TS EAMCET 2025 Chemistry Chapter-Wise Questions with Solutions PDF

Chemical Bonding and Molecular Structure

1. The main axis of the molecule is along the Z-axis. The orbitals Px and Py overlap to form:

(A) No bond is formed.
(B) δ-molecular orbital
(C) σ-molecular orbital
(D) π-molecular orbital

Solution:

The correct option is: (A) No bond is formed. Since Px and Py orbitals are oriented perpendicular to each other and to the Z-axis, they do not overlap effectively along the main axis (Z-axis) to form a bond.

2. Assuming that Hund's rule is violated, the bond order and magnetic nature of the diatomic molecule B2 is:

(A) 1 and diamagnetic
(B) 0 and diamagnetic
(C) 1 and paramagnetic
(D) 0 and paramagnetic

Solution:

For the diatomic molecule B2, if Hund's rule is violated (meaning electrons do not occupy degenerate orbitals singly before pairing), the bond order would be 1, and the molecule would be paramagnetic due to the presence of unpaired electrons in the molecular orbitals.

3. Intramolecular hydrogen bonding is formed in:

(A) H2O
(B) Salicylaldehyde
(C) NH3
(D) Benzophenone

Solution:

The Correct Answer is (B) Salicylaldehyde

Solutions

1. Calculate the osmotic pressure in pascals exerted by a solution prepared by dissolving 1.0 g of a polymer with a molar mass of 185,000 in 450 mL of water at 37°C.

(A) 31 Pa
(B) 27 Pa
(C) 23 Pa
(D) 19 Pa

The Correct Answer: (B) 27 Pa

2. If the density of CH3OH (methanol) is 0.793 kg/L, what is the volume of methanol needed to make 2.5 L of a 0.25 M solution?

(A) 20.2 mL
(B) 50.4 mL
(C) 25.2 mL
(D) 10.0 mL

The Correct Answer: (C) 25.2 mL

3. The osmotic pressure of a solution can be increased by:

A) Diluting the solution.
(B) Increasing the volume of the vessel.
(C) Decreasing the temperature of the solution.
(D) Increasing the temperature of the solution.

The Correct Answer: (D) Increasing the temperature of the solution.

Electrochemistry

1. The EMF of a galvanic cell consisting of two hydrogen electrodes is 0.17 V. If the concentration of [H+] at one electrode is 10−3 M, what is the pH at the other electrode?

(A) 5.88
(B) 4.88
(C) 2.08
(D) 3.08

Solution: pH=−log[H+]≈−log (5.49×10−4) ≈3.08

2. The overall reaction taking place at the anode during the electrolysis of fused sodium chloride using a suitable electrode is:

(A) Oxidation of chloride
(B) Reduction of sodium ions
(C) Reduction of chlorine
(D) Oxidation of sodium atoms

Solution:

The Correct Answer is (A) Oxidation of chloride

Explanation: In the electrolysis of fused sodium chloride (NaCl), sodium ions imigrate to the cathode, where they are reduced to sodium metal. Chloride ions (Cl−) migrate to the anode, where they are oxidized to chlorine gas (Cl2). The overall reaction at the anode is: 2Cl−→Cl2- -2Cl−→Cl2+2e−

This corresponds to the oxidation of chloride ions.

3. The name of the cell which is generally used in hearing aids is:

(A) Dry cell
(B) Galvanic cell
(C) Mercury cell
(D) Lithium cell

The Correct Answer is (C) Mercury cell

The p- Block Elements

1. Consider the compounds, BCl3, and CCl4. How will they behave with water? Justify.

(A) They will react vigorously with water.
(B) They will slowly react with water.
(C) They will partially react with water.
(D) They will show no reaction with water.

Solution:

The Correct Answer is (D) They will show no reaction with water.

In BCl3, there are only six electrons in the valence shell of B atom. Thus, the octet is incomplete and it can accept a pair of electrons from water and hence BCl3 undergoes hydrolysis. Whereas, in CCl4, the C atom has 8 electrons and its octet is complete. That's why it has no tendency to react with water.

2. Is boric acid a protic acid? Explain.

(A) Yes, because it donates protons in solution.
(B) No, because it accepts electron pairs from other molecules.
(C) Yes, because it dissociates to release H+ ions in water.
(D) No, because it reacts with water to form hydroxide ions directly.

The Correct Answer is (B) No, because it accepts electron pairs from other molecules. It is Lewis Acid.

3. Which of the following elements in the p-block has the highest oxidation state in its compounds?

(A) Carbon
(B) Nitrogen
(C) Phosphorus
(D) Sulphur

Explanation: In the p-block elements, nitrogen exhibits the highest oxidation state in its compounds. For example, in nitrogen trifluoride (NF_3), nitrogen has an oxidation state of +3, and in nitrogen pentafluoride (NF_5), it reaches +5. This is higher than the maximum oxidation states exhibited by carbon (+4), phosphorus (+5), and sulphur (+6) in their respective compounds.

The d- Block Elements

1: Which of the following d-block elements shows the maximum number of oxidation states?

(A) Chromium
(B) Manganese
(C) Iron
(D) Zinc

Explanation:

Manganese exhibits a wide range of oxidation states, from +2 to +7, which is the maximum number among the d-block elements listed.

2: Which of the following is true about the color of transition metal complexes?

(A) All transition metal complexes are colorless.
(B) Color of transition metal complexes are due to d-d transitions.
(C) The color of transition metal complexes is due to f-f transitions.
(D) The color of transition metal complexes is due to charge transfer transitions.

Explanation: The color of transition metal complexes is primarily due to the d-d electronic transitions, where electrons move between different d-orbitals split by the ligand field.

3: Which of the following statements about the stability of oxidation states of transition metals is correct?

(A) The stability of higher oxidation states increases with increasing atomic number.
(B) The stability of lower oxidation states is generally observed in lighter transition metals.
(C) Higher oxidation states are more stable in aqueous solutions.
(D) All transition metals exhibit only one stable oxidation state.

Explanation: In transition metals, the stability of lower oxidation states is often observed in lighter transition metals, while the heavier ones tend to exhibit higher oxidation states.