3.3.8 Aldehydes and Ketones

★ A-LEVEL ONLY — not examined at AS level

3.3.8	*Aldehydes and ketones: oxidation, reduction (NaBH4), nucleophilic addition (KCN), tests. Mechanisms.*

Aldehydes are readily oxidised to carboxylic acids; ketones are not (no H on the carbonyl C for further oxidation).

Reduction (NaBH4, aqueous): aldehyde → primary alcohol; ketone → secondary alcohol. Written as [H] in equations.

Mechanism (nucleophilic addition): H■ (from NaBH4) attacks the δ+C of C=O. π-bond breaks, electrons go to O. Then protonation by H2O.

Reaction with KCN (then dilute acid) → hydroxynitrile (chain extended by 1C).

Mechanism: CN■ attacks δ+C of C=O (nucleophilic addition). C=O π-bond breaks. Then H■ from dilute acid protonates O.

Chirality: product of KCN addition has a new chiral centre → racemic mixture (CN■ attacks equally from both faces of planar C=O).

Safety: KCN is extremely toxic — use in fume cupboard, wear gloves.