

ALCOHOLS, PHENOLS AND ETHERS

PREPARATION OF ALCOHOLS

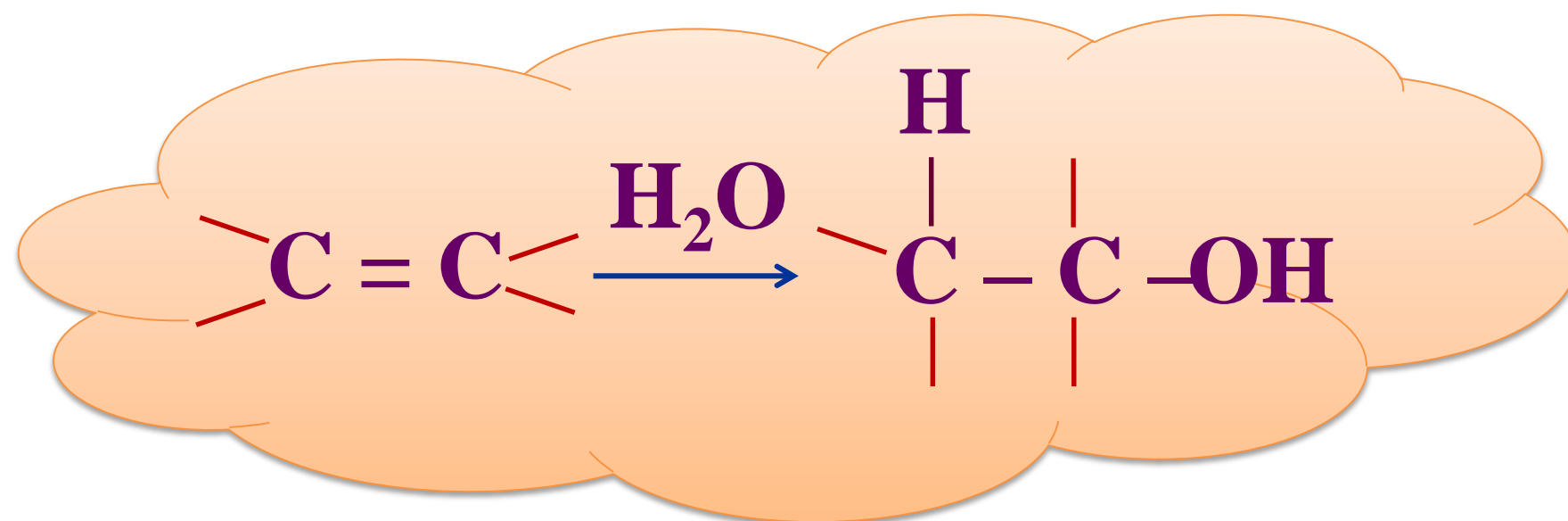
Methods of preparation of Alcohols ($R - OH$)

- **Hydration of Alkenes.**
- **Hydroboration – oxidation of alkenes.**
- **Reduction or hydrogenation of Carbonyl compounds.**
- **From Grignard's reagent
(alkyl magnesium halide) ($R - Mg - X$).**

Methods of preparation of Alcohols (R – OH)

Hydration of Alkenes

(Commercial / Industrial method)



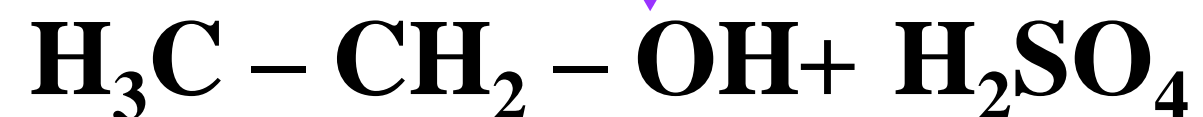


Ethene or Ethylene

Cold



Ethyl hydrogen sulphate



Ethanol

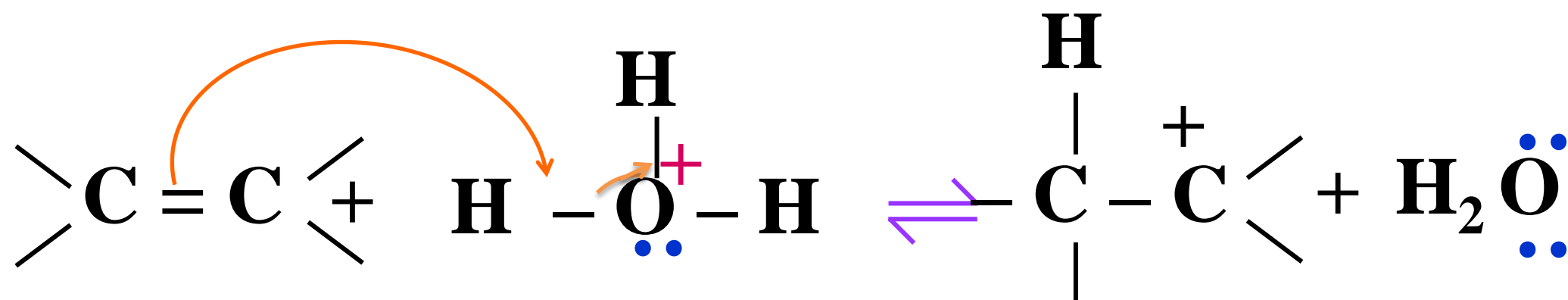
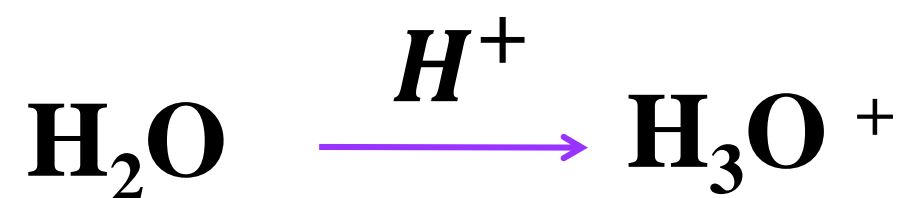
1^o alcohol

Commonly called as Grain alcohol

Mechanism of Hydration of alkenes :

Step I :

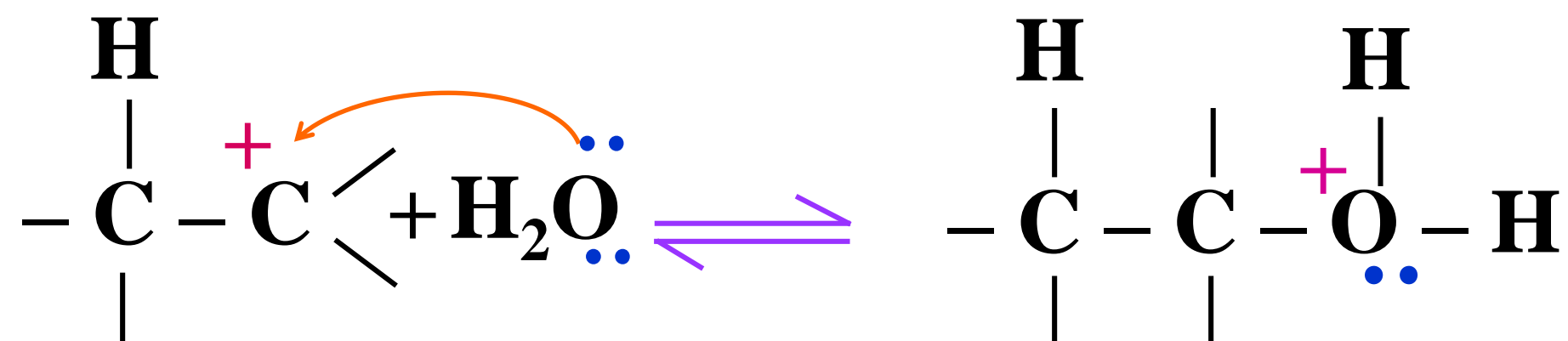
Protonation of alkene to form carbocation by Electrophilic attack of H_3O^+



Mechanism of Hydration of alkenes :

Step II :

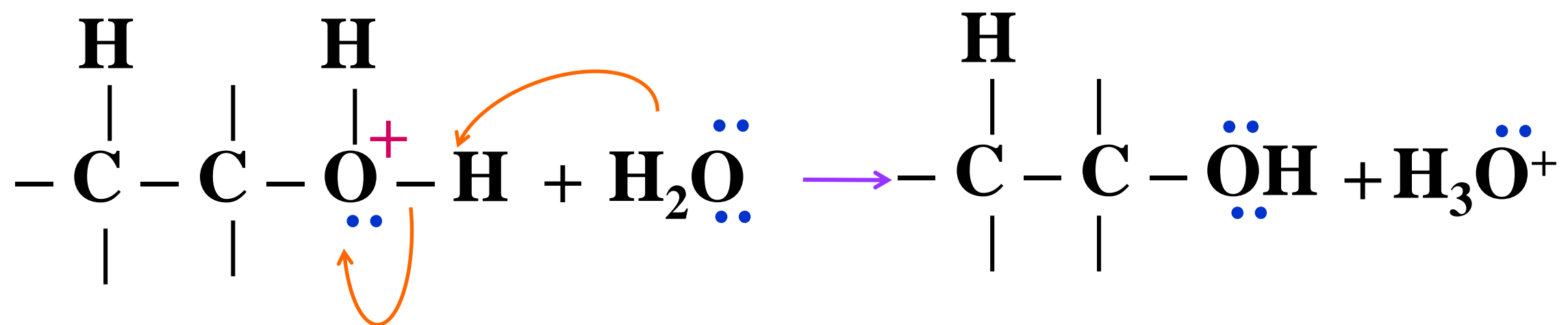
Nucleophilic attack of water on carbocation

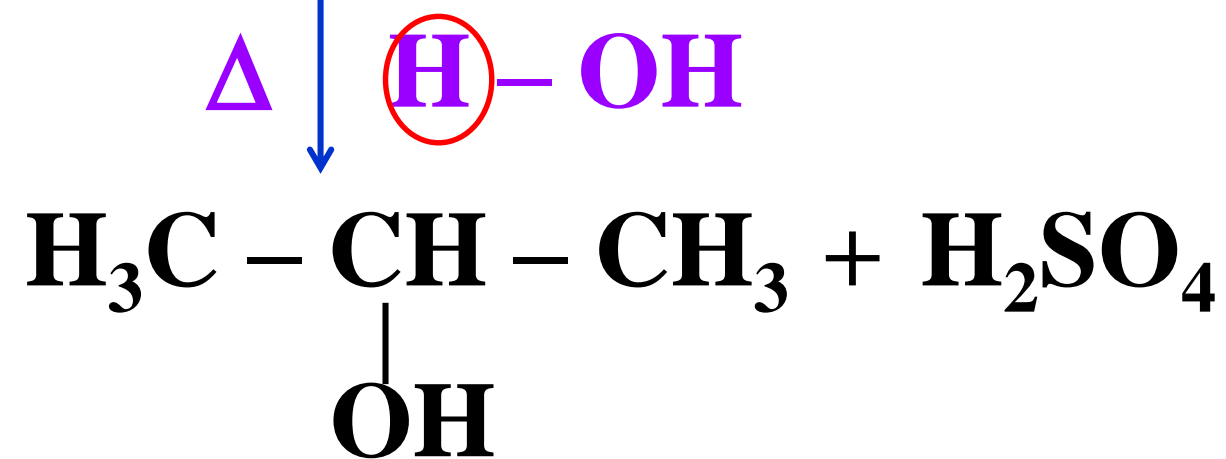


Mechanism of Hydration of alkenes :

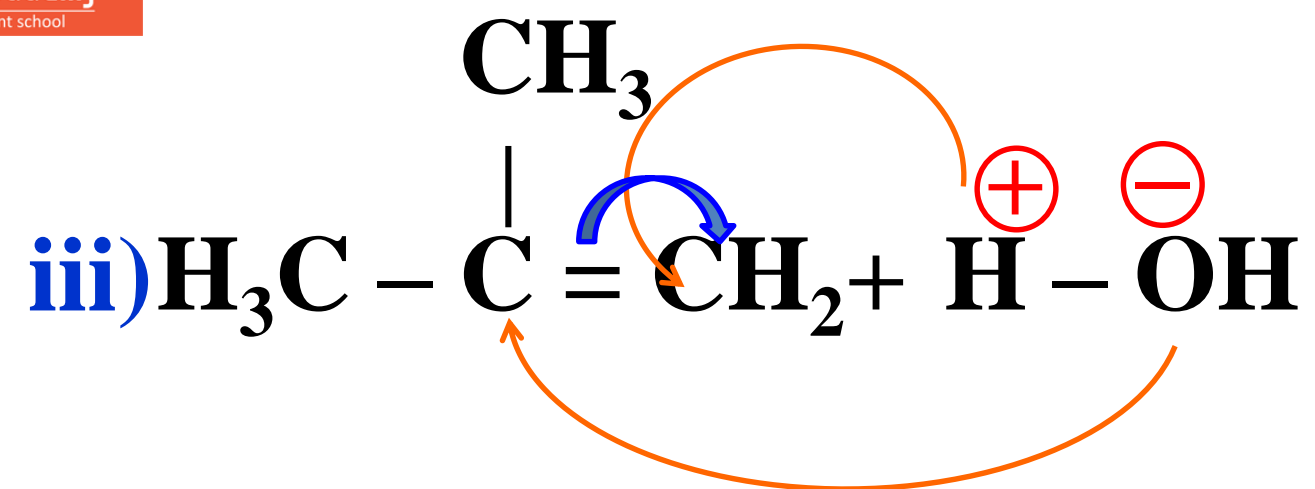
Step III :

Deprotonation to form an alcohol

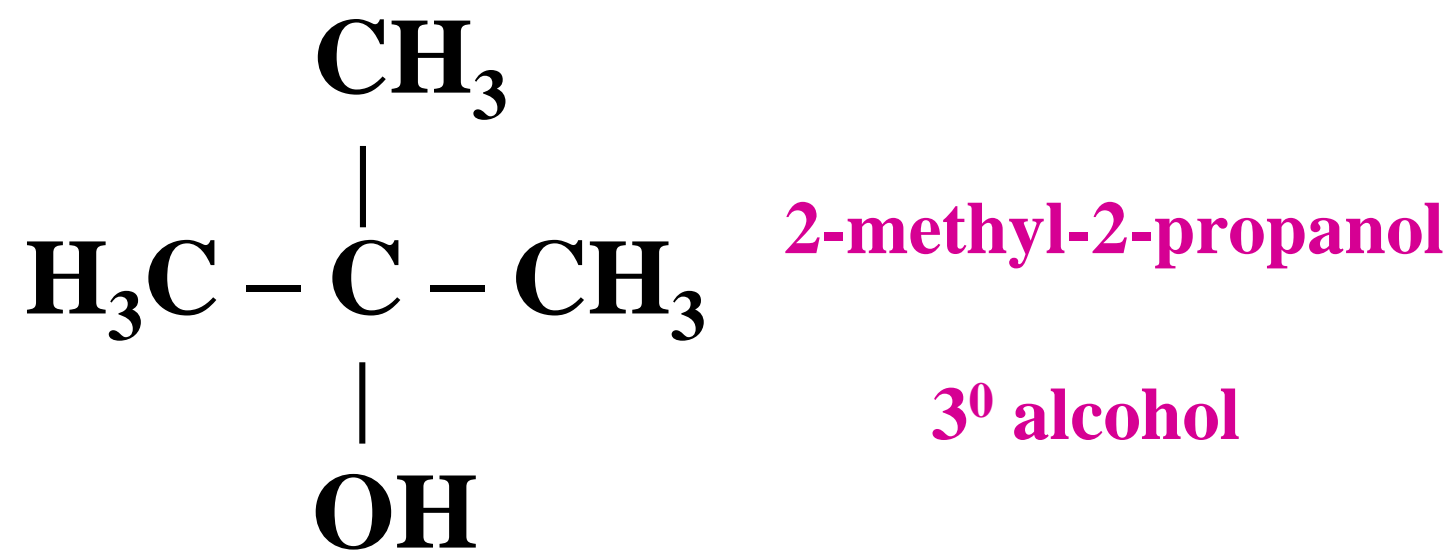
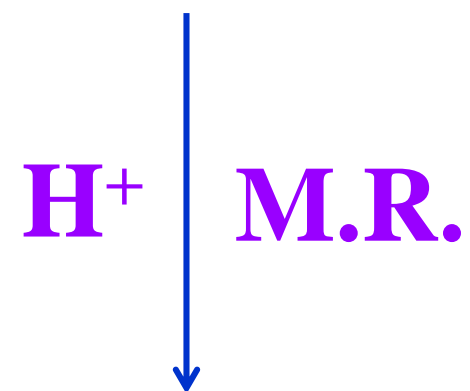




Iso/sec – propyl alcohol **or** Propan-2-ol
2° alcohol



Isobutylene
2-methylpropene



Tert – butyl alcohol

Note :

- i) This method is used to prepare 2^o and 3^o alcohols.**
- ii) This method is not useful to prepare 1^o alcohol except Ethanol.**

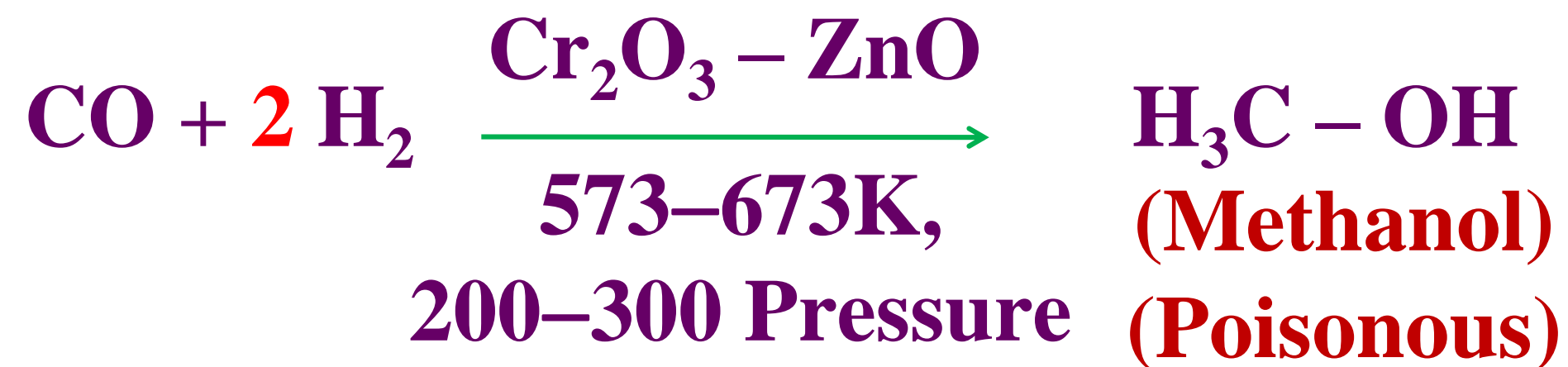
SOME COMMERCIALY IMPORTANT ALCOHOLS

Methanol

Ethanol

Methanol :

Methanol, CH₃OH, also known as ‘wood spirit’, was produced by destructive distillation of wood.

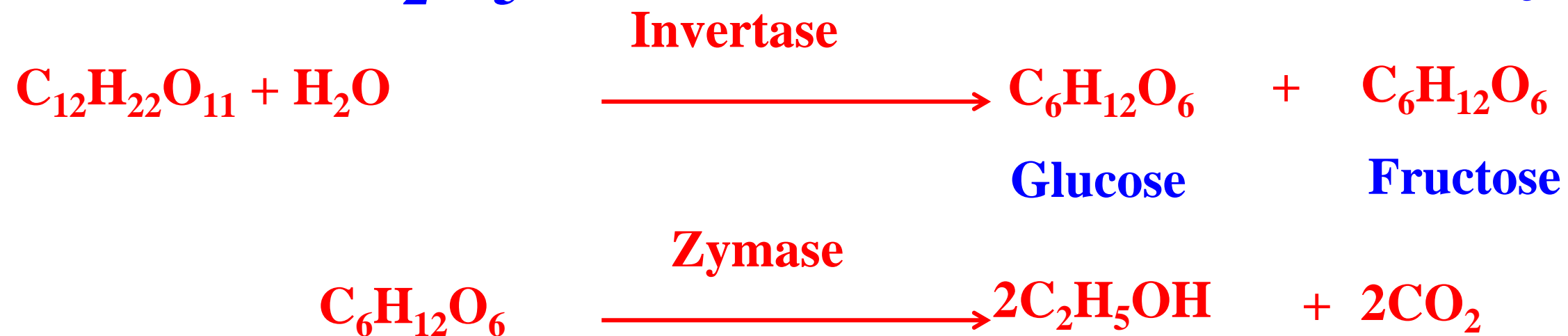


Methanol is a colourless liquid, boils at 337 K and highly poisonous in nature.

Methanol is used as a solvent in paints, varnishes.

Ethanol:

- Ethanol, C_2H_5OH , is obtained commercially by fermentation.



- Ethanol is a colourless liquid with boiling point 351 K
- Ethanol is used as a solvent in paint industry and in the preparation of a number of carbon compounds.

MCQs

1). Hydrolysis of 1-bromopentane by an aq NaOH gives...

- a) 1 - propanol**
- b) 2 - propanol**
- ✓ c) 1 - pentanol**
- d) 2 - pentanol**

2). Hydration of ethene produces ---

a) Propanol

b) 2-butanol

c) ethanol



d) methanol

3). Hydration of 2 - methyl but – 2 - ene produces...

a) 1 – methyl butanol

b) 2 – methyl pentan – 2 - ol

c)  2 – methyl butan - 2 - ol

d) 2 – ethyl butan – 2 - ol

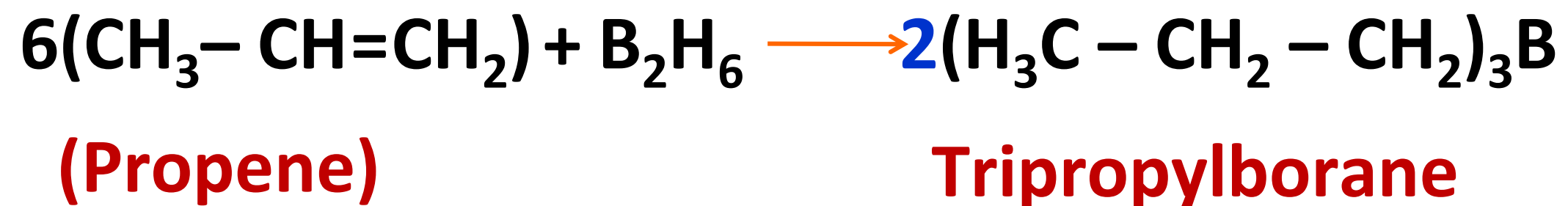
HYDROBORATION

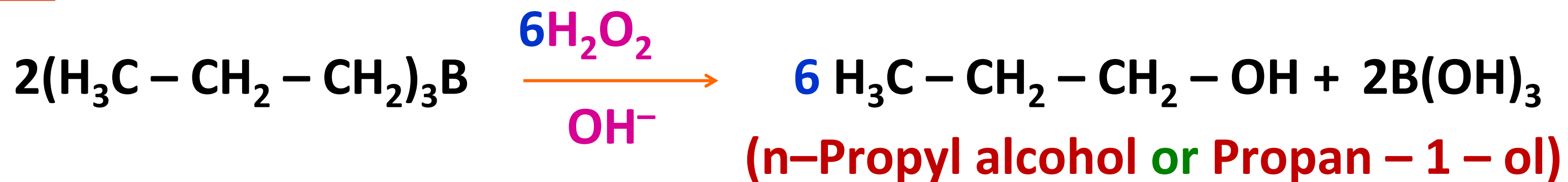
- OXIDATION OF ALKENES

Methods of preparation of Alcohols (R – OH)

Hydroboration – oxidation of alkenes

(Excellent yield of primary alcohol)





Note :

This reaction gives **AntiMarkownikoff's product.**

1). The only primary alcohol that can be prepared by hydration of alkene is...

a) Propanol

b) Butanol

c) Ethanol

d) Ethene

2). Hydroboration...oxidation reaction follows

a) Markownikoffs rule

 b) Anti – Markownikoff's rule

c) Saytzeff rule

d) Hoffmann

3). Isobutylene on hydration in presence of 50% H_2SO_4 gives...

a) n-butyl alcohol

b) Isobutyl alcohol

c)  tert-butyl alcohol

d) All of these

**REDUCTION
OR
HYDROGENATION OF
CARBONYL COMPOUNDS.**

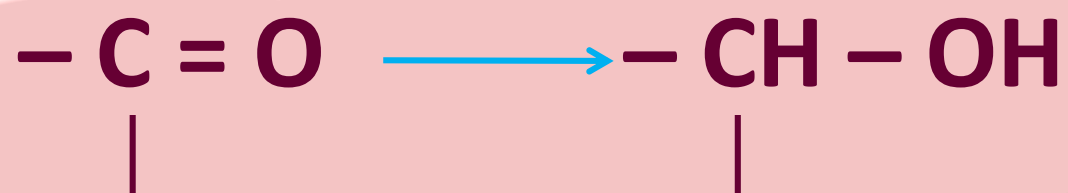
Methods of preparation of Alcohols (R – OH)

Reduction or Hydrogenation of Carbonyl compounds

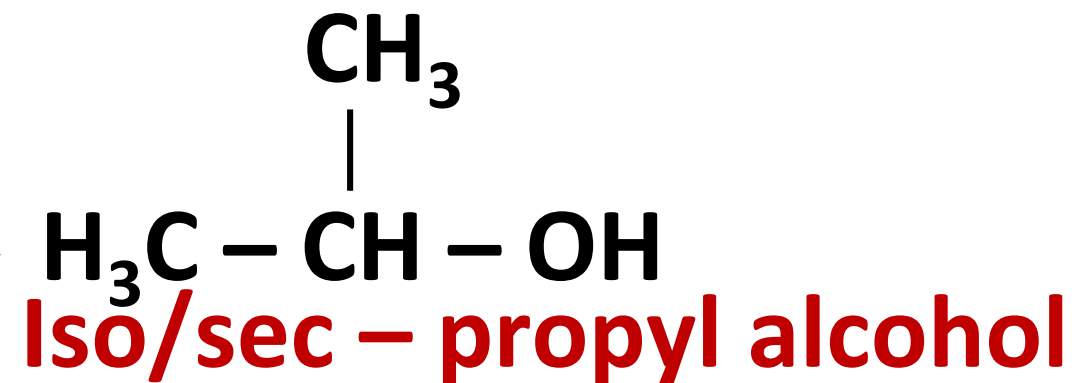
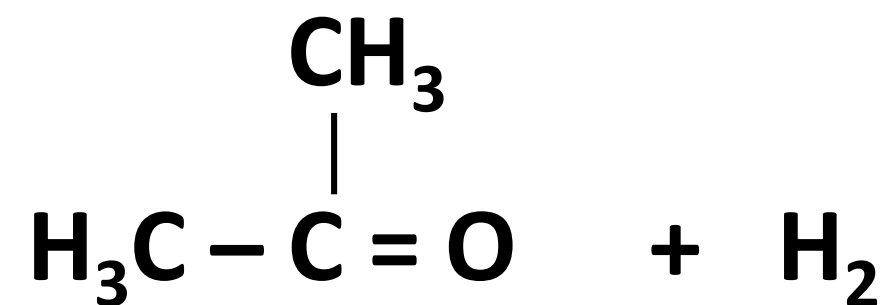
Reduction

Catalytic hydrogenation

Using $2[H]$







or

Propan – 2 – ol) (2°)

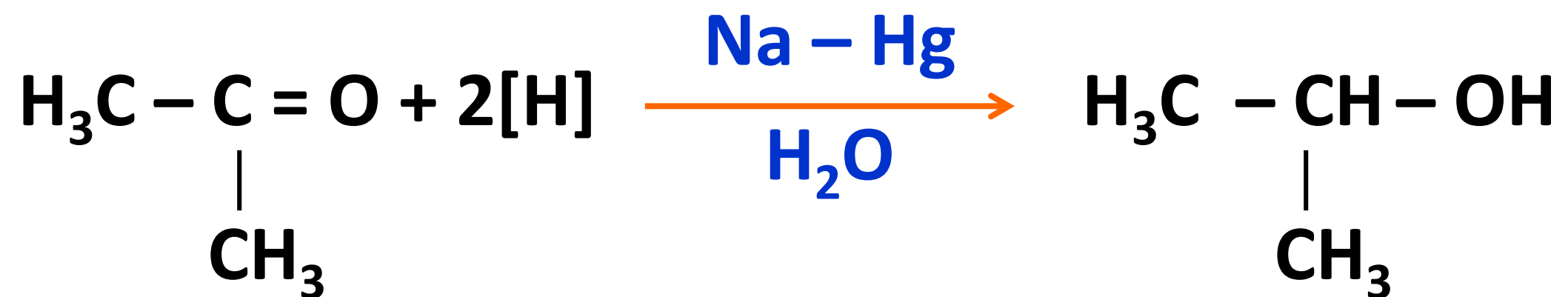
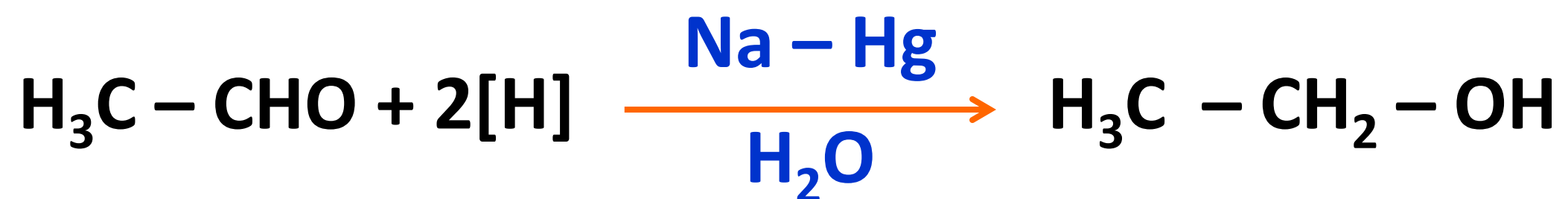
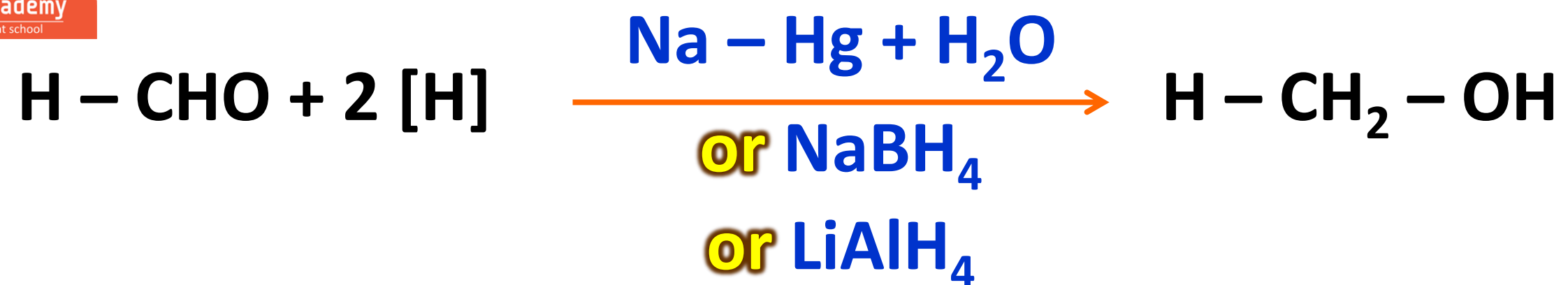
Acetone

or

Dimethyl ketone

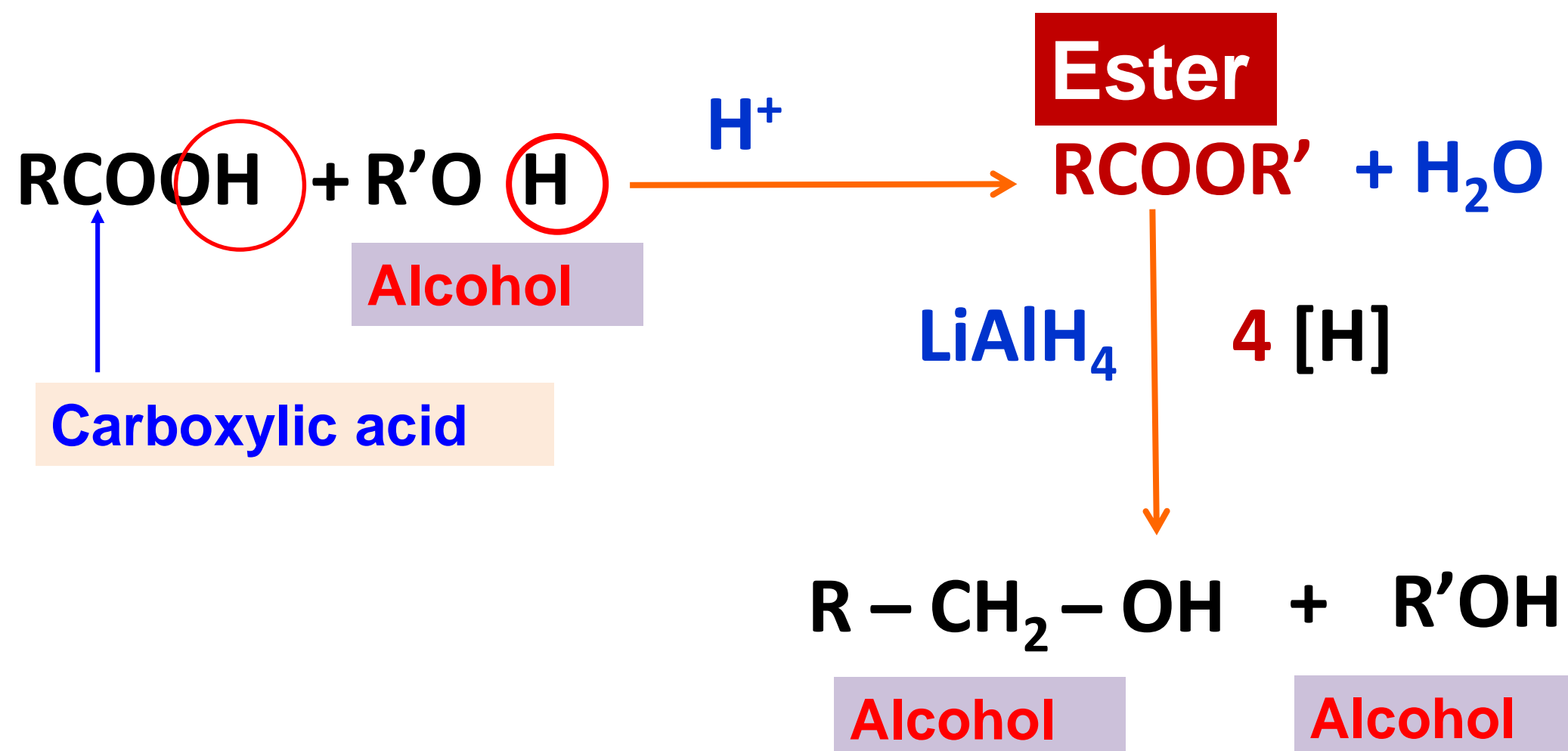
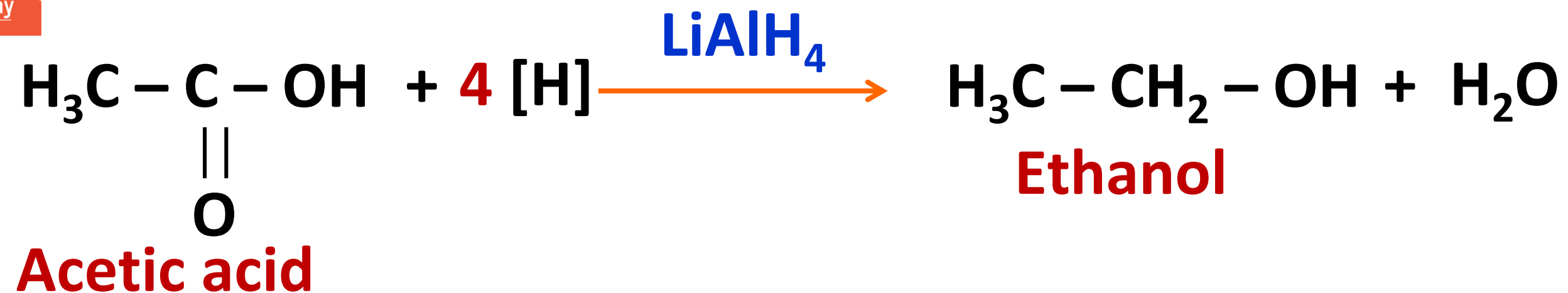
or

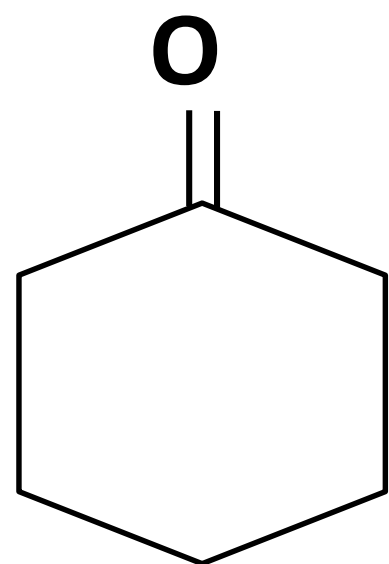
Propanone



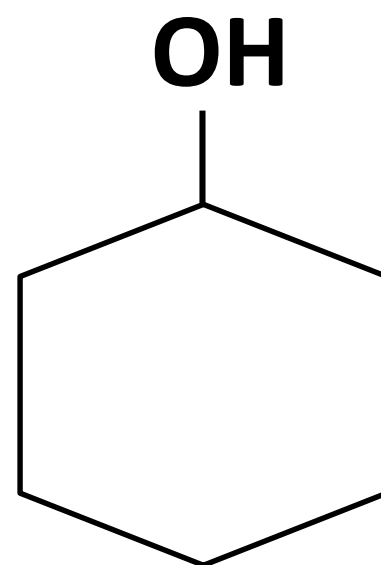
Note :

- i) Aldehyde gives 1^o alcohol on reduction.**
- ii) Ketone gives 2^o alcohol on reduction.**
- iii) 3^o alcohol can not be prepared by reduction.**
- iv) LiAlH_4 is an expensive reagent, so used for preparing special chemicals only. Acids are reduced to alcohols by converting them to the esters followed by their catalytic reduction.**





Reduction
⇌
oxidation




Cyclohexanone

Cyclohexanol

MCQs

1. The reagent used for converting ethanoic acid to ethanol is...

- a)  LiAlH₄**
- b) BH₃**
- c) PCl₅**
- d) K₂Cr₂O₇/H⁺**

2. Esterification of carboxylic acid followed by reduction with lithium aluminum hydride yields...

a) esters

b) ethers

c)  alcohols

d) aldehyde

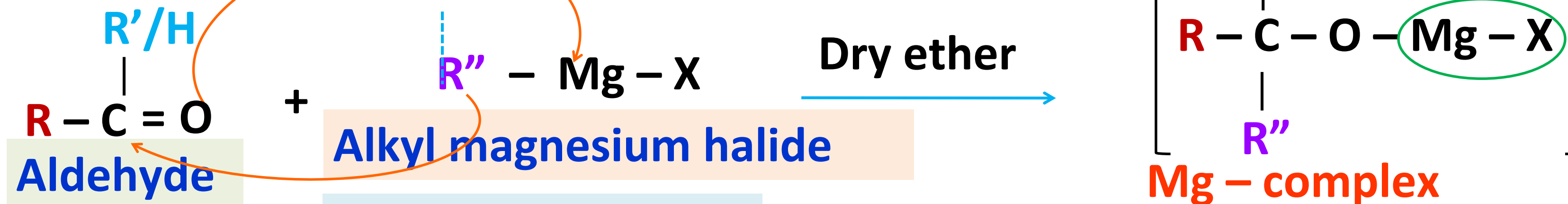


FROM:GRIGNARD'S REAGENT

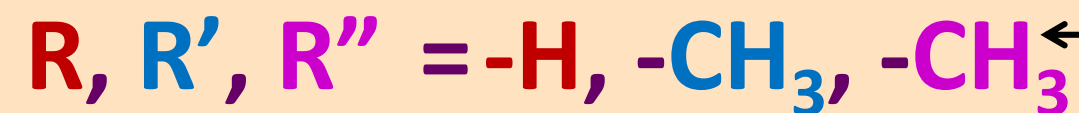
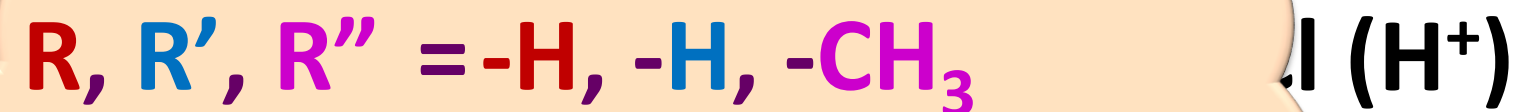
Methods of preparation of Alcohols (R – OH)

From Grignard's reagent (alkyl magnesium halide)(R – Mg – X)

The first step of the reaction is the nucleophilic addition of Grignard reagent



Use :



Alc

Note:

- i) Formaldehyde + G.R. \rightarrow 1^o alcohol
- ii) Aldehyde except formaldehyde + G.R. \rightarrow 2^o alcohol
- ii) ketone + G.R. \rightarrow 3^o alcohol

Note:

- i) By Grignard's reagent we can't prepare Methanol.
- ii) By G.R. we can't prepare any compound which contains only one carbon atom.

MCQs

1). Alcohols can be obtained from carbonyl compounds by...

a) Oxidation

b)  Reduction

c) Hydration

d) Dehydration

2). Acetaldehyde on reduction gives...

a) Methanol

b) Propanol

c) Ethanol

d) Ethene

3. sec-propyl alcohol is obtained from reduction of...

a) acetaldehyde

b)  acetone

c) formaldehyde

d) propanol

4). By using Grignard reagent, we can't prepare...

a) Methanol

b) ethanol

c) propanol

d) butanol

5). Identify the reagent to form t-butyl alcohol from acetone...

a)  CH₃MgI

b) AgNO₃

c) CuSO₄

d) Zn-Hg

6). When C_2H_5MgCl is treated with formaldehyde to form..

a) Pentanol-1

b)  Propan-1-ol

c) pentanol-2

d) Propan - 2 - ol

