CBSE CLASS 12 | ACADEMIC SESSION 2025-2026

3-IN-1 COMPLETE TOPPER COMBO

CLASS 12 CHEMISTRY

BRAHMASTRA TOPPER KIT

All 10 Rationalized NCERT Chapters (165+ Pages)

01 **Volume 1: Physical Chemistry**
Solutions, Electrochemistry & Kinetics with Numerical Derivations

02 **Volume 2: Inorganic Chemistry**
d- & f-Block Elements and Coordination Compounds with CFT Diagrams

03 **Volume 3: Organic Chemistry**
Haloalkanes, Alcohols, Carbonyls, Amines and Biomolecules

04 **All 32 Name Reactions Roadmap**
Aldol, Cannizzaro, Reimer-Tiemann, Kolbe, Gabriel Phthalimide

05 **Red Box Exam Traps & PYQs**
CBSE Examiner Pitfalls and 10-Year Step-Marking Blueprints

100/100 TOPPER SECRET | COMPLETE REACTION & FORMULA VAULT

UNNAT TUITION CENTER | KURUKSHETRA

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100% NCERT ALIGNED | ZERO-TO-TOPPER BLUEPRINT

SUPER-BOOSTER 01 • ORGANIC CHEMISTRY

The Organic Conversion Super-Highway

15+ Marks Guaranteed in CBSE Board

The Golden Rule of Board Conversions: कभी भी सीधे 1 स्टेप में सोचने की कोशिश मत करो। किसी भी कन्वर्जन का रास्ता 3 जंक्शन से होकर गुजरता है: (1) *Alkyl Halide ($R-X$)*, (2) *Alcohol ($R-OH$)*, या (3) *Carboxylic Acid ($R-COOH$)*।

1. The 3 Master Chain-Length Tricks (सीरीज घटाना और बढ़ाना)

Operation	Master Reagent Route	Board Reaction Equation
Step-Up (+1 Carbon) Cyanide Highway	`alc. KCN` followed by complete hydrolysis `H3O+`	`R-X + alc. KCN → R-CN →(+H3O+)→ R-COOH`
Step-Up (+1 Amine) Nitrile Reduction	`alc. KCN` followed by reduction `LiAlH4` or `H2/Ni`	`R-X + alc. KCN → R-CN →(+4[H])→ R-CH2-NH2`
Step-Up (Grignard) Carbonyl Route	`R-MgX` + Dry Ice (`CO2`) → Hydrolysis	`R-MgX + O=C=O → R-COOMgX →(+H3O+)→ R-COOH`
Step-Down (-1 Carbon) Hoffmann Bromamide	Acid to Amide (`SOCl2, then NH3`), then `Br2 + KOH`	`R-COOH → R-CONH2 →(Br2+4KOH)→ R-NH2 + K2CO3`
Step-Down (-1 Carbon) Decarboxylation	Sodium Salt of Acid with Soda-Lime (`NaOH + CaO, Δ`)	`R-COONa + NaOH →(CaO, Δ)→ R-H + Na2CO3`

2. Functional Group Inter-Conversion Matrix (FGI)

From → To	Reagents Used	Key Exam Caution / Trap
Alkane → Haloalkane	`Cl2 / hv` (Free Radical Halogenation)	Monohalogenation in dark does NOT occur.
Haloalkane → Alkene	`alc. KOH, Δ` (β-elimination)	Follows *Saytzeff's Rule* (more substituted alkene is major).
Alkene → Haloalkane	`HBr` (Markovnikov) vs `HBr + Peroxide` (Anti-Markovnikov)	Peroxide effect (Kharasch) only works with HBr, NEVER with HCl or HI!
Haloalkane → Alcohol	`aq. KOH` or moist `Ag2O`	Caution: *alc. KOH* gives Alkene; *aq. KOH* gives Alcohol!
1° Alcohol → Aldehyde	`PCC` (Pyridinium Chlorochromate) in CH_2Cl_2	Do NOT use $KMnO_4$! $KMnO_4$ oxidizes directly to Carboxylic Acid.
2° Alcohol → Ketone	`CrO3` (Jones) or `Cu / 573 K`	3° Alcohol with Cu/573 K gives *Dehydration (Alkene)*, NOT oxidation!
Aldehyde/Ketone → Alcohol	`NaBH4` or `LiAlH4`	$NaBH_4$ is mild, reduces only -CHO & >C=O, spares esters & acids.
Amine → Alcohol	`HNO2` (`NaNO2 + dil. HCl` at 273–278 K)	Aliphatic amines give unstable diazonium, releasing N_2 gas instantly.

SUPER-BOOSTER 02 • ORGANIC CHEMISTRY

15 Chemical Distinction Tests Master Bible

Direct 3 to 5 Marks in Board Exam

CBSE Examiner Checklist: डिस्टिंक्शन टेस्ट के सवाल में पूरे मार्क्स पाने के लिए 3 चीजें लिखना अनिवार्य है: (1) *Reagent* का नाम, (2) दोनों कंपाउंड्स के साथ दिखने वाला विज़ुअल चेंज *(Colour/Ppt/Gas)*, और (3) पॉजिटिव टेस्ट की केमिकल इक्वेशन।

Pair of Compounds	Test & Reagent	Observation (Compound A)	Observation (Compound B)	Reaction Equation
1. Propan-1-ol vs Propan-2-ol	**Lucas Test** (conc. HCl + anh. $ZnCl_2$)	**Propan-1-ol (1°):** No turbidity at room temperature; turbidity appears only on heating.	**Propan-2-ol (2°):** Cloudiness / turbidity appears within **5 minutes**.	$R_2CH\text{-}OH + HCl \rightarrow R_2CH\text{-}Cl \downarrow$ (turbid) + H_2O
2. Pentan-2-one vs Pentan-3-one	**Iodoform Test** (I_2 + NaOH / NaOI, warm)	**Pentan-2-one:** Contains $CH_3\text{-}C{=}O$ group. Forms **Yellow precipitate of CHI_3**.	**Pentan-3-one:** Lacks methyl ketone group. **No yellow precipitate**.	$CH_3COCH_2CH_2CH_3 + 3I_2 + 4NaOH \rightarrow CHI_3\downarrow$ (yellow)
3. Propanal vs Propanone	**Tollens' Test** (Ammoniacal $AgNO_3$)	**Propanal (Aldehyde):** Reduces Tollens' reagent; forms shining **Silver Mirror** on test tube.	**Propanone (Ketone):** Ketones do NOT reduce Tollens' reagent; **No silver mirror**.	$RCHO + 2[Ag(NH_3)_2]^+ + 3OH^- \rightarrow RCOO^- + 2Ag\downarrow + 4NH_3$
4. Benzaldehyde vs Acetaldehyde	**Fehling's Test** (Fehling A + Fehling B)	**Benzaldehyde (Aromatic):** Aromatic aldehydes do NOT reduce Fehling's; **No red ppt**.	**Acetaldehyde (Aliphatic):** Forms **Red precipitate of Cu_2O**.	$CH_3CHO + 2Cu^{2+} + 5OH^- \rightarrow CH_3COO^- + Cu_2O\downarrow$ (red)
5. Phenol vs Ethanol	**Neutral $FeCl_3$ Test**	**Phenol:** Forms a characteristic **Violet / Purple coloration**.	**Ethanol:** Alcohols do not react; **No violet color**.	$6C_6H_5OH + FeCl_3 \rightarrow [Fe(OC_6H_5)_6]^{3-}$ (violet) + $3H^+$
6. Benzoic acid vs Phenol	**$NaHCO_3$ Test** (Sodium Bicarbonate)	**Benzoic acid (Carboxylic):** Stronger acid; gives **Brisk effervescence of CO_2 gas**.	**Phenol:** Weaker than carbonic acid; gives **No effervescence**.	$C_6H_5COOH + NaHCO_3 \rightarrow C_6H_5COONa + H_2O + CO_2\uparrow$
7. 1° Amine vs 2° or 3° Amine	**Carbylamine Test** ($CHCl_3$ + alc. KOH, Δ)	**1° Amine (e.g. Ethylamine):** Produces an **Extremely foul / offensive smell** of isocyanide.	**2° and 3° Amines:** Do not undergo this reaction; **No foul smell**.	$R\text{-}NH_2 + CHCl_3 + 3KOH \rightarrow R\text{-}NC$ (carbylamine) + $3KCl + 3H_2O$
8. Aniline vs Ethylamine	**Azo Dye Test** ($NaNO_2$+HCl, 273 K, then β-naphthol)	**Aniline:** Forms stable diazonium salt which couples with β-naphthol to give **Orange-Red Dye**.	**Ethylamine:** Forms unstable diazonium, evolves **N_2 gas with effervescence**; no dye.	$C_6H_5N_2^+Cl^- +$ β-naphthol → Azo Dye (orange-red)

SUPER-BOOSTER 03 • INORGANIC CHEMISTRY

Top 50 Inorganic Reasoning Secrets

d & f-Block Elements & Coordination Compounds

Marking Scheme Hack: सीबीएसई इनऑर्गेनिक में पूरी कहानी पढ़ने का समय नहीं होता। एग्जामिनर सिर्फ कीवर्ड **(Keyword)** ढूंढता है। नीचे दिए गए उत्तरों में अंडरलाइंड कीवर्ड्स को अपनी आंसर शीट में ठीक वैसे ही लिखना है।

Part A: d- & f-Block Elements (Top 25 Board Reasons)

1. Why do transition metals exhibit very high enthalpies of atomisation?

Because of the presence of a **large number of unpaired electrons in their (n-1)d orbitals**, which results in **strong interatomic metallic bonding** (involving both ns and (n-1)d electrons).

2. Why are the atomic radii of 4d and 5d series elements (e.g. Zr and Hf, Nb and Ta) almost identical?

Due to **Lanthanoid Contraction**. The poor shielding effect of the intervening **diffused 4f electrons** causes an increase in effective nuclear charge (Z_{eff}), pulling the outer electrons inward.

3. Why is Cr^{2+} a strong reducing agent while Mn^{3+} is a strong oxidising agent, though both have d^4 configuration?

Cr^{2+} oxidises to Cr^{3+} (d^3), which has a **half-filled and stable t_{2g}^3 configuration** in aqueous medium. Conversely, Mn^{3+} reduces to Mn^{2+} (d^5), which possesses an **extra-stable half-filled d^5 subshell**.

4. Why do transition metal ions generally form coloured compounds?

In the presence of ligands, the degenerate d-orbitals split into two sets (t_{2g} and e_g). Electrons absorb energy from the visible light region and undergo **d-d transitions** to higher energy orbitals, transmitting the complementary colour. (Sc^{3+} and Zn^{2+} are colourless due to d^0 and d^{10} configs).

5. Why do transition metals and their compounds act as excellent catalysts?

Due to: (i) Their ability to exhibit **variable oxidation states** and form intermediate unstable complexes, and (ii) Their ability to provide a **large surface area** with vacant d-orbitals for reactant adsorption.

6. Why is $E^\circ(Cu^{2+}/Cu)$ positive (+0.34 V), whereas all other first-row transition metals have negative values?

The high sum of **enthalpy of atomisation and first + second ionisation enthalpies** of copper is NOT balanced by its **hydration enthalpy** of Cu^{2+} ion.

7. Why are interstitial compounds formed by transition metals so hard and having high melting points?

Small non-metal atoms (H, B, C, N) get trapped inside the **vacant interstitial spaces of the metal lattice** without changing crystal structure. This prevents lattice layers from sliding, enhancing hardness and electrical conductivity.

8. Why does Manganese exhibit the highest number of oxidation states (+2 to +7) in the 3d series?

Because the energy difference between the 3d and 4s orbitals is very small, allowing **both 4s (2 electrons) and all five 3d electrons to participate in bonding** ($2 + 5 = 7$).

9. Why is the highest oxidation state of transition metals observed only in their Oxides and Fluorides?

Due to the **small size and extremely high electronegativity** of Oxygen and Fluorine, and Oxygen's unique ability to form **multiple $p\pi$-$d\pi$ bonds** with the metal atom (e.g. in Mn_2O_7).

10. Why is Actinoid Contraction greater from element to element than Lanthanoid Contraction?

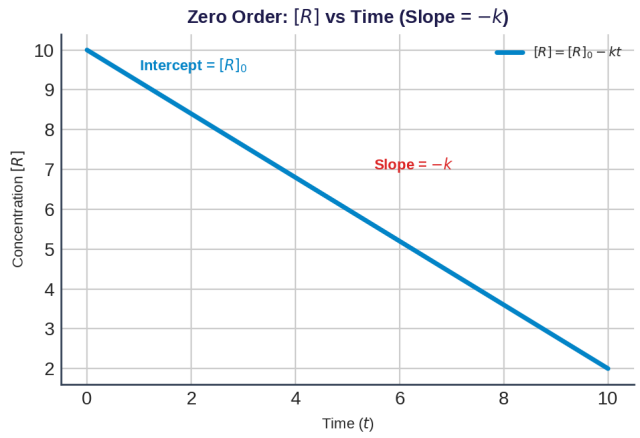
Because **5f electrons have poorer shielding effect** compared to 4f electrons due to their more diffused shapes in space, resulting in a steeper increase in effective nuclear charge.

11. Why does Cu^+ disproportionate in aqueous solution?

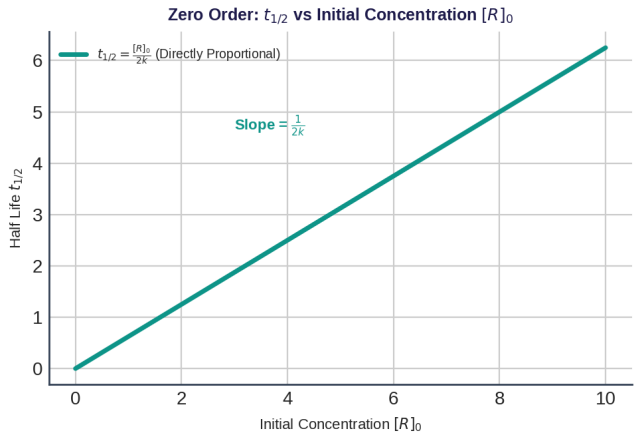
$2Cu^+_{(aq)} ightarrow Cu^{2+}_{(aq)} + Cu_{(s)}$. Although Cu^{2+} requires more ionisation energy, its **much higher hydration enthalpy** (due to smaller radius and double charge) compensates for the second ionisation enthalpy, making Cu^{2+} far more stable in water.

12. Why is Sc^{3+} diamagnetic while Cr^{3+} is paramagnetic?

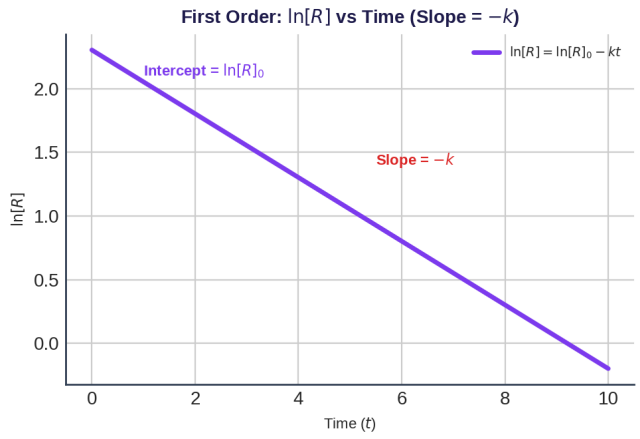
Sc^{3+} has $3d^0$ configuration (**zero unpaired electrons**, hence diamagnetic). Cr^{3+} has $3d^3$ configuration with **3 unpaired electrons** ($\mu = \sqrt{3(3+2)} = 3.87 ext{ BM}$), hence strongly paramagnetic.



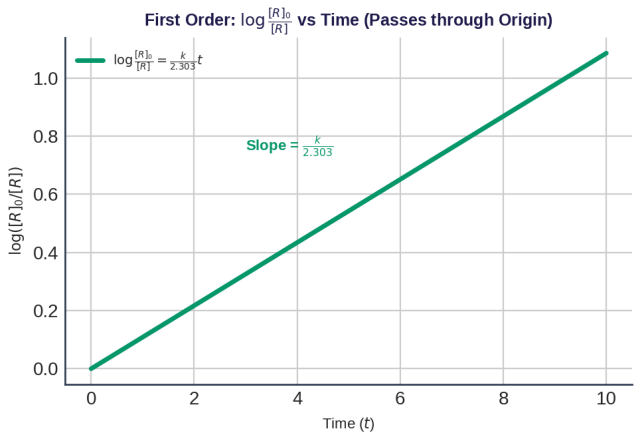
Graph 05: Zero-Order Rate Plot
$[R]$ vs t. Straight line with **Slope = $-k$** and **Intercept = $[R]_0$**. (E.g. decomposition of NH_3 on Pt).



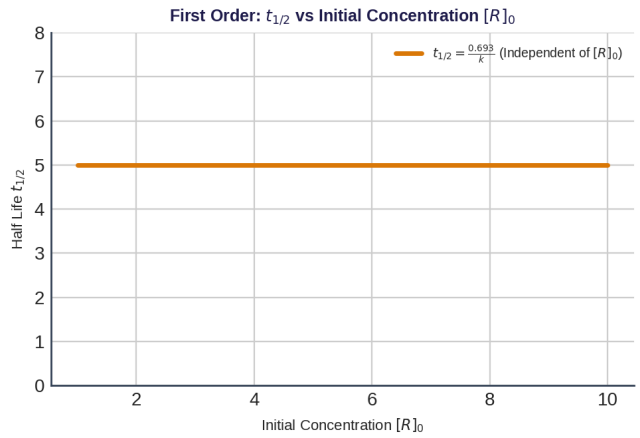
Graph 06: Zero-Order Half-Life
$t_{1/2}$ vs $[R]_0$. Directly proportional straight line passing through origin with **Slope = $ rac{1}{2k}$**.



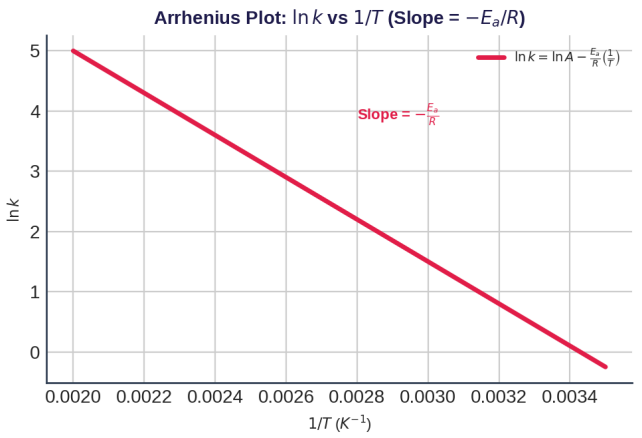
Graph 07: First-Order Natural Log Plot
$\ln[R]$ vs t. Straight line with **Slope = $-k$** and **Intercept = $ \ln[R]_0$**.



Graph 08: First-Order Log Ratio Plot
$\log rac{[R]_0}{[R]}$ vs t. Straight line passing through origin with **Slope = $ rac{k}{2.303}$**.



Graph 09: First-Order Half-Life Independence
$t_{1/2}$ vs $[R]_0$. Horizontal line parallel to concentration axis. $t_{1/2} = rac{0.693}{k}$ (0th power of $[R]_0$).



Graph 10: Arrhenius Natural Log Plot
$\ln k$ vs $1/T$. Straight line with negative slope: **Slope = $- rac{E_a}{R}$** and **Intercept = $\ln A$**.

CBSE CLASS 12 | COMPLETE 10-CHAPTER MASTER COMBO

Ch 1: Solutions (?????)

CBSE Board Syllabus Focus | 7 Marks Focus (High Yield Numericals)

[*] 3-MINUTE CONCEPT MINDMAP & CORE THEMES

- Concentration Units: Molarity, Molality, Mole Fraction; Molality is temperature independent.
- Henry's Law: P = K_H * X. Higher K_H means lower gas solubility in liquid at given T.
- Raoult's Law: P_A = P_A^o * X_A. Ideal vs Non-ideal solutions (Positive vs Negative deviations).
- Colligative Properties: (1) Delta P / P_A^o = X_B, (2) Delta T_b = i * K_b * m, (3) Delta T_f = i * K_f * m, (4) pi = i * C * R * T.
- Van 't Hoff Factor i: i > 1 for dissociation (NaCl -> 2, BaCl2 -> 3), i < 1 for association (Acetic acid in benzene dimerizes).

[!] RED BOX BOARD EXAM TRAP (Common Mistakes - 90% Students Lose Marks Here)

- TRAP 1: Confusing Henry's constant K_H with solubility. Aquatic species are more comfortable in cold water because temperature is lower, K_H is lower, so dissolved oxygen solubility is HIGHER!
- TRAP 2: Forgetting Van 't Hoff factor i in colligative numericals. A 0.1 M BaCl2 solution produces 3 times the boiling point elevation of 0.1 M glucose (i=3 vs i=1).

[+] 100/100 TOPPER ANSWER WRITING SECRET (By Rohit Sir)

- Always write the SI units of cryoscopic and ebullioscopic constants: K * kg / mol.
- In osmotic pressure numericals, convert temperature to Kelvin (T = 273 + C) and volume to liters!

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DATE

- Imp points of vapour pressure :

① In closed vessel.

② V.P ∝ Temp

③ Depends on Temp and nature of liquid.

④ Open vessel → evaporation

Closed vessel → Both evaporation and condensation

⑤ Temp ∝ K.E

$K.E = \frac{3}{2} nRT$

⑥ At Higher attitude

P = low

B.P (H_2O) < 100°C

⑦ In pressure cooker → cooking time For Food → B.P (H_2O) ↑

Reduced

⑧ During eva/ conden → no. of molecules on the surface area always constant.

⑨ B.P — Temp at which V.P of liq = 1 atm

$B.P \propto \frac{1}{V.P}$

H_2O — 100°C

CH_3OCH_3 — 38°C

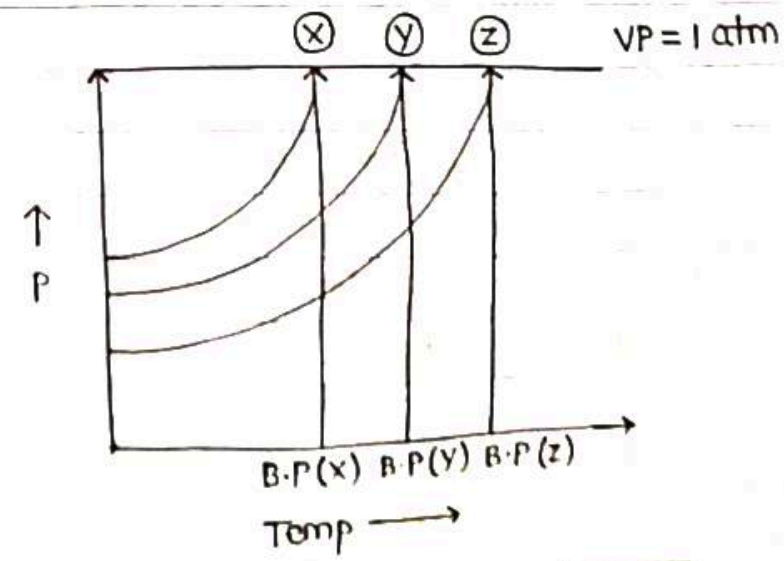
C_6H_6 — 65°C

C_2H_5OH — 85°C

$C_6H_5NH_2$ — 225°C

Low BP — High VP — Volatile liquid

High BP — Low VP — Non - Volatile liquid

- 

① BP order

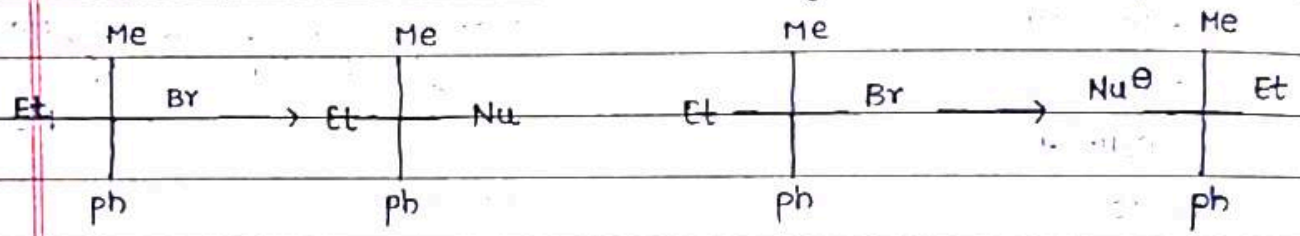
Z > Y > X

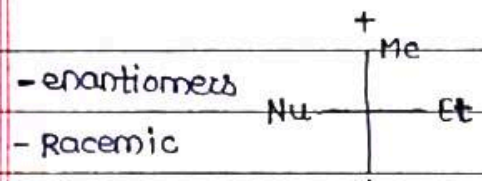
② VP order

Z < Y < X

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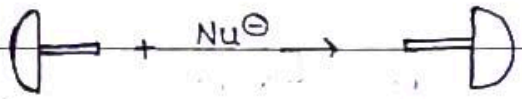
	S_N1 Reaction	S_N2 Reaction
①	Effect of leaving group Good leaving group. Rule ① : Neutral molecules are good leaving molecule. Rule ③ : Weak Base are good leaving group.	Effect of leaving group : Good leaving group. Rule ② : Down the group leaving group tendency increases. Rule ④ : leaving tendency ∝ stability of leaving is $F < Cl < Br < I$ ↓ poor ↓ good leaving group
②	Stereochemistry of S_N1 - Both side attack is possible	Stereochemistry of S_N2 : - Only Back attack is possible.





- enantiomers
- Racemic mixture.

- Welden Invesion



③	Effect of substrate ∝ Bulky group.	Effect of substrate ∝ small group.

- ① $C=C-X$ ②  → do not show S_N1 and S_N2

Molecule		S_N1		S_N2
①	$CH_2 = CH - CH_2 - X$	Yes	<	Yes
②	$CH_2 = \underset{\underset{CH_3}{|}}{C} - CH_2 - X$ Branch allylic Condition	Yes	>	Yes