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:

Approach by matching each property to the right valency. Werner described the metal's ***primary*** valency as the ionisable charge that equals the metal's oxidation state, and it is neutralised by anions; the ***secondary*** valency is the fixed, non-ionisable coordination number filled by ligands (neutral or anionic).

Eliminate: 'equal to coordination number' and 'satisfied by neutral molecules' and 'non-ionisable' all describe the secondary valency, so they are ruled out. Only 'satisfied by negative ions' is a property of the primary valency.

Hence the correct option is (C).

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

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:

Balance the charges on the complex ion. The two ***en*** ligands are neutral and contribute **0**; the two Cl^- contribute $2 \times (-1) = -2$. Writing the metal oxidation state as n and equating to the ionic charge **+2**:

$$n + (-2) = +2 \Rightarrow n = +4$$

So platinum is in the **+4** state. **Correct option: (B) +4.**

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:

Identify the functional groups and the reagent's job. Salicylic acid carries a ***phenolic*** hydroxyl next to a carboxylic acid. Acetic anhydride is an acetylating agent: under acid it converts a phenol –OH into an acetate ester $–OCOCH_3$, leaving the –COOH group unchanged.
The result is acetylsalicylic acid (aspirin), with substituents $–OCOCH_3$ and –COOH on the ring. Options keeping a free –OH (no acetylation) or esterifying the acid instead are incorrect. **Correct option: (D).**

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:

Decide which reagent gives three different responses. Carbylamine ($CHCl_3$ + ethanolic KOH) and the iodoform test (NaOH + I_2) are confirmatory tests, not a way to separate all three amine classes; benzoyl chloride acylates 1° and 2° alike. ***Hinsberg's*** reagent, benzenesulphonyl chloride, is the standard choice: 1° → alkali-soluble sulphonamide, 2° → alkali-insoluble sulphonamide, 3° → no reaction — three distinguishable results. **Correct option: (A).**

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

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:

Compare the anode candidates for dilute brine. Oxidising Cl^- to Cl_2 requires a reasonable chloride concentration; in a ***very dilute*** solution that route is suppressed, so water is oxidised instead, releasing O_2 at the anode:

$$2H_2O \rightarrow O_2 + 4H^+ + 4e^-$$

Sodium is never deposited from aqueous solution and no gas is reduced at the anode, ruling out the other anode options. **The condition-specific answer is (C), O_2 at the anode** (H_2 is simultaneously released at the cathode).

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

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:

Recall the NCERT result for ethyl-substituted amines in aqueous medium. Although in the gas phase basicity rises $1° < 2° < 3°$ (pure inductive effect), in ***water*** the solvation of the ammonium ion and steric factors rearrange the order. For the ethyl series the measured order is diethylamine > triethylamine > ethylamine.
Matching this to the options, only (D) reads $(C_2H_5)_2NH > (C_2H_5)_3N > C_2H_5NH_2$. **Correct option: (D).**

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:

Use the definition of molality and convert to mole fraction. Molality **2.0** means $n_{solute} = 2.0$ mol in **1000** g water, and $n_{water} = 1000/18 \approx 55.6$ mol.

$$x_{solute} = \frac{2.0}{2.0 + 55.6} \approx \frac{2.0}{57.6} \approx 0.0347$$

The value is close to $m \times M_{water}/1000 = 2.0 \times 18/1000 = 0.036$, confirming the order of magnitude. **Correct option: (C) 0.0347.**

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:

Test each option against its characteristic states. Manganese ranges from +2 up to +7, scandium is fixed at +3, and zinc — with a full d^{10} core — shows only +2. ***Copper*** is the one element that is stable in both a **+1** (cuprous) and a **+2** (cupric) state, so it is the metal exhibiting +1 and +2. **Correct option: (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:

Work from the building blocks of each carbohydrate. Sucrose is glucose + fructose, so it cannot give only glucose; starch (amylose/amylopectin) and maltose are built from α-D-glucose units.
Cellulose alone is a polymer of β-D-glucose linked β-1,4, so its complete hydrolysis yields β-glucose exclusively. **Correct option: (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:

Rank by the count of ortho/para nitro groups, since each $-NO_2$ withdraws electron density and stabilises the intermediate formed when the nucleophile adds. Plain chlorobenzene has none and reacts the least; 4-nitro has one, 2,4-dinitro has two, and 2,4,6-trinitro (picryl chloride) has three and reacts the most. So ease increases I < IV < III < II. **Correct option: (A).**

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