

# Chemistry

Daily Practice Paper #1 · JEE Advanced 2026 · Class 12

SolveFlow · Demo Paper

Field	Value
Subject	Chemistry
Total Questions	10
Total Marks	40
Negative Marking	−1 per wrong answer
Time Suggested	30 minutes
Syllabus	Class 12 — Electrochemistry, Kinetics, p-Block, d-Block, Coordination, Organic

## CO & Bloom's Level Mapping

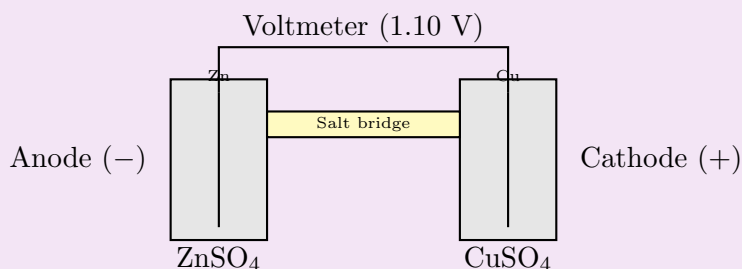
Q No.	Topic	CO	Bloom's Level
1	Electrochemistry — Daniell Cell	CO1	L3 — Apply
2	Chemical Kinetics — First Order	CO1	L3 — Apply
3	Surface Chemistry — Adsorption	CO2	L2 — Understand
4	p-Block — Bond Angles	CO2	L4 — Analyse
5	d-Block — Oxidation States	CO3	L2 — Understand
6	Coordination Chemistry — IUPAC	CO3	L3 — Apply
7	Aldehydes & Ketones — Tollens'	CO4	L4 — Analyse
8	Amines — Basic Strength	CO4	L4 — Analyse
9	Polymers — Nylon-6,6	CO5	L1 — Remember
10	Biomolecules — Protein Structure	CO5	L2 — Understand

### Instructions

- Each question carries **4 marks** for a correct answer.
- **−1 mark** is deducted for each incorrect answer.
- No marks are deducted for unattempted questions.
- Use of calculator is **not** permitted.
- All reactions assumed to occur in aqueous solution unless stated otherwise.

## Q1 | Electrochemistry — Daniell Cell Marks: 4 | CO/BL: CO1 / L3

The standard electrode potentials are:  $E^\circ(\text{Zn}^{2+}/\text{Zn}) = -0.76 \text{ V}$  and  $E^\circ(\text{Cu}^{2+}/\text{Cu}) = +0.34 \text{ V}$ . The EMF of the Daniell cell  $\text{Zn} | \text{ZnSO}_4 || \text{CuSO}_4 | \text{Cu}$  under standard conditions is:



- (A)  $-1.10 \text{ V}$
- (B)  $+1.10 \text{ V}$
- (C)  $+0.42 \text{ V}$
- (D)  $-0.42 \text{ V}$

## Solution — Correct Answer: (B)

Cu has a higher reduction potential, so it acts as the **cathode**; Zn is the **anode**:

$$E^\circ_{\text{cell}} = E^\circ_{\text{cathode}} - E^\circ_{\text{anode}} \quad (1)$$

$$= (+0.34) - (-0.76) \quad (2)$$

$$= \boxed{+1.10 \text{ V}} \quad (3)$$

Cell reaction:  $\text{Zn} + \text{Cu}^{2+} \longrightarrow \text{Zn}^{2+} + \text{Cu}$

## Key Point

$\Delta G^\circ = -nFE^\circ_{\text{cell}}$ . For the Daniell cell:  $n = 2$ , so  $\Delta G^\circ = -2 \times 96485 \times 1.10 \approx -212 \text{ kJ/mol}$  (spontaneous).

## Q2 | Chemical Kinetics — First Order Reaction Marks: 4 | CO/BL: CO1 / L3

For a first-order reaction, the half-life  $t_{1/2} = 693 \text{ s}$ . The rate constant  $k$  is:

- (A)  $1.0 \times 10^{-3} \text{ s}^{-1}$
- (B)  $0.693 \text{ s}^{-1}$
- (C)  $1.0 \times 10^{-2} \text{ s}^{-1}$
- (D)  $693 \text{ s}^{-1}$

**Solution — Correct Answer: (A)**

For a first-order reaction:

$$t_{1/2} = \frac{\ln 2}{k} = \frac{0.693}{k} \quad (4)$$

$$k = \frac{0.693}{t_{1/2}} = \frac{0.693}{693 \text{ s}} = \boxed{1.0 \times 10^{-3} \text{ s}^{-1}} \quad (5)$$

**Key Point**

First-order:  $t_{1/2} = 0.693/k$  — **independent of initial concentration.**

Second-order:  $t_{1/2} = 1/(k[A]_0)$  — **depends on initial concentration.**

**Q3 | Surface Chemistry — Physisorption vs Chemisorption Marks: 4 | CO/BL: CO2 / L**

Physisorption differs from chemisorption primarily because physisorption:

- (A) Involves high activation energy
- (B) Is highly specific to the adsorbent
- (C) Is reversible and involves van der Waals forces
- (D) Forms covalent bonds with the surface

**Solution — Correct Answer: (C)**

Property	Physisorption	Chemisorption
<b>Force</b>	Van der Waals	Chemical bond
<b>Reversibility</b>	Reversible	Irreversible
<b>Specificity</b>	Non-specific	Highly specific
$\Delta H_{ads}$	20–40 kJ/mol	40–400 kJ/mol
<b>Activation energy</b>	Low/None	High
<b>Layers</b>	Multilayer	Monolayer

Physisorption is reversible, non-specific, and involves van der Waals forces.

**Key Point**

BET adsorption isotherm applies to physisorption (multilayers). Langmuir adsorption isotherm assumes monolayer (applies to chemisorption).

Q4 | *p*-Block Elements — Bond Angles Marks: 4 | CO/BL: CO2 / L4

The correct order of bond angles among  $\text{NH}_3$ ,  $\text{NF}_3$ , and  $\text{PH}_3$  is:

- (A)  $\text{NH}_3 > \text{NF}_3 > \text{PH}_3$
- (B)  $\text{NF}_3 > \text{NH}_3 > \text{PH}_3$
- (C)  $\text{NH}_3 > \text{PH}_3 > \text{NF}_3$
- (D)  $\text{PH}_3 > \text{NH}_3 > \text{NF}_3$

## Solution — Correct Answer: (A)

All three molecules are pyramidal ( $sp^3$  hybridised central atom, one lone pair):

Molecule	Bond Angle	Reason
$\text{NH}_3$	$107.8^\circ$	H is less electronegative; bond pairs closer to N
$\text{NF}_3$	$102.5^\circ$	F withdraws $e^-$ density; bp–bp repulsion reduced
$\text{PH}_3$	$93.3^\circ$	P is larger; poor $p$ -orbital overlap; lp more diffuse

$\therefore \text{NH}_3 (107.8^\circ) > \text{NF}_3 (102.5^\circ) > \text{PH}_3 (93.3^\circ)$

## Key Point

In  $\text{PH}_3$ : P uses nearly pure  $p$ -orbitals for bonding (lone pair is in  $s$ -orbital), so the bond angle is close to  $90^\circ$ .

Q5 | *d*-Block Elements — Manganese Oxoanions Marks: 4 | CO/BL: CO3 / L2

The highest oxidation state of Mn in its common oxoanion is +7. The formula of the **permanganate ion** is:

- (A)  $\text{MnO}_4^-$
- (B)  $\text{MnO}_4^{2-}$
- (C)  $\text{Mn}_2\text{O}_7$

(D)  $\text{MnO}_2$

**Solution — Correct Answer: (A)**

Let oxidation state of Mn =  $x$ :

$$x + 4(-2) = -1 \quad (6)$$

$$x = -1 + 8 = \boxed{+7} \quad (7)$$

Formula:  $\text{MnO}_4^-$  (permanganate ion).  $\text{Mn}_2\text{O}_7$  is the anhydride (Mn = +7 also) but it is a covalent compound, not the ion.

**Key Point**

Common Mn oxidation states: +2 ( $\text{MnO}$ , pale pink), +4 ( $\text{MnO}_2$ , brown), +6 ( $\text{MnO}_4^{2-}$ , manganate, green), +7 ( $\text{MnO}_4^-$ , permanganate, purple).

**Q6 | Coordination Chemistry — IUPAC Nomenclature** Marks: 4 | CO/BL: CO3 / L3

The IUPAC name of  $[\text{Co}(\text{NH}_3)_4(\text{NO}_2)\text{Cl}]\text{Cl}$  is:

- (A) Tetraamminechloronitrocobalt(III) chloride
- (B) Tetraamminechloridonitrito- $\kappa\text{O}$ -cobalt(III) chloride
- (C) Tetraamminenitrochloridocobalt(III) chloride
- (D) Chloridotetraamminenitroso-cobalt(III) chloride

**Solution — Correct Answer: (B)**

**Step 1 — Identify ligands and metal:**

- $4 \times \text{NH}_3$  = tetraammine
- $\text{Cl}^-$  = chlorido (alphabetically before nitrito)
- $\text{NO}_2^-$  via O = nitrito- $\kappa\text{O}$
- Metal: Co; charge: +3 (from overall neutral complex with one outer  $\text{Cl}^-$ )

**Step 2 — Alphabetical order of ligands:** chlorido < nitrito < tetraammine

**Name:** Tetraamminechloridonitrito- $\kappa\text{O}$ -cobalt(III) chloride

**Key Point**

Ligands named alphabetically ignoring multiplying prefixes (di, tri, tetra).  $\kappa\text{O}$  indicates the nitrito ligand is O-bonded (vs N-bonded = nitro).

## Q7 | Aldehydes &amp; Ketones — Tollens' vs Fehling's Test Marks: 4 | CO/BL: CO4 / L4

Which compound gives a **positive Tollens' test** but **negative Fehling's test**?

- (A) Formaldehyde ( $\text{HCHO}$ )
- (B) Acetaldehyde ( $\text{CH}_3\text{CHO}$ )
- (C) Benzaldehyde ( $\text{C}_6\text{H}_5\text{CHO}$ )
- (D) Acetone ( $\text{CH}_3\text{COCH}_3$ )

**Solution — Correct Answer: (C)**

Compound	Tollens'	Fehling's	Reason
Formaldehyde	+ve	+ve	Aliphatic aldehyde
Acetaldehyde	+ve	+ve	Aliphatic aldehyde
Benzaldehyde	+ve	−ve	Aromatic aldehyde
Acetone	−ve	−ve	Ketone

Benzaldehyde is an aldehyde, so it reduces Tollens' reagent ( $\text{Ag}^+ \rightarrow \text{Ag}\downarrow$ , silver mirror). But aromatic aldehydes *cannot* reduce  $\text{Cu}^{2+}$  in Fehling's reagent — only aliphatic aldehydes do. Answer: (C) Benzaldehyde

**Key Point**

Tollens' test: *all* aldehydes react. Fehling's test: only *aliphatic* aldehydes react. Ketones fail both (no  $-\text{CHO}$  group).

## Q8 | Amines — Basic Strength in Aqueous Solution Marks: 4 | CO/BL: CO4 / L4

The correct order of basic strength of amines **in aqueous solution** is:

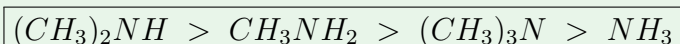
- (A)  $(\text{CH}_3)_3\text{N} > (\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > \text{NH}_3$
- (B)  $(\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_3\text{N} > \text{NH}_3$
- (C)  $\text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH} > (\text{CH}_3)_3\text{N} > \text{NH}_3$
- (D)  $\text{NH}_3 > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH} > (\text{CH}_3)_3\text{N}$

**Solution — Correct Answer: (B)**

In aqueous solution, two effects compete:

1. **Inductive (+I) effect** — more methyl groups → higher electron density on N → stronger base.
2. **Solvation effect** — more methyl groups → more steric hindrance → less solvation of the cation → weaker base.

The secondary amine  $(\text{CH}_3)_2\text{NH}$  achieves the best balance:

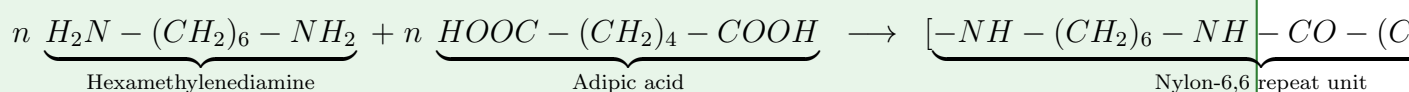
**Key Point**

In *gas phase*, order follows +I effect:  $(\text{CH}_3)_3\text{N} > (\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > \text{NH}_3$ . In *aqueous solution*, solvation inverts the order of secondary vs. tertiary.

**Q9 | Polymers — Nylon-6,6 Marks: 4 | CO/BL: CO5 / L1**

Nylon-6,6 is formed by the condensation polymerisation of:

- (A) Caprolactam
- (B) Hexamethylenediamine and adipic acid
- (C) Hexamethylenediamine and sebacic acid
- (D) Glycol and terephthalic acid

**Solution — Correct Answer: (B)**

Both monomers have **6 carbon atoms** — hence the name Nylon-**6,6**. Answer: (B)

Compare: **Nylon-6** is made from caprolactam (ring-opening of a single 6-C monomer).

**Key Point**

Nylon-6,6: two different monomers (diamine + diacid), condensation polymer.  
Nylon-6: one monomer (caprolactam), addition polymer via ring opening.

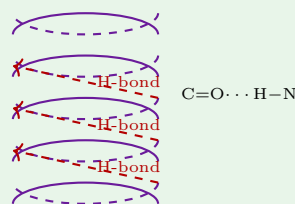


Q10 | Biomolecules — Protein Secondary Structure Marks: 4 | CO/BL: CO5 / L2

The secondary structure of a protein is maintained primarily by:

- (A) Peptide bonds ( $-\text{CO}-\text{NH}-$ )
- (B) Disulfide bridges ( $-\text{S}-\text{S}-$ )
- (C) Hydrogen bonds between  $\text{C}=\text{O}$  and  $\text{N}-\text{H}$  groups of the backbone
- (D) Ionic interactions between charged side chains

**Solution — Correct Answer: (C)**



$\alpha$ -helix (schematic)

The **secondary structure** ( $\alpha$ -helix,  $\beta$ -sheet) is stabilised by **hydrogen bonds** between the  $\text{C}=\text{O}$  of one peptide bond and the  $\text{N}-\text{H}$  of another (4 residues away in an  $\alpha$ -helix).

Answer: (C)

#### Key Point

Structure hierarchy: Primary = peptide bonds; Secondary = H-bonds; Tertiary = H-bonds, disulfide bridges, hydrophobic, ionic; Quaternary = interactions between subunits.