

TOPIC /UNIT	SOLUTIONS/1
QUESTION NUMBER	1
EXPECTED LEARNING OUTCOMES	<i>Learning Outcome -Students describe colligative properties of solutions and correlate these with molar masses of the solutes.</i>
CORE CONCEPTS /MAJOR AREA	Colligative properties and Determination of Molar Mass
CRITERIA/ TYPE OF QUESTION	Multiple Choice Question
<p>If molality of a dilute solution is doubled, the cryoscopic constant will be: (a) unchanged (b) halved (c) doubled (d) tripled Answer: 1. (a) unchanged</p>	
QUESTION NUMBER	2
EXPECTED LEARNING OUTCOMES	<i>Learning Outcome - Students observe and analyse the consequences of osmosis</i>
CORE CONCEPTS /MAJOR AREA	Osmosis and Osmotic Pressure
CRITERIA/ TYPE OF QUESTION	Multiple Choice Question
<p>QUESTION 2: As a result of osmosis, the volume of more concentrated solution (a) gradually decreases (b) gradually increases (c) is not affected (d) suddenly increases. Answer: 2. (b) gradually increases</p>	
QUESTION NUMBER	3
EXPECTED LEARNING OUTCOMES	<i>Learning Outcome - Students distinguish between ideal and non-ideal solutions, classifies the non-ideal solutions.</i>
CORE CONCEPTS /MAJOR AREA	Ideal and Non-Ideal Solutions
CRITERIA/ TYPE OF QUESTION	<u>ASSERTION & REASONING</u>
<p>QUESTION 3: Assertion: Azeotropic mixtures are formed only by non-ideal solutions and they may have boiling points either greater than both the components or less than both the components. Reason: The composition of the vapour phase is same as that of the liquid phase of an azeotropic mixture. 3.(b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion</p>	
QUESTION NUMBER	4

EXPECTED LEARNING OUTCOMES	<i>Learning Outcome - Students compare and contrast the terms hypotonic and hypertonic.</i>
CORE CONCEPTS /MAJOR AREA	Osmosis and Osmotic Pressure
CRITERIA/ TYPE OF QUESTION	<u>ASSERTION & REASONING</u>
<p>QUESTION 4: Assertion: When the outer hard shell of an egg is removed and placed in distilled water it swells and shrinks if placed in saturated sodium chloride solution. Reason: Distilled water is hypertonic and so it flows into the egg while saturated sodium chloride solution is hypotonic, so water flows out from the egg. Answer: 4. (c) Assertion is correct, reason is incorrect.</p>	
QUESTION NUMBER	5
EXPECTED LEARNING OUTCOMES	<i>Learning Outcome - Students interpret the data and calculate the i value.</i>
CORE CONCEPTS /MAJOR AREA	Van't Hoff factor and Abnormal molar Mass
CRITERIA/ TYPE OF QUESTION	<u>CASE STUDY</u>
<p>The van 't Hoff factor i (named after Dutch chemist Jacobus Henricus van 't Hoff) is a measure of the effect of a solute on colligative properties such as osmotic pressure, relative lowering in vapor pressure, boiling-point elevation and freezing-point depression. The van 't Hoff factor is the ratio between the actual concentration of particles produced when the substance is dissolved and the concentration of a substance as calculated from its mass. For most non-electrolytes dissolved in water, the van 't Hoff factor is essentially 1. For most ionic compounds dissolved in water, the van 't Hoff factor is equal to the number of discrete ions in a formula unit of the substance. This is true for ideal solutions only, as occasionally ion pairing occurs in solution. At a given instant a small percentage of the ions are paired and count as a single particle. Ion pairing occurs to some extent in all electrolyte solutions. This causes the measured van 't Hoff factor to be less than that predicted in an ideal solution. The deviation for the van 't Hoff factor tends to be greatest where the ions have multiple charges.</p> <p>(i) Which one of the following salts will have the same value of van't Hoff factor (i) as that of $K_4[Fe(CN)_6]$. (a) $Al_2(SO_4)_3$ (b) $NaCl$ (c) $Al(NO_3)_3$ (d) Na_2SO_4 Answer: 5. (i)(a) $Al_2(SO_4)_3$</p>	
<i>Learning Outcome - Students predict the conditions under which abnormal molecular mass are observed.</i>	
<p>(ii)Assertion: $NaCl$ in water and organic acids in benzene show abnormal molecular mass. Reason: Abnormal molecular mass is obtained when the substance in the solution undergoes either dissociation or association. Answer: (ii)(a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.</p>	

<i>Learning Outcome - Students develop proficiency in doing numerical problems, applying the concepts.</i>
(iii)The Van't Hoff factor for the solution of SrCl₂ is 2.74. Calculate the percentage of dissociation of salt. Answer: (iii) $\alpha = \frac{i-1}{n-1}$ $i = 2.74, n = 3$ Substituting, $\alpha = .87$ Percentage of dissociation = 87%
Prepared by Karthika Nandakumar, PGT Bhavan's Adarsha Vidyalaya, Kakkanad

TOPIC /UNIT	Electrochemistry (up to Relation between Gibbs energy change and EMF of a cell)/02
QUESTION NUMBER	1
EXPECTED LEARNING OUTCOMES	The students will be able to analyse & apply the knowledge of electrode potential, equilibrium constant & Gibbs energy.
CORE CONCEPTS /MAJOR AREA	Electrochemical Cell and Gibbs Energy of the reaction
CRITERIA/ TYPE OF QUESTION	Multiple Choice Question
<p>For a certain redox reaction, the E°_{cell} is positive. This means that</p> <p>(a) ΔG° is positive, K is greater than 1 (b) ΔG° is positive, K is less than 1 (c) ΔG° is negative, K is greater than 1 (d) ΔG° is negative, K is less than 1</p> <p>ANSWER: c) ΔG° is negative, K is greater than 1</p>	
QUESTION NUMBER	2
EXPECTED LEARNING OUTCOMES	The students will be able to analyse & apply the knowledge of electrode potential, equilibrium constant & Gibbs energy.
CORE CONCEPTS /MAJOR AREA	Electrochemical Cell and Gibbs Energy of the reaction
CRITERIA/ TYPE OF QUESTION	Multiple Choice Question
<p>QUESTION 2: The standard emf of a galvanic cell involving 2 moles of electrons in a redox reaction is 0.59 V. The equilibrium constant for the reaction of the cell is</p> <p>a) 10^{10} c) 10^{15} b) 10^{20} d) 10^{30}</p>	

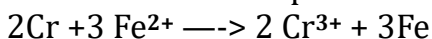
ANSWER: b) 10^{20}	
QUESTION NUMBER	3
EXPECTED LEARNING OUTCOMES	Learning outcomes: The students will be able to understand & analyse the Nernst equation & Gibbs energy of the cell reaction
CORE CONCEPTS /MAJOR AREA	Measurement of Electrode potential
CRITERIA/ TYPE OF QUESTION	<u>ASSERTION & REASONING</u>
<p>QUESTION 3: Assertion: $E_{Ag^+/Ag}$ increases with increase in concentration of Ag^+ ions. Reason: Ag is less reactive than hydrogen</p> <p>ANSWER: b) Assertion and reason both are correct statements but reason is not the correct explanation of assertion.</p>	
QUESTION NUMBER	4
EXPECTED LEARNING OUTCOMES	<i>Learning Outcome - Students compare and contrast the terms hypotonic and hypertonic.</i>
CORE CONCEPTS /MAJOR AREA	Electrochemical Cell and Gibbs Energy of the reaction
CRITERIA/ TYPE OF QUESTION	<u>ASSERTION & REASONING</u>
<p>QUESTION 4: Assertion: E_{cell} is an intensive parameter whereas Δ_rG is an extensive thermodynamic property Reason: Δ_rG for a reaction is a measure of maximum useful work that can be obtained from a chemical reaction.</p> <p>ANSWER: b) Assertion and reason both are correct statements but reason is not the correct explanation of assertion.</p>	
QUESTION NUMBER	5
EXPECTED LEARNING OUTCOMES	The students will be able to identify and apply the cell reaction taking place in the Galvanic cell.
CORE CONCEPTS /MAJOR AREA	Electrochemical Cell
CRITERIA/ TYPE OF QUESTION	<u>CASE STUDY</u>

Read the paragraph given below and answer the following questions.

Electrochemistry deals with oxidation-reduction reactions that either produce or utilize electrical energy and electrochemical reactions take place in cells. A galvanic cell or voltaic cell, is an electrochemical cell in which an electric current is generated from spontaneous Oxidation-Reduction reactions. A common apparatus generally consists of two different metals, each immersed in separate beakers containing their respective metal ions in solution that are connected by a salt bridge or separated by a porous membrane. Galvanic cells are extensions of spontaneous redox reactions allowing some of the chemical energy released to be converted into electrical energy. In its simplest form, a half-cell consists of a solid metal (called an electrode) that is submerged in a solution; the solution contains cations (+) of the electrode metal and anions (-) to balance the charge of the cations. The full cell consists of two half-cells, usually connected by a semipermeable membrane or by a salt bridge that prevents the ions of the more noble metal from plating out at the other electrode.

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

1. The correct cell to represent the following reaction is



- a) $3\text{Fe}/\text{Fe}^{2+} // \text{Cr}/\text{Cr}^{3+}$ c) $\text{Cr}/\text{Cr}^{3+} // \text{Fe}^{2+}/\text{Fe}$
b) $\text{Fe}/\text{Fe}^{2+} // \text{Cr}^{3+}/\text{Cr}$ d) $\text{Cr}^{3+}/\text{Cr} // \text{Fe}^{2+}/\text{Fe}$

ANSWER: c) $\text{Cr}/\text{Cr}^{3+} // \text{Fe}^{2+}/\text{Fe}$

The students will be able to explain the functions of salt bridge in the galvanic cell

2. Saturated solution of NH_4NO_3 is used to make salt bridge because

- (a) It forms a jelly-like material with agar-agar.
(b) It is a weak electrolyte.
(c) It is a good conductor of electricity.
(d) Velocity of both NH_4^+ and NO_3^- are nearly the same

ANSWER: d) Velocity of both NH_4^+ and NO_3^- are nearly the same.

Student will be able to understand the redox reaction taking place in the Daniell cell

3. Which of the following statements is true for electrochemical Daniel cell

- a) Electrons flow from Cu electrode to Zn electrode
b) Current flows from Zn electrode to Cu electrode
c) Cations move toward Cu electrode
d) Cations move toward Zn electrode

ANSWER: c) Cations move toward Cu electrode

Prepared by Letha S, PGT B M Vidyashram, Tripunithura

TOPIC /UNIT	Electrochemistry (from conductance in electrolytic solution to corrosion)/02
QUESTION NUMBER	1
EXPECTED LEARNING OUTCOMES	Learning Outcome: Children identify anode cathode reactions in lead storage battery
CORE CONCEPTS /MAJOR AREA	Cells and Batteries
CRITERIA/ TYPE OF QUESTION	Multiple Choice Question
While charging the lead storage battery _____. (a) PbSO_4 anode is reduced to Pb. (b) PbSO_4 cathode is reduced to Pb. (c) PbSO_4 cathode is oxidised to Pb. (d) PbSO_4 anode is oxidised to PbO_2 . Ans: (a) PbSO_4 anode is reduced to Pb.	
QUESTION NUMBER	2
EXPECTED LEARNING OUTCOMES	Learning Outcome: Children apply Kohlrausch's law to determine limiting molar conductivity.
CORE CONCEPTS /MAJOR AREA	Measurement of conductivity of Ionic Solutions
CRITERIA/ TYPE OF QUESTION	Multiple Choice Question
QUESTION 2: If limiting molar conductivity of Ca^{2+} and Cl^- are 119.0 and 76.3 $\text{S cm}^2 \text{mol}^{-1}$, then the value of limiting molar conductivity of CaCl_2 will be (a) 195.3 $\text{S cm}^2 \text{mol}^{-1}$ (b) 271.6 $\text{S cm}^2 \text{mol}^{-1}$ (c) 43.3 $\text{S cm}^2 \text{mol}^{-1}$ (d) 314.3 $\text{S cm}^2 \text{mol}^{-1}$. Ans (b) 271.6 $\text{S cm}^2 \text{mol}^{-1}$	
QUESTION NUMBER	3
EXPECTED LEARNING OUTCOMES	Learning Outcome: Children are able to recall resistivity and its SI unit.
CORE CONCEPTS /MAJOR AREA	Measurement of the conductivity of Ionic Solutions

CRITERIA/ TYPE OF QUESTION	<u>ASSERTION & REASONING</u>
<p>QUESTION 3: 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 meter (m) Ans (b) Both A and R are true but R is not the correct explanation of A</p>	
QUESTION NUMBER	4
EXPECTED LEARNING OUTCOMES	Learning Outcome: Children relates Faraday's Law of electrolysis
CORE CONCEPTS /MAJOR AREA	Electrolytic cells and Electrolysis
CRITERIA/ TYPE OF QUESTION	<u>ASSERTION & REASONING</u>
<p>QUESTION 4: Assertion: In electrolysis, the quantity of electricity needed for depositing 1 mole silver is different from that required for 1 mole of copper. Reason: The molecular weights of silver and copper are different. Ans (b) Both A and R are correct but R is not the correct explanation of A.</p>	
QUESTION NUMBER	5
EXPECTED LEARNING OUTCOMES	Learning outcome: Children apply the knowledge of quantitative aspects of electrolysis and are able to predict the products of electrolysis.
CORE CONCEPTS /MAJOR AREA	Quantitative aspects of Electrolysis
CRITERIA/ TYPE OF QUESTION	<u>CASE STUDY</u>
<p>Read the given passage and answer the following questions: In <u>chemistry</u> and <u>manufacturing</u>, electrolysis is a technique that uses <u>direct electric current</u> (DC) to drive an otherwise non-spontaneous <u>chemical reaction</u>. Electrolysis is commercially important as a stage in the separation of <u>elements</u> from naturally occurring sources such as <u>ores</u> using an <u>electrolytic cell</u>. The <u>voltage</u> that is needed for electrolysis to occur is called the decomposition potential. The word "lysis" means to separate or break, so in terms, electrolysis would mean "breakdown via electricity". The key process of electrolysis is the interchange of atoms and ions by the removal or addition of electrons due to the applied current. The desired products of electrolysis are often in a different physical state from the electrolyte and can be removed by mechanical processes (e.g. by collecting gas above an electrode or precipitating a product out of the electrolyte).The quantity of the products is proportional to the current, and when two or more electrolytic cells are connected in series to the same power source, the products produced in the cells are proportional to their <u>equivalent weight</u>. These are known as <u>Faraday's laws of electrolysis</u>.</p> <p>1) The charge required for the reduction of 1 mol of MnO_4^- to MnO_2 is (a) 1 F</p>	

- (b) 3 F
 (c) 5 F
 (d) 6 F
 Ans (b) 3F

2) The products formed when an aqueous solution of NaBr is electrolysed in a cell having inert electrodes are:

- (a) Na and Br₂
 (b) Na and O₂
 (c) H₂, Br₂ and NaOH
 (d) H₂ and O₂
 Ans (c) H₂, Br₂ and NaOH

3) A current of 3A was passed through a solution of AuCl₄⁻ ions using gold electrodes and it caused deposition of 1.234g of Au (Atomic mass of Au=197u). The time for which the current was passed is

- (a) 20 min 8s
 (b) 30 min 12s
 (c) 10 min 4s
 (d) 10 min 40s
 Ans (c) 10 min 4s

OR

If 54g of silver is deposited during an electrolysis reaction, how much aluminium will be deposited by the same amount of current?

- (a) 2.7g
 (b) 4.5g
 (c) 2.7g
 (d) 5.4g

Ans (b) 4.5g

Prepared by Mary, PGT B Newsprint velloor

TOPIC /UNIT	CHEMICAL KINETICS /3
QUESTION NUMBER	1
EXPECTED LEARNING OUTCOMES	Students will analyse the condition for pseudo first order reaction.
CORE CONCEPTS /MAJOR AREA	Pseudo First order reaction
CRITERIA/ TYPE OF QUESTION	<u>ASSERTION & REASONING</u>

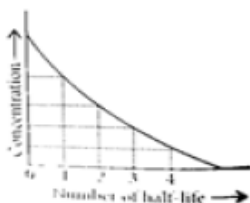
QUESTION 1:

ASSERTION: Hydrolysis of methyl ethanoate is a pseudo-first-order reaction.

REASON: Water is present in large excess and therefore its concentration remained constant throughout the reaction.

Ans:A. Both Assertion and Reason are correct and reason is the correct explanation for assertion.	
QUESTION NUMBER	2
EXPECTED LEARNING OUTCOMES	Students will apply the principle of collision theory to find the answer. Student will analyse only effective collision leads to the formation of the product.
CORE CONCEPTS /MAJOR AREA	Collision Theory of Chemical Reactions
CRITERIA/ TYPE OF QUESTION	Assertion and Reason
QUESTION 2:	
<p>ASSERTION:(A) All collisions of reactant molecules lead to product formation.</p> <p>REASON:(R) Only those collisions in which molecules have the correct orientation and sufficient kinetic energy lead to the compound formation.</p> <p>Ans: D. Assertion is false but Reason is true</p>	
QUESTION NUMBER	3
EXPECTED LEARNING OUTCOMES	Students will apply the concept of order to find the answer.
CORE CONCEPTS /MAJOR AREA	Order of the reaction
CRITERIA/ TYPE OF QUESTION	<u>ASSERTION & REASONING</u>
QUESTION 3:	
<p>ASSERTION:(A) The sum of powers of the concentration of the reactants in the rate law expression is called the order of that chemical reaction.</p> <p>REASON:(R): A zero order reaction means that the rate of reaction is independent of the concentration of reactants.</p> <p>Ans: Both (A) and (R) are true but (R) is not the correction explanation for assertion.</p>	
QUESTION NUMBER	4
EXPECTED LEARNING OUTCOMES	Students will apply the formula of half-life period and rate constant formula of first order reaction.
CORE CONCEPTS /MAJOR AREA	Half Life Period
CRITERIA/ TYPE OF QUESTION	Case Study Based Questions
QUESTION 4:	
<p>The half-life of a reaction is the time required for the concentration of reactant to decrease by half, i.e., $[A]_t = [A]/2$. 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</p>	

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.



(a) The rate of a first order reaction is 0.04 mol/l/s at 10 minutes and 0.03 mol/L/s at 20 minutes after initiation. The half-life of the reaction is [Given $K=0.02876$]

- (i) 4.408min (ii) 44.08min **(iii) 24.08min** (iv) 2.408min

Ans-**(iii) 24.08min**

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

- (i) It is independent of initial concentration
(ii) It is independent of temperature
 (iii) It decrease with the introduction of a catalyst.
 (iv) None of these.

Answer-**(ii) It is independent of temperature**

(c) The rate constant for a first order reaction is $7.0 \times 10^{-4} \text{ s}^{-1}$. If initial concentration of reactant is 0.080 M , what is the half-life of reaction?

- (i) 990s** (ii) 79.2s (iii) 12375s (d) $10.10 \times 10^{-4} \text{ s}$

Answer-**(i) 990s**

(Or)

(c) A first order reaction has a rate constant $k=3.01 \times 10^{-3} / \text{s}$. How long it will take to decompose half of the reactant?

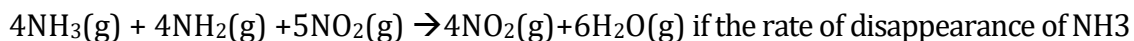
- (i) 2.303s (ii) 23.03s **(iii) 230.3s** (iv) 2303s

Answer-**(iii) 230.3s**

QUESTION NUMBER	5
EXPECTED LEARNING OUTCOMES	Students will apply the formula of half-life period and rate constant formula of first order reaction.
CORE CONCEPTS /MAJOR AREA	Half Life Period
CRITERIA/ TYPE OF QUESTION	<u>CASE STUDY</u>

The rate of a chemical reaction is expressed either in terms of decrease in the concentration of a reactant per unit time or increase in the concentration of a product per unit time. Rate of the reaction depends upon the nature of reactants, concentration of reactants, temperature, presence of catalyst, surface area of the reactants and presence of light. Rate of reaction is directly related to the concentration of reactant. Rate law states that the rate of reaction depends upon the concentration terms on which the rate of reaction actually depends, as observed experimentally. The sum of powers of the concentration of the reactants in the rate law expression is called order of reaction while the number of reacting species taking part in an elementary reaction which must collide simultaneously in order to bring about a chemical reaction is called molecularity of the reaction.

a). Express the rate of the following reaction in terms of different reactants and products.



if the rate of disappearance of NH_3 is $3.6 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$, what is the rate of formation of H_2O ?

Ans: $5.4 \times 10^{-3} \text{ mol/l/s}$

b). Why do pieces of wood burn faster than a log of wood of the same mass?

Ans: Pieces of wood have larger surface area than the log of wood of the same mass. Greater the surface area, faster is the reaction.

c). Why does the rate of any reaction generally decrease during the course of the reaction?

Ans: The rate of a reaction depends on the concentration of reactants. As the reaction progresses, reactants start getting converted to products so the concentration of reactants decreases hence the rate decreases.

(Or)

c). Why is molecularity applicable only for elementary reactions and order is applicable as well as complex reactions?

Ans: A complex reaction proceeds through several elementary reactions. Number of molecules involved in each elementary reaction may be different, i.e., the molecularity of each step may be different

PREPARED BY: ARUNKUMAR SAMPATHU BHAVANS PUBLIC SCHOOL -DOHA

CLASS XII

CHEMISTRY CHAPTER PART I – d and f block elements

TOPIC - General Trends in the Chemistry Of Transition

Elements

TYPE: MCQ

QUESTION 1:

EXPECTED LEARNING OUTCOME: Student can identify transition element and their compounds on the basis of their characteristic property by calculating the no of unpaired electron.

1. Which of the following will be coloured in solid state ?

- (a) Ag_2SO_4 (b) CuF_2 (c) ZnF_2 (d) CuCl_2

CORRECT OPTION (b)

EXPLANATION: Calculate the oxidation no of Cu. As option a and c salt is white in colour. Find out which one has unpaired electron.

Cu^{+2} has one unpaired electron. $[\text{Ar}] 3d^9$ Therefore, in CuF_2 , it is coloured in solid state.

Question 2:

EXPECTED LEARNING OUTCOME: Students will be able to learn the position of Cu in electrochemical series and apply it in explaining the reactivity.

Which of the following statement is not correct?

- (a) copper liberates hydrogen from acids
(b) In its higher oxidation states, Mn forms stable compounds with oxygen and fluorine.
(c) Ti^{+2} and Cr^{+2} are reducing agents in aqueous solution
(d) Mn^{+3} and Co^{+3} are oxidising agents in aqueous solution

CORRECT OPTION (a)

EXPLANATION: Cu does not liberate hydrogen from acids as Cu occupies its position in **electrochemical series** below hydrogen.

TYPE: ASSERTION & REASONING

QUESTION 3 :

EXPECTED LEARNING OUTCOME: Student appreciate the relative stability of various oxidation state in terms of electronic configuration.

ASSERTION: The highest oxidation state of Osmium is +8.

REASONING: Osmium is a 5d block element.

Answer : option (b)

(Assertion and Reasoning statements are true and reason is not the correct explanation of Assertion).

EXPLANATION – The highest oxidation state of osmium is +8. It is due to its ability to **expand octet** by using its all 8 electrons.

QUESTION 4:

EXPECTED LEARNING OUTCOME: Student will understand and realise the importance of lanthanoid contraction and relate it with nuclear charge.

ASSERTION: The first ionisation energy of the 5d series are lesser than 3d and 4d series.

REASONING : Due to lanthanoid contraction, effective nuclear charge increases.

Answer: option (d)

Assertion is false and reason is correct

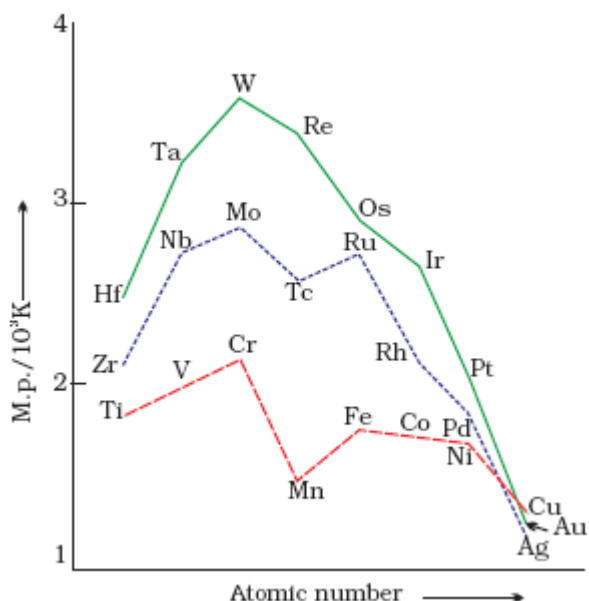
EXPLANATION : The first ionisation energy of 5d series are higher than 3d and 4d. 5d elements have much more **nuclear charge and weakest shielding** of valence electron and maximum electrostatic force of attraction from nucleus.

TYPE : CASE STUDY

EXPECTED LEARNING OUTCOME: Student will be able to compare the difference between 3d , 4d and 5d series and using this they can interpret the variation in melting point for different series.

Read the passage and answer the questions that follows:

The transition elements have very high melting point and boiling point. In each series melting point of these metals rise to a maximum value and then decrease with increase in atomic number. The melting point of most of the transition elements except Zn , Cd and Hg are above 1173 K. Analyse the given graph and answer the following questions.



- Melting points first increases and then decreases and also show a dip in the middle. Explain the variation in melting point.
- Why transition elements have irregularities in their electronic configuration?
- There occurs much more frequent metal – metal bonding in compounds of heavy transition metals (i.e. 3d series) Explain

OR

Which element in 3d series has lowest enthalpy of atomisation and why?

EXPLANATION

1) Melting point first increases as the number of **unpaired electron increases** and thereby metallic bonding increases. The decreases as **pairing of electrons start** . The dip in middle is due to exactly **half filled configuration of d subshell** which has higher stability. As a result metallic bonding is weaker.

2) Difference in the energy of **(n-1)d subshell and ns subshell**. The incoming electron can occupy either of subshell.

3) Due to **Lanthanide contraction** , effective nuclear charge remains almost the same . Therefore metallic radii are nearly same and hence metal metal bonding is more.

OR

Zn has lowest enthalpy of atomisation. **Completely filled d orbitals** . Therefore d electrons are not involved in metallic bonding.

COMPETENCY BASED QUESTIONS

(COORDINATION COMPOUNDS)

I. MULTIPLE CHOICE QUESTIONS

1. The stabilization of coordination compounds due to chelation is called the chelate effect. Which of the following is the most stable complex species?

- | | |
|---|---|
| a) $[\text{Fe}(\text{CO})_5]$ | b) $[\text{Fe}(\text{CN})_6]^{3-}$ |
| c) $[\text{Fe}(\text{C}_2\text{O}_4)]^{3-}$ | d) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ |

ANS. (c) is the correct option .
Oxalate ion is a bidentate ligand.

2. Indicate the complex ion which shows geometrical isomerism.

- a) $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]^+$ b) $[\text{Pt}(\text{NH}_3)_3\text{Cl}]$
c) $[\text{Co}(\text{NH}_3)_6]^{3+}$ d) $[\text{Co}(\text{CN})_5(\text{NC})]^{3-}$

ANS. (a) is the correct option.

II. ASSERTION REASON BASED QUESTIONS

3. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): $[\text{Ni}(\text{en})_3]\text{Cl}_2$ has lower stability than $[\text{Ni}(\text{NH}_3)_6]\text{Cl}_2$.

Reason (R): In $[\text{Ni}(\text{en})_3]\text{Cl}_2$ the geometry of the complex is octahedral. .

Select the most appropriate answer from the options given below:

- (a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

ANS. (d)

4. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): $[\text{FeF}_6]^{3-}$ is a low spin complex.

Reason (R): Low spin complexes have lesser number of unpaired electrons .

Select the most appropriate answer from the options given below:

- (a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

ANS. (d)

III. CASE BASED QUESTIONS

The coordination compounds are of great importance. These compounds are widely present in the mineral, plant and animal worlds and play important functions in the area of analytical chemistry, metallurgy, industry and medicine. Formation of coordination compounds is largely used in analytical Chemistry for the qualitative detection and quantitative estimation of metal ions. Coordination compounds are also used as an antidote to poisoning caused by the ingestion of poisonous metals by human beings.

Read the passage and answer the following questions:

1. Which complexing material is added to vegetable oils to remove the ill effects of undesired metal ions?

Ans. EDTA

2. Which complex is used in the treatment of cancer?

Ans. Cisplatin/

3. What is chelate therapy?

Ans. Chelate therapy is used for the removal of excess of metal ions present in toxic amounts in the body.

SUBJECT : CHEMISTRY

CLASS : XII

CHAPTER : HALOALKANES AND HALOARENES

XII HALOALKANES AND HALOARENES

DEEPTHY U T

CASE STUDY QUESTIONS

LEARNING OUTCOMES: The students will be able to explain the various reactions of Haloarenes

1. Read the passage given below and answer the following questions:

Haloarenes are less reactive than haloalkanes. The low reactivity of haloarenes can be attributed to

- (i) Resonance effect
- (ii) sp² hybridisation of the C atom bearing the C- X bond
- (iii) Polarity of C-X bond
- (iv) Instability of phenyl cation
- (v) repulsion between the electron rich attacking nucleophiles and electron rich arenes. Reactivity of haloarenes can be increased or decreased by the presence of certain groups at certain positions for example, nitro (-NO₂) group at ortho or para positions increases the activity of haloarenes towards nucleophilic substitution reactions.

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

i. Aryl halides are less reactive towards nucleophilic substitution reaction as compared to alkyl halides due to-

- (A) The formation of less stable carbonium ion
- (B) Resonance stabilisation
- (C) Larger carbon-halogen bond length
- (D) Inductive effect.

ANSWER : (B) Resonance stabilisation

(ii) Which of the following group at para position increase the reactivity of aryl halides towards nucleophilic substitution?

- (A) -CH₃
- (B) -OCH₃
- (C) -NH₂

(D) -NO₂

ANSWER : (D) -NO₂

(iii) Chlorobenzene is formed by reaction of chlorine with benzene in the presence of AlCl₃. Which of the following species attacks the benzene ring in the reaction?

(A) Al

(B) Cl⁺

(C) AlCl₃

(D) [AlCl₄]⁻

ANSWER : (B) Cl⁺

ASSERTION REASON

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

(A) Assertion and reason both are correct and reason is correct explanation of assertion.

(B) Assertion and reason both are correct statements but reason is not correct explanation of assertion

(C) Assertion is correct but reason is wrong statement.

(D) Assertion is wrong but reason is correct statement.

LEARNING OUTCOME: The students will be able to analyse the reactivity of Aryl halides

IV. Assertion : Aryl halides undergo nucleophilic substitution reactions with ease

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

ANSWER : (D) Assertion is wrong but reason is correct statement.

LEARNING OUTCOME: The students will be able to describe the nucleophilic substitution reactions in haloarenes.

v. Assertion : The presence of nitro group at ortho and para position makes nucleophilic substitution in chlorobenzene easier

Reason: Nitro group donates electrons to stabilise the intermediate ion formed by the addition of incoming nucleophile.

ANSWER: (C) Assertion is correct but reason is wrong statement.

MULTIPLE CHOICE QUESTIONS

LEARNING OUTCOME: The students will be able to identify and apply the name reaction

1. Which of the following is the most suitable for the preparation of n-propylbenzene?
- Friedal-Crafts Alkylation
 - Wurtz Reaction
 - Wurtz-Fittig Reaction
 - Grignard Reaction

ANSWER : (C) Wurtz-Fittig Reaction

LEARNING OUTCOME: The students will be able to recall and differentiate reactions of benzene

2. Chlorobenzene and benzene hexachloride are obtained from benzene by the reaction of chlorine, in the presence of
- Direct sunlight and anhydrous AlCl_3 respectively
 - Sodium hydroxide and sulphuric acid respectively
 - Ultraviolet light and anhydrous FeCl_3 respectively
 - Anhydrous AlCl_3 and direct sunlight respectively

ANSWER : (d) Anhydrous AlCl_3 and direct sunlight respectively

STD -XII

HALO ALKANES

1. Which is maximum reactive towards HCl?
- $\text{CH}_2=\text{CH}-\text{CH}_2\text{OH}$
 - $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{OH}$
 - $\text{CH}_3-\text{CH}(\text{OH})-\text{CH}_3$
 - $\text{CH}_2=\text{CH}-\text{OH}$
- Ans ; a
2. $\text{C}_3\text{H}_7\text{Cl} + \text{KOH}(\text{alco}) \rightarrow \text{A} + \text{Cl}_2(\text{g}) / 770\text{K} \rightarrow \text{B}$. B can be
- Vinyl chloride
 - Allyl chloride
 - Ethyl chloride
 - Ethyl iodide

Ans ; b

The following questions consist of two statements – Assertion (A) and Reason

(R). Answer these questions by selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
- (b) Both A and R are true, but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

3. Assertion: Alkyl halides are insoluble in water

Reason : Alkyl halides have halogen attached to sp^3 hybrid carbon.

Ans b

4. Assertion : AgCN forms isocyanide when react with haloalkanes while KCN form alkyl cyanides

Reason : KCN is ionic while AgCN is covalent in nature thus providing different ions in solution.

Ans ;b

Read the passage given below and answer the following questions

Alkyl halides are a group of compounds formed via substitution of a halogen for hydrogen in an alkane. These may also be classified according to the type of halogen. They are widely used commercially as refrigerants, flames retardants, and solvents. Alkyl halides are of interest due to their widespread use and diverse beneficial and toxic impact.

$CHCl_3$ (Chloroform: organic solvent)

CF_2Cl_2 (Freon-12: refrigerant CFC)

$CF_3CHClBr$ (Halothane: anesthetic).

Lucas test is a test to differentiate between primary , secondary and tertiary alcohols . This test consists of treating an alcohol with Lucas reagent , and turbidity , due to the formation of insoluble alkyl chloride ,is observed. Lucas test is based on the difference in reacting of three classes of alcohols with HCl via SN_1 reaction. The different reactivity reflects the differing ease of formation of the corresponding carbocations.

- 5. Which of the following alcohol when treated with Lucas reagent , shows immediate turbidity?
 - a. 3-Methyl-2-butanol
 - b. 2- Methylpropanol
 - c. 2- Methyl-2-butanol
 - d. 2-Methyl-1-butanol
- 6. What is Lucas reagent?
- 7. Alkenes decolourise bromine water in presence of CCl_4 due to the formation of
 - a. Allyl bromide
 - b. Vinyl bromide
 - c. Bromoform
 - d. Vicinal dibromide

Prepared by

BISMI S NAIR

BHAVAN'S VARUNA VIDYALAYA , THRIKKAKARA
KOCHI

UNIT 11 . ALCOHOLS AND PHENOLS

ASSERTION -REASON QUESTIONS

Question 1:

Learning Outcome: Students compare the acidic nature of substituted phenols.

Electron withdrawing group increases the acidic strength and electron donating group decreases the acidic nature of the substituted phenols.

ASSERTION: p-Nitrophenol is a stronger acid than p-cresol

REASON : NO₂ group is an electron releasing group while –CH₃ group is electron withdrawing in nature.

Answer

Assertion is true Reason is false.

Question 2

Learning Outcome: Students analyse the factors affecting the solubility of alcohols in water.

The solubility of alcohols in water increases with decrease in the size of the alkyl group.

ASSERTION: The solubility of n-alcohols in water decreases with increase in molecular mass.

REASON: The relative proportion of the hydrocarbon part in alcohols increases with increasing molecular mass which permits enhanced hydrogen bonding with water.

Answer

Assertion is true Reason is false.

MULTIPLE CHOICE QUESTIONS:

Question 1:

Learning Outcome: Students analyse the properties of Alcohols.

Primary alcohols on oxidation give carboxylic acids.

A Compound A, with molecular formula C₃H₈O can be oxidized to another compound B ,with molecular formula C₃H₆O₂. The compound A may be

- a. CH₃CH₂-O-CH₃ b. CH₃CH(OH)CH₃ c. CH₃CH₂CH₂OH d. CH₂CHO

Answer : c - CH₃CH₂CH₂OH

Question 2:

Learning Outcome: Students analyse the different methods to prepare alcohols and identify a suitable method of preparation.

Alcohols are produced by the reaction of Grignard reagents with aldehydes and Ketones.

1 Phenyl propanol may be prepared by the reaction of C_6H_5MgBr with

- a. CH_3CHO b. CH_3CH_2CHO c. CH_3COCH_3 d. $HCHO$

Answer : b - CH_3CH_2CHO

CASE BASED QUESTIONS

Alcohols and phenols are the most important compounds used in our daily life. Alcohols are prepared by hydration of alkenes, fermentation of glucose, reduction of aldehydes, ketones, carboxylic acids, and esters. Alcohols and phenols react with sodium metal producing Hydrogen. Alcohols on dehydration give alkene at 443K, follow the carbocation mechanism. Excess of alcohol at 413K on dehydration with conc. H_2SO_4 also follows a carbocation mechanism but gives diethyl ether. Alcohol is used as a solvent in paint industry.

Ethanol is a colourless liquid with a boiling point 351K. It is also known as grain alcohol because it is manufactured from starchy grains. 95% ethanol is known as rectified spirit which can be converted to absolute alcohol by adding small amount of benzene and then distilling. Ethyl alcohol in the alcoholic beverages is used for drinking. In moderate amount it affects judgement and lowers inhibitions. The commercial alcohol is made unfit for drinking by denaturation.

1. Arrange the following in the order of increasing reactivity towards Aluminium metal.



2. What do you understand by denatured spirit?
3. Write the mechanism for the hydration reaction of ethene to yield ethanol.

OR

How will you carry out the following conversions ?

- i) Methyl alcohol to ethanamine.
- ii) Ethanol to ethanal.

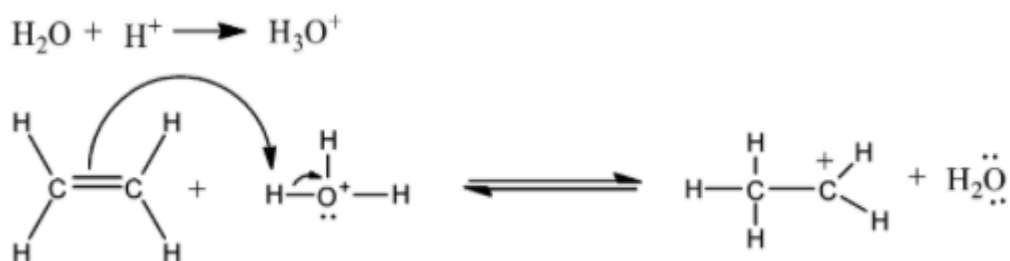
Answer

1. $CH_3CH(OH)CH_3, CH_3CH_2CH_2OH, CH_3CH_2OH$

2. To prevent the misuse of ethanol, it is mixed with methanol, $CuSO_4$ and pyridine and it is called denatured alcohol.

3. This conversion of ethene molecule to ethanol molecule involves three steps. The three steps are:

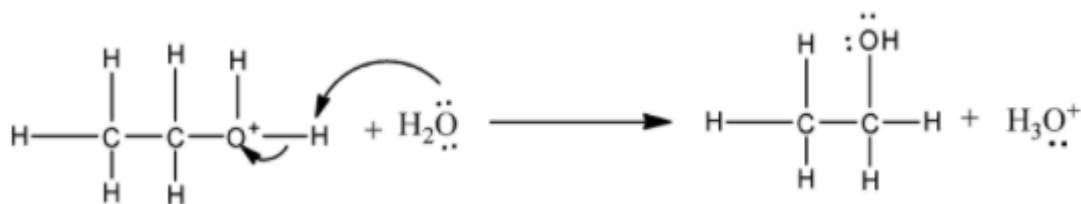
1) Electrophilic attack on the hydronium ion takes place which protonates the ethene to form a carbocation.



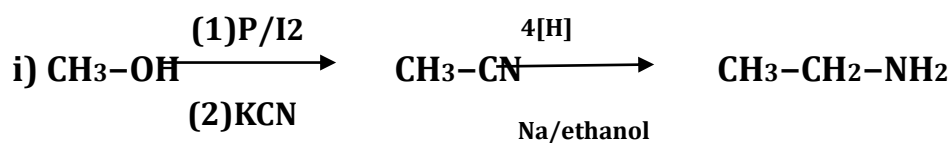
2) In the second step, the carbocation is attacked by the water molecule.



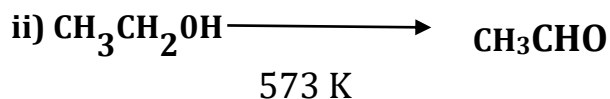
3) The deprotonation lastly generates the ethanol.



OR



Cu



CHAPTER :ALCOHOLS PHENOLS AND ETHERS

Prepared by :SREEJA V N ,BHAVANS VIDYA MANDIR ,KOLAIKKAD MANNAPRA

INSTRUCTIONS: In the following question a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- (a) Both assertion and reason are true and the reason is the correct explanation of assertion.
- (b) Both assertion and reason are true but the reason is not the correct explanation of assertion.
- (c) Assertion is true but reason is false.
- (d) Assertion is false but reason is true.

Learning outcome: Students will be able to analyse the chemical reactivity of ethers

1.Assertion: Ethers behave as bases in the presence of mineral acids.

Reason: Due to the presence of lone pairs of electrons on oxygen.

Ans (a) Assertion and reason both are correct statements but the reason is a correct explanation for assertion.

Learning outcome:Students will be able to analyse the order of stability of carbocation

2.Which of the following alcohol will give the most stable carbocation during dehydration

- (a)2-methyl-1-propanol (b)2-methyl-2-propanol (c)1-butanol (d)2-butanol

Ans) 2-methyl-1-propanol

3. Acid catalysed dehydration of t-butanol is faster than that of n-butanol because

- (a) Tertiary carbocation is more stable than primary carbocation
- (b) Primary carbocation is more stable than tertiary carbocation
- (c) t-butanol has a higher boiling point
- (d) Rearrangement takes place during dehydration of t- butanol

Learning outcome: Students will be able to understand the chemical reactions, properties and IUPAC nomenclature of ethers

4.Ethers are a class of organic compounds that contain an ether group—an oxygen atom connected to two alkyl or aryl groups. They have the general formula R–O–R', where R and R' represent the alkyl or aryl groups. Ether like water have a tetrahedral geometry i.e. oxygen is sp³ hybridised. The C–O–C bond angle in ethers is slightly greater than the tetrahedral angle due to repulsive interactions between the two bulky groups when they are attached to oxygen.

Question(i). Which of the following cannot be made by using Williamson Synthesis:

- (a) Methoxybenzene (b) Benzyl p-nitrophenyl ether
- (c) tert. butyl methyl ether (d) Di tert. butyl ether

Ans) Di tert. butyl ether

Question(ii). The I.U.P.A.C. name of the ether CH₂ = CH-CH₂O CH₃ is

- (a) Alkyl methyl ether (b) 1-Methoxy-2-propene
- (c) 3-Methoxy-1-propene (d) Vinyl dimethyl ether

Ans) (c) 3-Methoxy-1-propene

Question(iii). Dehydration of alcohol to ethers is catalysed by

(a) conc. H₂SO₄ at 413 K (b) Hot NaOH (c) Hot HBr (d) Hot HNO₃

Ans) (a) conc. H₂SO₄ at 413 K

Question(iv). Ethers are

(a) Neutral (b) Basic (c) Acidic (d) Amphoteric

Ans) (b) Basic

Learning outcome: Students will be able to identify the preparation of alcohol

5) Propanone on reaction with alkyl magnesium bromide followed by hydrolysis will produce

(a) Primary alcohol (b) secondary alcohol (c) tertiary alcohol (d) Carboxylic acid

Ans) tertiary alcohol

Chapter : Aldehydes, ketones, carboxylic acid

Name of teacher : T V BINYA

(I) Name of the Topic – Aldehydes, ketones & carboxylic Acids

Expected learning outcomes- Learner understand the distinguishing test for aldehydes.

Assertion reason type

Q1 Assertion - Aromatic aldehydes do not give Fehling's test.

Reason- Aldehydes have carbonyl group.

Answer-both assertion and Reason are true but reason is not the correct explanation of the Assertion.

(II) Topic-Aldehydes, Ketones & carboxylic acids

Expected learning outcomes- learner recall the physical properties of aldehydes.

Type of question - Assertion Reason type

Q2 Assertion – Methanal is miscible with water.

Reason- Methanal form hydrogen bond with water.

Answer – Both assertion and Reason are true and reason is the correct explanation of the Assertion.

.

(III) Topic – Aldehyde, Ketone & Carboxylic acid

Expected learning outcome- apply the knowledge of ozonolysis and haloform reaction

Type of question- MCQ

Q 3 Ozonolysis of but-2-ene followed by reaction with zinc dust and water gives 2 moles of 'A'. The compound A when treated with I_2 and NaOH gives a yellow precipitate of B. Identify A and B

- a) A = CH_3COCH_3 , B = CHI_3
- b) A = CH_3CHO , B = CHI_3
- c) A = CH_3CH_2OH , B = CH_3ONa
- d) A = $CH_3CH_2CH_2CHO$, B = NaI

Answer (b)

(IV) Topic- Aldehydes, Ketones & Carboxylic acids

Expected learning outcome – understanding the clemmenson reduction.

Type of question MCQ

Q 4 .Propanone when treated with zinc amalgam and conc.HCl gives the product

- (a) Propyl chloride
- (b) Propane
- (c) Propanol
- (d) Propanal

Answer (b)

(V) Case Based Question

Topic -Aldehyde, ketones & carboxylic acid

Expected learning outcome -Learner must be able to explain the aldol condensation reaction.

Type of Question case based

Passage- The **aldol condensation reaction** is an organic reaction introduced by Charles Wurtz, who first prepared the β -hydroxy aldehyde from acetaldehyde in 1872. In an aldol condensation, an enolate ion reacts with a carbonyl compound in the presence of acid/base catalyst to form a β -hydroxy aldehyde or β -hydroxy ketone, followed by dehydration to give a conjugated enone. It is a useful carbon-carbon bond-forming reaction.

Now answer the Following Questions

(i) Which out of the following does not undergo aldol condensation:

Ethanal, Propanone, 2,2-dimethylpropanal, propanal

Answer: 2,2- dimethylpropanal

ii) Give the IUPAC name of the product formed by aldol condensation reaction between two molecules of propanal.

Answer: 2- Methylpent-2-enal

(i) Does methanal undergo aldol condensation? Give reason.

Answer : No, due to absence of alpha hydrogen (2)

OR

(ii) Alpha hydrogen of aldehydes and ketones are acidic in nature. Explain

Answer : alpha hydrogen of aldehydes and ketones are acidic in nature due to strong electron withdrawing carbonyl group and resonance stabilisation of conjugate base.

Chemistry Class XII

(I) Name of the Topic – Aldehydes, ketones & carboxylic Acids

Expected learning outcomes- Learner should understand the concept of nucleophilic addition-elimination reaction criteria to be followed Assertion reason type

Q1 Assertion - Aldehydes are more reactive than ketones towards nucleophilic addition reactions.

Reason- The presence of a hydrogen atom attached to the carbonyl group in aldehydes makes them more susceptible to nucleophilic attack.

Answer- True . Reason is the correct explanation of the Assertion.

(II) Topic-Aldehydes, Ketones & carboxylic acids

Expected learning outcomes- learner should catalyze protonates the carbonyl oxygen, facilitating the reaction.

Criteria to be followed- Assertion Reason type

Q2 Assertion – Esters are formed by the reaction between alcohols and carboxylic acids.

Reason- In esterification, the –OH group of carboxylic acid reacts with the –OH group of the alcohol, leading to the formation of an ester and water.

Answer – Reason is a wrong statement. Esters are formed by the reaction

involving condensation of the carboxylic acids-COOH group and the alcohols -OH group. A proton is transferred to one of the hydroxyl groups to form a good leaving group.

(III) Topic –Aldehyde, Ketone & Carboxylic acid

Expected learning outcome-knowledge of the use of strong oxidizing agents like $KMnO_4$ for the oxidative cleavage of aldehydes & ketones

Type of question- MCQ

Q 3 Which reagent is used for the oxidative cleavage of aldehydes and ketones to produce carboxylic acids?

(a) Tollen's Reagent (b) Fehling's solution (c) Sulphuric acid (d) $KMnO_4$

Answer (d) $KMnO_4$

(IV) Topic- Aldehydes, Ketones & Carboxylic acids

Expected learning outcome – understanding the mechanism of cannizzaro reaction, including the oxidation and reduction processes involved

Type of question MCQ

Q 4 In the cannizzaro reaction which type of compound is oxidized and which is reduced?

- (a) Aldehydes are reduced and ketones are oxidized.
- (b) Aldehydes are oxidized and ketones are reduced.
- (c) Aldehydes are both oxidized and reduced
- (d) Aldehydes and ketones do not participate in the cannizzaro reaction.

Answer (b)

(V) Case Based Question

Topic -Aldehyde, ketones & carboxylic acid

Expected learning outcome -Learner must be able to explain the mechanism for Nucleophilic addition reaction.

Type of Question case based

Passage- Aldehydes are generally more reactive than ketones in nucleophilic addition reaction due to steric and electronic reason. Sterically. The presence of two relatively large substituent in ketones hinders the approach of nucleophile to carbonyl carbon than is aldehydes having only one substituent. Electronically. Aldehydes are more

reactive than ketones because two alkyl groups reduce the electrophilicity of the carbonyl carbon more effectively than is former.

2

Now answer the Following Questions

(a) Arrange the following compounds in increasing order of their reactivity towards nucleophilic addition reactions

(i) Ethanal, Propanal, Propanone, Butanone

Answer Butanone < Propanone < Propanol < Ethanal

(ii) Benzaldehyde, P-Tolualdehyde, P-Nitrobenzaldehyde, Acetophenone

Answer Acetophenone, P-Tolualdehyde, Benzaldehyde < P-Nitrobenzaldehyde

(iii) $C_6H_5COCH_3$, CH_3CHO , CH_3COCH_3

Answer $C_6H_5COCH_3 < CH_3COCH_3 < CH_3CHO$

(iv) Would you expect benzaldehyde to be more reactive or less reactive in nucleophilic addition reactions than propanal? Explain

Answer The carbon atom of the carbonyl group of benzaldehyde is less electrophilic than the carbon atom of the carbonyl group in propanal. The polarity of the carbonyl group is reduced in benzaldehyde due to resonance. Hence it is less reactive.

(v) Arrange aldehyde, acetone, methyl tert-butyl ketone in decreasing order of reactivity with HCN

Answer Acetaldehyde > Acetone > Methyl tert-butyl ketone

Competency Based Questions

Class XII

Chapter: Amines

Multiple Choice Questions

Learning Outcome: Student is able to understand the reaction of primary amines with nitrous acid.

1. The product obtained when methylamine is treated with nitrous acid is
a) CH_3OH b) CH_3ONO c) CH_3OCH_3 d) CH_3NC

Learning Outcome: Student is able to explain about Gabriel phthalimide synthesis. Also understands why aryl amines can not be prepared by this method.

2. Which of the following can be prepared by Gabriel Phthalimide reaction?
a) Triethylamine b) t-butylamine c) Neo-pentylamine d) n-Butylamine

Assertion Reason Questions

Learning outcome: Student is able to understand that the reaction is used for preparing primary amines with one carbon atom less than the amide taken initially.

1.Assertion: When acetamide reacts with NaOH and Br₂ , methylamine is formed.

Reason: The reaction occurs through intermediate formation of isocyanate.

Learning outcome: Student is able to explain the reaction of alkyl halides and ammonia to get a mixture of amines.

2.Assertion: Ammonolysis of alkyl halides involve reaction between alkyl halides and alcoholic ammonia.

Reason: Ammonolysis of alkyl halides mainly produces secondary amines.

Case Based Questions

Read the passage given below and answer the following questions

Amines are basic in nature due to the presence of a lone pair of electrons on N-atom of the -NH₂ group , which it can donate to electron deficient compounds. Aliphatic amines are stronger bases than NH₃ because of the +I effect of the alkyl groups . Greater the number of alkyl groups attached to N-atom , higher is the electron density on it and more will be its basicity. Thus the order of basic nature of amines is expected to be 3^o > 2^o > 1^o. However the observed order is 2^o > 1^o > 3^o . This is explained on the basis of crowding on N-atom of the amine by alkyl groups which hinders the approach and bonding by a proton, consequently, the electron pair which is present on N is unavailable for donation and hence 3^o amines are the weakest bases. Aromatic amines are weaker bases than ammonia and aliphatic amines. Electron donating groups such as -CH₃ , -OCH₃ etc. increase the basicity while electron withdrawing groups such as -NO₂ , -CN etc. decrease the basicity of amines. The effect of these substituents is more at para than at meta position.

Choose the appropriate answer .

Learning outcome.

Student is able to compare the basicity of various aliphatic and aromatic amines.

1. Which of the following is the strongest base in aqueous solution ?

- a) Methylamine b) Trimethyl amine c) Aniline d) Dimethyl amine

2. Which order of basicity is correct?

- a) Aniline > o- nitroaniline > o- Toluidine
b) Aniline > o-Toluidine > o-nitroaniline
c) o-Toluidine > aniline > o-nitroaniline
d) o-nitroaniline > aniline > o-toluidine

3. Which is the weakest base among the following?

- a) Aniline b) Ammonia c) Methanamine d) o-nitroaniline

4. Choose the correct statement .

- a) Dimethyl amine is weaker base than ammonia
b) Dimethyl amine is stronger base than ammonia
c) Aniline is stronger base than ammonia
d) Aniline is stronger base than dimethyl amine.

Answers

MCQ: 1) a 2) d

Assertion- Reason : 1) a 2) c

Case Based: 1) d 2) c 3) d 4) b

Questions prepared by T. Premkumar

Principal – Indian Educational School, Kuwait MCQ:

1. The D/L configuration of carbohydrates is based on the position of -OH group on -----
 - (a) C1 of Glucose
 - (b) C2 of Glyceraldehyde
 - (c) C4 of Glucose
 - (d) C3 of Glyceraldehyde

LO – Students understand that D or L does not represent optical rotation of the molecule rather it is a convention to represent the chiral carbon atoms of naturally occurring biomolecules wrt to Glyceraldehyde.

2. On mild oxidation of glucose with bromine water, glucose gives-----
 - (a) Saccharic acid
 - (b) Glucaric acid
 - (c) Gluconic acid
 - (d) Adipic acid

LO – Students understand that Br₂ is a mild oxidizing agent that oxidizes the aldehyde group to a -COOH group and the product is gluconic acid.

Assertion and Reason questions:

Q-1

1. Assertion: Pentaacetate of glucose reacts with hydroxylamine to give an oxime.
2. Reason: When aldehyde group is free, it reacts with hydroxylamine to give an oxime.

LO – Students relate the formation of an oxime when carbonyl compounds react with Hydroxylamine.

Q-2

1. Assertion: Fructose is represented as D – (-) Fructose.
2. Reason: D here means it rotates the plane polarized light to the right.

LO – Students should know the difference between D and d ; L and l to answer this question correctly.

Case based question:

Carbohydrates is a class of compounds that include polyhydric aldehydes and ketones and large number of other polymeric molecules that yield these on hydrolysis, e.g., sugars, glycogen, cellulose, starch, etc. Depending upon their behaviour on hydrolysis, carbohydrates are further divided into three types: Monosaccharides (e.g., glucose, fructose etc.), disaccharides (e.g., sucrose, maltose etc.) and polysaccharides (e.g., starch, cellulose, etc.) Another classification of carbohydrates is as sugars and non-sugars. Sugars are sweet in taste, crystalline, soluble in water, mainly include mono and oligosaccharides. Non-Sugars are tasteless, amorphous, water insoluble and mainly include polysaccharides. Carbohydrates can also be classified as reducing and non-reducing sugars. Reducing sugars respond to Tollens' and Fehling solution test. All monosaccharides, aldoses and ketoses fall in this category. Some other oligosaccharides also may be reducing. All polysaccharides are non-reducing (starch, cellulose, glycogen etc). Sucrose is a disaccharide and non-reducing sugar.

A pair of stereoisomeric ring forms of any sugar differing in configuration only at carbon 1 (the anomeric carbon) are called anomers. The spontaneous change that takes place in specific rotation of an optically active sugar when dissolved in water is known as mutarotation. The hydrolysis of sucrose brings about a change in the sign of rotation, from dextro (+) to laevo (-). Such a change is known as inversion of sugar.

1. Anomers differ in
 - (a) Chemical properties
 - (b) Chemical and physical properties
 - (c) Physical properties
 - (d) Behaviour towards plane polarized light

LO – Students can understand the term anomers with reference to the position of the functional group on C1 or C2 in a cyclic monosaccharide.

2. Assertion: When sucrose is hydrolyzed, glucose and maltose are obtained.
Reason: The optical rotation changes during the hydrolysis of sucrose.

LO – Students will be able to understand the products of hydrolysis of sucrose, maltose and lactose. Also during the hydrolysis of sucrose there is change in the angle of rotation taking place and reason for that as well.

3. What are enantiomers?

LO – Students will be able to define correctly enantiomers and understand the difference between isomers and enantiomers.

4. Draw the cyclic structure of glucose.

LO – Students develop the skill to depict the position of the – OH groups correctly from C1 – C5 using the rules.

=====

GRADE12 BIOMOLECULES

TOPIC: PROTEINS, VITAMINS, NUCLEIC ACID

PREPARED BY: Ms. DEEPA DINESH, PIES, ABUDHABI

1. The most abundant biomolecules of the living system are proteins. They are polymers of α – amino acids connected to each other by peptide linkage. Amino acids contain amino (- NH₂) and carboxyl (-COOH) group. Amino acids are classified as acidic, basic or neutral depending upon the relative number of amino and carboxyl groups in their molecule. They behave like salts rather than simple amines or carboxylic acids. In aqueous solution, the carboxyl group can lose a proton and amino group can accept a proton, giving rise to a dipolar ion known as zwitter ion.

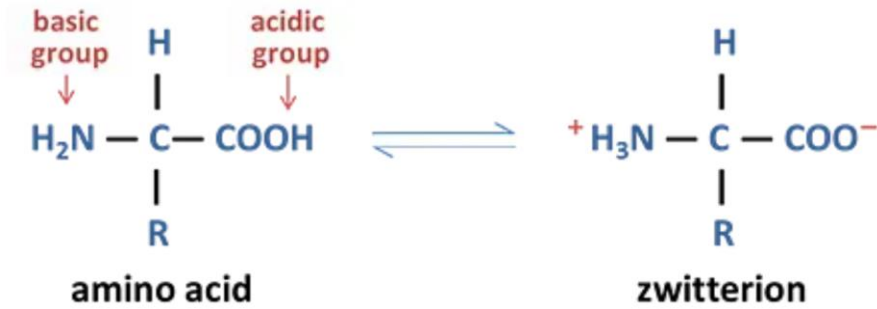
The amino acids, which can be synthesized in the body, are known as non-essential amino acids. On the other hand, those which cannot be synthesized in the body and must be obtained through diet, are known as essential amino acids.

1. The K_b and K_a values of α – amino acid are very low. Why?

Ans: In α – amino acids the acidic group is -NH₃⁺, instead of -COOH group as in carboxylic acids and the basic group is -COO⁻ instead of -NH₂ group as in amines. That is why they have low values of K_a and K_b.

2. Draw the structure of zwitter ion of amino acid.

Ans:

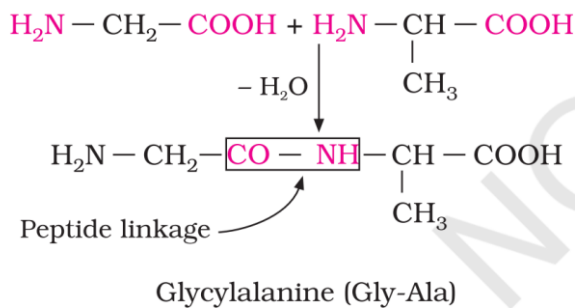


3. Write the structure of dipeptide formed when glycine combines with alanine. Circle the peptide bond in the dipeptide formed.

OR

The sample of a virus was tested and it was found to contain 20% adenine, 20% thymine, 20% cytosine and 20% guanine and the rest cytosine. Is the genetic material of this virus (a) DNA – double helix (b) DNA-single helix (c) RNA? What do you infer from this data?

Ans:



OR

$$A=T=20\%$$

But G is not equal to C so double helix is ruled out. The base pairs are ATGC and not AUGC so it is not RNA. The virus is a single helix DNA virus.

2. Cheliosis and digestive disorders are due to the deficiency of
- ascorbic acid
 - pyridoxine
 - thiamine
 - riboflavin

ans: d

3. In both DNA and RNA, heterocyclic base and phosphate ester linkages are at

- a) C₅' and C₂' respectively of the sugar molecule
- b) C₂' and C₅' respectively of the sugar molecule
- c) C₁' and C₅' respectively of the sugar molecule
- d) C₅' and C₁' respectively of the sugar molecule

Ans:d

4. The following questions consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
- (b) Both A and R are true, but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Assertion: α-amino acids exist as internal salt in solution as they have amino and carboxylic groups in the near vicinity.

Reason: H⁺ ion given by carboxyl group (-COOH) is captured by the amino group (-NH₂) having lone pair of electrons.

Ans:a

5. **Assertion:** Glycine must be taken through diet.

Reason: It is a non-essential essential amino acid.

Ans: d
