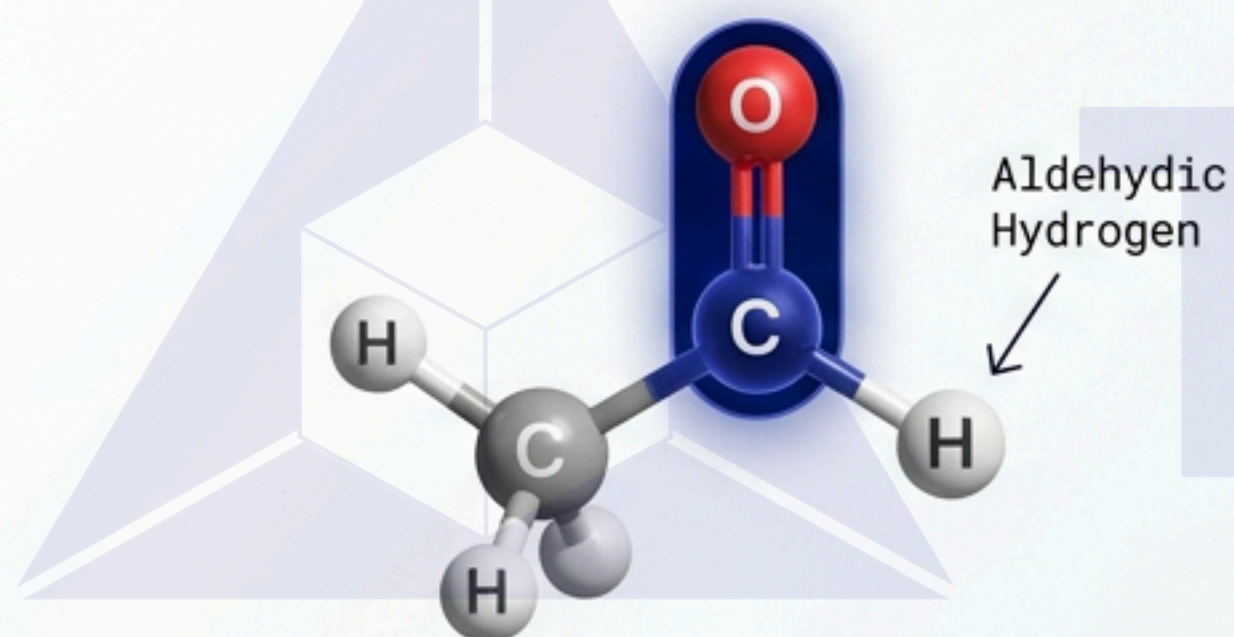
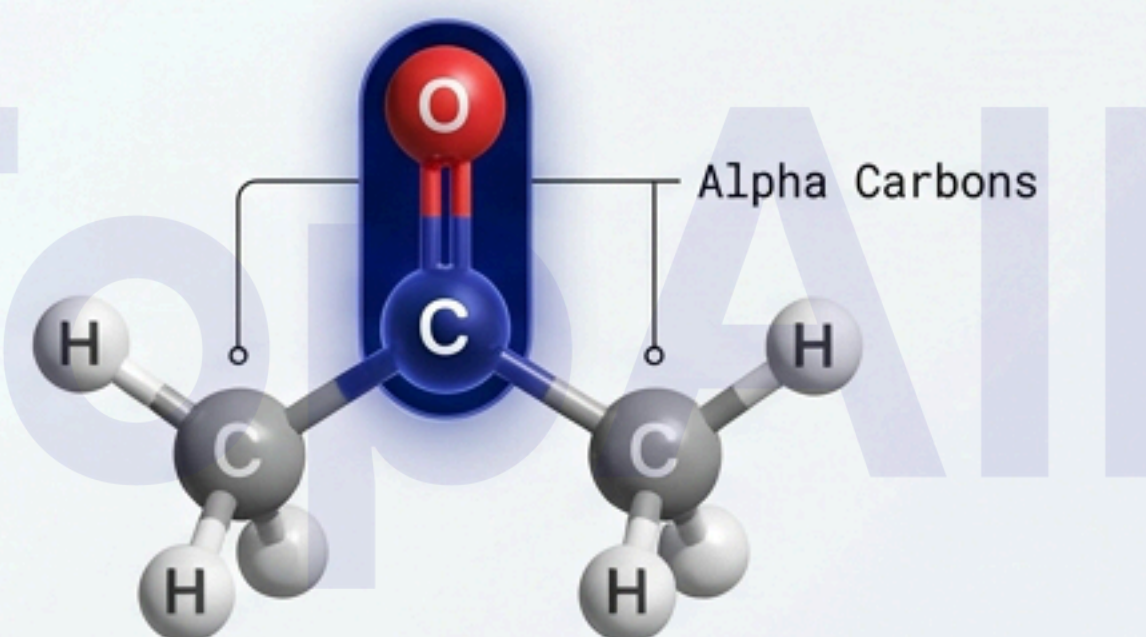


Oxidation of Aldehydes and Ketones

Understanding Carbonyl Reactivity and Bond Cleavage



Aldehyde ($R-CHO$)



Ketone ($R-CO-R'$)

Diagnostic Comparative Study

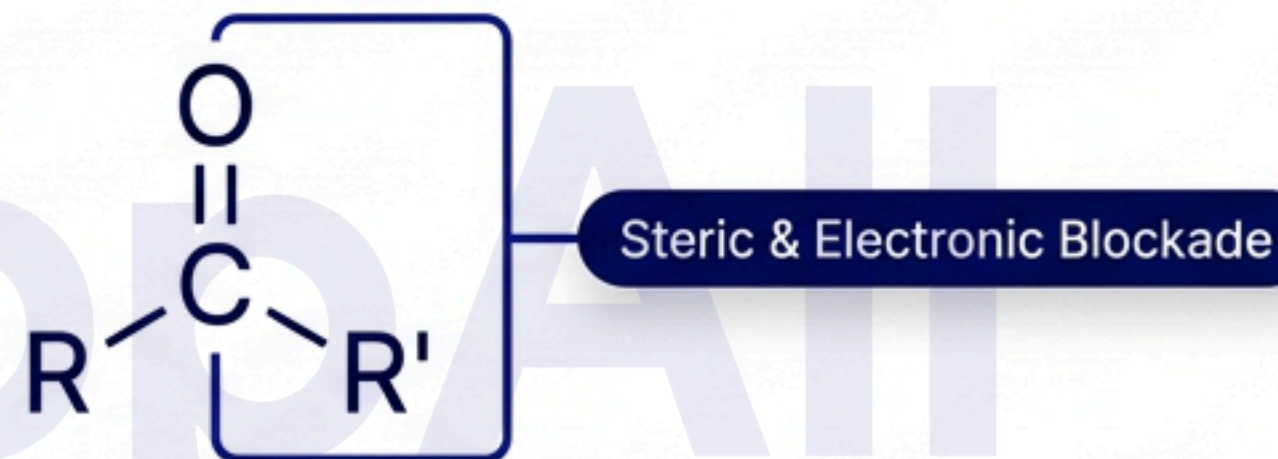
Why Aldehydes Oxidise Easily

Concept Diagnostic Cards



The presence of an α -hydrogen on the carbonyl carbon allows for direct oxygen insertion with low activation energy.

Concept Diagnostic Cards



Lacking a direct hydrogen atom, the carbonyl carbon is shielded. Oxidation requires the destruction of the molecule's core framework.

Aldehydes smoothly accept oxygen. Ketones stubbornly resist until forced to break apart.

Aldehyde $\rightarrow$ Carboxylic Acid

Strong Oxidants



Mild Oxidants

Tollens' Reagent

Ammoniacal silver nitrate $\rightarrow$ Silver mirror

Fehling's Reagent

Aqueous copper sulphate + Rochelle salt $\rightarrow$ Reddish-brown ppt

Reaction Strip



✓ Carbon Skeleton Remains Intact



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Ketone Oxidation Requires Vigorous Conditions



Conditions Card

Strong Oxidizing Agents

(e.g., KMnO_4 , HNO_3)

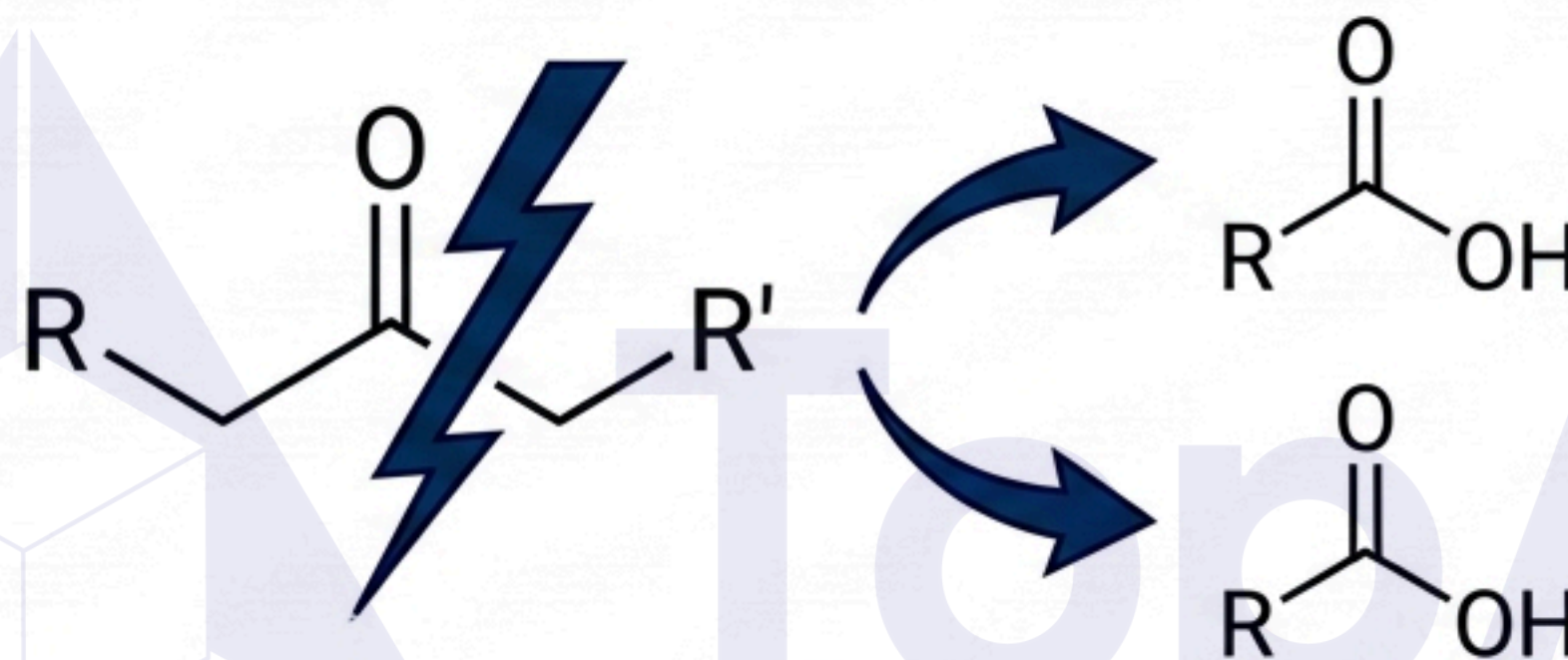
+

Elevated Temperatures

(Heat / Δ)

Mild reagents fail. Ketones remain completely unreactive to both Tollens' and Fehling's tests, making these tests the standard diagnostic tool to distinguish aldehydes from ketones.

C-C Bond Cleavage in Ketones



Exam Insight: The resulting mixture of carboxylic acids will always contain fewer carbon atoms than the parent ketone.

Aldehyde vs. Ketone Oxidation Contrast

	Aldehydes	Ketones
Susceptibility to Oxidation	High (Easily Oxidised)	Low (Stubborn)
Reagents Required	Mild & Strong (Tollens', Fehling's, KMnO_4)	Strong + Heat Only
C–C Bond Cleavage?	✗ No	✓ Yes
Final Product Chain Length	Same number of carbons	Fewer carbons than parent



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