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Reducing and Oxidising Aldehydes and Ketones

1. Reduction to alcohols

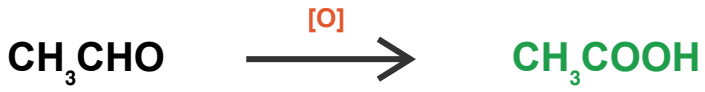
$NaBH_4$ or **$LiAlH_4$** (or catalytic hydrogenation) reduce the carbonyl group: aldehyde → **primary alcohol**, ketone → **secondary alcohol**.

2. Reduction to CH_2

Name	Reagents
Clemmensen reduction	Zn–Hg, concentrated HCl
Wolff-Kishner reduction	NH_2NH_2, then KOH in ethylene glycol, heat

3. Oxidation of aldehydes

An aldehyde has an **H on the carbonyl carbon**. That C–H bond oxidises easily, even with mild oxidising agents, giving a **carboxylic acid with the same number of carbons**.



4. Oxidation of ketones

A ketone has no such H. It oxidises only under **strong conditions**. A **C–C bond breaks**, giving a **mixture of acids with fewer carbons**.

	Aldehyde	Ketone
Reduction	Easy	Easy
Oxidation	Easy	Tough

Solved example

Q. Give the products of propanone with (a) $NaBH_4$ (b) Zn–Hg, conc. HCl.
A. (a) Propan-2-ol, a secondary alcohol. (b) Propane: C=O becomes CH_2.

Practice questions

1. (MCQ) Ethanal on reduction with $NaBH_4$ gives (a) ethane (b) ethanol (c) ethanoic acid (d) methanol
2. (Very short) Name the reagents of Clemmensen reduction.
3. (Very short) What does a ketone give on $NaBH_4$ reduction?
4. (Short) Why are aldehydes easily oxidised?
5. (Short) Why does ketone oxidation give acids with fewer carbons?

6. (Very short) What does ethanal give on oxidation?

Answer key

1. (b).
2. Zinc amalgam and concentrated HCl.
3. A secondary alcohol.
4. They have an H on the carbonyl carbon, and that C–H bond oxidises easily.
5. A C–C bond breaks.
6. Ethanoic acid.

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