DEHRADUN PUBLIC SCHOOL
ASSIGNMENT (2022-23)
SUBJECT - CHEMISTRY (043)
CLASS – XII

UNIT-II (SOLUTION)

Q1. Read the questions and tick the correct option.

i. Which of the following fluoride is used as rat poison?

a. CaF_2 b. KF c. NaF d. MgF_2

ii. Vapour pressure of a pure liquid X is 2 atm at 300 K. It is lowered to 1 atm on dissolving 1 g of Y in 20 g of liquid X. If molar mass of X is 200,what is the molar mass of Y?

a. 20 b. 50 c. 100 d. 200

iii. Most of the processes in our body occur in

a. solid solution b. liquid solution c. gaseous solution d. colloidal solution

iv. The term homogenous mixtures signify that

a. its composition is uniform throughout the mixture.
b. its properties are uniform throughout the mixture.
c. both composition and properties are uniform throughout the mixture.
d. neither composition nor properties are uniform throughout the mixture.

v. Which of the following units is useful in relating concentration of solution with its vapour pressure?

a. mole fraction b. parts per million c. mass percentage d. molality

Q2. In the following questions, a statement of assertion (A) followed by statement of reason(R) is given. Choose the correct answer out of the following choices.

a. Both assertion and reason are correct and reason is the correct explanation of assertion.
b. Both assertion and reason are correct but reason is not a correct explanation of the assertion.
c. Assertion is correct but reason is incorrect.
d. Assertion is incorrect but reason is correct.

i. **Assertion:** Molarity of a solution in liquid state changes with temperature.
Reason: The volume of a solution changes with change in temperature.

ii. **Assertion:** If a more volatile liquid solute is added to the solvent, the vapour pressure of the solution may increase i.e.$p_s > p_o$.
Reason: In the presence of a more volatile liquid solute, only the solute will form the vapours and solvent will not.

Q3. i.**Which of the following analogies is correct?**

a. Ideal solution: $\Delta H_{mix}= 0$, :$\Delta V_{mix}= 0$:: Non ideal solution: $\Delta H_{mix}\neq 0$, : $\Delta V_{mix}= 0$
b. Ideal solution: $\Delta H_{mix}= 0$, :$\Delta V_{mix}= 0$:: Non ideal solution: $\Delta H_{mix}\neq 0$, : $\Delta V_{mix}\neq 0$
c. Ideal solution: $\Delta H_{mix}\neq 0$, :$\Delta V_{mix}= 0$:: Non ideal solution: $\Delta H_{mix}\neq 0$, : $\Delta V_{mix}= 0$
d. Ideal solution: $\Delta H_{mix}\neq 0$, :$\Delta V_{mix}\neq 0$:: Non ideal solution: $\Delta H_{mix}\neq 0$, : $\Delta V_{mix}\neq 0$

ii. **Complete the following analogy.**

The elevation in boiling point for 1M urea :A :: 1M NaCl:B.

a.Urea:1:: NaCl:2 b.Urea:2:: NaCl:2 c.Urea:2:: NaCl:1 d.Urea:1:: NaCl:1

Q4. Answer the following questions.

i. State Raoult's law. How is it formulated for solutions of non-volatile solutes?
ii. State Henry's law and mention two of its important applications.

iii. 18 g of glucose, $C_6H_{12}O_6$ (Molar mass 180 g mol^{-1}) is dissolved in 1 kg of water in a sauce pan. At what temperature will this solution boil? (K_b for water = 0.52 K kg mol^{-1}, boiling point of pure water = 373.15 K)

iv. Derive expression for Raoult's law when the solute is non-volatile.

v. What is meant by positive deviations from Raoult's law? Give an example. What is the sign of $\Delta_{mix}H$ for positive deviation?

vi. Define azeotropes. What type of azeotrope is formed by positive deviation from Raoult's law? Give an example.

vii. Define osmotic pressure of a solution. How is the osmotic pressure related to the concentration of a solute in a solution?

Q5. Read the passage given below and answer the questions that follow.

The concentration of a solute is very important in studying chemical reactions because it determines how often molecules collide in solution and thus indirectly determine the rate of reactions and the conditions at equilibrium. There are several ways to express the amount of solute present in a solution. The concentration of a solution is a measure of the amount of solute that has been dissolved in a given amount of solvent or solution. Concentration can be expressed in terms of molarity, molality, parts per million, mass percentage, volume percentage etc.

i. A solution is prepared using aqueous KI which is turned out to be 20% w/w. Densityof KI is 1.202 g/ml. The molality of the given solution and mole fraction of solute are respectively:

a. 1.95 m, 0.12 b. 1.5 m, 0.0263 c. 2.5 m, 0.0569 d. 3.0 m, 0.0352

ii. Which of the following is temperature dependent?

a. molarity b. molality c. mole fraction d. mass percentage

iii. Define minimum boiling azeotropic mixture?

iv. What is the molality of pure water?

v. Calculate mole fraction of solute in one molal aqueous solution.

UNIT-III (ELECTROCHEMISTRY)

Q1. Read the questions and tick the correct option.

i. The charge required for the reduction of 1 mol of MnO_4^- to MnO_2 is:

a. 1 F b. 3 F c. 5 F d. 6 F

ii. If limiting molar conductivity of Ca^{2+} and Cl^- are 119.0 and 76.3 S cm^2 mol^{-1}, then the value of limiting molar conductivity of $CaCl_2$ will be:

a. 195.3 S cm^2 mol^{-1} b. 271.6 S cm^2 mol^{-1} c. 43.3 S cm^2 mol^{-1} d. 314.3 S cm^2 mol^{-1}

iii. The reaction, $3ClO^-_{(aq)} \rightarrow ClO_{3\,(aq)} + 2Cl^-_{(aq)}$ is an example of:

a. Oxidation reaction b. Disproportionation reaction
c. Reduction reaction d. Decomposition reaction

iv. The emf of the cell:

Ni / Ni^{2+} (1.0 M) || Au^{3+} (1.0 M) / Au
(E° = -0.25 V for Ni^{2+}/Ni; E° = 1.5 V for Au^{3+}/Au)

a. 1.25 V b. -1.25 V c. 1.75 V d. 2.0 V

v. The standard emf of a galvanic cell involving cell reaction with n = 2 is formed to be 0.295 V at 25° C. The equilibrium constant of the reaction would be:

a. 1.0×10^{10} b. 2.0×10^{11} c. 4.0×10^{12} d. 1.0×10^{2}

[Given F = 96500 C mol^{-1}, R = 8.314 JK^{-1} mol^{-1}]

Q2. In the following questions, a statement of assertion (A) followed by statement of reason(R) is given. Choose the correct answer out of the following choices.

a. Both assertion and reason are correct and reason is the correct explanation of assertion.

b. Both assertion and reason are correct but reason is not a correct explanation of the assertion.

c. Assertion is correct but reason is incorrect.
d. Assertion is incorrect but reason is correct.

i. **Assertion:** The resistivity for a substance is its resistance when it is one meter long and its area of cross section is one square meter.
Reason: The SI units of resistivity is ohm metre .

ii. **Assertion:** On increasing dilution, the specific conductance keeps on increasing.
Reason: On increasing dilution, degree of ionisation of weak electrolyte increases and molality of ions also increases.

Q3. i. **Which of the following analogies is incorrect?**
a. Drycell : Primary battery :: Fuel cell : Secondary battery
b. Dry cell : Primary battery :: Mercury cell : Primary battery
c. Dry cell :Secondary battery :: Mercury cell : Secondary battery
d. Fuel cell : Secondary battery :: Lead storage cell :: Secondary battery

ii. **Complete the following analogy.**
sign of G :A:: sign of K:B(for spontaneous cell reaction:)
a. A:Positive :: B: Positive
b. A:Negative :: B: Positive
c. A:Positive :: B: Negative
d. A:Negative :: B: Negative

Q4. Answer the following questions.
i. Express the relation between conductivity and molar conductivity of a solution held in a cell.
ii. What is the effect of catalyst on:
a. Gibbs energy (ΔG) and
b. activation energy of a reaction?
iii. The chemistry of corrosion of iron is essentially an electrochemical phenomenon. Explain the reactions occurring during the corrosion of iron in the atmosphere.
iv. Two half-reactions of an electrochemical cell are given below :
$MnO^-_{4\,(aq)} + 8H^+_{(aq)} + 5e^- \rightarrow Mn^{2+}_{(aq)} + 4H_2O_{(l)}$, $E° = 1.51$ V
$Sn^{2+}_{(aq)} \rightarrow Sn^{4+}_{(aq)} + 2e^-$, $E° = +0.15$ V.
Construct the redox equation from the standard potential of the cell and predict if the reaction is reactant favoured or product favoured.
v. Express the relation among cell constant, resistance of the solution in the cell and conductivity of the solution. How is molar conductivity of a solution related to its conductivity?
vi. Write the reactions taking place at cathode and anode in lead storage battery when the battery is in use. What happens on charging the battery?
vii. Write the name of the cell which is generally used in transistors. Write the reactions taking place at the anode and the cathode of this cell.

Q5. Read the passage given below and answer the questions that follow.
All chemical reactions involve interaction of atoms and molecules. A large number of atoms/molecules are present in a few grams of any chemical compound varying with their atomic/molecular masses. To handle such large number conveniently, the mole concept was introduced. All electrochemical cell reactions are also based on mole concept. For example, a 4.0 molar aqueous solution of NaCl is prepared and 500 ml of this solution is electrolysed. This leads to the evolution of chlorine gas at one of the electrodes. The amount of products formed can be calculated by using mole concept.
i. The total number of moles of chlorine gas evolved is :
a.0.5 b. 1.0 c.1.5 d.1.9
ii. If cathode is a Hg electrode, then the maximum weight of amalgam formed from this solution is:
a.300g b.446g c.396g d.296g
iii. Calculate chemical equivalent value of Silver.
iv. Predict the products of electrolysis of aq. $CuCl_2$.

v. What is the use of platinum foil in the hydrogen electrode?

UNIT-IV (CHEMICAL KINETICS)

Q1. Read the following questions and tick the correct options.

i. In chemical equation H_2 (g) + I_2 (g) ⇌ 2HI (g) the equilibrium constant K_p depends on

a. total pressure b. catalyst used c. amount of H_2 and I_2 d. temperature

ii. If the rate of a reaction is expressed by, rate = K $[A]^2$ [B], the order of reaction will be:

a. 2 b. 3 c. 1 d. 0

iii. For a reaction nx + y → z the rate of reaction becomes twenty-seven times when the concentration of X is increased three times. What is the order of the reaction?

a. 2 b. 1 c. 3 d. 0

iv. The rate constant of a reaction depends upon:

a. temperature of the reaction b. extent of the reaction

c. initial concentration of the reactants d. the time of completion of reaction

v. The chemical reaction, $2O_3 \rightarrow 3O_2$ proceeds as:

$O_3 \rightleftharpoons O_2 + |O|$ (fast)

$|O| + O_3 \rightarrow 2O_2$ (slow)

The rate law expression will be:

a. Rate = k [O] $[O_3]$ b. Rate = k $[O_3]^2$ $[O_2]^{-1}$

c. Rate = k $[O_3]^2$ d. Rate = k $[O_2]$ [O]

Q2. In the following questions, a statement of assertion (A) followed by statement of reason(R) is given. Choose the correct answer out of the following choices.

a. Both assertion and reason are correct and reason is the correct explanation of assertion.

b. Both assertion and reason are correct but reason is not a correct explanation of the assertion.

c. Assertion is correct but reason is incorrect.

d. Assertion is incorrect but reason is correct.

i. **Assertion**: Order of the reaction can be zero or fractional.

Reason: We cannot determine order from a balanced chemical equation.

ii. **Assertion**: Order and molecularity are same.

Reason: Order is determined experimentally and molecularity is the sum of the Stoichiometric coefficient of rate determining elementary step.

Q3. Which of the following analogies is correct?

i. $2NH_3 \rightarrow N_2 + 3H_2$ (presence of platinum catalyst)

a. Order of reaction:2 :: Molecularity : 2 b. Order of reaction : 0 :: Molecularity : 2

c. Order of reaction :1 :: Molecularity : 1 d. Order of reaction :0 :: Molecularity : 0

ii. $CH_3COOC_2H_5 + H_2O \longrightarrow CH_3COOH + C_2H_5OH$

a. Order of reaction : 1 :: molecularity : 2 b. Order of reaction : 1 :: molecularity : 1

c. Order of reaction :2 :: molecularity : 2 d. Order of reaction :2 :: molecularity : 1

Q4. Answer the following questions.

i. Express the rate of the following reaction in terms of the formation of ammonia:

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

ii. Define the following terms:

a. Order of a reaction b. Pseudo first order reaction

c. Half-life period of reaction ($t_{1/2}$)

iii. Distinguish between 'rate expression' and 'rate constant' of a reaction.

iv. Rate constant k for a first order reaction has been found to be 2.54×10^{-3} sec^{-1}. Calculate its $3/4^{th}$ life, (log 4 = 0.6020).

v. A first order gas phase reaction: $A_2B_2(g) \rightarrow 2A(g) + 2B(g)$ at the temperature 400°C has the rate constant k = 2.0×10^{-4} sec^{-1}. What percentage of A_2B_2 is decomposed on heating for 900

seconds? (Antilog 0.0781 = 1.197)

vi. A first order reaction has a rate constant of 0.0051 min^{-1}. If we begin with 0.10 M concentration of the reactant, what concentration of reactant will remain in solution after 3 hours?

vii. For a decomposition reaction the values of rate constant k at two different temperatures are given below:

$k_1 = 2.15 \times 10^{-8}$ L mol^{-1} s^{-1} at 650 K

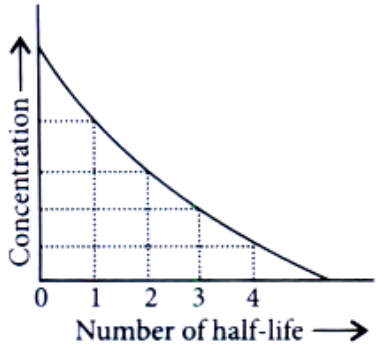
$k_2 = 2.39 \times 10^{-7}$ L mol^{-1} s^{-1} at 700 K

Calculate the value of activation energy for this reaction.

(R = 8.314 J K^{-1} mol^{-1})

Q5. Read the passage given below and answer the questions that follow.

The half-life of a reaction is the time required for the concentration of reactant to decrease by half, i.e., For first order reaction,$t_{1/2}$=0.693/k, this means $t_{1/2}$ is independent of initial concentration. Figure shows that typical variation of concentration of reactant exhibiting first order kinetics. It may be noted that though the major portion of the first order kinetics may be over in a finite time, but the reaction will never cease as the concentration of reactant will be zero only at infinite time. The following questions are multiple choice questions. Choose the most appropriate answer**:**



i. A first order reaction has a rate constant k = 3.01 x 10^{-3} is. How long it will take to decompose half of the reactant?

a. 2.303 s b. 23.03 s c. 230.3 s d. 2303 s

ii. The rate constant for a first order reaction is 7.0x 10^{-4} s^{-1}. If initial concentration of reactant is 0.080 M, what is the half-life of reaction?

a . 990 s b. 79.2 s c. 12375 s d. 10.10 x 10^{-4}s

iii. For the half-life period of a first order reaction, which one of the following statements is generally false?

a. It is independent of initial concentration.

b. It is independent of temperature.

c. It decreases with the introduction of a catalyst.

d. It increases with increase of temperature

iv. The rate of a first order reaction is 0.04 mol L^{-1} s^{-1} at 10 minutes and 0.03 mol L^{-1} s^{-1} at 20 minutes after initiation. Calculate the half life of the reaction .

v. Write the relation between initial concentration of reactant and half life period of a zero order reaction.

UNIT-VIII (d & f- BLOCK ELEMENTS)

Q1. Read the following questions and tick the correct option:

i. Lanthanoid contraction is due to increase in:

a. atomic number b. effective nuclear charge

c. atomic radius d. valence electrons

ii. The number of unpaired electrons in gaseous species of Mn^{3+}, Cr^{3+} and V^{3+} respectively are and

the most stable species is:

a. 4, 3 and 2; V^{3+} b. 3, 3 and 2; Cr^{3+}

c. 4, 3 and 2; Cr^{3+} d. 3, 3 and 3; Mn^{3+}

iii. Fe^{3+} ion is more stable than Fe^{2+} ion because:

a. more the charge on the atom, more is its stability

b. configuration of Fe^{2+} is $3d^5$ while Fe^{3+} is $3d^5$

c. Fe^{2+} has a larger size than Fe^{3+}

d. Fe^{3+} ions are coloured hence more stable

iv. Which one of the following is called green vitriol?

a. $FeSO_4 .7H_2O$ b. $CuSO_4.5H_2O$ c. $CaSO_4.2H_2O$ d. $CaSO_4$

v. Colour of transition metal ions are due to absorption of some wavelength. This results in

a. d-s transition b. s-s transition c. s-p transition d. d-d transition

Q2. In the following questions, a statement of assertion (A) followed by statement of reason(R) is given. Choose the correct answer out of the following choices:

a. Both assertion and reason are correct and reason is the correct explanation of assertion.

b. Both assertion and reason are correct but reason is not a correct explanation of the assertion.

c. Assertion is correct but reason is incorrect.

d. Assertion is incorrect but reason is correct.

i. **Assertion:** Cuprous ion (Cu^+) has unpaired electrons while cupric ion (Cu^{++}) does not.

Reason: Cuprous ion (Cu^+) is colourless whereas cupric ion (Cu^{++}) is blue in the aqueous solution.

ii. **Assertion:** Transition metals show variable valency.

Reason: Transition metals have a large energy difference between the ns^2 and (n – 1)d electrons.

Q3. i. **Which of the following analogies is correct?**

a. Transition elements : Paramagnetic :: Transition Elements : High enthalpy Of atomization

b. Transition elements : Diamagnetic :: Transition Elements : Form coloured compounds

c. Transition elements : Paramagnetic :: Transition Elements : Colourless

d. Transition elements :Colourless :: Transition Elements : Low enthalpy of atomization

ii. **Complete the following analogy**.

Brass:A ::Bronze :B

a. A : Cu & Zn :: B : Cu & Sn b. A : Cu & Sn :: B : Cu &Zn

c. A : Cu & Fe :: B : Cu &Zn d. A : Cu & Zn :: B : Cu &Fe

Q4. Answer the following questions.

i. Which metal in the first transition series exhibits a +1 oxidation state most frequently and why?

ii. How does the colour of $Cr_2O_7^{2-}$ change when treated with an alkali?

iii. Give reasons for the following statements:

a. Transition metals and their compounds are generally found to be good catalysts.

b. Metal-metal bonding is more frequent for the 4d and the 5d series of transition

c. Actinoid contraction is greater than lanthanoid contraction.

d. The E^θ value for the Mn^{3+}/Mn^{2+} couple is much more positive than that for Cr^{3+}/Cr^{2+} or Fe^{3+}/Fe^{2+}.

e. Transition elements exhibit higher enthalpies of atomization.

f. Out of Sc^{3+}, Co^{2+}, and Cr^{3+} ions, only Sc^{3+} is colourless in aqueous solutions. (Atomic no.: Co = 27; Sc = 21 and Cr = 24)

g. The $E°_{Cu^{2+}/Cu}$ for copper metal is positive (+0.34), unlike the remaining members of the first transition series

h. $La(OH)_3$ is more basic than $Lu(OH)_3$.

iv. Complete the following chemical equations:

a. $Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \longrightarrow$

b. $2CrO_4^{2-} + 2H^+ \longrightarrow$

c. $2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \longrightarrow$

Q5. Read the passage given below and answer the questions that follow.

The f-block elements are those in which the differentiating electrons enters the (n-2)f orbitals. There are two series of f-Block elements corresponding to filling of 4f and 5f-orbitals. The series of 4f-orbitals is called lanthanides. Lanthanides show different oxidation states depending upon stability of f^0, f^7 and f^{14} configurations, though the most common oxidation states are +3. There is a regular decrease in the size of lanthanides ions with increase in atomic number which is known as lanthanides contraction.

The following questions are multiple choice question. Choose the most appropriate answer:

i. The atomic number of three lanthanides elements X, Y and Z are 65, 68 and 70 respectively, their Ln^{3+} electronic configuration is:

a. $4f^8, 4f^{11}, 4f^{13}$ b. $4f^{11}, 4f^8, 4f^{13}$ c. $4f^0, 4f^2, 4f^{11}$ d. $4f^3, 4f^7, 4f^9$

ii. lanthanoide contraction is observed in:

a. Gd b. At c. Xe d. Te

iii. Write general electronic configuration of lanthanoids.

iv. Can lanthanum ion (Z=57) exist in +4 oxidation state?

v. Why is Europium (II) more stable than Cerium(II)?

UNIT-IX (COORDINATION COMPOUNDS)

Q1. Read the following questions and tick the correct option.

i. The number of possible isomers for the complex:
$[Co(C_2O_4)_2 (NH_3)_2]$ is:

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

ii. The oxidation state of nickel in $[(Ni(CO_4)]$ is:

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

iii. According to Werner's theory of coordination compounds:

a. Primary valency is ionisable.

b. Secondary valency is ionisable.

c. Primary and secondary valencies are ionisable.

d. Neither primary nor secondary valency is ionisable.

iv. Ammonia acts as a very good ligand but ammonium ion does not form complexes because:

a. NH_3 is a gas while $NH_4^+$is in liquid form.

b. NH_3 undergoes sp^3 hybridisation while NH_4^+ undergoes sp^3d hybridisation.

c. NH_4^+ion does not have any lone pair of electrons.

d. NH_4^+ion has one unpaired electron while NH_3 has two unpaired electrons.

v. The ligand $N(CH_2CH_2NH_2)$ is:

a. bidentate b. tridentate c. tetradentate d. pentadentate

Q2. In the following questions, a statement of assertion (A) followed by statement of reason(R) is given. Choose the correct answer out of the following choices.

a. Both assertion and reason are correct and reason is the correct explanation of assertion.

b. Both assertion and reason are correct but reason is not a correct explanation of the assertion.

c. Assertion is correct but reason is incorrect.

d. Assertion is incorrect but reason is correct.

i. **Assertion**: Toxic metal ions are removed by the chelating ligands.
Reason: Chelate complexes tend to be more stable.

ii. **Assertion**: $[Cr(H_2O)_6]Cl_2$ and $[Fe(H_2O)_6]Cl_2$ are reducing in nature.
Reason: Unpaired electrons are present in their d-orbitals.

Q3. Which of the following analogies is correct?

i. a.$[CoF_6]^{3-}$: sp^3d^2 :: $[NiCl_4]^{2-}$: sp^3
b.$[CoF_6]^{3-}$: d^2sp^3 :: $[NiCl_4]^{2-}$: sp^3
c.$[CoF_6]^{3-}$: sp^3d^3:: $[NiCl_4]^{2-}$: dsp^2
d.$[CoF_6]^{3-}$: sp^3d:: $[NiCl_4]^{2-}$: sp

ii. a. $[CoBr(NH_3)_5]SO_4$: Ionisation isomers :: $[Co(H_2O)_6]Cl_3$:Hydrate isomers
b.$[CoBr(NH_3)_5]SO_4$: Linkage isomers :: $[Co(H_2O)_6]Cl_3$:Hydrate isomers
c. $[CoBr(NH_3)_5]SO_4$: Hydrate isomers :: $[Co(H_2O)_6]Cl_3$:Linkage isomers
d. $[CoBr(NH_3)_5]SO_4$: Hydrate isomers :: $[Co(H_2O)_6]Cl_3$: Ionisation isomers

Q4. Answer the following questions.

i. A coordination compound $CrCl.4H_2O$ precipitates silver chloride when treated with silver nitrate. Why?
ii. The molar conductance of its solution corresponds to a total of two ions. Write the structural formula of the compound and name it.
iii. On the basis of crystal field theory explains why Co (III) forms a paramagnetic octahedral complex with weak field ligands whereas it forms a diamagnetic octahedral complex with strong field ligands.Why?
iv. Give the electronic configuration of the following complexes on the basis of Crystal Field Splitting theory:
$[CoF_6]^{3-}$, $[Fe(CN)_6]^{4-}$ and $[Cu(NH_3)_6]^{2+}$.
v. $CuSO_4.5H_2O$ is blue in colour while $CuSO_4$ is colourless. Why?
vi. Give IUPAC name of ionization isomer of $[Ni(NH_3)_3NO_3]Cl$.
vii. Using crystal field theory, draw an energy level diagram, write electronic configuration of the central metal atom/ion and determine the magnetic moment value in the following:
a. $[CoF_6]^{3-}$, $[Co(H_2O)_6]^{2+}$, $[Co(CN)_6]^{3-}$
b. $[FeF_6]^{3-}$, $[Fe(H_2O)_6]^{2+}$, $[Fe(CN)_6]^{4-}$

Q5. Read the passage given below and answer the following questions.

Coordination compounds are formulated and named according to the IUPAC system.
There are few rules for naming coordination compounds. In ionic complex, the cation is named first and then the name of the anion will be done. In the coordination entity, the ligands are named first and then the central metal ion. When more than one type of ligands are present, they are named in alphabetical order of preference with any consideration of charge.

The following questions are multiple choice question. Choose the most appropriate answer:

i. The IUPAC name of $[Ni(CO)_4]$ is:
a. tetra carbonyl nickel(II) b. tetra carbonyl nickel(0)
c. tetra carbonyl nickelate (II) d. tetra carbonyl nickelate(0)

ii. The IUPAC name of the complex $[Pt(NH_3)_3Br(NO_2)Cl]Cl$ is:
a. Triamminechlorobromonitro platinum(IV) chloride
b. Triamminebromonitrochloro platinum(IV) chloride
c. Triamminebromidochloronitro platinum(IV) chloride
d. Ttriamminenitrochlorobromo platinum(IV) chloride

iii. Write hybridisation and shape of the complex $[Co(H_2O)_6]Cl_3$.
iv. Predict the magnetic nature of tris-(ethane-1,2-diamine)cobalt(III) ion.
v. Correct formula of pentaamminenitrito-O-cobalt(III) sulphate

UNIT- X (HALOALKANES AND HALOARENES)

Q1. Read the questions and tick the correct option.

i. Which of the following possesses highest melting point?

a. Chlorobenzene
b. o-Dichlorobenzene
c. m-Dichlorobenzene
d. p-Dichlorobenzene.

ii. Which of the following sequence of reactions (reagents) can be used for conversion of $C_6H_5CH_2CH_3$ into $C_6H_5CH{=}CH_2$?

a. $SOCl_2$; H_2O
b. SO_2Cl_2; alc. KOH
c. Cl_2/hv; H_2O
d. $SOCl_2$; alc. KOH

iii. Alkyl halides are immiscible in water though they are polar because:

a. they react with water to give alcohols.
b. they cannot form hydrogen bonds with water.
c. C -X bond cannot be broken easily.
d. they are stable compounds and are not reactive.

iv. The organic chloro compound, which shows complete stereochemical inversion during a S_N^2 reaction, is:

a. CH_3Cl
b. $(C_2H_5)_2CHCl$
c. $(CH_3)_3CCl$
d. $(CH_3)_2CHCl$

v. Reaction of trans-2-phenyl-1-bromocyclo pentane on reaction with alcoholic KOH produces:

a. 4-phenylcyclopentane
b. 2-phenylcyclopentene
c. 1-phenylcyclopentene
d. 3-phenylcyclopentene

Q2. In the following questions, a statement of assertion (A) followed by statement of reason(R) is given. Choose the correct answer out of the following choices.

a. Both assertion and reason are correct and reason is the correct explanation of assertion.
b. Both assertion and reason are correct but reason is not a correct explanation of the assertion.
c. Assertion is correct but reason is incorrect.
d. Assertion is incorrect but reason is correct.

i. **Assertion**: Phosphorous chlorides are preferred over thionyl chloride for the preparation of alkyl chlorides from alcohol.
Reason: Phosphorous chlorides give pure alkyl halides.

ii. **Assertion**: Aryl halides undergo nucleophilic substitution reactions with use.
Reason: The carbon halogen bond in aryl halides has partial double bond character.

iii. **Assertion**: Presence of Nitro group at ortho and para position increases the reactivity of haloarenes towards nucleophilic substitution.
Reason: Nitro group being an electron withdrawing group decreases the electron density over the benzene ring.

Q3. i. **Which of the analogies is incorrect?**

a. Swartz reaction : R-X, AgF , dry ether :: Finkelstein reaction: R-Br, KI, Acetone, heat
b. SN^1 mechanism : Inversion :: SN2 mechanism : Racemisation
c. Wurtz reaction: Alkane :: Fittig reaction: Biphenyl
d. Saytzeff rule : Dehydrohalogenation :: Kharasch effect : Presence of peroxide

ii. **Complete the following analogy.**

Antiseptic for wounds : A :: Refrigerant : B

a. A : CHI_3 :: B : CF_2Cl_2
b. A: CCl_4 :: B : CF_2Cl_2
c. A : CF_2Cl_2 :: B : CHI_3
d. A : CHI_3 :: B : CCl_4

Q4. Answer the following Questions.

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

ii. Account for the following:

a. Iodination of benzene is carried out in the presence of HIO_3 or HNO_3.
b. Benzylic halides and allylic halides are more reactive towards nucleophile than halo alkanes.

iii. An organic compound 'A' having molecular formula C_4H_8 on treatment with dil. H_2SO_4, gives 'B'. 'B' on treatment with conc. HCI and anhydrous $ZnCl_2$, gives 'C' and on treatment with sodium ethoxide gives back 'A'. Identify the compounds 'A', 'B' and 'C' and write the equations involved.

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

v. How do you convert the following:
a. Chlorobenzene to Biphenyl
b. Propene to 1-lodopropane
c. Propene toPropan-2-ol
d. 1-Bromo propane to 2-Bromo propane

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

vii. What happens when:
a. n-butyl chloride is treated with alcoholic KOH.
b. bromobenzene is treated with Mg in the presence of dry ether.
c. chlorobenzene is subjected to hydrolysis.
d. ethyl chloride is treated with aqueous KOH.
e. methyl bromide is treated with Na in the presence of dry ether.

viii. Give the products and explain the mechanisms of the following reactions:
a. $CH_3\ CH_2\ Br + OH^- \longrightarrow$
b. $(CH_3)_3C\text{-}Br + OH^- \longrightarrow$
c. n-BuBr + KOH $\longrightarrow$

Q5. Read the passage given below and answer the following questions.

An alkyl halide with β hydrogen atoms when reacted with a base or a nucleophile has two competing routes: Substitution (S_N1 and S_N2) and elimination. Which route will be taken up depends upon the nature of the alkyl halide, strength and size of the base/nucleophile and reaction conditions, Thus, bulkier nucleophile prefers to act as a base and abstracts a proton rather than approaching a tetravalent carbon atom (steric reasons) and vice-versa.

i. Isopropyl bromide on heating with concentrated solution of alcoholic (ethanolic) KOH predominantly gives:
a. Propene
b. Propan-2-ol
c. Propan-1-ol
d. Isopropyl ethyl ether

ii. 2-Bromopropane is separately heated with aq. CH_3CO_2Na or with CH_3CH_2ONa/ CH_3CH_2OH, the major product obtained in each case respectively are:
a. Propene, isopropyl ethyl ether
b. Isopropyl acetate, propene
c. Isopropyl acetate, isopropyl ethyl ether
d. Propene in both the cases

iii. 2-Bromopentane is heated with potassium ethoxide in ethanol. The major product obtained is:
a. 2-Ethoxypentane
b. Pentene-1
c. cis-Pentene-2
d. trans-Pentene-2

UNIT-XI (ALCOHOLS, PHENOLS AND ETHERS)

Q1. Read the questions and tick the correct option.

i. Phenyl magnesium bromide reacts with methanol to give:
a. a mixture of anisole and Mg(OH)Br
b. a mixture of benzene and Mg(OH)Br
c. a mixture of toluene and Mg(OH)Br
d. a mixture of phenol and Mg(OH)Br

ii. The major product formed when 3, 3 dimethylbutan-2-ol is heated with concentrated sulphuric acid is _____.

a. 2, 3-dimethyl-2-butene
b. 2, 3-dimethyl-1-butene
c. cis- and trans-isomers of 2,3-dimethyl-1,1- butene
d. cis- and trans-isomers of 3,3-dimethyl-2 butene

iii. The most suitable reagent for the conversion of primary alcohol into aldehyde with the same number of carbon atoms is:
a. acidified $K_2Cr_2O_7$ b. alkaline $KMnO_4$
c. pyridinium chlorochromate d. CrO_3

iv. Williamson synthesis in an example of _____.
a. Nucleophilic addition b. Electrophilic addition
c. Electrophilic substitution d. Nucleophilic substitution reaction

v. An ether is more volatile than alcohol having the same molecular formula. This is due to:
a. intermolecular hydrogen bonding in alcohols
b. dipolar character of ethers
c. alcohols having resonance structures
d. intermolecular hydrogen bonding in ethers

Q2. In the following questions, a statement of assertion (A) followed by statement of reason(R) is given. Choose the correct answer out of the following choices.

a. Both assertion and reason are correct and reason is the correct explanation of assertion.
b. Both assertion and reason are correct but reason is not a correct explanation of the assertion.
c. Assertion is correct but reason is incorrect.
d. Assertion is incorrect but reason is correct.

i. **Assertion**: In Lucas test, 3° alcohols react immediately.
Reason: An equimolar mixture of anhydrous $ZnCl_2$ and conc. HCl is called Lucas reagent.

ii. **Assertion**: p-nitrophenol is more acidic than phenol.
Reason: Nitro group helps in the stabilization of the phenoxide ion by dispersal of negative charge due to resonance.

Q3. i. **Which of the analogies is incorrect?**
"Alcohols can be prepared by the reduction of the corresponding carbonyl compound."
a. $CH_3CHO : CH_3CH_2OH :: CH_3COCH_3 : CH_3CH(OH)CH_3$
b. $CH_3CHO : CH_3OH :: CH_3COCH_3 : CH_3CH_2OH$
c. $CH_3CH_2CHO : CH_3CH(OH)CH_3 :: CH_3CHO : CH_3CH_2OH$
d. $HCHO : CH_3OH :: CH_3COCH_3 : CH_3CH_2OH$
Which of the analogies is incorrect?

ii. For Kolbe's reaction, complete the following analogy where A is the product for step 1 and B is the product for step 2.
C_6H_5OH : A :: A : B
a. A : Phenoxide :: B: Salicylaldehyde b. A : Phenoxide :: B : Benzaldehyde
c. A : Phenoxide :: B: Salicylic acid d. A : Phenoxide :: B : Benzoic acid

Q4. Answer the following questions.

i. 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'. What is 'B' known as?

ii. Give one chemical test each to distinguish between the following pairs of compounds:
a. Phenol and Benzoic acid b. 1-Propanol and 2-Propanol

iii. How would you obtain:
a. Picric acid (2, 4, 6-trinitrophenol) from phenol
b. 2-Methylpropene from 2-methylpropanol?

iv. Give reasons for the following:

a. Phenol is more acidic than methanol.

b. The C-O-H bond angle in alcohols is slightly less than the tetrahedral angle (109°28').

c. $(CH_3)_3C\text{-}O\text{-}CH_3$ on reaction with HI gives $(CH_3)_3C\text{-}I$ and $CH_3\text{-}OH$ as the main products and not $(CH_3)_3C\text{-}OH$ and $CH_3\text{-}I$.

d. The boiling points of alcohols decrease with increase in branching of the alkyl chain.

e. Phenol does not give protonation reaction readily.

f. Phenylmethyl ether reacts with HI to give Phenol and Methyl iodide and not Iodobenzene and Methyl alcohol.

v. Write the mechanism of the following reactions:

a. $CH_3CH_2OH + HBr \rightarrow CH_3CH_2Br + H_2O$

b. Preparation of alcohols from alkenes. (Acid catalysed hydration).

vi. Write the equation involved in Reimer-Tiemann reaction.

vii. Name the reagents used in the following reactions:

a. Benzyl alcohol to benzoic acid.

b. Dehydration of propan-2-ol to propene.

c. Butan-2-one to butan-2-ol.

d. Bromination of phenol to 2,4,6-tribromophenol.

e. Butan-2-one to Butan-2-ol.

f. Friedel-Crafts alkylation of anisole.

g. Oxidation of primary alcohol to carboxylic acid.

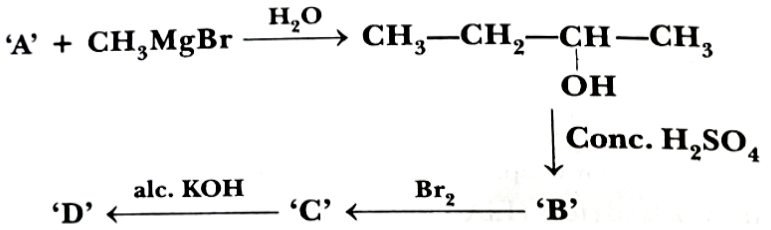
viii. How are the following obtained?

a.Toluene from phenol b.Phenol from aniline.

ix. Write IUPAC name of the following:

$CH_3\text{-}C(CH_3)=C(Br)\text{-}CH_2OH$

x. Write the structural formulae of the organic compounds 'A', 'B', 'C' and 'D' in the following sequence of reactions:



Q5. Read the passage given below and answer the following questions.

Both symmetrical and unsymmetrical ethers can by prepared by Williamson synthesis which involves the reaction between an alkyl halide and an alkoxide ion. The reaction occurs by S_N2 mechanism. Therefore, for good yields of ethers, the alkyl halide must be primary while the alkoxide may be derived from 1°, 2° or 3° alcohols. Since 2° and 3° alkyl halides prefer to undergo elimination rather than substitution reactions, therefore, they are not suitable starting materials in Williamson synthesis. Likewise, vinyl and aryl halides being unreactive do not undergo Williamson synthesis. The reverse process involving the cleavage of ethers to give back the original alkyl halide and the alcohol can be carried out by heating the ether with HI at 373 K. If one group is methyl and the other is a 1° or a 2° alkyl group, the reaction occurs by S_N2 mechanism. Because of steric hindrance, the I ion attacks the smaller alkyl group leading to the formation of alkyl iodide and the alcohol derived from the bulkier alkyl group. If, however, one group is methyl and the other is a tert-alkyl group, the reaction occurs by S_N1 mechanism and the alkyl halide is derived from the more stable carbocation.

i. Which of the following reagents when heated will give a good yield of an ether?

a. Isopropyl bromide and sodium iso-propoxide

b. Isopropyl bromide and sodium ethoxide

c. Bromobenzene and sodium phenoxide

d. Sodium tert-butoxide and ethyl bromide

ii. Which of the following ethers can be prepared by Williamson synthesis?

a. Benzyl methyl ether b. Methyl vinyl ether

c. Divinyl ether d. Diphenyl ether

iii. How can allyl phenyl ether be prepared?

iv. Name the product form when benzyl ethyl ether reacts with HI.

v. What are the limitations of Williamson's ether synthesis?

UNIT- XII (ALDEHYDES, KETONE AND CARBOXYLIC ACIDS)

Q1. Read the questions and tick the correct option.

i. Which of the following combination of aldehydes gives cross Cannizzaro reaction?

a. CH_3CHO, HCHO b. C_6H_5CHO, CH_3CHO

c. C_6H_5CHO, HCHO d. all of these

ii. $(CH_3)_2C=CHCOCH_3$ can be oxidised to $(CH_3)_2C=CHCOOH$ by:

a. Chromic acid b. NaOI

c. Cu at 300°C d. KMnO4

iii. The increasing order of the rate of HCN addition to compounds, A–D is:

A: HCHO; B: CH_3COCH_3; C: $PhCOCH_3$ and D: PhCOPh

a. A < B < C < D b. D<B<C<A

c. D<C<B<A d. C < D < B < A

iv. Which of the following presents the correct order of the acidity in the given compounds?

a. $FCH_2COOH > ClCH_2COOH > BrCH_2COOH > CH_3COOH$

b. $CH_3COOH > BrCH_2COOH > ClCH_2COOH > FCH_2COOH$

c. $FCH_2COOH > CH_3COOH > BrCH_2COOH > ClCH_2COOH$

d. $BrCH_2COOH > ClCH_2COOH > FCH_2COOH > CH_3COOH$

v. A liquid was mixed with ethanol and a drop of concentrated H_2SO_4 was added. A compound with a fruity smell was formed. The liquid was:

a. HCHO b. CH_3COCH_3

c. CH_3COOH d. CH_3OH

Q2. In the following questions, a statement of assertion (A) followed by statement of reason(R) is given. Choose the correct answer out of the following choices.

a. Both assertion and reason are correct and reason is the correct explanation of assertion.

b. Both assertion and reason are correct but reason is not a correct explanation of the assertion.

c. Assertion is correct but reason is incorrect.

d. Assertion is incorrect but reason is correct.

i. **Assertion:** Cannizzaro reaction is given by formaldehyde and benzaldehyde.

Reason: Both the compounds lack of α-hydrogen atom.

ii. **Assertion**: Carboxylic Acids undergo halogenation in presence of red phosphorus.

Reason: Formic acid and benzoic acid do not undergo halogenation in presence of red phosphorus.

Q3. For Hell-Volhard Zelinsky reaction, Identify the correct analogy where A and B are the reactants:

a. A: $R\text{-}CH_2OH$ :: B: R'COOH b. A: RCH_2COOH :: B: X_2/Red P

c. A: $RCOCH_3$ :: B: NaOX d. A: $R\text{-}CH_2OH$ :: B: X_2/Red P

Q4. Answer the following questions.

i. Account for the following statements.

a. Carboxylic acids do not give the characteristic reactions of carbonyl group.

b. Fluorine is more electronegative than chlorine but p-fluorobenzoic acid is a weaker

acid than p- chlorobenzoic acid.

c. Benzoic acid is a stronger acid than acetic acid.

d. Methanal is more reactive towards nucleophilic addition reaction than ethanal.

e. Aromatic carboxylic acids do not undergo Friedel-crafts reaction.

f. pk_a value of 4-nitrobenzoic acid is lower than that of benzoic acid.

ii. Write the equations involved in the following reactions:

a. Wolff-Kishner reduction b. Etard reaction.

iii. Give simple chemical tests to distinguish between the following pairs of compounds.

a. Propanal and Propanone b. Butanal and Butan-2-one c. Benzoic acid and Phenol.

iv. An aromatic compound 'A' on treatment with $CHCl_3$, and KOH gives two compounds, both of which give same product 'B' when distilled with zinc dust. Oxidation of B gives 'C' with molecular formula $C_7H_6O_2$. Sodium salt of 'C' on heating with soda lime gives 'D' which may also be obtained bydistilling 'A' with zinc dust. Identify A, B, C and D.

v. Write balanced chemical equations for the following reactions:

a. Thionyl chloride reacts with benzoic acid.

b. Acetic acid is reacted with red phosphorus and HI.

c. Acetic acid is treated with Zn metal.

vi. Write products when $(CH_3)_3C\text{-}CHO$ reacts with the following:

a. Zinc amalgam and dilute hydrochloric acid.

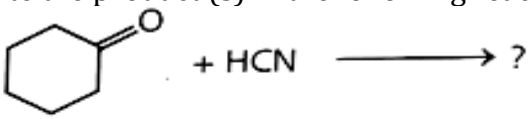
b. Concentrated sodium hydroxide solution.

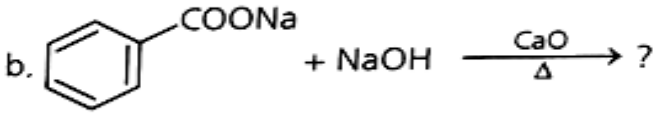
c. Semicarbazide and a weak acid.

vii. a. Give IUPAC name of salicylic acid and formic acid.

viii. A ketone 'A' (C_4H_8O) which undergoes a haloform reaction gives compound 'B' on reduction. 'B' on heating with sulphuric acid gives a compound 'C' which forms mono-ozonide 'D'. 'D' on hydrolysis with Zn dust gives only 'E' identify 'A' to 'E'. Write the reactions involved.

ix. Write the product (s) in the following reactions:

a. 

b. 

c. $CH_3CH = CH—CN \xrightarrow[\text{(ii) } H_2O]{\text{(i) DIBAL-H}} ?$

x. How will you prepare the following compounds starting with benzene?

a. Benzaldehyde b. Acetophenone

xi. How will you bring about the following conversions?

a. Propanone to propene b. Ethanol to 3- hydroxy butanal

c. Benzaldehyde to benzophenone

Q5. Read the passage given below and answer the following questions.

Due to electronegativity difference between carbon and oxygen atoms, the C=O group undergoes nucleophilic addition reactions which are governed by electrophilicity of the carbonyl carbon and the steric hindrance in the transition state. Further, since the a-hydrogens of aldehydes and ketones are weakly acidic, they readily form enolate ions on treatment with dilute aqueous bases. These enolate ions, in turn, can participate in nucleophilic addition reactions leading to the formation of aldols which subsequently undergo acid-catalysed dehydration to form a, B unsaturated carbonyl compounds. Cross aldol condensations between two aldehydes is not of any synthetic utility unless one of the aldehydes does not contain α-hydrogen/s. If one 124 of the aldehydes used is benzaldehyde, the initially formed aldol undergoes dehydration, in situ, to form a, β-unsaturated carbonyl compounds. Aldehydes which do not contain a hydrogen/s can add a hydroxide ion to form an anion which acts as a hydride donor to another molecule of the same

aldehyde giving a mixture of an alcohol and the corresponding carboxylate ion. Such self oxidation-reduction or disproportionation reactions between two different aldehydes, one of which is always formaldehyde, leads to oxidation of formaldehyde and reduction of the other aldehyde.

i. The correct order of increasing reactivity towards nucleophilic addition reactions is:
   a. benzaldehyde <p-tolualdehyde< acetophenone <p-nitrobenzaldehyde
   b. acetophenone <p-tolualdehyde<benzaldehyde <p-nitrobenzaldehyde
   c. benzaldehyde < acetophenone <p-nitrobenzaldehyde< p-tolualdehyde
   d. p-nitrobenzaldehyde<p-tolualdehyde< acetophenone < benzaldehyde

ii. The least reactive compound towards nucleophilic addition reactions is:
   a. Propanone b. 3-Pentanone
   c. 2-Pentanone d. 2, 4-Dimethylpentan-3-one

iii. Aldol condensation between which of the following two compounds followed by dehydration gives methyl vinyl ketone?
   a. Formaldehyde and acetone b. Formaldehyde and acetaldehyde
   c. Two molecules of acetaldehyde d. Two molecules of acetone

UNIT-XIII (AMINES)

Q1. Read the questions and tick the correct option.

i. $C_4H_{11}N$ on reaction HNO_2, forms a tertiary alcohol. Thus, $C_4H_{11}N$ is:
   a. primary amine b. secondary amine
   c. tertiary amine d. quaternary ammonium salt

ii. When aniline is heated with conc. H_2SO_4 at 455-475 K, it forms _____.
   a. Aniline hydrogen sulphate b. m-Aminobenzensulphonic acid
   c. Benzenesulphonic acid d. Sulphanilic acid.

iii. When ethylamine is treated with CH_3MgBr, the product is:
   a. CH_3CH_3 b. CH_4
   c. $CH_3CH_2CH_3$ d. $CH_3CH_2CH_2CH_3$

iv. Which of the following will give N_2 gas on treatment with nitrous acid ($NaNO_2$ + HCl)?
   a. $C_2H_5NH_2$ b. CH_3NH_2
   c. $(CH_3)_2CH\text{-}NH_2$ d. All will give N_2

v. Which of the following statements is true?
   a. Trimethylamine forms a soluble compound with Hinsberg's reagent and KOH.
   b. Dimethylamine reacts with KOH and phenol to form an azo dye.
   c. Methylamine reacts with nitrous acid and liberates N2 from aqueous solution.
   d. Methylamine is less basic than dimethylamine.

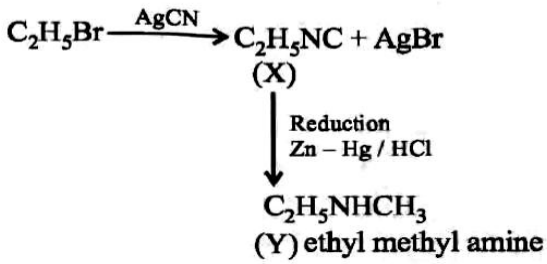
Q2. In the following questions, a statement of assertion (A) followed by statement of reason(R) is given. Choose the correct answer out of the following choices.

a. Both assertion and reason are correct and reason is the correct explanation of assertion.
b. Both assertion and reason are correct but reason is not a correct explanation of the assertion.
c. Assertion is correct but reason is incorrect.
d. Assertion is incorrect but reason is correct.

i. **Assertion:** Hoffmann's bromamide reaction is given by primary amines.
   Reason: Primary amines are more basic than secondary amines.

ii. **Assertion:** Acetanilide is less basic than aniline.
   Reason: Acetylation of aniline results in the decrease of electron density of nitrogen.

iv. For the reaction sequence:



Q3. Which of the following analogies is correct?

a. X : Ethyl isocyanide :: Y : Ethylmethylamine b. X : Ethylamine :: Y : Isopropylamine
c. X : Ethyl isocyanide :: Y : Ethylamine d. X : Isopropylamine :: n-propylamine

Q4. Answer the following questions.

i. Arrange the following in increasing order of basic character:
a. $C_6H_5NH_2$, CH_3NH_2,$(C_2H_5)2NH$, $C_6H_5N(CH_3)_2$.
b. $C_2H_5NH_2$, $(C_2H_5)2NH$, $C_2H_5NH_2$, $C_6H_5NHCH_3$ in decreasing order of pK_b.

ii. Account for the following:
a. Methylamine in water reacts with ferric chloride to precipitate hydrated ferric oxide.
b. Diazonium salts of aromatic amines are more stable than those of aliphatic amines.
c. The amino group in aniline acts as a powerful activator and ortho and para director towards electrophilic substitution reaction.

iii. How will you convert the following:
a. Ethanamine into methanamine b. Aniline into 1, 3, 5-tribromobenzene
c. Aniline into 4-Bromoaniline d. Nitrobenzene to Phenol.
e. Aniline to Chlorobenzene.

iv. A primary amine, RNH_2 can be reacted with CH_3-X to get secondary amine. R-$NHCH_3$ but the only disadvantage is that tertiary amine and quaternary ammonium salts are also obtained as side products. Can you suggest a method where RNH_2 forms only 2° amine?

v. Distinguish between the following pairs of compounds:
a .Aniline and N-methyl aniline b. $(CH_3)_2NH$ and $(CH_3)_3N$

vi. What is Gabriel phthalimide synthesis? For what purpose is it used? Give equation to explain your answer.

vii. Two isomeric compounds A and B having molecular formula $C_4H_{11}N$ both lose N_2 on treatment with HNO_2, and gives compound C and D respectively. C is resistant to oxidation but immediately responds to Lucas reagent, whereas 'D' responds to Lucas reagent after 5 minutes and gives a positive iodoform test. Identify A and B.

viii. Illustrate the following reactions giving suitable example in each case:
a. Hoffmann's Bromamide degradation reaction b. Diazotization

ix. Write the structures of main products when benzene diazonium chloride ($C_6H_5N_2Cl$) reacts with the following reagents: a. HBF_4 /Δ b.Cu/HBr

x. Write the structures of A, B and C in the following reactions:

a. $C_6H_5NO_2 \xrightarrow{Sn/HCl} A \xrightarrow{NaNO_3+HCl} B \xrightarrow{H_2O} C$

b. $CH_3Cl \xrightarrow{KCN} A \xrightarrow{LiAlH4} B \xrightarrow{HNO_3\ at273K} C$

Q5. Read the passage given below and answer the following questions.

Amines are classified as primary, secondary and tertiary amines. Primary amines cannot be obtained by ammonolysis of alkyl halide because we will get mixture of 1°, 2° and 3° amines. Cyanides, on reduction give primary amines where as isocyanides on reduction give secondary amines. Nitro compounds, on reduction also give primary amines. Primary amines react with

$CHCl_3$ and KOH to form foul smelling isocyanide. They react with HNO_2 and liberate N_2 gas. They react with Hinsberg's reagent to form salt soluble in KOH. Secondary amine form yellow oily compounds with HNO_2 and salt formed with $C_6H_5SO_2Cl$, is insoluble in KOH. 3° amines form salt soluble in water with HNO_2 but does not react with $C_6H_5SO_2Cl$. Diazonium salts are prepared by reaction of Aniline with $NaNO_2$ and conc. HCl at 0–5°C. Aromatic diazonium salts are more stable because phenyl diazonium ion is stabilized by resonance. Benzene diazonium chloride can be used to prepare halo benzene, phenol, nitro benzene, benzene, *p*-hydroxy azo benzene (azo dye) and large number of useful compounds.

i. Acid anhydrides on reaction with primary amines give :

a. amide b. imide c. secondary amine d. imine

ii. The gas evolved when methyl amine reacts with nitrous acid is :

a. NH_2 b. N_2 c. H_2 d. C_2H_6.

iii. Write the isomer of C_3H_9N which does not react with Hinsberg reagent.

iv. CH_2NH_2, on heating with $CHCl_3$ and KOH gives 'X'. Identify 'X'.

v. Convert Aniline to phenol.

UNIT- XIV (BIOMOLECULES)

Q1. Read the questions and tick the correct option.

i. The deficiency of vitamin C causes _____.

a. Scurvy b. Rickets
c. Pyrrohea d. Pernicious anaemia.

ii. The term anomer of glucose refers to:

a. isomers of glucose that differ in configuration at carbons one and four (C-1 and C-4)
b. a mixture of (D)-glucose and (L)-glucose
c. enantiomers of glucose
d. isomers of glucose that differ in configuration

iii. The secondary structure of a protein refers to:

a. fixed configuration of the polypeptide backbone
b. a-helical backbone
c. hydrophobic interactions
d. sequence of a-amino acids

iv. If one strand of DNA has the sequence ATGCTTGA, the sequence in the complimentary strand would be:

a. TCCGAACT b. TACGTAGT
c. TACGAACT d. TAGCTAGT

v. Glucose does not react with:

a. NH_2OH b. $NaHSO_3$
c. $C_6H_5NHNH_2$ d. HCN

Q2. In the following questions, a statement of assertion (A) followed by statement of reason(R) is given. Choose the correct answer out of the following choices.

a. Both assertion and reason are correct and reason is the correct explanation of assertion.
b. Both assertion and reason are correct but reason is not a correct explanation of the assertion.
c. Assertion is correct but reason is incorrect.
d. Assertion is incorrect but reason is correct.

i. **Assertion**: D(+) - Glucose is dextrorotatory in nature.
Reason: 'D' represents its dextrorotatory nature.

ii. **Assertion:** Alpha amino acids exist as internal salt in solution as they have amino and carboxylic acid groups in near vicinity.
Reason: H+ ion given by carboxyl group is captured by amino group having lone pair of electrons.

Q3. i. **Which of the analogies is incorrect?**

a. Optically inactive amino acid : Glycine :: Optically active protein : Lysine
b. Essential amino acid : Lysine :: Non essential amino acid : Glycine
c. Basic amino acid : Aspartate :: Acidic amino acid : Histidine
d. Glucose : Pyranose :: Fructose : Furanose

ii. **Complete the following analogy.**

Linkage between two monosaccharide units : A :: Sugar-heterocyclic base combination : B

a. A : Glycosidic linkage :: B : Nucleotide
b. A : Peptide bond :: B : Nucleoside
c. A : Nucleoside :: B : Glycosidic linkage
d. A : Glycosidic linkage :: B : Nucleoside

Q4. Answer the following questions.

i. Fructose is a ketohexose but it is a reducing sugar. Why?
ii. Enumerate the reactions of glucose which cannot be explained by open structures.
iii. Distinguish between the following:
a. starch and cellulose
b. amylose and amylopectin
c. starch and Glycogen.
d. α helix and β sheet structuree. fibrous and globular protein
f. nucleoside and nucleotide
g. primary and secondary structure of protein
iv. Explain glycosidic linkage with an example.
v. What are enzymes? Explain the mechanism of enzyme catalysed reaction.
vi. What are nucleic acids? Mention the functions of nucleic acids.
vii. What is invert sugar? Why is it called so?
viii. Mention the sources of each vitaminA,C,D.E.K, B_1 B_2, B_6andB_{12}.Name the diseases caused due to the deficiency of each vitamin.
ix. Draw the Howarth structure of sucrose, maltose and lactose. Classify them as reducing or non reducing sugar. Justify your answer.

Q5. Read the passage given below and answer the following questions.

When a protein in its native form, is subjected to physical changes like change in temperature or chemical changes like change in pH, the hydrogen bonds are disturbed. Due to this, globules unfold and helix get uncoiled and protein loses its biological activity. This is called denaturation of protein. The denaturation causes change in secondary and tertiary structures but primary structures remains intact. Examples of denaturation of protein are coagulation of egg white on boiling, curding of milk, formation of cheese when an acid is added to milk.

i. Mark the wrong statement about denaturation of proteins.
a. The primary structure of the protein does not change.
b. Globular proteins are converted into fibrous proteins.
c. Fibrous proteins are converted into globular proteins.
d. The biological activity of the protein is destroyed.

ii. α-helix and β-pleated structures of proteins are classified as:
a. primary structure
b. secondary structures
c. tertiary structure
d. quaternary structure

iii. Cheese is a _____.
a. globular protein
b. conjugated protein
c. denatured protein
d. derived protein

iv. Secondary structure of protein refers to:
a. mainly denatured of proteins and structures of prosthetic groups.
b. three-dimensional structure, especially the bond between amino acid residues that are distant from each other in the polypeptide chain.
c. linear sequence of amino acid residues in the polypeptide chain.
d. regular folding patterns of continuous portions of the polypeptide chain.