CBSE Class 12 Chemistry 2026

Questions with Solutions

Set 56/3/3 · Section A · Detailed step-by-step solutions

General Instructions

(i) This booklet contains 10 questions, each provided with a complete, step-by-step solution.

(ii) It comprises 10 single-correct multiple-choice questions.

(iii) Attempt each question on your own before reviewing the given solution.

1. According to Werner's theory, the primary valencies of the central metal atom :

(A) are satisfied by neutral molecules or negative ions.

(B) are equal to its coordination number.

(C) are satisfied by negative ions.

(D) are non-ionisable.

Correct Answer: (C) are satisfied by negative ions.

Solution:

Concept: In Werner's theory the central metal shows two kinds of valency. **Primary (principal) valency** equals the oxidation number, is ionisable, and is satisfied by **negative ions**. **Secondary valency** equals the coordination number, is non-ionisable, and is satisfied by neutral molecules or negative ions (the ligands).

Reasoning: The statement about primary valencies being satisfied by negative ions matches option (C); the other options describe the secondary valency or are wrong.

Answer: (C) are satisfied by negative ions.

Quick Tip: Primary valency = oxidation number, ionisable, met by anions; secondary valency = coordination number.

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2. The oxidation number of Pt in $[Pt(en)_2Cl_2]^{2+}$ is :

(A) + 3

(B) + 4

(C) + 2

(D) + 6

Correct Answer: (B) + 4

Solution:

Concept: Overall charge = (oxidation number of metal) + (sum of ligand charges).
Step 1: Ethylenediamine (en) is a neutral bidentate ligand, charge 0; each chloride is -1, so two give -2.
Step 2: Let Pt be x. The complex ion carries $+2$:

$$x + 2(0) + 2(-1) = +2 \Rightarrow x - 2 = +2 \Rightarrow x = +4$$

Answer: $\boxed{+4}$, option (B).

Quick Tip: en is neutral (0); each Cl is -1; sum of charges must equal the +2 on the ion.

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3. Which of the following product is formed when salicylic acid is treated with $(CH_3CO)_2O$ in the presence of acid ?

(A) o-$C_6H_4(COOCH_3)(OH)$ — methyl 2-hydroxybenzoate

(B) o-$C_6H_4(OCOCH_3)(OH)$

(C) o-$C_6H_4(COCH_3)(COOH)$

(D) o-$C_6H_4(OCOCH_3)(COOH)$ — aspirin (acetylsalicylic acid)

Correct Answer: (D) o-$C_6H_4(OCOCH_3)(COOH)$ — aspirin (acetylsalicylic acid)

Solution:

Concept: Salicylic acid is 2-hydroxybenzoic acid — it has a phenolic –OH and a –COOH on adjacent carbons. Acetic anhydride, $(CH_3CO)_2O$, acetylates the phenolic –OH (O-acetylation) in the presence of acid.
Reasoning: The –OH becomes $–OCOCH_3$ while the –COOH is untouched, giving 2-(acetyloxy)benzoic acid, i.e. **aspirin**.
Answer: (D) o-$C_6H_4(OCOCH_3)(COOH)$.

Quick Tip: Acetic anhydride acetylates the phenolic -OH of salicylic acid → aspirin; -COOH stays.

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4. Which reagent is used to distinguish between primary, secondary and tertiary amines ?

(A) $C_6H_5SO_2Cl$

(B) C_6H_5COCl

(C) $CHCl_3$ + ethanolic KOH

(D) NaOH + I_2

Correct Answer: (A) $C_6H_5SO_2Cl$

Solution:

Concept: Benzenesulphonyl chloride, $C_6H_5SO_2Cl$ (**Hinsberg's reagent**), reacts differently with the three classes of amine.
Reasoning: With a 1° amine it gives a sulphonamide that is soluble in alkali; with a 2° amine it gives a sulphonamide insoluble in alkali; a 3° amine does not react. These three distinct outcomes let it tell 1°, 2° and 3° amines apart.
Answer: (A) $C_6H_5SO_2Cl$.

Quick Tip: Hinsberg's reagent = benzenesulphonyl chloride; gives 3 different responses for 1/2/3-amines.

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5. On electrolysis of very dilute aqueous solution of NaCl using platinum electrodes :

(A) H_2 gas is evolved at anode.

(B) Na is produced at anode.

(C) O_2 gas is evolved at anode.

(D) H_2 gas is evolved at cathode.

Correct Answer: (C) O_2 gas is evolved at anode.

Solution:

Concept: The species with the more favourable electrode potential is discharged. In a **very dilute** NaCl solution the Cl^- concentration is too low to compete, so water is oxidised at the anode.

Anode (oxidation): $2H_2O \rightarrow O_2 + 4H^+ + 4e^-$ — so $\mathbf{O_2}$ is evolved (Cl_2 would need concentrated brine).

Answer: (C) O_2 gas is evolved at anode.

Note: at the cathode H_2O is reduced to H_2, so option (D) is also a true statement; option (C) is the one that specifically reflects the 'very dilute' condition being tested.

Quick Tip: Dilute brine → water oxidised at anode → O2 (Cl2 needs concentrated NaCl); H2 forms at cathode.

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6. The correct order of decreasing basic strength in aqueous solution of the following is :

(A) $(C_2H_5)_3N > C_2H_5NH_2 > (C_2H_5)_2NH$

(B) $(C_2H_5)_2NH > C_2H_5NH_2 > (C_2H_5)_3N$

(C) $C_2H_5NH_2 > (C_2H_5)_2NH > (C_2H_5)_3N$

(D) $(C_2H_5)_2NH > (C_2H_5)_3N > C_2H_5NH_2$

Correct Answer: (D) $(C_2H_5)_2NH > (C_2H_5)_3N > C_2H_5NH_2$

Solution:

Concept: Basicity of amines in water is a balance of three effects — the electron-releasing (+I) effect of alkyl groups, steric hindrance, and stabilisation of the protonated cation by hydration (H-bonding).

Reasoning: For ethyl amines these effects give the experimentally observed order $2^\circ > 3^\circ > 1^\circ$: the secondary amine has enough +I effect with good cation hydration, the tertiary amine has the most +I but poor hydration and high steric crowding, and the primary amine has the least +I effect.

Answer: (D) $(C_2H_5)_2NH > (C_2H_5)_3N > C_2H_5NH_2$.

Quick Tip: Ethyl amines in water: 2-amine > 3-amine > 1-amine (solvation + steric + inductive balance).

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7. The mole fraction of a solute in 2.0 molal aqueous solution is :

(A) 1.87

(B) 0.347

(C) 0.0347

(D) 0.00347

Correct Answer: (C) 0.0347

Solution:

Concept: A 2.0 molal solution has 2.0 mol solute per 1 kg (1000 g) of water.

Step 1: Moles of water $= \dfrac{1000}{18} = 55.56$ mol.

Step 2: Mole fraction of solute

$$x_{solute} = \frac{n_{solute}}{n_{solute} + n_{water}} = \frac{2.0}{2.0 + 55.56} = \frac{2.0}{57.56} = 0.0347$$

Answer: $\boxed{0.0347}$, option (C).

Quick Tip: 2 molal = 2 mol solute in 1000 g water (55.56 mol); x = 2/(2+55.56).

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8. Which of the following transition metals shows +1 and +2 oxidation states ?

(A) Mn

(B) Zn

(C) Cu

(D) Sc

Correct Answer: (C) Cu

Solution:

Concept: Common oxidation states reflect the use of 4s and 3d electrons.
Reasoning: Copper shows **+1** (cuprous, e.g. Cu_2O) and **+2** (cupric, e.g. $CuSO_4$). Mn shows +2 to +7, Sc is essentially only +3, and Zn is only +2.
Answer: (C) Cu.

Quick Tip: Cu = cuprous (+1) and cupric (+2); Zn only +2, Sc only +3, Mn +2 to +7.

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9. On hydrolysis, which of the following carbohydrates gives only β-glucose ?

(A) Starch

(B) Sucrose

(C) Maltose

(D) Cellulose

Correct Answer: (D) Cellulose

Solution:

Concept: The hydrolysis products depend on the monosaccharide units and the type of glycosidic linkage.
Reasoning: Cellulose is a straight-chain polymer of **β-D-glucose** joined by β-1,4 linkages, so hydrolysis gives only β-glucose. Starch and maltose give α-glucose,

while sucrose gives glucose + fructose.

Answer: (D) Cellulose.

Quick Tip: Cellulose = beta-1,4 polymer of beta-D-glucose; starch/maltose give alpha-glucose; sucrose gives glucose+fructose.

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10. Consider the following compounds : Chlorobenzene (I), 2,4,6-trinitrochlorobenzene (II), 2,4-dinitrochlorobenzene (III), 4-nitrochlorobenzene (IV). The correct order of increasing ease of nucleophilic substitution reactions of these compounds is :

(A) I < IV < III < II

(B) I < III < IV < II

(C) II < III < IV < I

(D) IV < III < II < I

Correct Answer: (A) I < IV < III < II

Solution:

Concept: Nucleophilic aromatic substitution on an aryl halide is accelerated by electron-withdrawing $-NO_2$ groups at the ortho/para positions, which stabilise the carbanion (Meisenheimer) intermediate. More such groups → faster substitution.

Reasoning: Number of activating $-NO_2$ groups: I (0) < IV (1) < III (2) < II (3). Hence increasing ease of substitution is I < IV < III < II.

Answer: (A) I < IV < III < II.

Quick Tip: More o/p -NO2 groups stabilise the intermediate → faster NAS: 0 < 1 < 2 < 3 nitro groups.