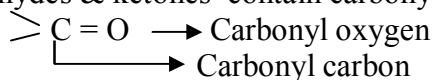
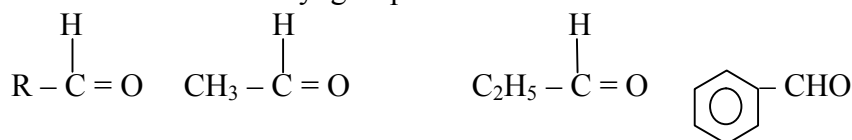




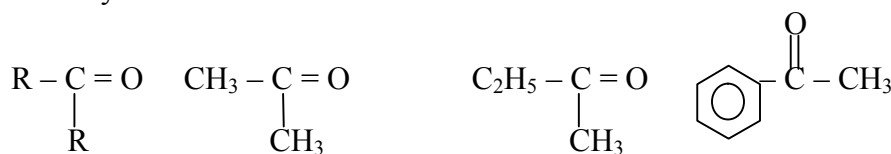
Aldehydes & ketones contain carbonyl group so called carbonyl compounds.



In aldehydes carbonyl group is further attached to H atom, So aldehydic functional group will be –CHO. It is also called as formyl group. The general formula for aldehydes will be R – CHO or Ar – CHO where ‘Ar’ is aryl group.



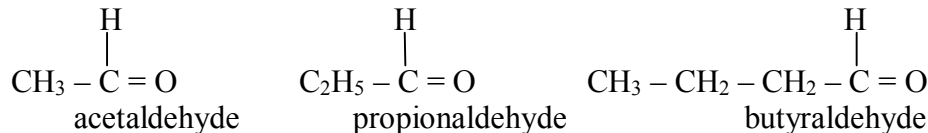
In Ketones Carbonyl Carbon is bonded to two alkyl or two aryl groups. These two radicals may be same or may be different



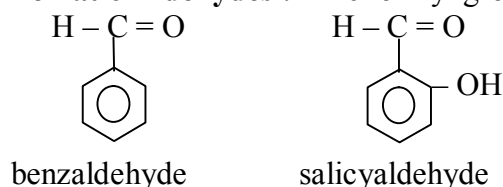
### Classification Of aldehydes :-

They are of two types :

**A] Aliphatic aldehydes :-** The compounds in which aldehydic group is directly attached to saturated or  $\text{SP}^3$  hybridized carbon are called aliphatic aldehydes. (Except formaldehyde) thus aldehydic carbon is a primary carbon atom. So this group is always terminal group.

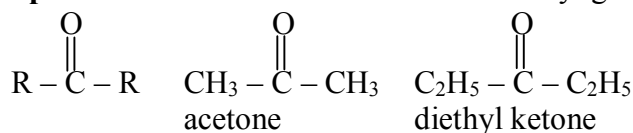


**B] Aromatic Aldehydes :-** The formyl group is directly attached to benzene ring or aromatic ring .



### Classification of Ketones

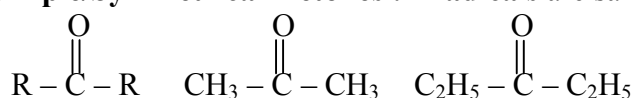
**1] Aliphatic Ketone :-** In these ketones carbonyl group is directly attached to two alkyl radicals.



Aliphatic Ketones are further

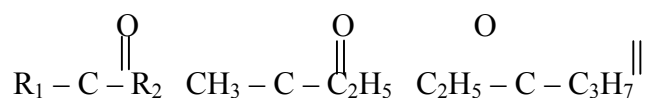
Classified into two classes

**a] Simple/Symmetrical ketones :-** Radicals are same

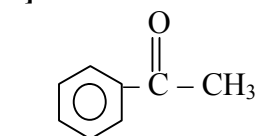




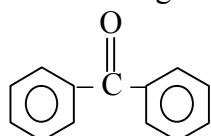
**b) Mixed or Unsymmetrical Ketones :- Radicals are different**



**2) Aromatic Ketones :-** The Aromatic group is attached to at least one aryl group i.e. benzene ring.



acetophenone

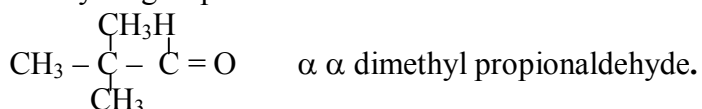


benzophenone

### Nomenclature of Aldehydes:

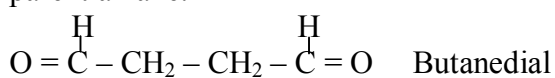
Common names of aldehydes are derived from common names of carboxylic acids.

In the common names, sometimes  $\alpha$ ,  $\beta$  i.e. Greek alphabets are used. But  **$\alpha$  carbon** is adjacent to aldehydic group.



In the IUPAC system, from the name of the parent alkane, the last letter 'e' should be replaced by the letters 'al'. So aldehyde are named as alkanal.

Presence of two aldehydic groups is denoted by 'dial' which is suffix to the complete name of parent alkane.

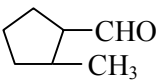
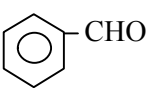
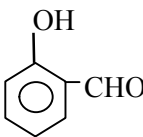
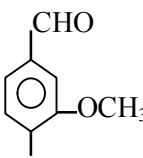
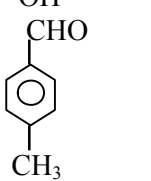


In the cyclic compound, aldehydic group is called as carbaldehyde which is suffixed to the name of cycloalkane.

Aromatic aldehyde such as benzaldehyde has same IUPAC name



## **Aldehydes, Ketones, Carboxylic Acids**

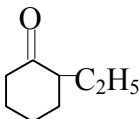
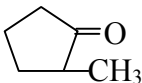
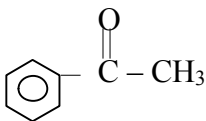
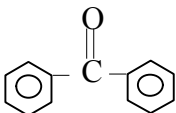
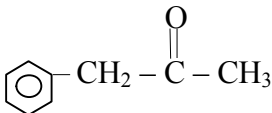
Sr.No.	Formula	Common Name	IUPAC name
1	$\begin{array}{c} \text{H} \\   \\ \text{H} - \text{C} = \text{O} \end{array}$	Formaldehyde	Methanal
2	$\begin{array}{c} \text{H} \\   \\ \text{CH}_3 - \text{C} = \text{O} \end{array}$	Acetaldehyde	Ethanal
3	$\begin{array}{c} \text{H} \\   \\ \text{C}_2\text{H}_5 - \text{C} = \text{O} \end{array}$	Propionaldehyde	Propanal
4	$\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CHO}$	Butyraldehyde	Butanal
5	$\begin{array}{c} \text{CH}_3 \\   \\ \text{CH}_3 - \text{C} - \text{CHO} \\   \\ \text{H} \end{array}$	Isobutyraldehyde or $\alpha$ methylpropionaldehyde	2 methylpropanal
6	$\begin{array}{c} \text{H} \\   \\ \text{CH}_2 = \text{C} - \text{CHO} \end{array}$	Acrolein	prop-2-enal
7	$\begin{array}{c} \text{H} \quad \text{H} \\   \quad   \\ \text{CH}_3 - \text{C} = \text{C} - \text{CHO} \end{array}$	Crotanaldehyde	But – 2 – enal
8		-----	2 methyl Cyclopentane, Carbaldehyde
9		Benzaldehyde	Benzaldehyde
10		Salicylaldehyde	2 hydroxy benzaldehyde
11		Vanillin	4 hydroxy 3 methoxy benzaldehyde
12		p tolualdehyde	4 methyl benzaldehyde
13	$\text{OHC} - \text{CHO}$	Glycoldehyde	Ethradial


**Nomenclature of Ketones**

The common names of Ketones are given on the basis of alkyl radicals attached to carbonyl group. In aliphatic ketones, for IUPAC name, from the name of the parent alkane the last letter 'e' should be replaced by the letters 'one' along with number of carbonyl carbon. So ketones are considered as 'alkanones'.

In cyclic Ketones, from the name of the cycloalkane the last letter 'e' should be replaced by 'one' and carbonyl carbon is considered on C<sub>1</sub>.

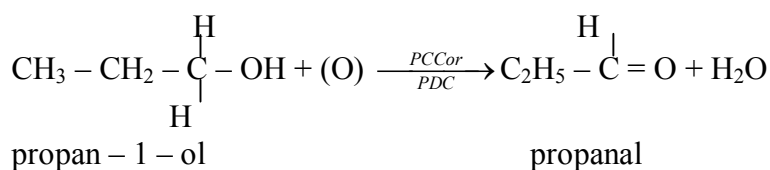
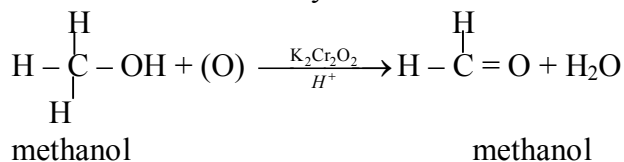
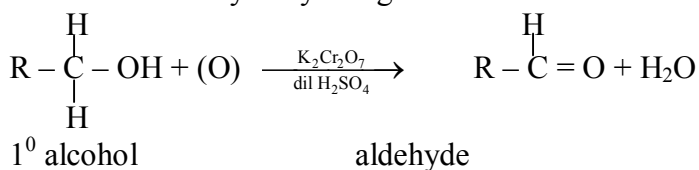
In aromatic ketones such as acetophenone and benzophenone, common names and IUPAC names are same.

S.N.	Formula	Common Name	IUPAC Name
1	$\text{R} - \overset{\text{O}}{\underset{\text{  }}{\text{C}}} - \text{R}$	Dialkyl Ketone	Alkanone
2	$\text{CH}_3 - \overset{\text{O}}{\underset{\text{  }}{\text{C}}} - \text{CH}_3$	Acetone or dimethyl ketone	Propanone
3	$\text{C}_2\text{H}_5 - \overset{\text{O}}{\underset{\text{  }}{\text{C}}} - \text{CH}_3$	ethyl methyl ketone	Butanone
4	$\text{C}_2\text{H}_5 - \overset{\text{O}}{\underset{\text{  }}{\text{C}}} - \text{C}_2\text{H}_5$	diethyl ketone	Pentan-3-one
5	$\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \underset{\text{CH}_3}{\underset{ }{\text{C}}} = \text{O}$	methyl n-propyl ketone	Pentan-2-one
6	$\text{CH}_3 - \underset{\text{H}}{\underset{ }{\text{C}}} = \underset{\text{H}}{\underset{ }{\text{C}}} - \underset{\text{CH}_3}{\underset{ }{\text{C}}} = \text{O}$	mesityl oxide	4 methylpent-3-en-2-one
7		-----	3 ethylcyclohexanone
8		-----	2 methyl cyclopentanone
9		Acetophenone	Acetophenone
10		Benzophenone	Benzophenone
11		Phenyl acetone	1-phenyl propan-1-one

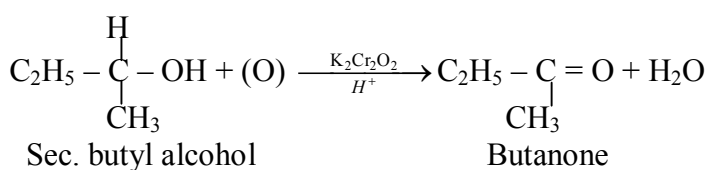
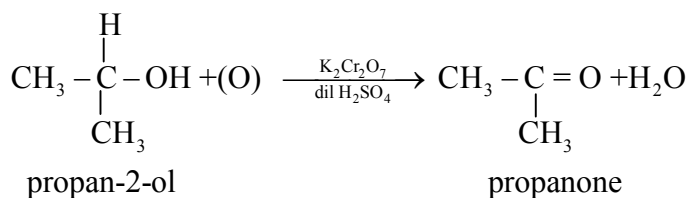
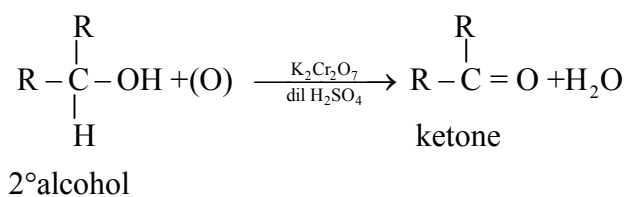
## Methods of Preparation of Aldehydes and Ketones

### 1) By oxidation of alcohols

**Aldehyde:** A primary alcohol on oxidation by acidified potassium dichromate gives aldehyde. But this aldehyde should be distilled out for preventing its further oxidation. Also primary alcohols are oxidized to aldehyde by using either PCC or PDC.

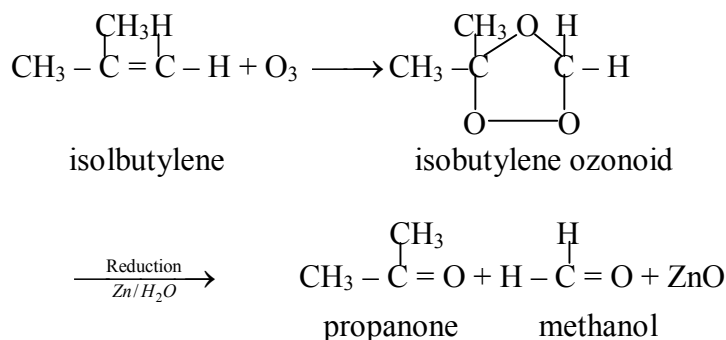
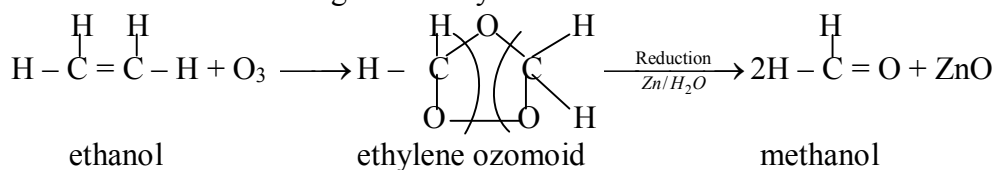


**Ketones:** When a secondary alcohol is oxidized by acidified potassium dichromate corresponding ketone is obtained.



**2) By Ozonolysis of alkenes:**

Ozononised oxygen gas is passed through the solution of alkenes in a suitable organic solvent. Ozone reacts with alkene forming ozonide at the place of unsaturation. This ozonide is reduced by boiling with zinc dust and water. This gives aldehydes or Ketones or both.

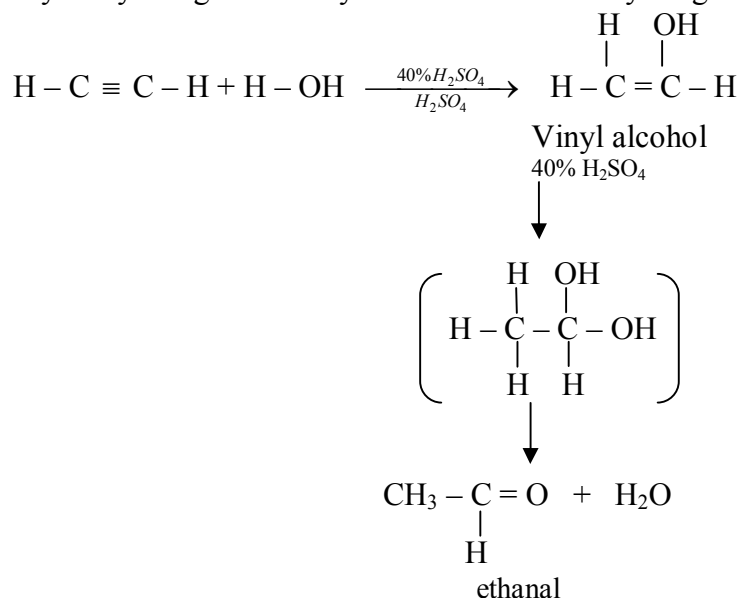


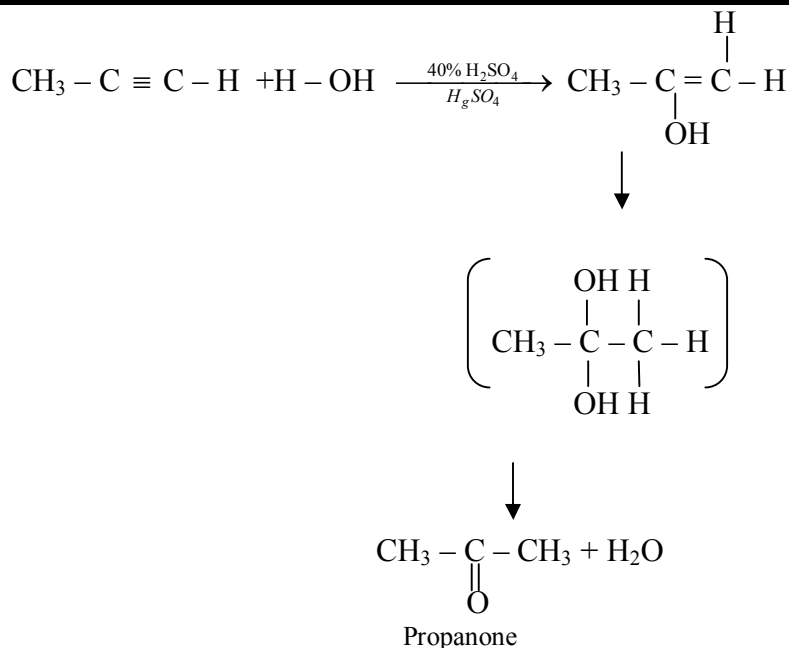
❖ Ozonoid ring break at the position of previous double bond. So reaction is used to locate the position of double bond in alkene.

**5) By hydration of alkynes using 40% H<sub>2</sub>SO<sub>4</sub>.**

Addition of water across triple bond of alkyne is called **hydration**. Alkynes undergo hydration in the presence of 40% H<sub>2</sub>SO<sub>4</sub> and mercuric sulphate as catalyst. The reaction is completed in two steps.

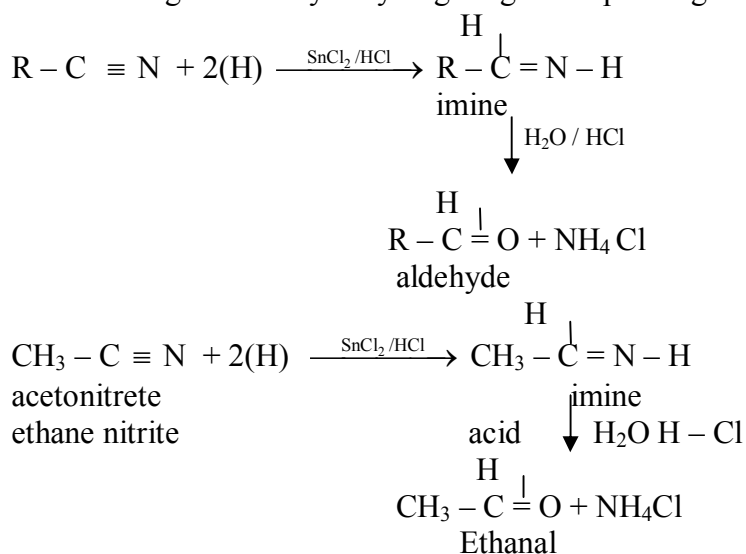
❖ Only acetylene gives aldehyde while all other alkynes give ketone.



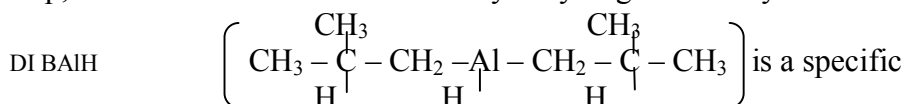


### 6) Preparation of only aldehyde by partial reduction of alkyl cyanides (Stephen's Reaction)

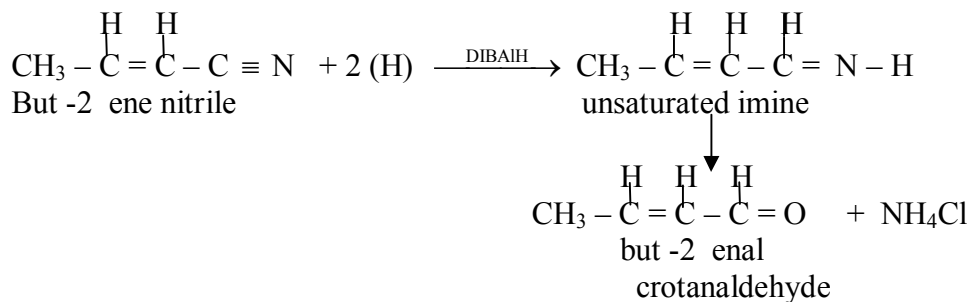
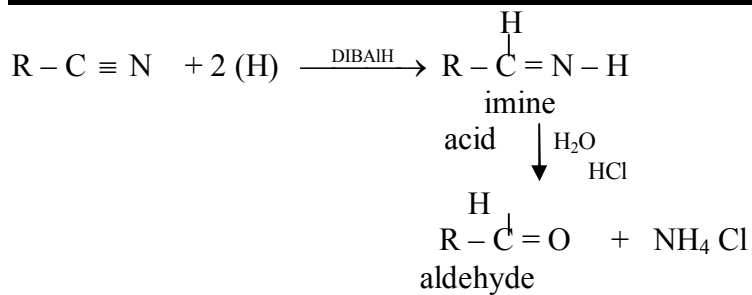
Aldehydes are obtained by partial reduction of alkyl cyanide using stannous chloride and dilute HCl. It results in the formation of imino compound. In the second step of Stephen's reaction, this imine undergoes acid hydrolysis giving corresponding aldehyde only.



Alkyl cyanides can also be reduced by DIBALH (**Di iso butyl aluminium hydride**). In the first step, imine is formed which on acid hydrolysis gives aldehyde.



This reducing agent is specific for cyanide group. Therefore unsaturated cyanides are converted into unsaturated aldehydes.



### 7) Preparation of only aldehydes by partial reduction of esters.

Esters can be partial reduced by DIBAlH at 468K. This partial reduction gives an aldehyde and alcohol.

