DEHRADUN PUBLIC SCHOOL ASSIGNMENT (2023-24) **SUBJECT - CHEMISTRY (043) CLASS - XII**

UNIT-II (SOLUTION)

Multiple choice questions:

a. benzone + chloroform

- **01.** Which of the following does not show positive deviation from Raoult's law?
 - b. benzene + acetone
 - c . benzene + ethanol d. benzene + CCl₄
- **Q2.** 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
- Q3. 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.

Assertion – Reason type questions:

- 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.
- **Q4. Assertion:** Molarity of a solution in liquid state changes with temperature.
 - **Reason:** The volume of a solution changes with change in temperature.
- **05.** Assertion: If a more volatile liquid solute is added to the solvent, the vapour pressure of the solution may increase i.e. $p_s > p_0$.
 - **Reason:** In the presence of a more volatile liquid solute, only the solute will form the vapours and solvent will not.

Subjective type questions:

- Q6. State Raoult's law. How is it formulated for solutions of non-volatile solutes?
- **07.** State Henry's law and mention two of its important applications.
- **Q8.** 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)
- **Q9.** i. Derive expression for Raoult's law when the solute is non-volatile.
 - ii. Define osmotic pressure of a solution. How is the osmotic pressure related to the concentration of a solute in a solution?

Q10. Read the following passage 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. Density of 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. Calculate mole fraction of solute in one molal aqueous solution.

UNIT-III (ELECTROCHEMISTRY)

Multiple choice questions:

Q1. If limiting molar conductivity	of Ca ²⁺ and Cl ⁻ are 11	9.0 and 76.3 S cm ² m	ol ⁻¹ , then the value of
limiting molar conductivity of	f 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	
Q2. The reaction, $3ClO^{-}_{(aq)} \rightarrow ClO_{3}_{(aq)} + 2Cl^{-}_{(aq)}$ is an example of:			
a. Oxidation reaction		b. Disproportionatio	on reaction
c. Reduction reaction		d. Decomposition reaction	
Q3. The emf of the cell:			
Ni / Ni ²⁺ (1.0 M) Au ³⁺ (1.0 I	M) / Au		
(E° = -0.25 V for Ni ²⁺ /Ni; E° =	= 1.5 V for Au ³⁺ /Au)		
a. 1.25 V	b1.25 V	c. 1.75 V	d. 2.0 V
Assertion – Reason type questions:			

- 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.
- **Q4. Assertion:** The resistivity for a substance is its resistance when it is one meter long and its areaof cross section is one square meter.
 - **Reason:** The SI unit of resistivity is ohm metre.
- Q5. 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.

Subjective type questions:

- **Q6.** Express the relation between conductivity and molar conductivity of a solution held in a cell.
- **Q7.** 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?
- **Q8.** Write the name of the cell which is generally used in transistors. Write the reactions takingplace at the anode and the cathode of this cell.
- **Q9.** i. What is the effect of catalyst on?
 - a. Gibbs energy (Δ G) and b. activation energy of a reaction?
 - i. The chemistry of corrosion of iron is essentially an electrochemical phenomenon. Explain the reactions occurring during the corrosion of iron in the atmosphere.
 - ii. Two half-reactions of an electrochemical cell are given below :

Construct the redox equation from the standard potential of the cell and predict if the reaction is reactant favoured or product favoured.

Q10. Read the following passage 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.0.5b. 1.0c.1.5d.1.9ii. If cathode is a Hg electrode, then the maximum weight of amalgam formed from this solution is:
a.300gb.446gc.396gd.296giii. Calculate chemical equivalent value of Silver.

UNIT-IV (CHEMICAL KINETICS)

Multiple choice questions:

Q1. If the rate of a reaction is	expressed by, rat	$te = K [A]^2 [B]$, the orde	r of reaction will be:
a. 2	b. 3	c. 1	d. 0
Q2. For a reaction $nx + y \rightarrow zt$	he rate of reaction	on becomes twenty-sev	en times when the
concentration of X is incre	ased three times	. What is the order of t	he reaction?
a. 2	b. 1	c. 3	d. 0
Q3. The chemical reaction, $2O_3 \rightarrow 3O_2$ proceeds as:			
$O_3 \rightleftharpoons O_2 + O $ (fast)			
$ 0 + 0_3 \rightarrow 20_2 \text{ (slow)}$			
The rate law expression w	rill be:		
a. Rate = k [O] [O ₃]		b. Rate = k [C	$0_3]^2 [0_2]^{-1}$
c. Rate = k $[O_3]^2$		d. Rate = k [C	0 ₂] [0]

Assertion- Reason type questions:

- 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.
- **Q4.** Assertion: Order of the reaction can be zero or fractional.
- **Reason**: We cannot determine order from a balanced chemical equation.
- **Q5.** 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.

Subjective type questions:

- **Q6**. Rate constant k for a first order reaction has been found to be 2.54×10^{-3} sec⁻¹. Calculate its $3/4^{\text{th}}$ life, (log 4 = 0.6020).
- **Q7.** 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)
- **Q8.** 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 3hours?
- **Q9.** For a decomposition reaction the values of rate constant k at two different temperatures are given below:
 - $k_1 = 2.15 \times 10^{-8} \text{ L mol}^{-1} \text{ s}^{-1} \text{ at } 650 \text{ K}$

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

Calculate the value of activation energy for this reaction.(R = 8.314 J K⁻¹ mol⁻¹)

Q10. Read the following passage 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 $k = 3.01 \times 10^{-3}$ 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 10⁻⁴s 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.

UNIT-VIII (d & f- BLOCK ELEMENTS)

Multiple choice questions:

Q1. The number of unpaired electrons in gaseous species of Mn³⁺, Cr³⁺ and V³⁺ respectively are and the most stable species is:

- a. 4, 3 and 2; V³⁺ b. 3, 3 and 2; Cr³⁺ c. 4, 3 and 2; Cr³⁺ d. 3, 3 and 3; Mn³⁺
- **Q2.** Fe³⁺ ion is more stable than Fe²⁺ ion because:
 - a. more the charge on the atom, more is its stability
 - b. configuration of Fe²⁺ is $3d^5$ while Fe³⁺ is $3d^5$
 - c. Fe²⁺ has a larger size than Fe³⁺
 - d. Fe³⁺ ions are coloured hence more stable
- **Q3.** Which one of the following is called green vitriol?
 - b. CuSO₄.5H₂O a. FeSO₄ .7H₂O

Assertion – Reason type questions:

- 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.
- **Q4.** 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.
- **Q5.** Assertion: Transition metals show variable valency.

Reason: Transition metals have a large energy difference between the ns² and (n – 1)delectrons. Subjective type questions:

- **Q6.** Which metal in the first transition series exhibits a +1 oxidation state most frequently and why?
- **07.** How does the colour of $Cr_2O_7^{2-}$ change when treated with an alkali?
- **Q8.** 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
- CHEM/XII/ASGMT

Page 4 of 12

- c. $CaSO_4 H_2O$ d.CaSO₄

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.

Q9. Complete the following chemical equations:

a. Cr₂O₇²⁻ + 6Fe²⁺ + 14H⁺

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

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

Q10. Read the following passage 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 f⁰, f⁷ and f¹⁴ 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 questions. Choose the most appropriate answer:

i. The atomic number of three lanthanides elements X, Y and Z are 65, 68 and 70 respectively, their Ln³⁺ 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.	Те
iii	. Write general electronic co	nfiguration of lanthanoids.				

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

UNIT-IX (COORDINATION COMPOUNDS)

Multiple choice questions:

Q1. 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.

Q2. 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. NH₃ undergoes sp³ hybridisation while NH₄⁺ undergoes sp³d hybridisation.

- c. NH₄⁺ ion does not have any lone pair of electrons.
- d. NH₄⁺ ion has one unpaired electron while NH₃ has two unpaired electrons.
- **Q3.** The ligand $N(CH_2CH_2NH_2)$ is:

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

Assertion – Reason type questions:

- 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.
- **Q4. Assertion**: Toxic metal ions are removed by the chelating ligands.

Reason: Chelate complexes tend to be more stable.

Q5. 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.

Subjective type questions:

Q6. 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?

- **Q7.** Give the electronic configuration of the following complexes on the basis of Crystal Field Splitting theory: $[CoF_6]^{3-}$, $[Fe(CN)_6]^{4-}$ and $[Cu(NH_3)_6]^{2+}$.
- **O8.** CuSO₄.5H₂O is blue in colour while CuSO₄ is colourless. Why?
- **Q9.** 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. [CoF₆]³⁻, [Co(H₂O)₆]²⁺, [Co(CN)₆]³⁻ b. [FeF₆]³⁻, [Fe(H₂O)₆]²⁺, [Fe(CN)₆]⁴⁻

Q10. Read the following passage and answer the questions that follow:

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 questions. Choose the most appropriate answer: i. The IUPAC name of [Ni(CO)₄] is:

a. tetra carbonyl nickel(II)

b. tetra carbonyl nickel(0)

d. tetra carbonyl nickelate(0)

c. tetra carbonyl nickelate (II)

- ii. The IUPAC name of the complex [Pt(NH₃)₃Br(NO₂)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.

UNIT-X (HALOALKANES AND HALOARENES)

Multiple choice questions:

Q1. 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. SOCl₂; H₂O b. SO₂Cl₂; alc. KOH d. SOCl₂; alc. KOH
- c. Cl₂/hv; H₂O

Q2. 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.

Q3. 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

Assertion – Reason type questions:

- 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.
- **Q4.** Assertion: Phosphorous chlorides are preferred over thionyl chloride for the preparation of alkyl chlorides from alcohol.

Reason: Phosphorous chlorides give pure alkyl halides.

Q5. Assertion: Aryl halides undergo nucleophilic substitution reactions with use.

Reason: The carbon halogen bond in aryl halides has partial double bond character.

Subjective type questions:

06. 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 ZnCl₂, gives 'C' and on treatment with sodium ethoxide gives back 'A'. Identify the compounds 'A', 'B' and 'C' and write the equations involved.

07. How do you convert the following:

a. Chlorobenzene to Biphenyl

c. Propene toPropan-2-ol

- b. Propene to 1-lodopropane
- d. 1-Bromo propane to 2-Bromo propane

Q8. 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. methyl bromide is treated with Na in the presence of drv ether.
- **Q9.** Give the products and explain the mechanisms of the following reactions:
 - a. $CH_3 CH_2 Br + OH^-$
 - b. $(CH_3)_3C$ -Br + OH⁻ _____ c. n-BuBr + KOH _____

c. n-BuBr + KOH

Q10. Read the following passage and answer the questions that follow:

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
- c. Propan-1-ol

b. Propan-2-ol d. Isopropyl ethyl ether

d. trans-Pentene-2

ii. 2-Bromopropane is separately heated with aq. CH₃CO₂Na or with CH₃CH₂ONa/CH₃CH₂OH, the

major product obtained in each case respectively are:

- b. Isopropyl acetate, propene a. Propene, isopropyl ethyl ether
- 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
- iv. Give reasons why?
 - a. C-Cl bond length in chlorobenzene is shorter than C-Cl bond in CH₃Cl.
 - b. The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.

UNIT-XI (ALCOHOLS, PHENOLS AND ETHERS)

Multiple choice questions:

Q1. The most suitable reagent for the conversion of primary alcohol into aldehyde with the same number of carbon atoms is:

a. acidified K ₂ Cr ₂ O ₇	b. alkaline KMnO4
c. pyridinium chlorochromate	d. CrO ₃
Q2. Williamson synthesis in an example of	;
a. Nucleophilic addition	b. Electrophilic addition

- d. Nucleophilic substitution reaction
- **Q3.** 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. Electrophilic substitution

- c. alcohols having resonance structures
- d. intermolecular hydrogen bonding in ethers

Assertion – Reason type questions:

- 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.

- **Q4.** Assertion: In Lucas test, 3° alcohols react immediately.
- **Reason**: An equimolar mixture of anhydrous ZnCl₂ and conc. HCl is called Lucas reagent. **05.** 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.

Subjective type questions:

Q6. Give one chemical test each to distinguish between the following pairs of compounds: a. Phenol and Benzoic acid

b. 1-Propanol and 2-Propanol

Q7. How would you obtain:

a. Picric acid (2, 4, 6-trinitrophenol) from phenol

- b. 2-Methylpropene from 2-methylpropanol?
- **Q8.** 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. $(CH_3)_3C$ -O-CH₃ on reaction with HI gives $(CH_3)_3C$ -I and CH₃-OH as the main products and not (CH₃)₃C-OH and CH₃-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.
- **Q9.** 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.

Q10. Read the following passage and answer the questions that follow:

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_{N^2} 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.

UNIT- XII (ALDEHYDES, KETONE AND CARBOXYLIC ACIDS)

Multiple choice questions:

Q1. The increasing order of the rate of HCN addition to compounds, A–D is:

- A: HCHO; B: CH₃COCH₃; C: PhCOCH₃ and D: PhCOPh
- a. A < B < C < D

b. D<B<C<A

c. D<C<B<A

d. C < D < B < A

Q2. Which of the following presents the correct order of the acidity in the given compounds? a. FCH₂COOH > CICH₂COOH > BrCH₂COOH > CH₃COOH

- b. $CH_2COOH > BrCH_2COOH > BrCH_2COOH > FCH_2COOH$
- c. FCH₂COOH > CH₃COOH> BrCH₂COOH> CICH₂COOH > CICH₂COOH
- d. BrCH₂COOH > CICH₂COOH > FCH₂COOH > CH₃COOH
- **Q3.** A liquid was mixed with ethanol and a drop of concentrated H₂SO₄ was added. A compound with a fruity smell was formed. The liquid was:

5	
a. HCHO	b. CH ₃ COCH ₃
c. CH ₃ COOH	d. CH ₃ OH

Assertion - Reason type questions:

- 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.
- **Q4.** Assertion: Cannizzaro reaction is given by formaldehyde and benzaldehyde.
- **Reason:** Both the compounds lack of α -hydrogen atom.
- Q5. Assertion: Carboxylic Acids undergo halogenation in presence of red phosphorus.

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

Subjective type questions:

- **Q6.** 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 pchlorobenzoic 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.
- **Q7.** Write the equations involved in the following reactions:
- a. Wolff-Kishner reduction b. Etard reaction.
- **Q8.** 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. **Q9.** Write products when (CH₃)₃C-CHO reacts with the following:
 - a. Zinc amalgam and dilute hydrochloric acid.
 - b. Concentrated sodium hydroxide solution.
 - c. Semicarbazide and a weak acid.

Q10. Read the following passage and answer the questions that follow:

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
- c. Two molecules of acetaldehyde
- b. Formaldehyde and acetaldehyde
- d. Two molecules of acetone
- iv. Give a chemical test to distinguish between ethanal and propanal.

UNIT-XIII (AMINES)

Multiple choice questions:

Q1. C ₄ H ₁₁ N on reaction HNO ₂ , forms a tertiary a	alcohol. Thus, C ₄ H ₁₁ N is:
a. primary amine	b. secondary amine
c. tertiary amine	d. quaternary ammonium salt
Q2. When aniline is heated with conc. H_2SO_4 at	455-475 K, it forms
b. Aniline hydrogen sulphate	b. m-Aminobenzensulphonic acid
c. Benzenesulphonic acid	d. Sulphanilic acid.
Q3. When ethylamine is treated with CH ₃ MgBr,	the product is:
a. CH ₃ CH ₃	b. CH ₄
c. CH ₃ CH ₂ CH ₃	d. CH ₃ CH ₂ CH ₂ CH ₃
Assertion – Reason type questions:	
a. Both assertion and reason are correct a	nd reason is the correct explanation of assertion.
b. Both assertion and reason are correct b	ut reason is not a correct explanation of the assertion.
c. Assertion is correct but reason is incorr	ect.
d. Assertion is incorrect but reason is corr	·ect.
Q4. Assertion: Hoffmann's bromamide reactio	n is given by primary amines.
Reason: Primary amines are more basic th	an secondary amines.
Q5. Assertion: Acetanilide is less basic than an	iline.
Reason: Acetylation of aniline results in th	e decrease of electron density of nitrogen.
Subjective type questions:	
Q6. Account for the following:	
a. Methylamine in water reacts with ferric cl	nloride to precipitate hydrated ferric oxide.
b. Diazonium salts of aromatic amines are m	ore stable than those of aliphatic amines.
c. The amino group in aniline acts as a powe	rful activator and ortho and para director towards
electrophilic substitution reaction.	-
Q7. How will you convert the following:	
a. Ethanamine into methanamine	b. Aniline into 1, 3, 5-tribromobenzene

d. Nitrobenzene to Phenol.

- c. Aniline into 4-Bromoaniline e. Aniline to Chlorobenzene.
- **Q8.** Distinguish between the following pairs of compounds:
 - a . Aniline and N-methyl aniline CHEM/XII/ASGMT

b. $(CH_3)_2NH$ and $(CH_3)_3N$

Page 10 of 12

Q9. What is Gabriel phthalimide synthesis? For what purpose is it used? Give equation to explain your answer.

Q10. Read the following passage and answer the questions that follow:

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 CHCl₃ and KOH to form foul smelling isocyanide. They react with HNO₂ and liberate N₂ gas. They react with Hinsberg's reagent to form salt soluble in KOH. Secondary amine form yellow oily compounds with HNO₂ and salt formed with C₆H₅SO₂Cl, is insoluble in KOH. 3° amines form salt soluble in water with HNO₂ but does not react with C₆H₅SO₂Cl. Diazonium salts are prepared by reaction of Aniline with NaNO₂ 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 :

 $\begin{array}{cccc} a. amide & b. imide & c. secondary amine \\ ii. The gas evolved when methyl amine reacts with nitrous acid is : \\ a. NH_2 & b. N_2 & c. H_2 & d. C_2H_6. \end{array}$

iii. Write the isomer of C₃H₉N which does not react with Hinsberg reagent.

iv. CH₂NH₂, on heating with CHCl₃ and KOH gives 'X'. Identify 'X'.

UNIT-XIV (BIOMOLECULES)

Multiple choice questions:

- **Q1.** 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

Q2. 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
- Q3. Glucose does not react with:
 - a. NH2OH
 - c. C₆H₅NHNH₂

Assertion – Reason type questions:

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.

b. NaHSO₃

d. HCN

- c. Assertion is correct but reason is incorrect.
- d. Assertion is incorrect but reason is correct.
- **Q4.** Assertion: D(+) Glucose is dextrorotatory in nature.

Reason: 'D' represents its dextrorotatory nature.

Q5. 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.

Subjective type questions:

Q6. Distinguish between the following:

- a. starch and cellulose
- b. amylose and amylopectin

- c. starch and Glycogen
- d. α helix and β sheet structure
- e. fibrous and globular protein
- **Q7.** Explain glycosidic linkage with an example.
- **Q8.** What are nucleic acids? Mention the functions of nucleic acids.
- **Q9.** Draw the Howarth structure of sucrose, maltose and lactose. Classify them as reducing or non reducing sugar. Justify your answer.

Q10. Read the following passage and answer the questions that follow:

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 structureb. secondary structuresc. tertiary structured. quaternary structure
- iii. Cheese is a_____
 - a.globular protein c. denatured protein

- b. conjugated protein
- d. derived protein

iv. Differentiate between globular and fibrous proteins.