oxygen is evolved at anode which reacts with carbon electrode to form CO and CO_2 . This will result in slow corrosion of carbon electrodes and therefore, these have been replaced from time to time.

PART – VI

1. Ans. (a) Iron oxide present as impurity in sulphide ore of copper forms slag which is iron silicate and copper is produced in the form of copper matte.



(b) Sulphides are not reduced easily but oxides are easily reduced.

2. Ans. (a) **CUPELLATION**: Cupellation is a method used for refining of those metals which contain impurities of other metals which form volatile oxides. For example, removal of last traces of lead from silver.

POLING : Molten metal is stirred with green poles of wood. The green poles of wood release the hydrocarbon gases which reduce the oxide impurities.

(b) **HYDROMETALLURGY** : This is based on fact that more electropositive metal can displace less electropositive metal from its salt solution.

PYROMETALLURGY : This process is used when impurities have greater affinity for oxygen than metal itself.

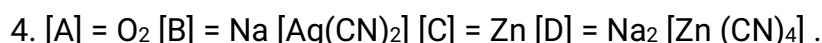
(c) **LEACHING** : Treatment of ore with a suitable reagent so as to make it soluble while impurities remain insoluble.

LEVIGATION/ GRAVITY SEPARATION : It is a method of concentration of ore, which is based on the difference in densities of the ore particles and impurities.

3. (a) Chalcocite being a sulphide ore of copper needs roasting (heating in excess of air) and not calcination.

(b) Basic lining of magnesia (MgO) is used to remove the acidic impurities such as P_2O_5 and SO_2 .

(c) As both Zn and C have nearly equal affinities for O atoms. So excess of carbon is added to reduce ZnO to Zn.



5. Ans (a) The entropy of a substance is higher in liquid state than solid state. In the reduction of metal oxide, the entropy change will be positive if metal formed is in liquid state. Thus, the value of ΔG^0 becomes negative and reduction occurs easily.

(b) Au and Ag. They are not oxidised at anode. They are less electropositive than copper.

(c) Zinc reacts at faster rate as compared with copper, further zinc is cheaper than copper.

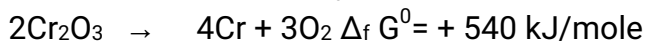
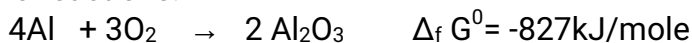
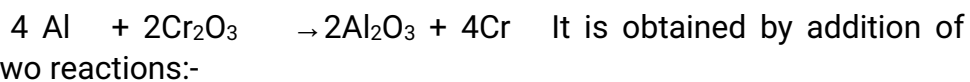
PART -VII

1.(a) Copper matte consists of Cu_2S and FeS . When blast of air is passed through molten matte in silica lined converter, FeS present in matte is oxidized to FeO , which combines with silica to form slag.





(b) The desired conversion is



Therefore, ΔG^0 for desired reaction is $-827+540=-287$, as a result reduction is possible.

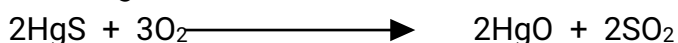
(c) Aqua regia is a mixture of conc. HCl and conc. HNO₃ in the ratio 3: 1 by volume.

Gold forms a soluble complex on heating with aqua regia.

While Silver forms a white ppt of silver chloride on reacting with nascent chlorine. The ppt is water insoluble.

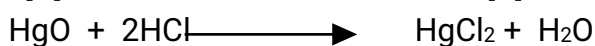
2. The available data indicates the sulphide ore is of mercury i.e., it is mercuric sulphide or cinnabar. The chemical reactions involved are listed:

Roasting



[A]

[B]



[A]

[C]



[C]

[D] Nessler's Reagent



[D]

Iodine of million's base [E] Brown ppt.

Unit 6 p BLOCK ELEMENTS

ANSWER KEY

PART-I

ANSWER 1. (3) 2. (1) 3. (1) 4. (1) 5. (2)

PART-II

1. (B) 2. (A) 3. (C) 4. (D) 5. (B)

PART -III

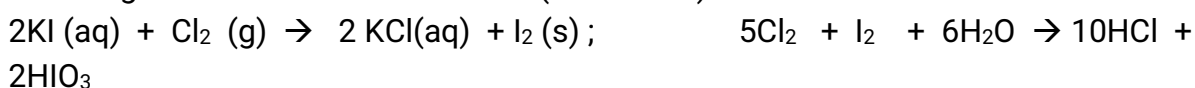
1. (A) 2. (C) 3. (A)

PART - IV

ANSWER : 1

PART-V TWO MARKS QUESTIONS

Sol.1. (a) Cl₂ being a stronger oxidising agent than I₂, first oxidises KI to I₂ which imparts brown colour to the solution. But when Cl₂ is passed in excess, the I₂ so formed gets further oxidised to HIO₃ (colourless)



(b) Oxidation state of Cl in HClO_4 is +7 and that of S in H_2SO_4 is +6. (Cl is more electronegative than S). As a result, ClO_4 part of HClO_4 can break the O-H bond more easily to liberate a proton than SO_2 part in H_2SO_4 . Thus HClO_4 is a stronger acid than H_2SO_4 .

2.(a) It forms H_2 gas.
$$\text{Fe} + 2\text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2$$

Liberation of hydrogen prevents the formation of ferric chloride.

(b) Blue litmus changes to red due to acidic nature ($\text{Cl}_2 + \text{H}_2\text{O} \rightarrow \text{HOCl} + \text{HCl}$) but it is a bleaching agent also, therefore, it decolourises the red litmus.

3. Xe has relatively lower ionisation energy among inert gases and thus the outermost shell electrons of Xe are excited to d-subshell and thereby showing unpaired electronic structure. Therefore Xe shows covalent bonding with fluorine showing sharing of electron pair.

4. (a) $\text{O}_3 + 2\text{I}^- + 2\text{H}^+ \rightarrow \text{O}_2 + \text{I}_2 + \text{H}_2\text{O}$

(b) $\text{O}_3 + \text{S} + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4 + 3\text{O}_2$

5. (a) Because fluorine is more electronegative as compared to chlorine.

(b) Due to small size of fluorine six F^- ions can be accommodated around sulphur whereas chloride ion is comparatively larger in size, therefore, there will be interionic repulsion.

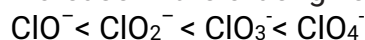
PART-VI THREE MARKS QUESTIONS

1. (a) Acid fog is formed, which is difficult to condense.

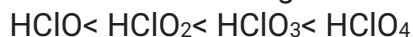
(b) Mercury is a mobile liquid but in presence of ozone it loses its mobility due to the formation of mercury suboxide and starts sticking to the glass. This is called as tailing of mercury.



(c) Oxygen is more electronegative than chlorine, therefore dispersal of negative charge present on chlorine increases from ClO^- to ClO_4^- ion because number of oxygen atoms attached to chlorine is increasing. Therefore, stability of ions will increase in the order given below:

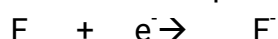


Thus due to increase in stability of conjugate base, acidic strength of corresponding acid increases in the following order



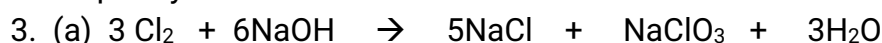
2.(a) Anhydrous HF is only slightly ionized and is, therefore a poor conductor of electricity. Thus a mixture of KF and HF is electrolysed to increase the conductivity.

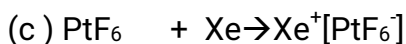
(b) The standard reduction potential of fluorine is maximum.



Thus, it cannot be oxidised by any other reagent. F^- ion is very stable due to small size and high electronegativity of fluorine atom.

(c) F does not have empty d-orbital like other halogens. The formation of F_3^- ions involves sp^3d hybridization





4. (a) No, the products of hydrolysis are XeOF_4 and XeO_2F_2 , where the oxidation state of all the elements remains the same as it was in the reacting state

(b) Because O_2 is paramagnetic whereas N_2 is diamagnetic.

(c) On heating, S_8 rings are broken and long chain polymers are formed up to 200°C . Thus due to polymerisation, liquid becomes viscous but beyond 200°C long chains are broken into short chains and ultimately S_2 molecules are formed in the vapour phase, so the viscosity of liquid decreases.

5. SO_3^{2-} - Pyramidal (Bond angle is more than 90°)

ClF_3 - T-shaped (Bond angle is less than 90°)

XeF_2 - Linear (Bond angle is 180°)

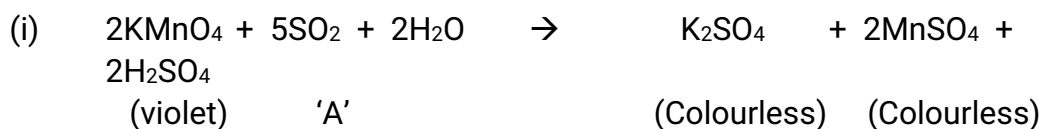
PART -VII FIVE MARKS QUESTIONS

Ans. 1. (a) The data suggests that the yellow solid 'A' is sulphur (S_8). The volatile hydride 'B' with a pungent smell is hydrogen sulphide (H_2S) gas.

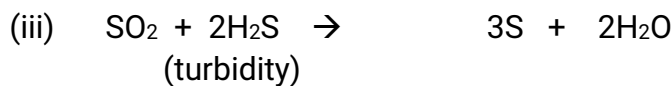
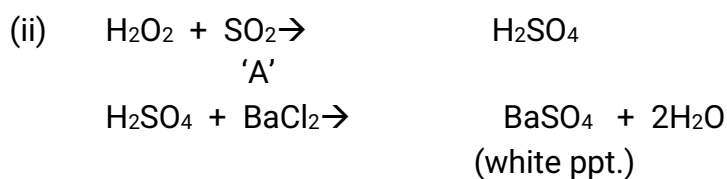
(b) Upon treatment with oxygen, H_2S is converted to sulphur dioxide which is a colourless pungent smelling gas 'C'.

(c) The gas 'C' decolourises acidified KMnO_4 solution and is also converted to another oxide SO_3 'D' in the presence of heterogeneous catalyst platinumised asbestos.

2. The data suggest that the gas 'A' is SO_2 . The equation for the various reactions involved are as follows:



boil



Ans 3.

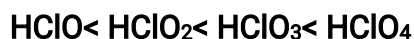
a)

Oxygen is more electronegative than chlorine, therefore dispersal of negative charge present in chlorine increases from ClO^- to ClO_4^- ion because number of oxygen atoms attached to chlorine is increasing. Therefore stability of ions will increase in the order below

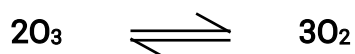


Thus due to increase in stability of conjugate base, acidic strength of corresponding

acid increases in the following order



b). Ozone is thermodynamically unstable wrt oxygen because it results in liberation of heat ($\Delta H = -ve$) and increase in entropy ($\Delta S = +ve$).



These two factors reinforce each other resulting in large negative Gibbs free energy change ($\Delta G = -ve$) for its conversion to oxygen. Therefore high concentration of ozone can result in dangerous explosion.

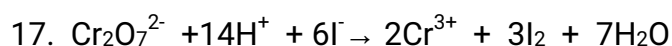
Unit 7 d and f BLOCK ELEMENTS

ANSWERS

I. Objective Type Questions:

1 d	2 d	3 b	4 c	5 a	6 b	7 d	8 b
9 a	10 d	11 a	12 b	13 c	14 a	15 b	

16.. $\text{Cr}_2\text{O}_7^{2-}$ (dichromate ion) in which the oxidation number of Cr is +6 which is equal to its group number 6.



18. Zinc has no unpaired electron in its 3d subshell hence its metallic bonding is weakest and that is why enthalpy of atomization of zinc is lowest in 3d series.

19. Atomic No. 25, Mn. Divalent ion Mn^{2+} , $3d^5 4s^0$ number of unpaired electrons = 5

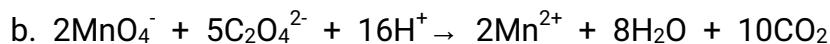
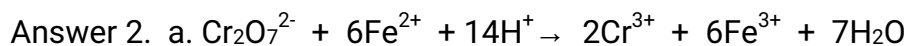
$$\mu = \sqrt{n(n+2)} = \sqrt{5(5+2)} = 5.92 \text{ B.M.}$$

20. Cerium (Ce)

II. SHORT ANSWER QUESTIONS (02 MARKS)

Answer 1. a. Co (II) ions is easily oxidized to Co(III) ions in the presence of strong ligands because of its high crystal field energy which causes the pairing of electrons

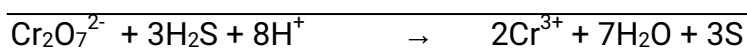
to give inner orbital complex (d^2sp^3).



b. Actinoids because of very small energy gap between 5f, 6d and 7s subshells all their electrons take part in bonding and shows greater range of oxidation states.

Answer 3. The mixture of KMnO_4 with conc. H_2SO_4 may explode due to the formation of Mn_2O_7 . $2\text{KMnO}_4 + \text{H}_2\text{SO}_4 \rightarrow \text{K}_2\text{SO}_4 + \text{Mn}_2\text{O}_7 + \text{H}_2\text{O}$

Answer 4. H_2S gets oxidized to sulphur

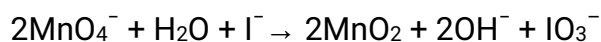


Answer 5. a. When crystals of potassium permanganate is heated to 513K Oxygen (O_2) gas is liberated.

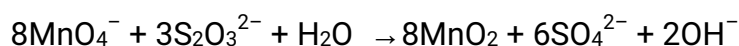
b. Acidified potassium permanganate when treated with oxalate ion at 333K, liberates Carbondioxide gas.

Answer 6. In neutral or faintly alkaline solutions:

(a) The oxidation of iodide to iodate:



(b) Thiosulphate is oxidised almost quantitatively to sulphate:



Short Answer Questions (03 Marks)

Answer 1.a. Because of increase in effective nuclear charge and weak shielding effect of d-electrons, the atomic radii decreases.

b. Copper has high enthalpy of atomization and low enthalpy of hydration. The high energy required to transform $\text{Cu}(\text{s})$ to $\text{Cu}^{2+}(\text{aq})$ is not balanced by its hydration enthalpy. Hence $E^\circ_{\text{M}^{2+}/\text{M}}$ for copper is positive.

c. The large positive E° value for $\text{Mn}^{3+}/\text{Mn}^{2+}$ shows that Mn^{2+} is much more stable than Mn^{3+} due to stable half filled configuration $3d^5$. Therefore the 3rd ionization enthalpy of Mn will be very high Mn^{3+} is unstable and can be easily reduced to Mn^{2+} . Fe^{3+} can also be reduced to Fe^{2+} but less easily. Thus Fe^{3+} is more stable than Mn^{3+} .

Answer 2. a. Scandium salts contain Sc^{3+} ($3d^04s^0$) which has no unpaired electron hence these salts are colourless. Ti^{3+} has one unpaired electron ($3d^14s^0$) hence it is coloured.

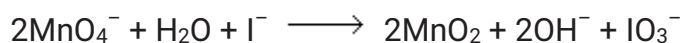
b. Neither zinc nor its ion has unpaired electrons in d-subshell hence it is not regarded as transition metal.

c. Irregularities in electronic configurations of actinoids are due to extra stabilities of fully filled and half filled electronic configurations (f^0, f^7 and f^{14}).

Answer3. In acidic medium, ferrous sulphate is oxidized to ferric sulphate.

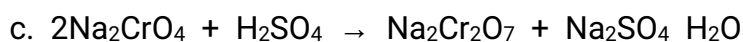
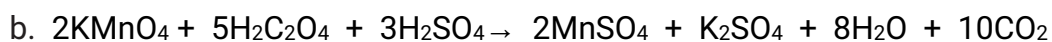


In alkaline medium iodide ion is oxidised to iodate salts.



Acid used: Dil. H_2SO_4

Base used: KOH



Answer 5 $3d^34s^2$ – Vanadium, Its oxidation states are +2, +3, +4 and +5; +5 state of vanadium is most stable.

$3d^54s^2$ – Manganese, Its oxidation states are +2, +3, +4, +5, +6 and +7; +2 and +7 are the stable states of Manganese.

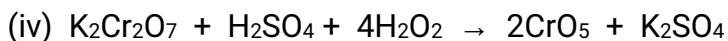
$3d^64s^2$ – Iron, Its oxidation states are +2, +3, +4 and +6; +2 and +3 are the stable oxidation states of iron.

LONG ANSWER TYPE QUESTIONS (05 MARKS)

Answer 1. (i) the orange coloured compound 'A' is $\text{K}_2\text{Cr}_2\text{O}_7$, Potassium dichromate.

(ii) The orange gas 'B' is Chromyl chloride, CrO_2Cl_2 .

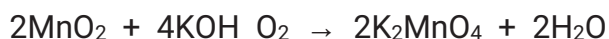
(iii) The yellow solution 'C' is Sodium chromate, Na_2CrO_4 .



Answer 2. A is Manganese oxide, MnO_2

B is K_2MnO_4 , Potassium manganate.

C is KMnO_4 , Potassium permanganate.





Answer 3. a. In transition elements, the oxidation states can vary from +1 to highest oxidation state by removing all its valence electrons and oxidation states differ by 1, while in p block elements, the oxidation states differ by 2.

b. Cu(II) (aq) is much more stable than Cu (I) (aq). This is because although second ionization enthalpy of copper is large, but hydration enthalpy of Cu(II) is much more negative than that of Cu(I) and hence it more than compensates for the second ionization enthalpy of copper. Hence many of Cu(I) ions disproportionate to Cu(II) ions in aqueous solutions.

c. orange colour of potassium dichromate solution when treated with alkali, it is converted to yellow coloured Potassium chromate. As follows:



d. (i) Lanthanoids shows limited oxidation states +2, +2, and +4, out of which +3 is most common which is due to large energy gap between 4f and 5d subshells while actinoids show large number of oxidation states due to small energy gap between 5f, 6d and 7s subshells.

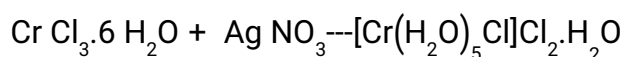
(ii) Actinoid contraction is greater than Lanthanoid contraction due to poor shielding effect of 5f electrons.

Unit 8 COORDINATION COMPOUNDS

1. (d) 0 and - 1
2. (b) One
3. (b) Cobalt
4. $[\text{Cr}(\text{SCN})_2(\text{NH}_3)_4]^+$
5. (c) Rhodium
6. Diamminechlorido Nitro - N - Platinum (II)
7. (a) Both the assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
8. (b) Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
9. (c) Assertion is CORRECT but, reason is INCORRECT.
10. (a) Both the assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

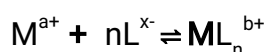
11. $[\text{Co}(\text{en})_3]^{3+}$ is more stable complex than $[\text{Co}(\text{NH}_3)_6]^{3+}$ because of Chelate effect.
12. Low spin tetrahedral complexes are rarely observed because orbital splitting energies for tetrahedral complexes are sufficiently large for forcing pairing.
13. Example: $[\text{Pt}(\text{NH}_3)_5(\text{Br})]\text{SO}_4$
 $[\text{Co}(\text{NH}_3)_5(\text{SO}_4)]\text{Br}$
14. It shows ionization isomerism and linkage isomerism.
15. 2.82 BM
16. (i) $\text{Na}[\text{Au}(\text{CN})_2]$ (ii) $[\text{Pt}(\text{NH}_3)_4\text{Cl}(\text{NO}_2)](\text{SO}_4)$
17. (i) The complex formed on mixing a coordination compound $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ with AgNO_3 is as

follows:



- (i) Pentaquaachloridochromium (III) Chloride Monohydrate
18. In $[\text{Co}(\text{NH}_3)_6]^{3+}$, the d-electrons of $\text{Co}^{3+}([\text{Ar}]3d^64s^0)$ get paired leaving behind two empty d-orbital and undergo d^2sp^3 hybridization and hence inner orbital complex, while in $[\text{Ni}(\text{NH}_3)_6]^{2+}$ the d-electrons of $\text{Ni}^{2+}([\text{Ar}]3d^84s^0)$ do not pair up and use outer 4d subshell hence out orbital complex.
19. Stability of a complex in solution means the measure of resistance to the replacement of a ligand by some other ligand. This stability can be expressed in terms of equilibrium constant.

Let the reaction between metal and ligand be represented as :



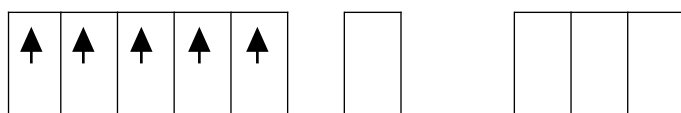
$$\text{Stability or Dissociation Constant (K)} = \frac{[\text{ML}_n^{b+}]}{[\text{M}^{a+}][\text{L}^{x-}]^n}$$

The reciprocal of the stability constant K is known as instability constant or dissociation constant

$$K = \frac{1}{K} = \frac{[\text{M}^{a+}][\text{L}^{x-}]^n}{[\text{ML}_n^{b+}]}$$

Factors affecting the stability of a complex ion

- (i) **Nature of metal ion:** Greater the charge and smaller the size of the ion, more is its charge density and greater will be stability of the complex.
- (ii) **Nature of ligand:** More the basicity of ligand, more is its tendency to donate electron pair and therefore, more is the stability of the complex.
20. In both the cases, Fe is in oxidation state +3. Outer electronic configuration of Fe^{+3} is :



3d

4s

4p

In the presence of CN^- , the 3d electrons pair up leaving only one unpaired electron. The hybridization involved is d^2sp^3 forming inner orbital complex which is weakly paramagnetic. In the presence of H_2O (a weak ligand), 3d electrons do not pair up. The hybridization involved is sp^3d^2 forming an outer orbital complex. As it contains five unpaired electrons so it is strongly paramagnetic.

21. (i) $[\text{CoF}_4]^{2-}$: Tetrafluorido Cobalt (III) ion

Coordination number = 4 Shape = Tetrahedral Hybridization =

sp^3

\therefore **Magnetic moment** (μ) = $\sqrt{n(n+2)}$ BM = $\sqrt{3(3+2)}$ = $\sqrt{15}$ = **3.87 BM**

(ii) $[\text{Cr}(\text{H}_2\text{O})_2(\text{C}_2\text{O}_4)_2]^-$: Diaquadioxalato Chromium (III) ion

Coordination number = 6 Shape = Octahedral Hybridization =

d^2sp^3

\therefore **Magnetic moment** (μ) = $\sqrt{n(n+2)}$ BM = $\sqrt{15}$ = **3.87 BM**

(ii) $[\text{Ni}(\text{CO})_4]$: Tetracarbonyl nickel (0)

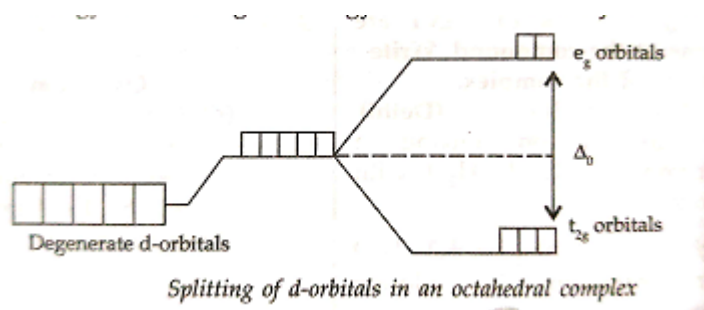
Coordination number = 4 Shape = Tetrahedral Hybridization =

sp^3

\therefore **Magnetic moment** (μ) = $\sqrt{n(n+2)}$ BM = $\sqrt{0(0+2)}$ = 0

22. (i) **Crystal field splitting:** It is the splitting of the degenerate energy levels due to the presence

of ligands. When ligand approaches a transition metal ion, the degenerate d-orbitals split into two sets, one with lower energy and the other with higher energy. This is known as crystal field splitting and the difference between the lower energy set and higher energy set is known as crystal field splitting energy. Example $3d^5$ of Mn^{2+}



(ii) **Linkage isomerism:** When more than one atom in an ambidentate ligand is linked with central metal ion to form two types of complexes,

then the formed isomers are called linkage isomers and the phenomenon is called linkage isomerism.

Example : $[\text{Cr}(\text{H}_2\text{O})_5(\text{SCN})]^{2+}$ - Pentaqua thiocyanate chromium (III) ion

and

$[\text{Cr}(\text{H}_2\text{O})_5(\text{NCS})]^{2+}$ - Pentaquaisothiocyanate chromium (III) ion

- (iii) **Ambidentate ligand** : The monodentate ligands with more than one coordinating atoms is known as ambidentate ligand. Monodentate ligands have only one atom capable of binding to a central metal atom or ion. For example, the nitrate ion NO_2^- can bind to the central metal atom /ion at either the nitrogen atom or one of the oxygen atoms.

Example: $-\text{SCN}$ thiocyanate, $-\text{NCS}$ isothiocyanate

23. (i) The electronic configuration of Ni is $[\text{Ar}]3d^84s^2$ which shows that it can only form two types of complexes i.e. square planar (dsp^2) in presence of strong ligand and tetrahedral

(sp^3) in presence of weak ligand. There are four empty orbitals in Ni while octahedral complexes require six empty orbitals.

- (ii) Due to presence of empty d – orbitals in transition metals, they can accept electron pairs from ligands containing π electrons and hence can form π -bonding complexes.
- (iii) Due to greater magnitude of Δ_o , CO produces strong fields which cause more splitting of d – orbitals and moreover it is also able to form π -bond due to back bonding.

24. (i) Coordination isomerism

(ii) $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ is an outer orbital complex due to weak field ligand H_2O and the presence of unpaired electrons undergoes d-d transition by absorbing red light and shows green colour while $[\text{Ni}(\text{CN})_4]^{2-}$ is an inner orbital complex and has no unpaired electrons hence colourless.

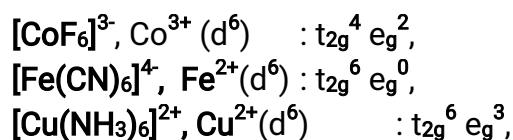
(iii) Pentaamminecarbonatocobalt (III) Chloride

25. (i) $[\text{Co}(\text{NH}_3)_5(\text{SCN})]^{2+}$ shows linkage isomerism.

(ii) Since in $[\text{NiCl}_4]^{2-}$, Cl^- is a weak field ligand, it forms outer orbital complex and has unpaired electrons which imparts paramagnetic character to complex while in $[\text{Ni}(\text{CN})_4]^{2-}$, CN^- is a strong field ligand, forms inner orbital complex and has paired electrons which imparts diamagnetic character to it.

(iii) Low spin tetrahedral complexes are rarely observed because orbital splitting energies for tetrahedral complexes are not sufficiently large for forcing pairing.

26.



Unit 9 HALOALKANES AND HALOARENES

1 MCQS:

Ans : (i) 1-Bromobut-2-ene (1° alkyl halide)

Ans : Option (a) is correct . In gem-dihalides both the halogens are attached to the same carbon atom Cl

$\text{CH}_3 \text{ CH} \text{ Cl}$ Ethylidene chloride

Ans. iii) 1-Bromo-2-methylbutane

Ans. ii) 3-Bromopentane

Ans.(iii) $\text{CH}_3\text{CH}(\text{Br})\text{CH}_2\text{CH}_3$

Ans : d) 1,1-propandiol

Ans : a) CH_3Cl

Ans: d) Dichlorodifluoromethane

ONE WORD ANSWER TYPE:

- 1- chloro-2,2-dimethylpropane
- 2-chlorobutane.
- (iii) < (i) < (iv) < (ii)
- Chloromethylbenzene
- But-2-ene
- Iodide ion
- Cyclohexyl chloride
- Correct structure
- Benzenehexachloride
- One

TRUE FALSE:

1. False
2. False
3. True
4. True
5. True
6. False
7. False
8. false
9. true

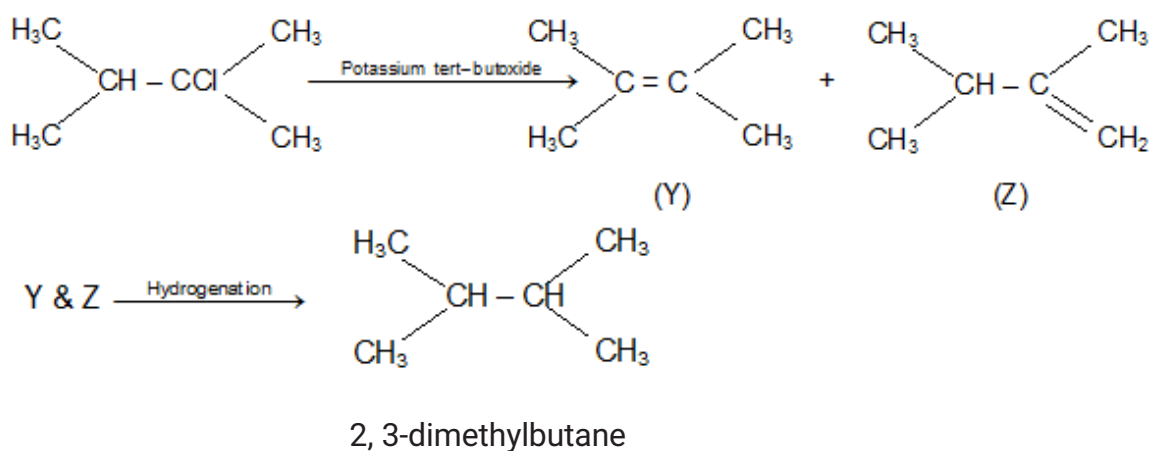
10. true
 11. false
 12. true
 13. true
 14. false

Match the following.

1	i
2	e
3	b
4	a
5	g
6	d
7	j
8	f
9	h
10	e

2 Mark Questions

Ans 1. An alkyl halide X ($C_6H_{13}Cl$) gives two isomeric alkenes Y and Z. Since it is forming two isomeric alkenes in a dehydrohalogenation reaction, Cl should not be at the terminal alkyl group. The reactions are



Ans 2. Haloalkanes are more polar than haloarenes. Therefore the carbon atom carrying the halogen in haloalkanes is more electron deficient (i.e., more +ively charged) than that in haloarenes.

On the other hand, haloarenes contain a benzene ring. Since the typical nature of benzene are electrophilic substitution reactions, therefore, haloarenes undergo electrophilic substitution reactions preferably while haloalkanes which contain a benzene ring don't undergo electrophilic substitution reactions.

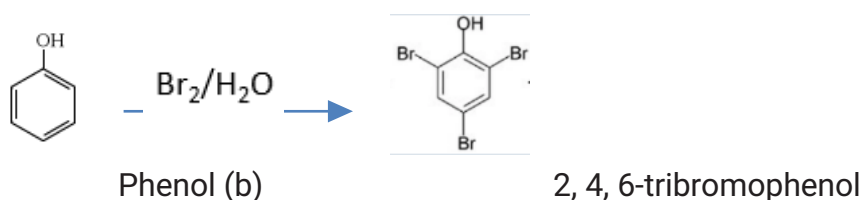
Ans 3. The S_N1 mechanism proceeds through the formation of carbocation. It involves breaking of C-Halogen bond for which energy is obtained through the solvation of halide ion with the proton of protic solvent. Thus polar solvents help in ionizations step by stabilizing the ions by solvation.

3 Mark Questions

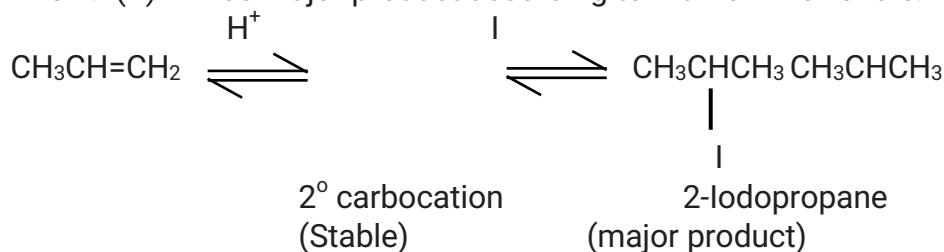
Ans 1. (b) A mixture of NaBr and H_2SO_4 gives Br_2 gas.



Phenol (b) reacts with Br_2 to form 2, 4, 6-tribromophenol



Ans 2. (B) will be major product according to Markovnikov's rule.



Ans 3.

a)

- I. Because of resonance there is partial double bond character in chlorobenzene making it shorter.
- II. C of chlorobenzene is sp^2 hybridized, so more electronegative i.e., C-X bond is shorter

- b) C-X in chlorobenzene is more electronegative so less tendency to release electrons to the Cl- atom and therefore-Cl bond is less polar than in alkyl halides.

- c) SN1 occur by formation of carbocation. Which is planer so attack of Nucleophilic can occur from either front or back side forming equal amount of two isomers

Unit 10 ALCOHOL , PHENOL AND ETHER

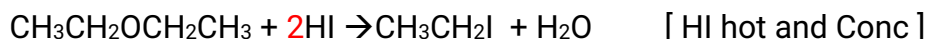
ANSWER

1. due to repulsion of bulky alkyl groups in ethers bond angles is slightly greater than tetrahedral bond angle.
2. Due to its bent structure.
3. d
4. d
5. a
6. a
7. a
8. Phenol
9. Chloroform forms phosgene gas(poisonous)on atmospheric oxidation.Ethanol reacts with phosgene to give harmless diethyl carbonate.

$$\text{COCl}_2 + 2\text{C}_2\text{H}_5\text{OH} \rightarrow (\text{C}_2\text{H}_5)_2\text{CO}_3 + 2\text{HCl}$$
10. This is due to presence of intermolecular hydrogen bonding in butanol which is lacking in butanal.
11. Grignard reagents form co-ordination complexes with ether but not benzene since the former has lone pair of electrons but the later does not.
12. $\text{R-OH} + \text{RCOOH}/\text{RCOOCOR} \leftrightarrow \text{RCOOR} + \text{H}_2\text{O}$
 $\text{R-OH} + \text{RCOCl} \leftrightarrow \text{RCOOR} + \text{HCl}$
 Sulphuric acid removes the water and prevent back ward reaction,
 Base like pyridine removes the acid HCl and prevent back ward reaction
13. In case of Halogenations of benzene Br_2 is polarized by FeBr_3 , but in case of phenol the polarization of Br_2 takes place by phenol due to highly activating effect of OH group present on the benzene ring.
14. CS_2 is a non-polar solvent whereas water is a polar solvent. In the presence of polar solvent phenol polarizes and gives more electrophilic substitution.
15. Secondary alcohols like isopropyl alcohol undergo dehydration on heating with 85% phosphoric acid at 440 K. forming an alkene (propene)
16. Dehydration of alcohols to alkenes occurs through the formation of carbocation intermediate. If HCl is used then chloride ion being a good nucleophile will result into substitution reaction forming alkyl chloride on the other hand, if H_2SO_4 is used then the bisulphate ion being very weak nucleophile cannot result into substitution reaction. Rather the carbocation loses a proton to form elimination product alkene. Conc. HNO_3 also cannot be used because it is a strong oxidizing agent and will preferably result into the

oxidation of alcohols to aldehydes, ketones or carboxylic acid.

17. Williamson's synthesis cannot be employed for
- tertiary alkyl halides as they yield alkenes instead of ethers. For example: the reaction of CH_3ONa with $(\text{CH}_3)_3\text{CBr}$ gives exclusively 2-methyl propene.
 - Aryl halides and vinyl halides cannot be used as substrates because of their low reactivity in nucleophilic substitution
18. A = $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$
IUPAC name Ethoxyethane



19. A = Phenol
B = 2-Hydroxybenzaldehyde
C = 4-Hydroxybenzaldehyde
D = Benzaldehyde
E = Benzoic Acid
F = Benzene
20. A = Methyl Chloride
B = Methyl magnesium chloride
B is known as Grignard Reagent
21. [A] = $(\text{CH}_3)_2\text{CHCH}_2\text{OH}$
[B] = $\text{CH}_3\text{CH}(\text{CH}_3)\text{COOH}$
[C] = $(\text{CH}_3)_2\text{C} = \text{CH}_2$
[D] = $(\text{CH}_3)_3\text{C} - \text{OH}$
Position isomerism
22. A = PHENOL
B SODIUM SALICILATE
C SALICYLIC ACID
D acetyl salicylic acid
ASPRIN
23. A = $\text{CH}_3\text{CH}_2\text{OCH}(\text{CH}_3)_2$
B = $\text{CH}_3\text{CH}_2\text{OH}$
C = $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$
D = CH_3COOH
E = CH_3COCH_3

Unit 11 ALDEHYDES KETONES AND CARBOXYLIC ACIDS

Answer Key

- A1 : a
A2 : c
A3 : c
A4 : d

- A5 : d
 A6 : C₆H₅COC₂H₅
 A7 : Propanal > Propanal > Propane
 A8 : Because of resonance in carboxylic acids
 A9 : Cu₂O
 A10 : a
 A11 : a
 A12 : e
 A13 : c
 A14 : e
 A15 : false
 A16 :

Unit 12 ORGANIC COMPOUND CONTAINING NITROGEN

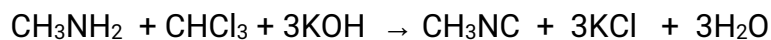
Answers

I. Objective Type Questions:

1 b	2 b	3 c	4 a	5 b	6 b	7 c	8 c
9 d	10 b	11 d	12 b	13 a	14 a	15 a	

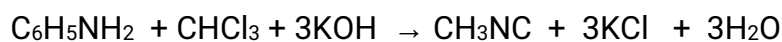
II. Short Answer type questions (02 marks)

Answer 1. a. Carbylamine test: Methylamine being a primary amine give this test, But N-methylamine being secondary amine does not give this test.



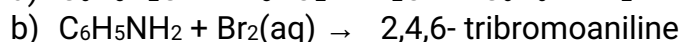
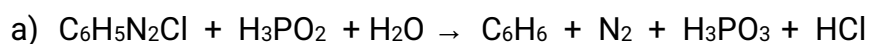
Fowl smell

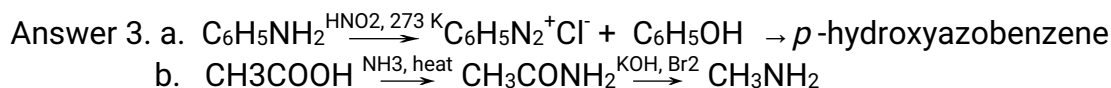
b. Carbylamine test: Aniline being a primary amine give this test, But N-methylamine being secondary amine does not give this test.



Fowl smell

Answer 2.





Answer 4. HNO_3 in the nitrating mixture is used for the nitration of benzene. This is because it acts as base and provides the electrophile NO_2^+ ion for the nitration of benzene.

Answer 5. a. Since O is more electronegative than N, O can accommodate the negative charge more easily than N. As a result, the amide ion is less stable than alkoxide ion. Hence are less acidic than alcohols of comparable molecular mass.

b. The strength of base is determined by its ability to donate a lone pair of electrons. In case of aromatic amines lone pair of electrons on N is in resonance with benzene ring. This makes aromatic amines weaker bases.

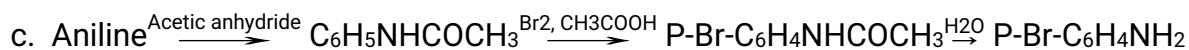
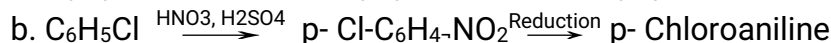
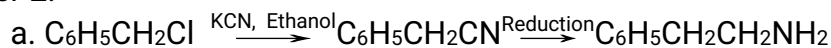
III. Short Answer type questions (03 marks)

Answer 1. a. $\text{C}_6\text{H}_5\text{NH}_2 > \text{C}_6\text{H}_5\text{NHCH}_3 > \text{C}_2\text{H}_5\text{NH}_2 > (\text{C}_2\text{H}_5)_2\text{NH}$

b. $(\text{CH}_3)_2\text{NH} < \text{C}_2\text{H}_5\text{NH}_2 < \text{C}_2\text{H}_5\text{OH}$

c. $(\text{C}_2\text{H}_5)_2\text{NH} < \text{C}_6\text{H}_5\text{NH}_2 < \text{C}_2\text{H}_5\text{NH}_2$

Answer 2.



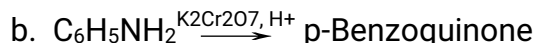
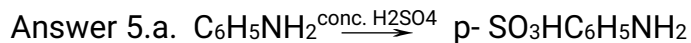
Answer 3. a. A- Ethanamide, B- Methanamine, C- Methyl isocyanide

b. A- Nitrobenzene, B- Aniline, C- N-Phenylacetamide or Acetanilide

Answer 4.a. Benzanilide

b. p-Nitroso-N,N-dimethylaniline

c. 4-Methoxy-2',4'dinitroazobenzene



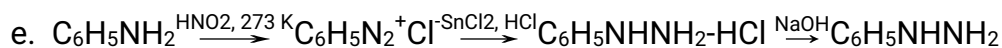
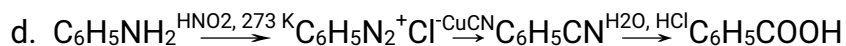
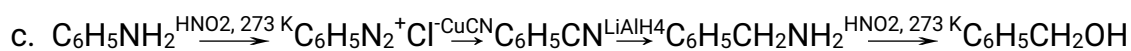
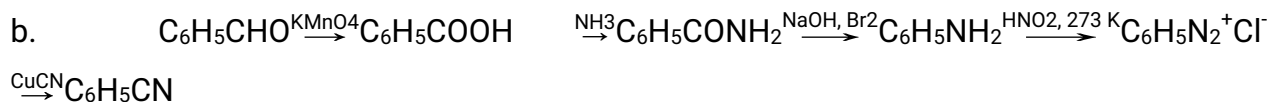
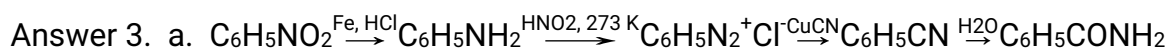
LONG ANSWER TYPE QUESTIONS (05 MARKS)

Answer 1. A – Benzamide, B- benzene diazonium chloride, C. benzene

D- Phenyl isocyanide , E- Iodobenzene

Answer 2. A – Benzoic acid, B- Aniline, C- Acetanilide,

D – benzyl amine, D- 2,4,6- Tribromoaniline



Unit 13 BIOMOLECULES

ANSWERS

True and False:

- 1) T
- 2) T
- 3) F
- 4) T
- 5) T
- 6) F
- 7) F
- 8) T
- 9) T
- 10) T

One word answer type questions

- 1) Ribose sugar
- 2) Inversion
- 3) Cyanocobalamin
- 4) Thymine
- 5) 5'-3'

Fill in the blanks:

- 1) Ans. Monosaccharide
- 2) Ans. Vitamin B12
- 3) Ans. Insulin
- 4) Ans. α 1,6-glycosidic linkage
- 5) Ans. β - D -fructose.
- 6) Ans. Soluble
- 7) Ans. Isoelectric point
- 8) Ans. Primary/ 1°
- 9) Ans. H-bonds
- 10) Ans. 1,4

- 11)Ans. "K"
- 12)Ans. Zwitter
- 13)Ans HI
- 14)Ans. Denaturation
- 15)Ans. Oxidation
- 16)Ans. Cobalt
- 17)Ans. Hydrogen bond.
- 18)Ans. Fehling solution.
- 19)Ans. Cellulose.
- 20)Ans. Zwitter
- 21)Ans. Uracil.
- 22)Ans. – COOH
- 23)Ans. A
- 24)Ans. 2

Match the following:

1.	i
2.	e
3.	a
4.	g
5.	c
6.	j
7.	d
8.	b
9.	f
10	h

TWO MARKS :

1. (a) In dil alkaline solution fructose undergoes isomerisation to glucose. So, fructose reduce tollens, reagent although it contains a keto group.
(b) After hydrolysis of sucrose, it gives equal moles of glucose and fructose. Since levorotation of fructose is greater than dextrorotation of glucose. So, sucrose becomes levorotatory after hydrolysis.
2. A sequence of basis on DNA is unique for a person and information regarding this is called DNA finger printing.

Application:

- (i) In identification of criminals

(ii) In identification of parents

3 Vitamin A prevents night blindness, vitamin D prevents rickets.

4 Chemical name of vitamin B₂ is riboflavin, chemical name of vitamin B₆ is pyridoxine.

5 A nucleoside is formed when a nitrogenous base is connected to C-1 of sugar. A nucleotide is formed when a nitrogenous base is connected to C-1 of sugar and phosphoric acid connected to C-5 of sugar.

THREE MARKS:

1. (a) An osazone is formed at C-1 and C-2 position and glucose and fructose differ at only C-1 and C-2 position. Their osazones are same.

(b) An amino acid has both acidic and basic groups.

(c) Amino acids are dipolar molecules. Due to strong dipole-dipole interaction, their boiling point is high.

2. (a) It indicates that the aldehyde group CHO in glucose is not free.

(b) correct structure.

(c) 'D' indicates -OH present at the right side of configuration. (+) indicates it is dextrorotatory.

3. In DNA adenine always pairs with thymine and cytosine always pairs with guanine. So, the two strands are said to be complementary. The complementary strand will be TACGATAAGT.

4. (a) Protein synthesis occurs at ribosome in cytoplasm.

(b) First two codons are important for coding.

5. K_a and K_b of an amino acid is low as in an amino acid the basic group is COO^- not NH_2 and acidic group is NH_3^+ not COOH .

On denaturation of protein, protein loses its tertiary and secondary structure due to which it loses its biological activity. Only primary structure is unaffected by denaturation.

FIVE MARKS

1. (A) It refers to the sequence of nucleotides in a chain of a nucleic acid.

(B) C₁ of one glucose unit is linked to C-2 of other glucose unit through glycosidic linkage.

(C) Glucose is called animal starch because its structure is similar to amylopectin.

(D) Yes, a monosaccharide with D-configuration can be levorotatory.

(E) The spontaneous change of specific rotation of an optically active substance with time is called mutarotation.

2. (A) Enzymes are biochemical catalysts with high molecular mass. But catalysts may not be a biomolecule and may not have high molecular mass.

(B) D and L stand for relative configuration of a compound with respect to D-glyceraldehyde.

(C) The isomers which differ only in the configuration of -OH group at C-1 are called anomers.

(D) t transfer, r for ribosomal, m for messenger.

(E) Deficiency of vitamin B₆ causes convulsions.

3. (a) DNA---- 2-deoxyribose sugar+Thymine+Phosphoric acid.

RNA----it is single strand hence there is no specific relationship among the quantity of hydrolysed product

(b) Nucleic acids are of two types as RNA(ribo nucleic acid) & DNA (deoxyribo nucleic acid).

Functions-----a) Synthesis of proteins by RNA.

b) Heredity transmission by DNA.

(c) No, only enantiomers have this characteristic property and anomers are not enantiomers.

Unit 14 POLYMERS

PART-I

Ans. 1.d 2.c 3.c 4.b 5.c

PART -II

Ans.1.(3) Correct Reason: Most of synthetic polymer are resistant to the environment degradation processes.

2. (1)

3. . (2) Correct explanation: Poly tetrafluoroethene is resistant to attack by corrosive reagents.

4..(4) CORRECT ASSERTION: For making rubber synthetically , neoprene molecules are polymerised.

5. (2) CORRECT EXPLANATION : Network polymer are cross linked and branched molecules.

PART-III

Ans. 1 (d) , 2 (a) , 3 (c) , 4 (d) , 5 (b)

PART-IV

1. Natural rubber is very soft and in summer it becomes brittle . Moreover, it cannot withstand wear and tear. The cross linking in natural rubber is done by the process of vulcanisation as a result of which sulphur atoms are introduced in the linear chains and they become cross linked. The vulcanised rubber is more stiff as compared to natural rubber. Moreover it is hard and non- sticky. Its elasticity maintained over a wide range of temperature.

2. On the basis of intermolecular forces the order is

Elastomers < Plastics < Fibres

Buna-S(Elastomers) < Polythene(Plastic) < Nylon-66 (Fibres)

Neoprene (Elastomers) < Polyvinyl chloride(Plastic) < Nylon-6 (Fibres)

3. (a) Natural rubber is a linear polymer of isoprene (2-methyl-1, 3-butadiene) and is also called as *cis* - 1, 4 - polyisoprene.

(b) It is obtained by the copolymerisation of 3-hydroxybutanoic acid and 3 - hydroxy pentanoic acid.

- (i) Elastomers (ii) Fibres (iii) Thermoplastic polymers (iv) Thermosetting polymers.
 - Elastomers : Polymers in which the intermolecular forces of attraction between the polymer chains are weakest are called elastomers. E.g., Natural rubber.
- Fibres : Polymers in which intermolecular forces of attraction are the strongest are called Fibres. e.g., Nylon-6, 6.

PART - V

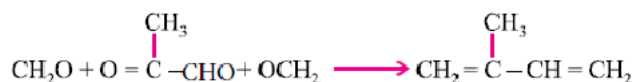
1. **Thermoplastics** : Polymers in which the intermolecular forces of attraction are in between those of elastomers and fibres are called thermoplastics. E.g., Nylon-6, PVC, etc.

Thermosetting polymers : These are semi-fluid substances with low molecular masses which when heated in a mould undergo a permanent change in chemical composition to give hard, infusible and insoluble mass. E.g., Bakelite.

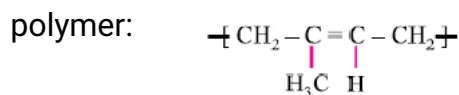
- (i) Bakelite (ii) Urea formaldehyde resin (iii) Nylon-66
- (a) Natural rubber is a cis-polyisoprene. These cis- double bonds do not allow to polymer unit to come close for effective interaction. Hence rubber show elasticity.

(b) Step growth polymerisation involves condensation between monomers having multifunctional groups. It is also known as condensation polymerisation. E.g., Adipic acid and hexamethylene diamine.

4. Ans. Structure of monomer :



Structure of



- (a) Yes.
Buna-S, Buna-N : Addition polymer
Nylon-6, 6, terylene : Condensation

(b) Natural rubber is a cis-polyisoprene. These cis- double bonds do not allow to polymer unit to come close for effective interaction. Hence rubber show elasticity.

Unit 15 CHEMISTRY IN EVERYDAY LIFE

ANSWER

- D
- A
- C
- C
- B

6. C
7. A
8. D
9. B
10. A
11. D
12. A
13. D
14. B
15. B
16. D
17. B
18. A
19. decomposed by microorganisms.
20. Detergents
21. Cetyltrimethylammonium bromide
22. Reduces
23. Bithional
24. Penicilin
25. Histamine
26. . Antibiotics are of two types : 1. Bactericidal antibiotics have cidal (killing) effect on microbes. For example, penicillin, ofloxacin, amino glycosides, etc. 2. Bacteriostatic antibiotics have a static (inhibitory) effect on microbes. For example, erythromycin, tetracycline, chloramphenicol, etc
27. Antipyretic
 - Analgesic
 - Anti blood coagulating
28. Antidepressant
 - Inhibit the enzyme which catalyse the degradation of noradrenaline
 - Phenelzine