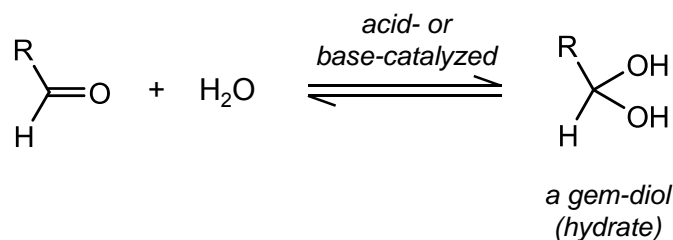
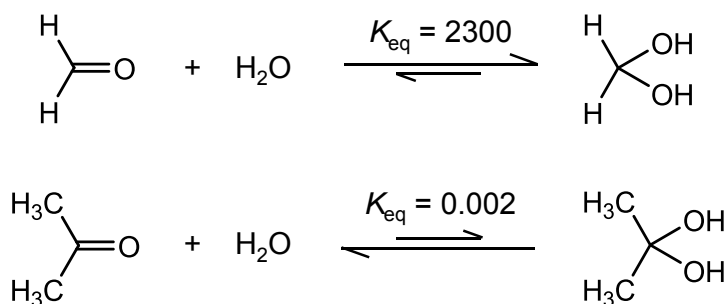


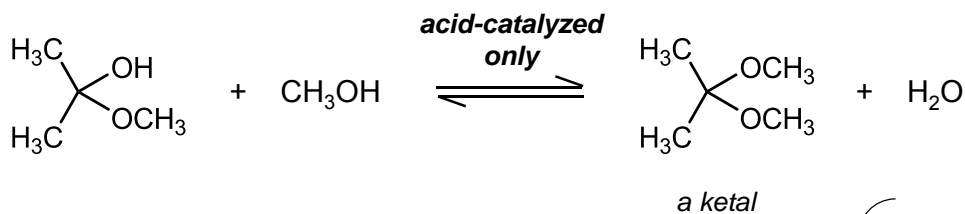
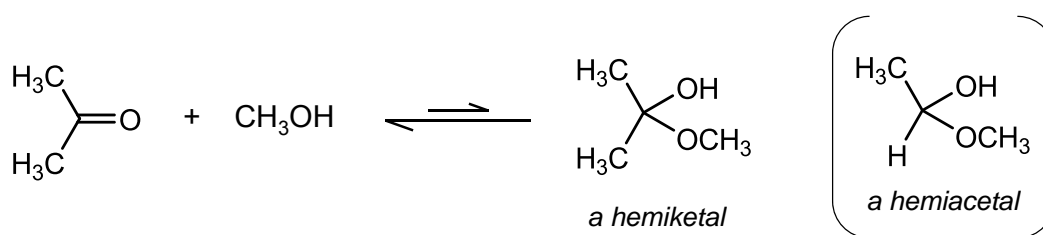
# Hydration of Aldehydes and Ketones



Steric hindrance, electron donating groups destabilize hydrate.

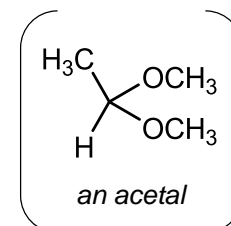


# Acetals and Ketals

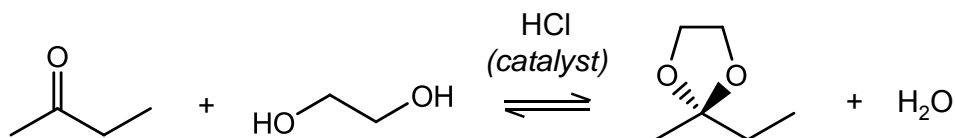


Under conditions where H<sub>2</sub>O can be selectively removed, equilibrium driven to ketal.

(But it's still entropically uphill. 3 molecules used to make ketal + H<sub>2</sub>O.)

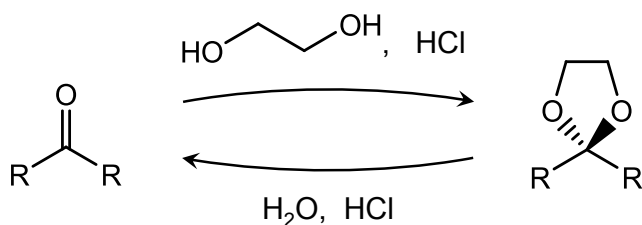


## Cyclic Acetals/Ketals



Entropically neutral.  
(2 molecules used to make 2 molecules.)

So, ketones and aldehydes can be reversibly converted to ketals and acetals:

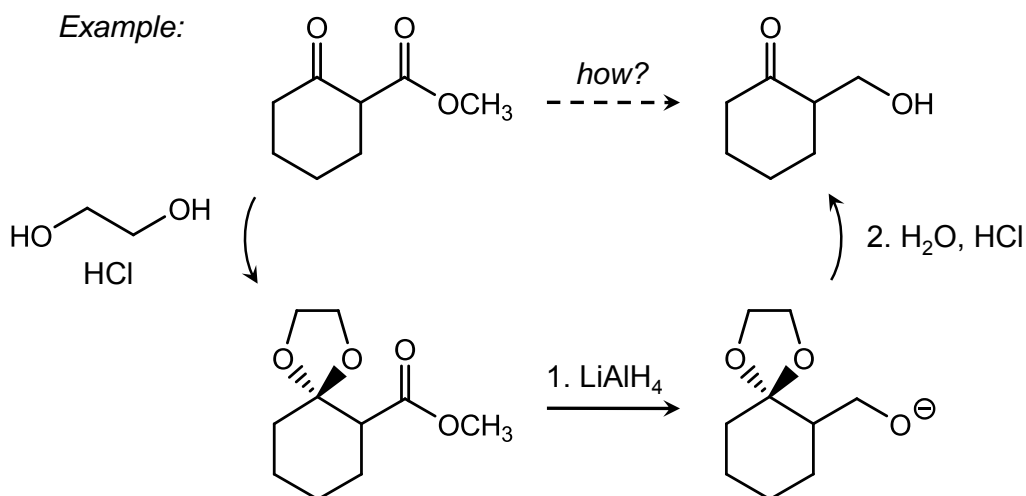


relative reactivities:

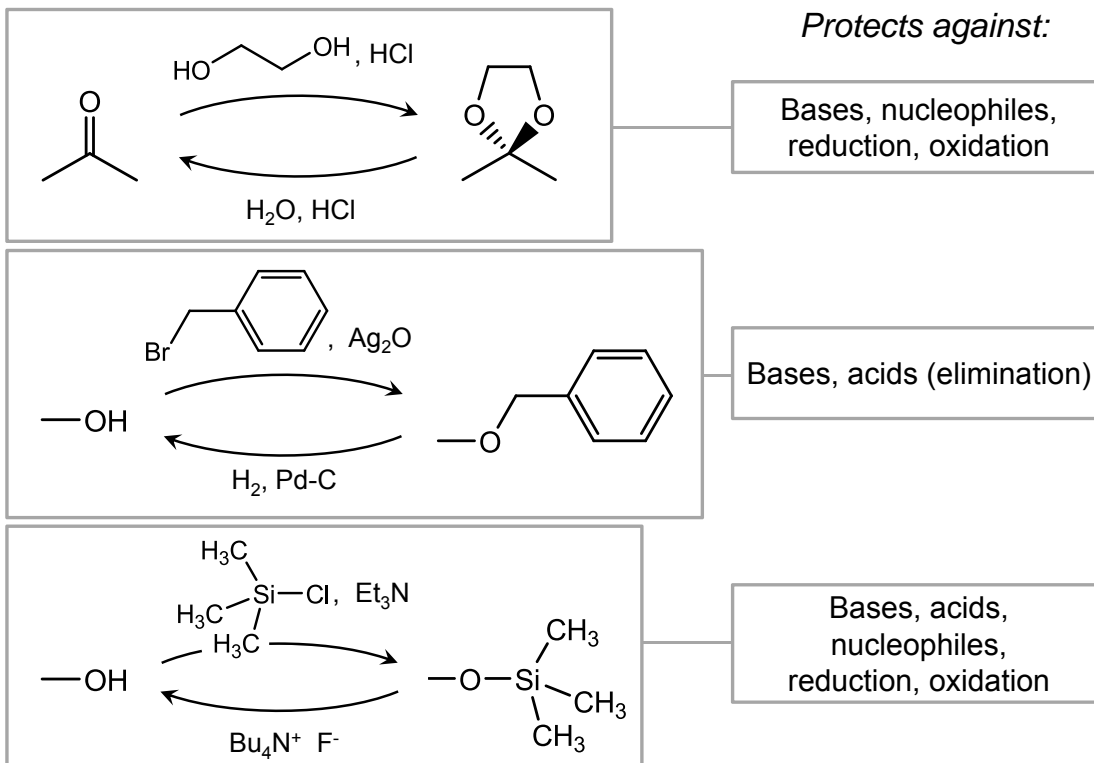
aldehyde  
>  
ketone  
>  
ester

## Cyclic Acetals/Ketals as Protecting Groups

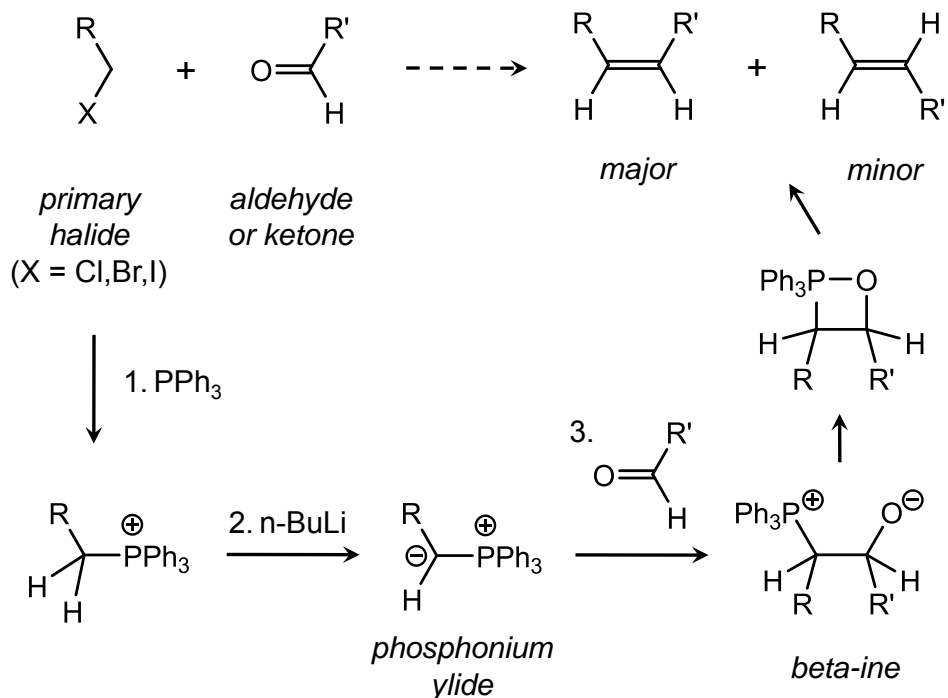
**Protecting Group:** A modification that protects a functional group from a synthetic operation it would not otherwise survive.



## Some Common Protecting Groups



## The Wittig Reaction



# The Wittig Reaction

The less-substituted carbon of the alkene must come from the alkyl halide.

*how would one synthesize:*

