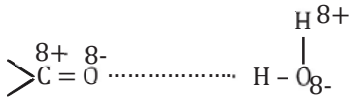
PHYSICAL PROPERTIES

Physical Properties of Aldehyde and Ketones

State: Formaldehyde is the only gaseous carbonyl compound; all others up to C_{11} are in liquid form, while those from C_{12} onward are solid.

Odor: Lower aldehydes emit an unpleasant odor, whereas higher aldehydes and all ketones have a pleasant fragrance.

Solubility: C_1 to C_3 (formaldehyde, acetaldehyde and propionaldehyde) and acetone are freely soluble in water due to polarity of $>\overset{\delta+}{C}=\overset{\delta-}{O}$ bond and can form H—bond with water molecule. C_5 onwards are insoluble in water.



Solubility $\propto \frac{1}{\text{Molecular weight}}$

H-bonding

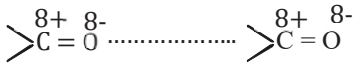
Boiling point:

$$\text{Boiling point} \propto \text{Molecular weight}$$

Boiling point order is:

Alcohol > Carbonyl compounds > Alkane

This distinction arises because alcohols exhibit intermolecular hydrogen bonding, while carbonyl compounds lack hydrogen bonding and instead rely on dipole-dipole van der Waals forces of attraction. In contrast, alkanes are nonpolar.



Density: Density of carbonyl compounds is lower than water.