CBSE EXAMINATION PAPER-2023

CHEMISTRY

(Solved)

Time allowed : 3 hours | Maximum Marks : 10

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **11 questions.** All questions are **compulsory.**

ii. This question paper is divided into **3 sections.**

iii. **Section A** – questions number **1 to 8** are multiple choice questions Each question carries **1 marks.**

iv. **Section B** – questions number **9 to 9** are very short answer Each question carries **2 marks.**

v. **Section C** – questions number **10 to 11** are case based questions

vi. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.

vii. Use of calculator is NOT allowed.

Section A

Question 1.

The colligative property used for the determination of molar mass of polymers and proteins is :

[1 Marks]

(A) Elevation is boiling point

(B) Depression in freezing point

(C) Relative lowering in vapour pressure

(D) Osmotic pressure

Explanation:

Osmotic pressure is the correct answer because it is a colligative property that depends on the number of solute particles in a solution. This property is especially useful for determining the molar mass of large molecules like polymers and proteins, as it allows for the calculation based on the effect of solute concentration on the osmotic pressure.

Question 2.

Low concentration of oxygen in the blood and tissues of people living at high altitude is due to :

[1 Marks]

(A) low atmospheric pressure

(B) both low temperature and high atmospheric pressure

(C) low temperature

(D) high atmospheric pressure

Explanation:

The correct answer is 'low atmospheric pressure.' At high altitudes, the atmospheric pressure is significantly lower than at sea level, which means that the amount of oxygen available in the air is also reduced. This leads to lower concentrations of oxygen in the blood and tissues.

Question 3.

The correct cell to represent the following reaction is : $Zn + 2Ag^{+} \rightarrow Zn^{2+} + 2Ag$

[1 Marks]

(A) $Ag^{+} \mid Ag \parallel Zn^{2+} \mid Zn$

(B) $Ag \mid Ag^{+} \parallel Zn \mid Zn^{2+}$

(C) $2Ag \mid Ag^{+} \parallel Zn \mid Zn^{2+}$

(D) $Zn \mid Zn^{2+} \parallel Ag^{+} \mid Ag$

Explanation:

The correct option is 'Zn | Zn^{2+} || Ag^{+} | Ag'. This representation correctly shows zinc on the left side as the anode (oxidizing agent) where it loses electrons to form Zn^{2+}, while silver ions (Ag^{+}) on the right side gain electrons to form solid silver (Ag) at the cathode. The notation follows the standard format of an electrochemical cell where the oxidation half-reaction is listed first.

Question 4.

The most common and stable oxidation state of a Lanthanoid is :

[1 Marks]

(A) + 4

(B) + 6

(C) + 3

(D) + 2

Explanation: The most common and stable oxidation state of Lanthanoids is +3. This is due to the fact that they typically lose three electrons, corresponding to the removal of the outermost 6s and 4f electrons, which is a characteristic behavior of these elements.

Question 5.

The compounds $[Co(SO_4)(NH_3)_5]Br$ and $[Co(Br)(NH_3)_5]SO_4$ represent :

[1 Marks]

(A) ionisation isomerism

(B) linkage isomerism

(C) coordination isomerism

(D) optical isomerism

Explanation:

The correct answer is ionisation isomerism. This is because ionisation isomers differ in the arrangement of counter ions and can exchange ligands with counter ions, as shown in the provided example of isomers [Co(NH3)5(SO4)]Br and [Co(NH3)5Br]SO4, where the sulfate and bromide ions are interchangeably present.

Question 6.

The synthesis of alkyl fluoride is best obtained from :

[1 Marks]

(A) Sandmeyer reaction

(B) Finkelstein reaction

(C) Free radicals

(D) Swartz reaction

Explanation:

The correct answer is 'Swartz reaction'. This reaction is specifically used to convert alkyl halides (like chlorides or bromides) into alkyl fluorides by using a fluoride ion source, making it the most suitable method for synthesizing alkyl fluorides among the options provided.

Question 7.

An α- helix is a structural feature of :

[1 Marks]

(A) Starch

(B) Sucrose

(C) Polypeptides

(D) Nucleotides

Explanation: The correct answer is Polypeptides. An α-helix is a common secondary structure found in polypeptides (proteins), formed by hydrogen bonding between the amino acid residues in the polypeptide chain, as described in the provided context.

Question 8.

Assertion (A) : Low spin tetrahedral complexes are rarely observed.

Reason (R) : Crystal field splitting energy is less than pairing energy for tetrahedral complexes.

[1 Marks]

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(B) Assertion (A) is true, but Reason (R) is false.

(C) Assertion (A) is false, but Reason (R) is true.

(D) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

Explanation:

Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A). Low spin tetrahedral complexes are indeed rare because the crystal field splitting energy in tetrahedral complexes is smaller than that in octahedral complexes, leading to weak field ligands causing less pairing compared to octahedral arrangements. However, the rarity of low spin tetrahedral complexes is not directly explained by the relationship between crystal field splitting and pairing energy.

Section B

Question 9.

What is Henry's law? Give one application of it.

[2 Marks]

Answer: Henry's Law states that the amount of gas dissolved in a liquid is directly proportional to the pressure of the gas above the liquid at a constant temperature. Mathematically, C = k_H * P, where C is the concentration of the gas dissolved, k_H is Henry's law constant, and P is the gas pressure.
Application: It is used in carbonated beverages where CO2 is dissolved in the drink under high pressure. When the bottle is opened, pressure decreases and CO2 comes out causing fizz.

Section C

Question 10. The rate of reaction is concerned with decrease in concentration of reactants or increase in the concentration of products per unit time. It can be expressed as instantaneous rate at a particular instant of time and average rate over a large interval of time. Mathematical representation of rate of reaction is given by rate law. Rate constant and order of a reaction can be determined from rate law or its integrated rate equation.

Question 11.

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