In aldehydes, there is no overlap between the bond connecting the hydrogen to the carbonyl and the π bond from the carbonyl, since they are orthogonal to each other.

In a ketone, both groups attached to the carbonyl are able to undergo hyperconjugation with the C=O. Hyperconjugation reduces the polarity of the carbonyl bond (by providing electron density to the δ+ carbon) which therefore reduces the reactivity of the C=O.
hydration of geminal diol

\[ \text{hydration} \quad \text{protonate} \quad \text{open} \quad \text{attack} \quad \text{deprotonate} \]

dehydration

\[ \text{cationic reactions - especially involving acid catalysts - are normally reversible.} \]

Reduction (of aldehydes + ketones)

- NaBH₄ - sodium borohydride
- LiAlH₄ - lithium aluminium hydride

The electronegativity difference between aluminum + hydrogen is much greater than the difference between boron and hydrogen. Lithium aluminium hydride is therefore a much more powerful reducing agent than sodium borohydride. NaBH₄ can be safely used in many protic solvents, decomposition will occur, but slowly enough reduction can still occur.

\[ \text{side rxn} : \quad \text{H₂} \rightarrow \text{H}_2 \]
Reduction, like many anionic reactions, is normally irreversible because of the large difference in basicities of the reactants and products.

\[
\text{Na}_2\text{N}_3
\]

\[
\text{N}^- = \text{N}^- = \text{N}^-
\]