

Preparation of Aldehydes and Ketones: General Methods

The 4 Synthetic Pathways

Oxidation of Alcohols

Removing hydrogen via oxidizing agents.

Dehydrogenation of Alcohols

Passing volatile alcohols over heavy metal catalysts.

Ozonolysis

Cleaving alkenes with ozone.

Hydration of Alkynes

Adding water across a triple bond.

Route Comparison Grid

Oxidation	Substrate 1°/2° Alcohols	Reagent Oxidizing agents	Rule 1° alcohol → aldehyde, 2° alcohol → ketone
Dehydrogenation	Substrate Volatile Alcohols	Reagent Ag or Cu catalyst	Rule 1° alcohol → aldehyde, 2° alcohol → ketone
Ozonolysis	Substrate Alkenes	Reagent O ₃ followed by Zn/H ₂ O	Rule Splits per substitution pattern
Hydration	Substrate Alkynes	Reagent H ₂ O / H ₂ SO ₄ / HgSO ₄	Rule Yields carbonyl compounds



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$$E=mc^2$$



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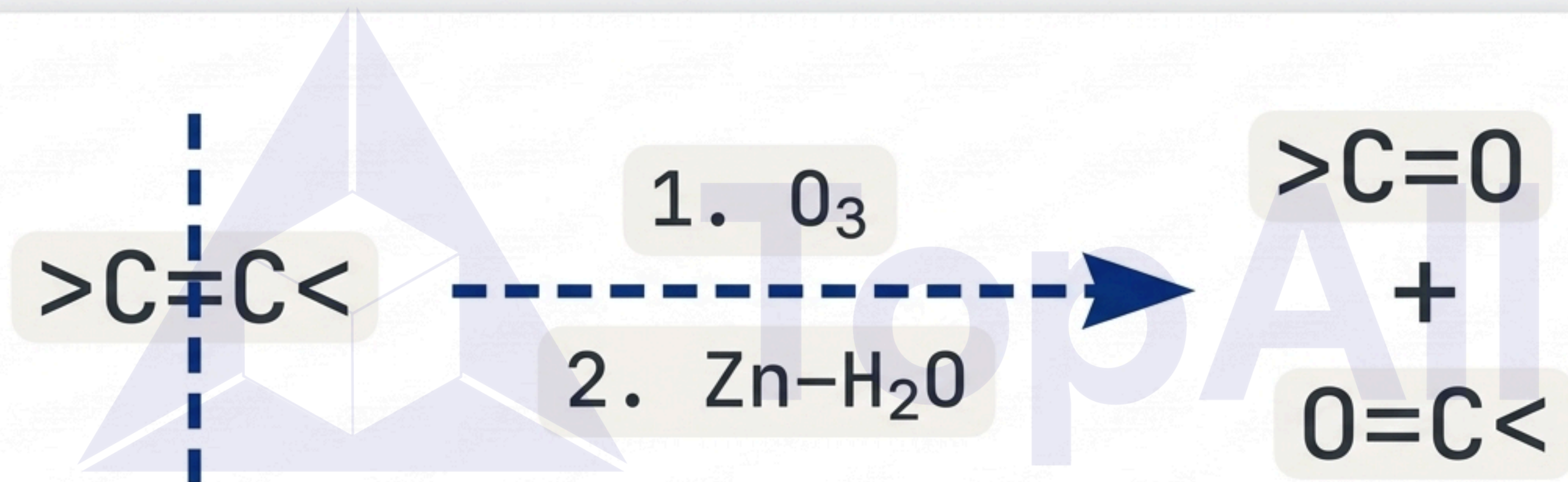
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Key Highlights

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Ozonolysis Spotlight: Cleaving the Alkene



The specific substitution pattern of the starting alkene directly dictates whether you yield aldehydes, ketones, or a mixture.

The Hydration Divide: Alkynes

The Sole Exception

Substrate: Ethyne ($\text{HC}\equiv\text{CH}$)

Reagents: H_2O / H_2SO_4 / HgSO_4



Product: Acetaldehyde (CH_3CHO)

The ONLY aldehyde possible via this route.

The General Rule

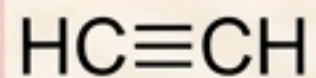
Substrate: Any other alkyne

Reagents: H_2O / H_2SO_4 / HgSO_4



Product: Ketones

JEE/NEET Trap Alert



Watch for this edge case:

“Examiners will ask: “Which of the following alkynes yields an aldehyde upon hydration?” and list complex structures.

Don't overthink the mechanism.

Ethyne is the **ONE AND ONLY** alkyne that gives an aldehyde (acetaldehyde) upon hydration with $\text{H}_2\text{SO}_4/\text{HgSO}_4$.

Every single other alkyne yields a ketone.

If the target is an aldehyde, the reactant **MUST** be **ethyne**.

Key Takeaways



- **Alcohol Degree is Destiny:** For both oxidation and catalytic dehydrogenation, 1° alcohols invariably yield aldehydes, while 2° alcohols invariably yield ketones.
- **The Ethyne Exception:** Ozonolysis splits alkenes based on substitution, but for alkyne hydration, **remember the strict rule:** Ethyne $\longrightarrow$ Acetaldehyde. **All other alkynes $\longrightarrow$ Ketones.**



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