

# Reduction of Aldehydes and Ketones

Reduction involves the addition of hydrogen (or hydride) to the carbonyl group (C=O), converting it into an alcohol.

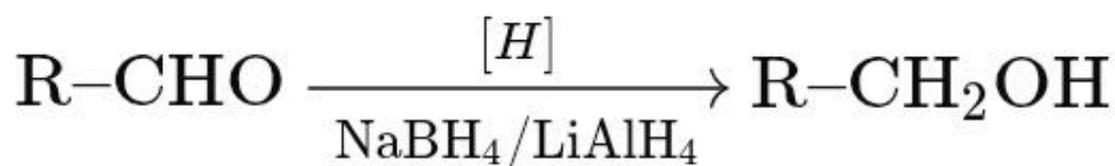
Common reducing agents:

- $\text{NaBH}_4$  (sodium borohydride)
  - $\text{LiAlH}_4$  (lithium aluminium hydride)
  - Catalytic hydrogenation ( $\text{H}_2/\text{Ni}$ ,  $\text{Pt}$ , or  $\text{Pd}$ )
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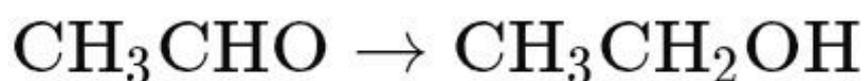
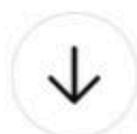
## 1. Synthesis of Primary Alcohols

### Reduction of Aldehydes

General reaction:



Example:



## 2. Synthesis of Secondary Alcohols

### Reduction of Ketones

General reaction:



Example:



Product: Isopropyl alcohol (secondary alcohol)

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## 3. Formation of Tertiary Alcohols

✗ Tertiary alcohols cannot be prepared by direct reduction of aldehydes or ketones because the carbonyl carbon has no hydrogen atom to be reduced.