

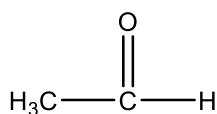
Carbonyl Compounds:

1. Introduction (Nomenclature and Properties):

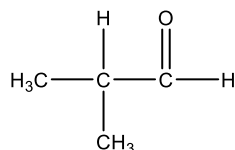
- ✓ Carbonyl = "C=O" Group
- ✓ Example: Aldehydes (RCHO) or Ketones (RCRO) **Carboxylic (COOH) is NOT a carbonyl compound

(a) Nomenclature:

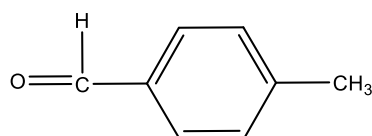
- ✓ Aldehyde ("-al")
- ✓ Eg.



Ethanal

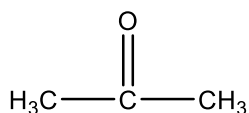


2-methylpropanal

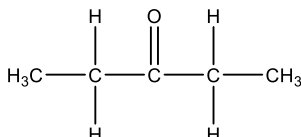


4-methylbenzaldehyde (Special Case)

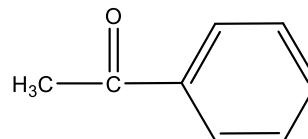
- ✓ Ketones ("-one")
- ✓ Eg.



Propanone



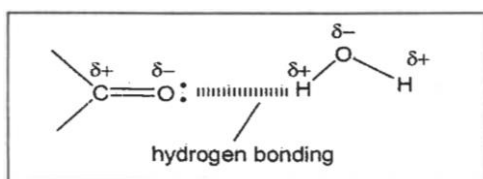
Pentan-3-one



phenylethanone

(b) Properties:

- ✓ Weaker boiling point compared to alcohols, as carbonyl molecules have weak Van der Waals forces of attraction between the molecules vs the stronger hydrogen bonds between the alcohol molecules
- ✓ Soluble in polar solvents like water, as hydrogen bonds can form between the carbonyl molecules and water molecules. However, the solubility decreases with higher Mr as the Van der Waals forces of attraction will predominate



2. Oxidation and Reduction reactions:

Oxidisers:

- ✓ KMnO_4 with dilute H_2SO_4
- ✓ $\text{K}_2\text{Cr}_2\text{O}_7$ with dilute H_2SO_4

Reducers:

- ✓ H_2 , Nickel Catalyst, High Temp/Pressure

- ✓ LiAlH_4 in dry ether, Room Temperature
- ✓ NaBH_4 in aqueous alkaline methanol

(a) Oxidation Reactions:

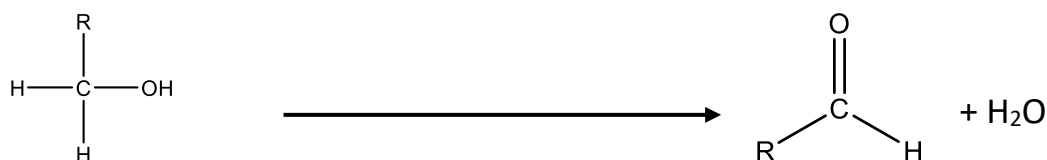
- Primary alcohol $\xrightarrow{1}$ Aldehyde $\xrightarrow{2}$ Carboxylic Acids
- Primary alcohol $\xrightarrow{3}$ Carboxylic Acids
- Secondary alcohol $\xrightarrow{4}$ Ketones
- Tertiary alcohol \rightarrow No Reaction

Oxidation Reaction 1:

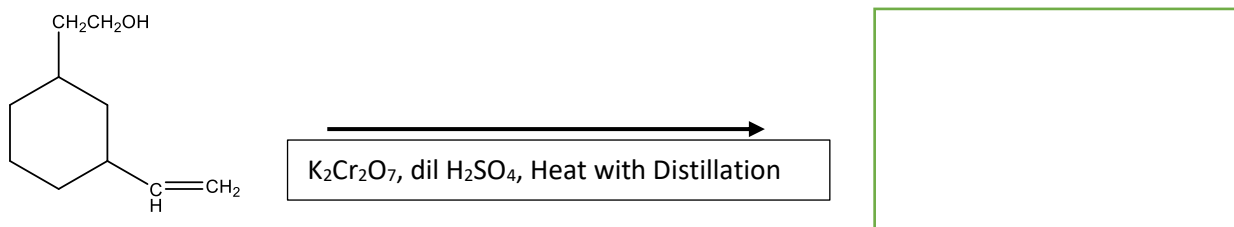
Primary Alcohols to Aldehydes:

- ✓ Reagents: $\text{K}_2\text{Cr}_2\text{O}_7$, Dilute H_2SO_4
- ✓ Conditions: Heat with Distillation
- ✓ Observation: Orange $\text{K}_2\text{Cr}_2\text{O}_7$ turns Green

Eg.

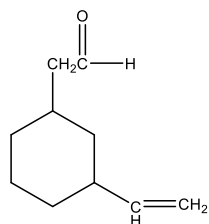


Past-Year Paper Example:



Thought process:

- $\text{K}_2\text{Cr}_2\text{O}_7$ is a weak oxidising agent, hence it can be used to oxidise any primary alcohol or secondary alcohol
- Heat with distillation is used. Since such a condition is used, only aldehydes can be formed
- However, since KMnO_4 , as well as heating with Reflux is not used, the $\text{C}=\text{C}$ bond cannot be broken



Hence, the answer is: