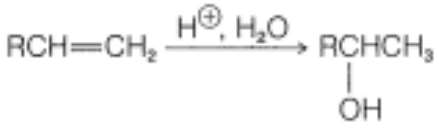
Lec.3

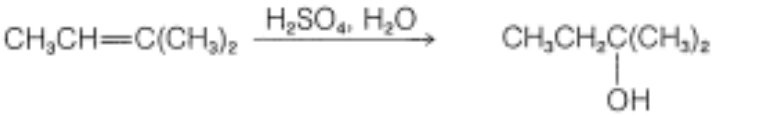
Preparation Alcohols

1- By hydration of alkenes

Add water to the double bond according to the Markownikoff rule

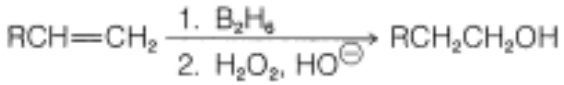
1. *Hydration of alkenes*

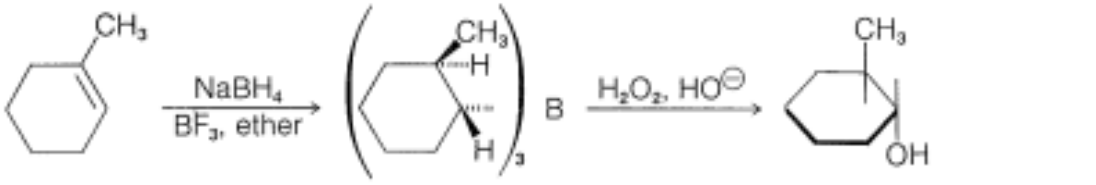




2-methyl-2-butene — 2-methyl-2-butanol, 74%

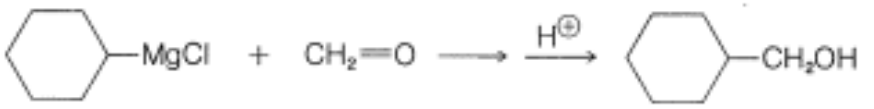
2. *Hydroboration of alkenes*





trans-2-methylcyclohexanol, 90%

3. *Reaction of organometallic compounds with carbonyl compounds*
   a. *primary alcohols from methanal (formaldehyde)*



cyclohexylmagnesium chloride — methanal — cyclohexylcarbinol 69%

1) Reduction of Ketones — Ketones can be reduced to secondary alcohols with lithium aluminum hydride or sodium borohydride.

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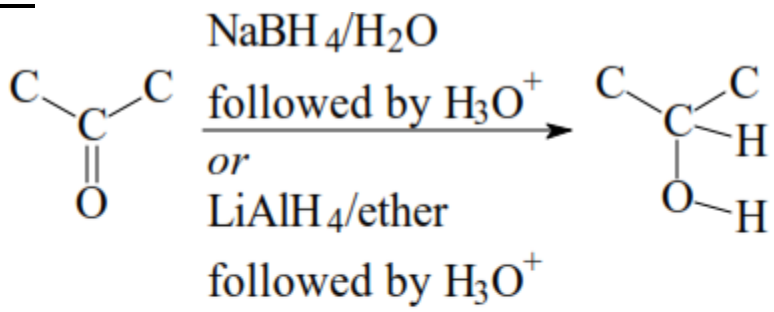
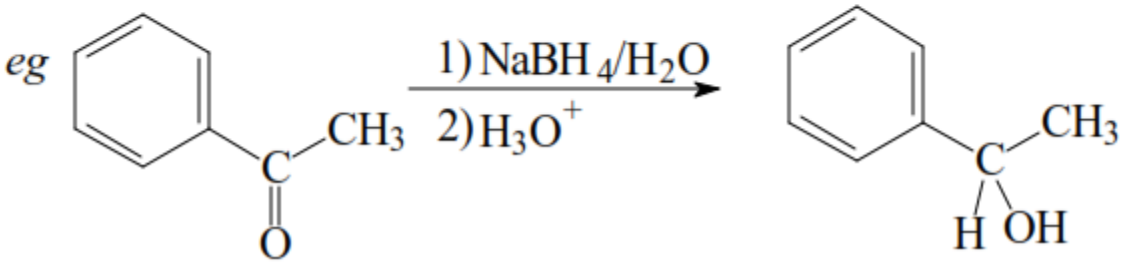
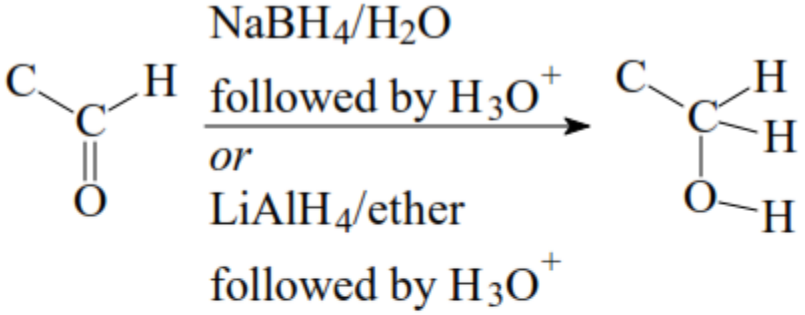
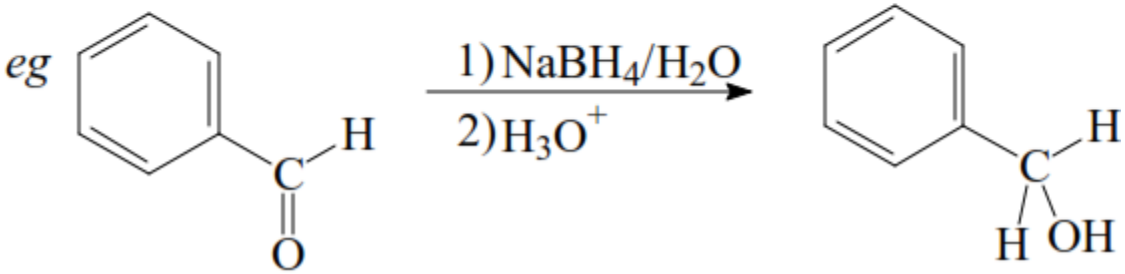




2) Reduction of Aldehydes

Aldehydes can be reduced to primary alcohols with sodium borohydride or lithium aluminum hydride. This reaction is analogous to (1).





3) Reduction of Carboxylic Acids and Esters —

Both esters and carboxylic acids can be reduced to primary alcohols by lithium aluminum hydride.

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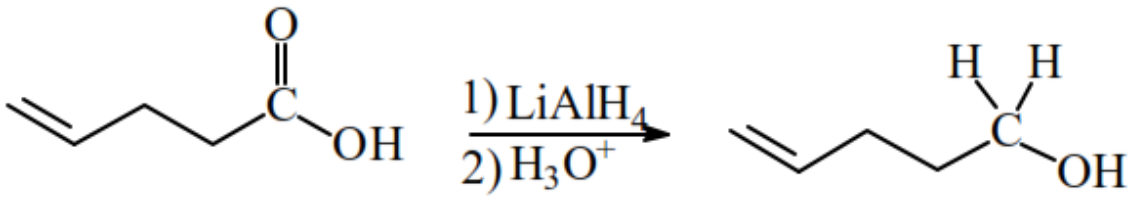
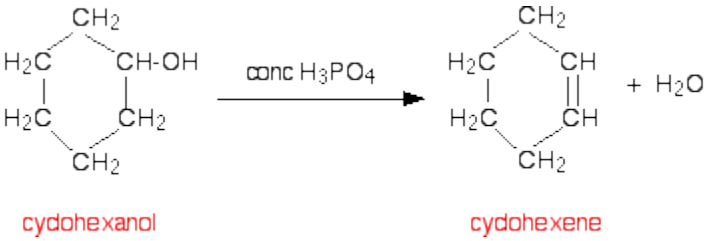
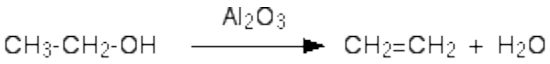


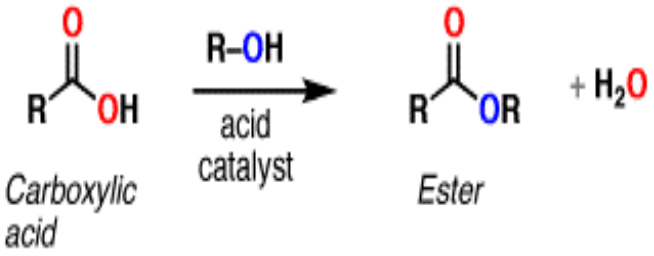
Dehydration of alcohols using aluminium oxide as catalyst

This is a simple way of making gaseous alkenes like ethene. If ethanol vapour is passed over heated aluminium oxide powder, the ethanol is essentially cracked to give ethene and water vapour.





Reaction of carboxylic acid with alcohol to make an ester (Fischer esterification)



Key bonds formed	Key bonds broken
C–OR	C–OH

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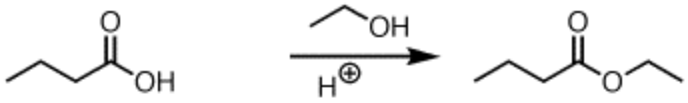
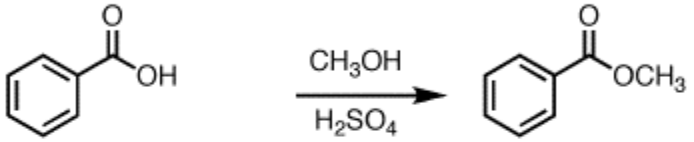
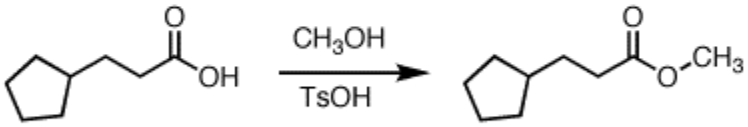
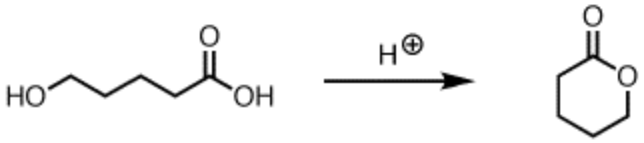
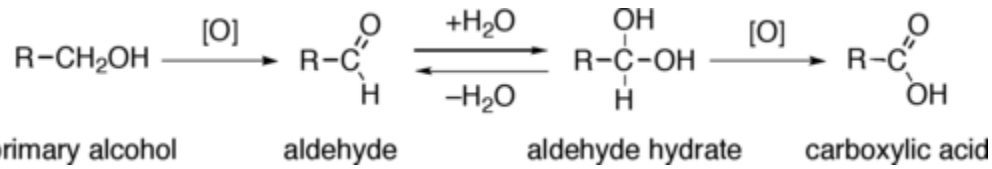








Oxidation of alcohol



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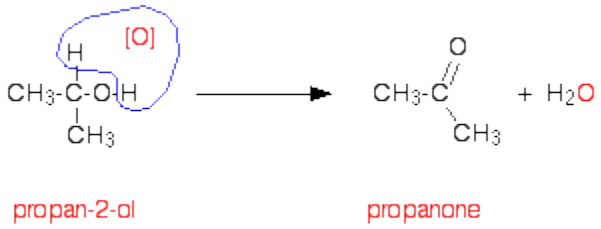
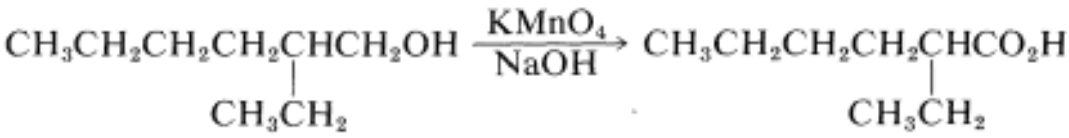
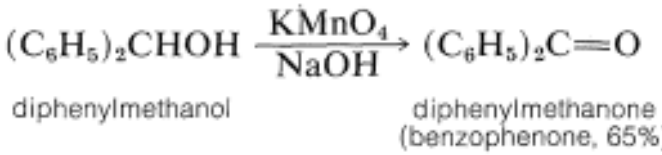


The usual reagent used for the oxidation of alcohol are hot acidic potassium dichromate or a hot alkaline solution of potassium permanganate.







Oxidation of Alcohols in Living systems

The oxidation of alcohols is an important reaction in living systems. Enzymes called dehydrogenase catalyze these reactions. One example is

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the oxidation of malate to oxaloacetate, which occurs in the citric acid cycle (Krebs cycle)

