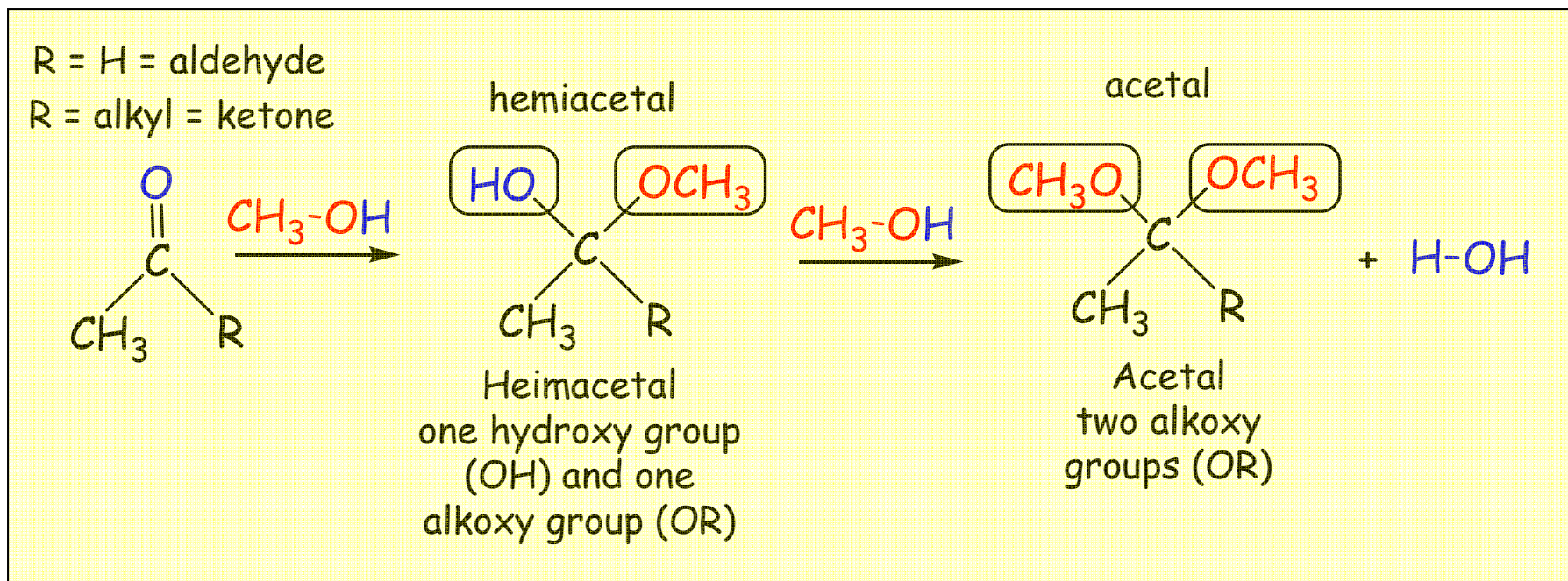


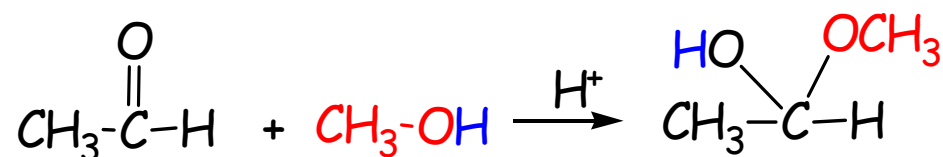
# Acetals and Hemiacetals



- Hemiacetals contain a hydroxy group and an alkoxy group attached to the same carbon.
- Acetals contain two alkoxy groups attached to the same carbon.

# Formation of Acetals and Hemiacetals

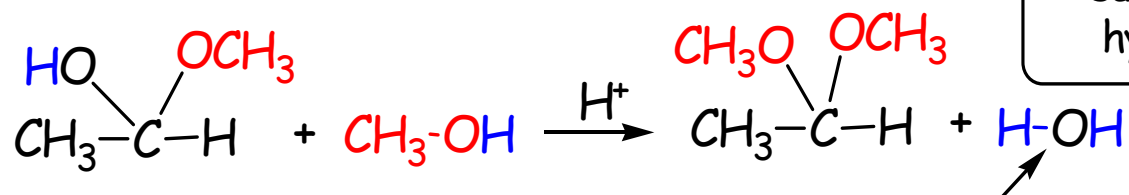
This is a **condensation process** since two equivalents of alcohol condense with one equivalent of aldehyde and eject one equivalent of water



1st step is an addition reaction: alcohol is added across a double bond (C=O) bond

2nd step is a substitution reaction: the alkoxy group substitutes the hydroxy group

Overall process is a condensation catalyzed by acid



The carbonyl oxygen atom is removed as water

# Hydrolysis of Acetals and Hemiacetals

Overall reaction is hydrolysis of acetal to the aldehyde (or ketone)



Hydrolysis is the reverse of acetal formation

## Formation and Hydrolysis of Acetals and Hemiacetals

The first step is formation of the hemiacetal. Hemiacetals are generally not stable and react further to form the acetal; it is often difficult to isolate the hemiacetal.

The major exception is the hemiacetal form of carbohydrates. Carbohydrate hemiacetals are usually called pyranose or furanose ring systems.