


# Chemistry Reactions Handbook

# Last-Minute Mastery for IIT JEE & NEET

This handbook is your final weapon before the exam. Every formula, every trick, every reaction map has been distilled into a compact, high-impact revision guide designed specifically for the last stretch of your preparation. Physical Chemistry formulas, Organic reaction mechanisms, Inorganic NCERT facts — all consolidated for peak performance. Use this as your daily companion in the final countdown.

 IIT JEE

 NEET

 LAST-MINUTE PREP

# The Strategy: Peak Efficiency

In the final days before your exam, **efficiency beats intensity**. The goal is no longer to learn new concepts — it is to solidify what you already know and eliminate careless errors. Your brain works best when it reinforces familiar pathways rather than carving new ones under pressure. Follow this three-pillar strategy to maximize your score potential.

## Stop Learning New Concepts


Resist the temptation to open new chapters or watch new lecture videos. Every hour spent on unfamiliar material is an hour stolen from consolidating what you already know. New concepts create anxiety, not confidence, in the final stretch. Trust your existing preparation — it is more complete than you think.

## Revise Your Error Notebook Daily

Your personal error notebook is your most valuable asset. These are the exact mistakes your brain is prone to making — revising them daily ensures you won't repeat them on exam day. Read through every marked error, re-solve the problem, and verbalize why you got it wrong. This active recall method is scientifically proven to reduce error rates by up to 60%.

## Focus on High-Weightage Topics

**Physical Chemistry** — Master all formulas; these are direct-mark questions. **Organic Chemistry** — Know every named reaction and mechanism; these carry the highest weightage. **Inorganic Chemistry** — NCERT line-by-line facts; these are the easiest marks if memorized. Allocate your revision time in a 35:40:25 ratio respectively for maximum ROI.

 **Pro Tip:** Create a one-page "cheat sheet" of your most-forgotten formulas and reactions. Review it every morning and every night until exam day. This single habit can add 15–20 marks to your score.

# Physical Chemistry: Formula Powerhouse

Physical Chemistry is the most formula-driven section of the paper. These equations appear directly in questions and are often the key to unlocking multi-step problems. **Memorize these cold** — not just the formula, but the conditions under which each applies. Understanding the derivation once helps you recall it forever.

## Mole Concept & Concentration

- $n = \text{mass} / \text{Molar Mass}$  — Foundation of all stoichiometry
- $\text{Molarity (M)} = \text{moles} / \text{Volume (L)}$
- $\text{Molality (m)} = \text{moles} / \text{Mass of solvent (kg)}$
- $\text{Mole Fraction} = n_1 / (n_1 + n_2)$
- $\text{Normality} = \text{Molarity} \times \text{n-factor}$
- For gases:  $PV = nRT$  (Ideal Gas Equation)

## Thermodynamics

- $\Delta U = q + w$  — First Law of Thermodynamics
- $\Delta G = \Delta H - T\Delta S$  — Spontaneity criterion
- $\Delta G < 0 \rightarrow \text{Spontaneous} \mid \Delta G > 0 \rightarrow \text{Non-spontaneous}$
- $\Delta H = \Delta U + \Delta n_x RT$  — For gaseous reactions
- Work done:  $w = -P\Delta V$  (reversible)

## Electrochemistry

- $E = E^\circ - (0.0591/n) \log Q$  — Nernst Equation at 298K
- $\Delta G^\circ = -nFE^\circ$
- $E^\circ_{\text{cell}} = E^\circ_{\text{cathode}} - E^\circ_{\text{anode}}$
- Faraday's Law:  $W = ZIt$

## Chemical Kinetics

- First order:  $t_{1/2} = 0.693 / k$
- Arrhenius:  $k = Ae^{(-E_a/RT)}$
- Integrated form:  $\ln(k_2/k_1) = (E_a/R)(1/T_1 - 1/T_2)$

# 35%

## Physical Chemistry

Approximate weightage in JEE Main & NEET papers

# 50+

## Key Formulas

Essential equations to memorize across all Physical Chemistry chapters

# 298K

## Standard Temp

Temperature at which 0.0591 V is used in Nernst equation

# Organic Chemistry: The Reaction Map

Organic Chemistry is the highest-scoring section if you know your reactions cold. Unlike Physical Chemistry, Organic questions test **pattern recognition and mechanism logic**. Master the electron flow, understand the stability of intermediates, and you can predict the product of almost any reaction. Use this reaction map as your quick-reference guide.

## Hydrocarbons

- **Markovnikov's Rule:** H adds to carbon with more H atoms; halogen adds to more substituted carbon
- **Anti-Markovnikov (Peroxide Effect):** Only with HBr + peroxide; Br adds to less substituted carbon
- Ozonolysis cleaves double bonds → aldehydes/ketones
- Hydroboration-oxidation gives Anti-Markovnikov alcohols

## Carbonyl Compounds


- **Reactivity Order:** Aldehyde > Ketone > Ester > Amide
- Aldehydes are more reactive due to less steric hindrance and less +I effect
- **Aldol Condensation:** Requires  $\alpha$ -hydrogen; base catalyst
- **Cannizzaro:** No  $\alpha$ -hydrogen; disproportionation reaction
- Tollens' test → Aldehydes only (silver mirror)

## Substitution Reactions

- **SN1:** Favored by 3° substrates; carbocation intermediate; racemization; polar protic solvent
- **SN2:** Favored by 1° substrates; backside attack; inversion (Walden); polar aprotic solvent
- **E1:** Competes with SN1; heat favors elimination
- **E2:** Requires strong base; anti-periplanar geometry

## Acidity & Basicity

- Stronger conjugate base = **weaker acid** (inverse relationship)
- Electron-withdrawing groups (-I, -M) **increase acidity**
- Electron-donating groups (+I, +M) **decrease acidity**
- Phenol is more acidic than alcohol due to resonance stabilization of phenoxide ion
- Carboxylic acids > Phenols > Alcohols (acidity order)

 **Critical Trick:** In SN1 reactions, always check for carbocation rearrangement (hydride or methyl shift). A more stable carbocation will always form — this is a frequent trap in JEE Advanced questions.

# Inorganic Chemistry: The NCERT Bible

Inorganic Chemistry is the most underrated section — and the easiest to score full marks in. **NCERT is the single source of truth** for Inorganic questions in both JEE and NEET. Every highlighted statement, every data table, every exception mentioned in the textbook has appeared in previous year papers. Treat NCERT as a scripture: read it line by line, highlight exceptions, and revise them repeatedly.

## High-Priority Chapters

### → Periodic Trends

Atomic radius, ionization energy, electron affinity, electronegativity trends across periods and groups. Know the exceptions (e.g., Be > B in IE, N > O in IE due to half-filled stability).

### → Chemical Bonding

VSEPR theory (memorize shapes for 2–7 electron pairs), hybridization ( $sp$ ,  $sp^2$ ,  $sp^3$ ,  $sp^3d$ ,  $sp^3d^2$ ), MOT (bond order, magnetic nature), Fajan's rules, hydrogen bonding types.

### → Coordination Compounds


IUPAC nomenclature, Werner's theory, Crystal Field Theory (CFT), color and magnetic properties, isomerism types, EAN rule. These are direct formula-based questions.

### → p-Block Elements

Group 15–18: preparation, properties, and reactions of important compounds ( $NH_3$ ,  $HNO_3$ ,  $SO_2$ ,  $H_2SO_4$ ,  $Cl_2$ , Xe compounds). NCERT tables are directly asked.

## Factual Exceptions to Memorize

- Fluorine has **lower electron affinity** than Chlorine (small size → repulsion)
- Nitrogen has **higher ionization energy** than Oxygen (half-filled  $2p^3$ )
- Be and Mg do **not impart color** to flame (high IE)
- Lithium shows **diagonal relationship** with Magnesium
- Boron is a **metalloid**, not a metal
- Helium has the **lowest boiling point** of any element
- Mercury is the only **liquid metal** at room temperature
- Zinc, Cadmium, Mercury are **not transition metals** (full d-orbital)
- Scandium is a transition metal but shows **only +3 oxidation state**
- Lanthanide contraction explains why  $Zr \approx Hf$  in size

 **Revision Strategy:** Create flashcards for each exception. Review them during short breaks — 5 minutes, 3 times a day, for 10 days = 150 repetitions. You will never forget them.

# Tricks: Boiling Points, Reactivity & Aromatic Substitution

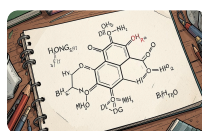
These are the high-frequency trick questions that separate top scorers from average performers. Understanding the **underlying principle** behind each trend allows you to answer even unfamiliar compound questions with confidence. These patterns appear in both JEE and NEET every single year.



## Boiling Point Trends

**General Rule:** Boiling point increases with molecular weight and surface area. However, **branching decreases boiling point** in alkanes because branched molecules are more compact → less surface area → weaker van der Waals forces.

**Exception:** For same molecular weight, **cyclic compounds have higher boiling points** than acyclic due to rigid structure and better packing. **Hydrogen bonding** dramatically increases boiling point — alcohols boil much higher than ethers of similar mass. Order: Carboxylic Acid > Alcohol > Aldehyde/Ketone > Ether > Alkane.



## Electrophilic Aromatic Substitution (EAS)

**Activating Groups (o-p directing):**  $-\text{OH}$ ,  $-\text{NH}_2$ ,  $-\text{OCH}_3$ ,  $-\text{CH}_3$ ,  $-\text{Cl}$ ,  $-\text{Br}$ . These donate electrons (via +M or +I), making the ring more reactive than benzene. Halogens are deactivating but still o-p directing due to their lone pairs. **Deactivating Groups (m-directing):**  $-\text{NO}_2$ ,  $-\text{CN}$ ,  $-\text{COOH}$ ,  $-\text{SO}_3\text{H}$ ,  $-\text{CHO}$ . These withdraw electrons ( $-\text{M}$  or  $-\text{I}$ ), making the ring less reactive.

**Trick:** In multi-substituted benzene, the **stronger activator** controls the position of the incoming group. Always identify the most activating group first.

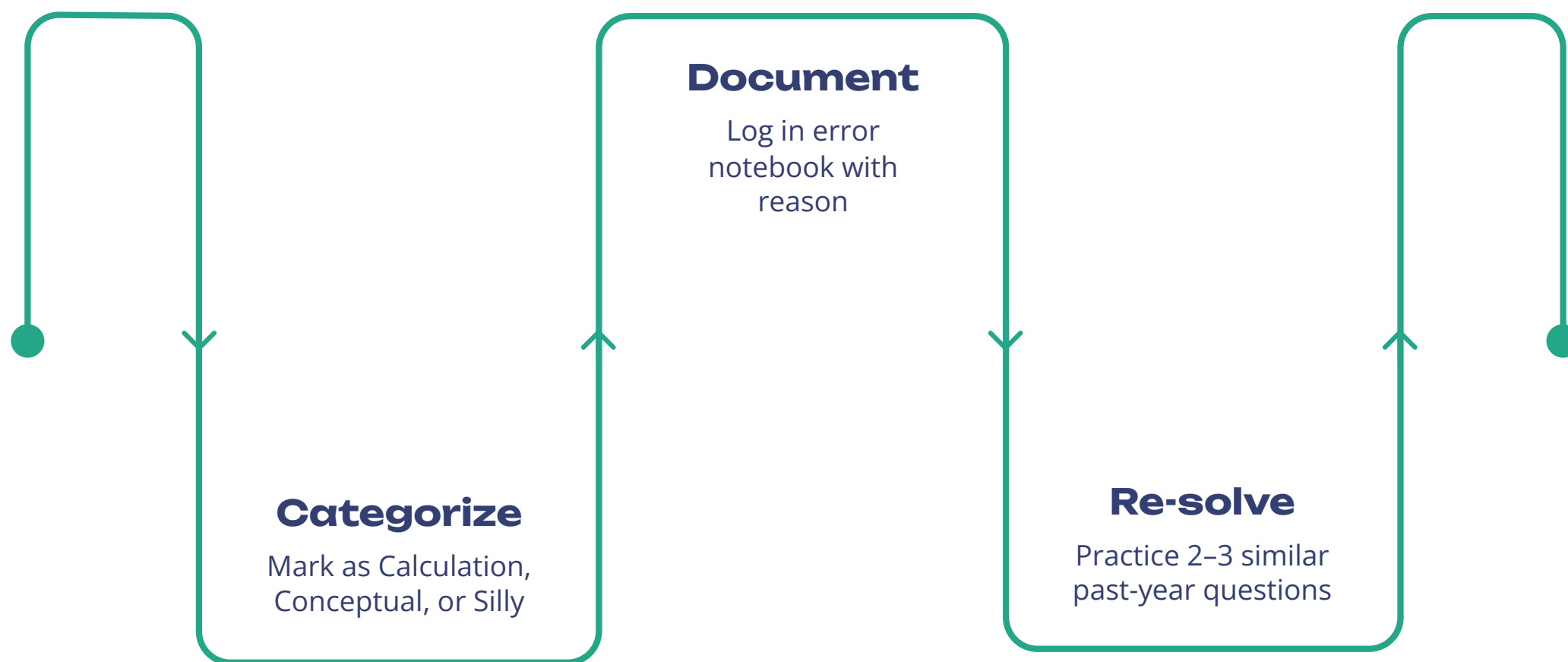


## Alkyl Halide Reactivity

**Reactivity Order:**  $\text{RI} > \text{RBr} > \text{RCI} > \text{RF}$ . This is because the C-I bond is the weakest (lowest bond dissociation energy), making iodine the best leaving group. Fluorine forms the strongest C-F bond, making RF almost unreactive in substitution. **For SN1:** Reactivity also follows carbocation stability:  $3^\circ > 2^\circ > 1^\circ$ . **For SN2:** Reactivity follows steric accessibility:  $1^\circ > 2^\circ > 3^\circ$ . **Key Exception:** Vinyl and aryl halides do NOT undergo SN1 or SN2 due to resonance stabilization of the C-X bond and  $\text{sp}^2$  hybridization.

# The "Double Check" Error System

Mistakes are not failures — they are **data points**. Every error you make during practice is a preview of an error you might make on exam day. The students who improve the fastest are not those who solve the most questions, but those who **analyze their mistakes most rigorously**. Implement this three-step error system starting today.



This systematic approach ensures that every mistake you make during practice translates directly into exam-day accuracy. Most students skip Step 3 — don't be most students.

## Categorize Every Mistake

- **Calculation Error:** Wrong arithmetic, sign errors, unit conversion mistakes. Fix by slowing down and double-checking.
- **Conceptual Error:** Wrong formula applied, misunderstood mechanism. Fix by revising the underlying concept and re-deriving the formula.
- **Silly Error:** Misread question, marked wrong option, skipped a step. Fix by developing a pre-answer checklist habit.
- **Knowledge Gap:** Didn't know the fact/formula. Fix by adding it to your flashcard deck immediately.

## Flashcard Protocol

For every formula you forget more than twice, create a flashcard. On the front: the formula name or reaction. On the back: the formula, conditions, and one example. Review these cards using **spaced repetition** — Day 1, Day 3, Day 7, Day 14. Apps like Anki work perfectly for this.

## PYQ Integration Rule

For every formula or reaction you revise, immediately solve **2–3 Previous Year Questions** that use it. This does three things: confirms you understand the application, exposes you to the exam's question style, and builds retrieval speed. PYQs are not optional — they are the most important practice material available.

# Exam Day Tactics: Execute With Precision

You have prepared. You have revised. Now it is time to **execute**. The difference between a good score and a great score on exam day often comes down to strategy, not knowledge. Follow these tactics to ensure your preparation translates into maximum marks.

## First 5 Minutes

**Scan the entire paper.** Identify your strong topics, note the distribution of Physical/Organic/Inorganic questions, and mentally plan your attempt order. Do NOT start solving yet — this planning phase saves time later.

## Accuracy Over Speed

Avoid risky guesses. Negative marking is brutal. If you are between two options and cannot eliminate further, **skip and return**. A question you leave blank costs 0; a wrong guess costs you marks AND time.

## Final 10 Minutes

Use this time to revisit marked questions and **check OMR sheet alignment**. Ensure every answered question is correctly bubbled. A single OMR error can cost you an entire question's marks — this is the most painful mistake to make.

1

2

3

4

5

## Build Momentum

Start with your **strongest section** — the one you are most confident in. Getting early correct answers builds confidence and reduces anxiety. For most students, this is Organic Chemistry or direct formula-based Physical Chemistry questions.

## Time Allocation

Divide time roughly as: Chemistry 45–50 min, Physics 50–55 min, Math/Biology 50–55 min. If stuck on a question for more than 2 minutes, **mark it and move on**. Come back only if time permits.

- 📌 **Mental Calm is a Strategy:** If you feel panic rising during the exam, close your eyes for 10 seconds, take three deep breaths, and remind yourself: "I have prepared for this." Anxiety narrows focus — calm broadens it. Your preparation is your greatest asset; trust it completely.

# Last 10 Days: Quality Over Quantity

The final 10 days are not for heroic study marathons — they are for **strategic consolidation**. Your brain needs rest to consolidate memory, and your confidence needs reinforcement, not depletion. Follow this structured plan to peak exactly on exam day.

## The 10-Day Revision Plan

O1

### Days 1–3: Full Mock Tests

Take **maximum 2–3 full-length mock tests** in exam-like conditions (same time of day, no distractions, timed). After each test, spend double the test time analyzing errors. Do not take more than 3 mocks — fatigue from over-testing reduces performance.

O2

### Days 4–7: Intensive Revision

Shift to **90% revision, 10% light practice**. Revise all formulas, reaction maps, and NCERT highlights. Go through your error notebook twice. Solve 10–15 PYQs daily just to maintain speed — not to learn new things.

O3

### Days 8–9: Light Review

Only revise your one-page cheat sheet, flashcards, and error notebook. No new problems. Let your brain rest and consolidate. Light walking or meditation is better than extra studying at this stage.

O4

### Day 10: Rest & Mental Prep

No studying after 2 PM. Check your exam center location, documents, and admit card. Eat well, sleep early, and visualize success. Your job now is to arrive fresh and confident.

## Sleep: Your Secret Weapon

Sleep is when your brain **consolidates memory**. Studies show that students who sleep 7–8 hours retain 40% more information than those who pull all-nighters. Fatigue is the enemy of recall — a tired brain makes careless errors even on questions you know perfectly.

- Sleep **7–8 hours** every night without exception
- Avoid screens 30 minutes before bed
- Take a 20-minute power nap if needed during the day
- Hydrate well — dehydration reduces cognitive performance by up to 20%

## What to Avoid

- Do NOT start new chapters or topics
- Do NOT compare your preparation with peers
- Do NOT pull all-nighters — they destroy recall
- Do NOT consume excessive caffeine — it increases anxiety
- Do NOT skip meals — your brain needs glucose

# Final Push: Go Secure Your Seat

## You Are Ready. Now Execute.

You have covered the formulas. You have mapped the reactions. You have memorized the exceptions. You have analyzed your errors. **You have done the work.** The only thing left is to walk into that exam hall and show them what you know. Chemistry is the most scoring section in both JEE and NEET — stay focused, stay fast, and trust your preparation completely.



### Trust Your Preparation

You have the tools to solve every question on that paper. When in doubt, fall back on fundamentals — mole concept, electron flow, and NCERT facts will carry you through.



### Chemistry = Your Score Booster

Chemistry is the most scoring section because it rewards memory and pattern recognition — both of which you have built over months of preparation. Attack this section with confidence and speed.



### Calm Execution Wins

Success is not built on knowing everything — it is built on calmly executing what you do know. Deep breath before you start. Read every question twice. Mark your OMR carefully. Finish strong.

**"The exam does not test how much you know — it tests how well you can show what you know under pressure."** Stay calm, stay sharp, and remember: every question you answer correctly is a step closer to your dream seat. [Go get it.](#)

 YOU'VE GOT THIS

 ALL THE BEST