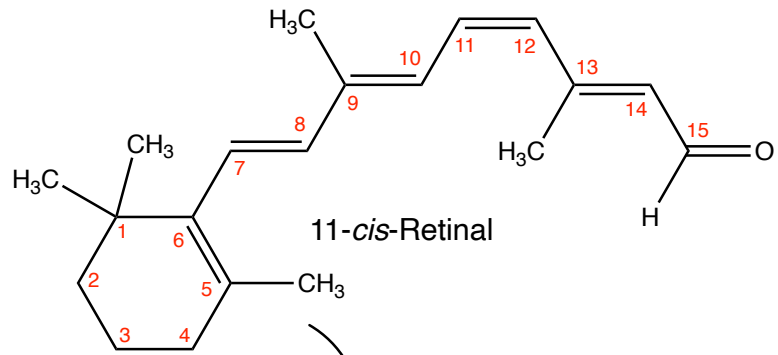


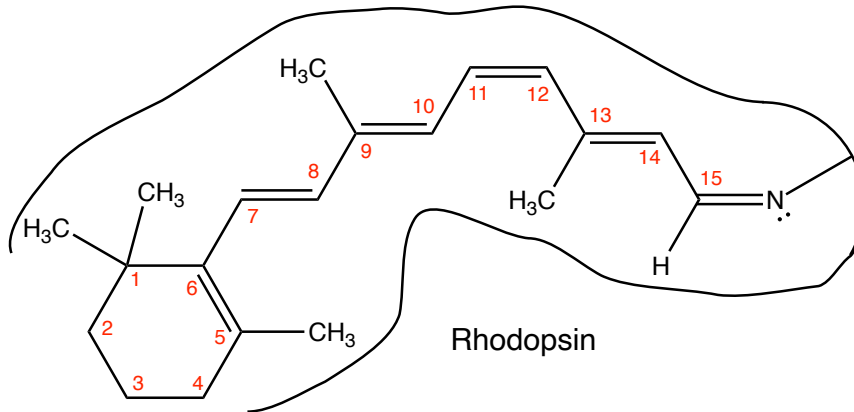


"Catching the O Chem Wave"

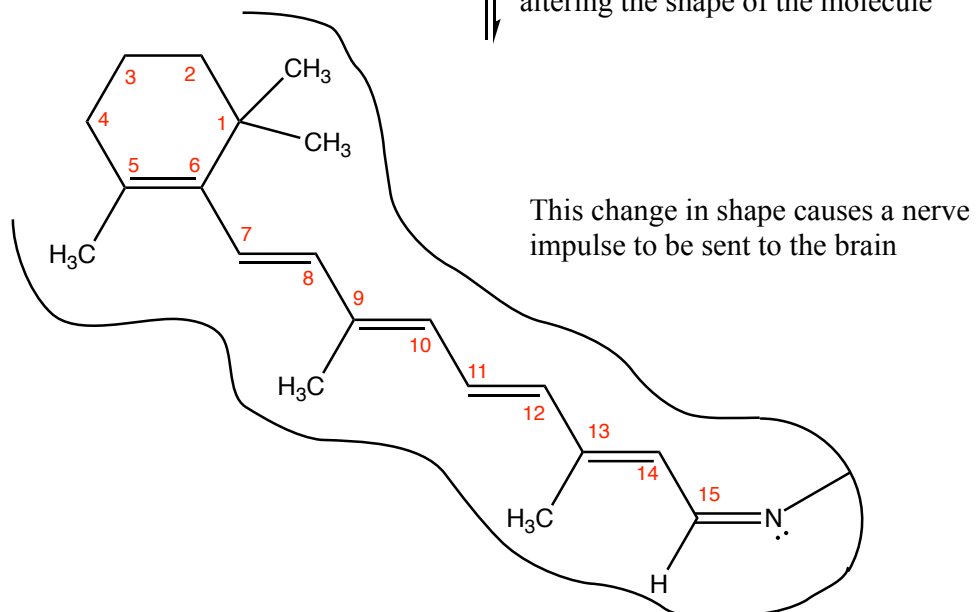
# How vision works



$\text{H}_2\ddot{\text{N}}\text{---}$   $\downarrow$  Binds to an  $\text{-NH}_2$  group from the amino acid lysine in the protein opsin

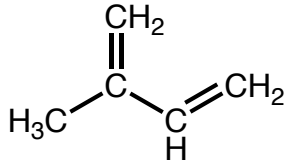


Molecule resets  $\updownarrow$  A photon of visible light is absorbed by the retinal, isomerizing the *cis* bond to *trans*, dramatically altering the shape of the molecule

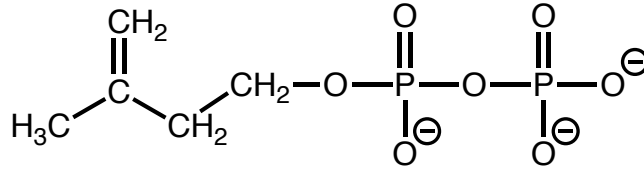


Plants

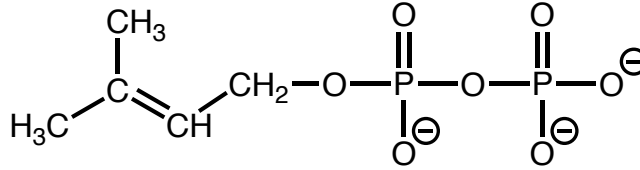
# Terpenes



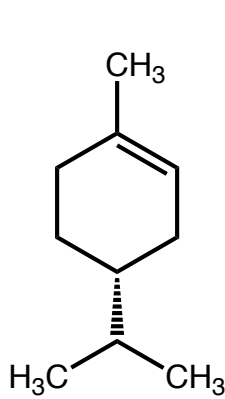
**Isoprene**



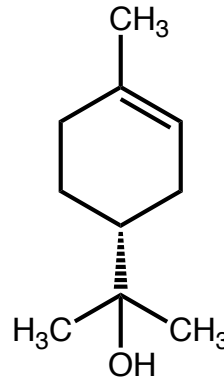
**Isopentanyl diphosphate**



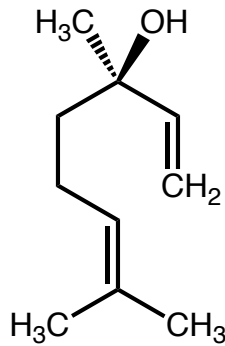
**Dimethylallyl diphosphate**



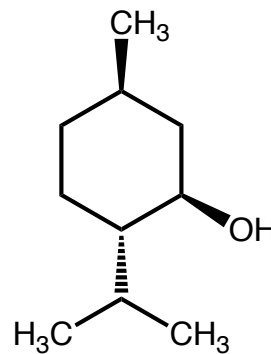
**Limonene**  
(citrus flavor)



**α-Terpineol**  
(from lilacs, used in perfume)

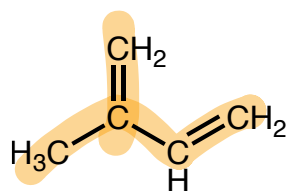


**(R)-(-)-Linalool**  
(from lavender, used in perfume)

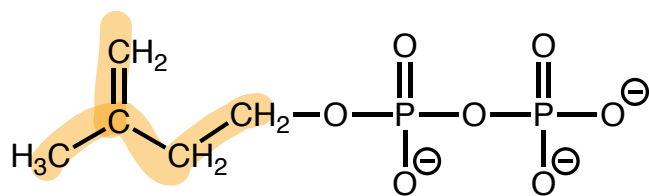


**(-)-Menthol**  
(common flavoring from peppermint)

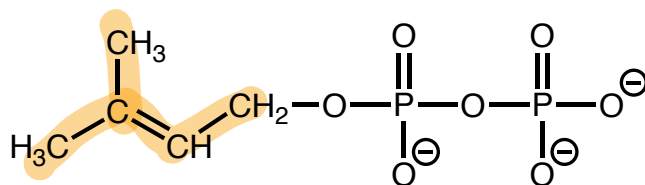
# Terpenes



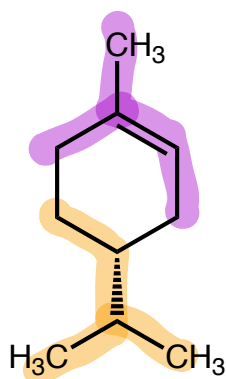
**Isoprene**



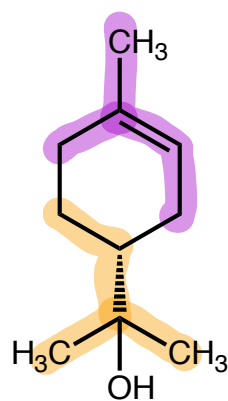
**Isopentanyl diphosphate**



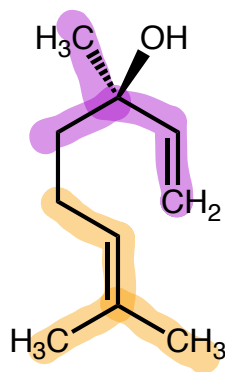
**Dimethylallyl diphosphate**



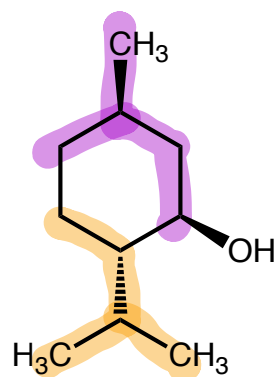
**Limonene**  
(citrus flavor)



**$\alpha$ -Terpineol**  
(from lilacs, used in perfume)



**(*R*)-(-)-Linalool**  
(from lavender, used in perfume)

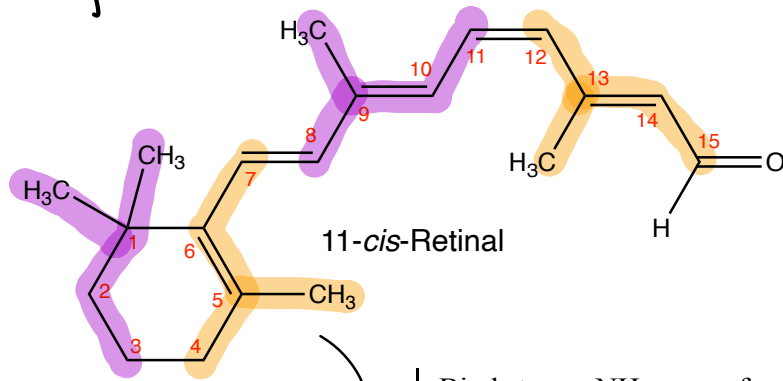


**(-)-Menthol**  
(common flavoring from peppermint)

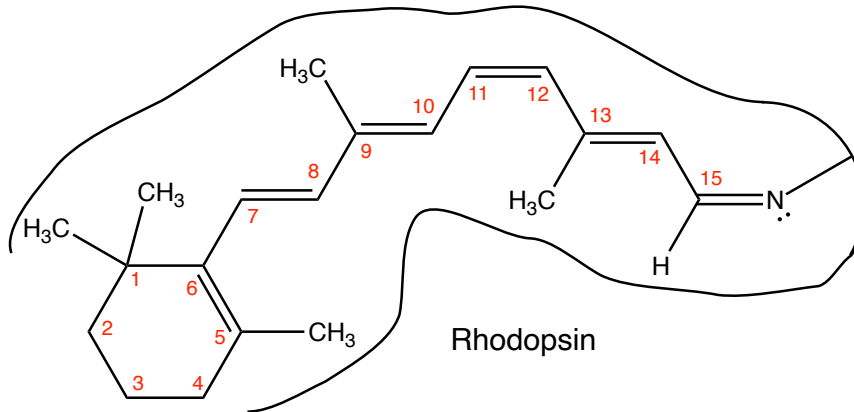
# How vision works

This is a terpene → From plants!

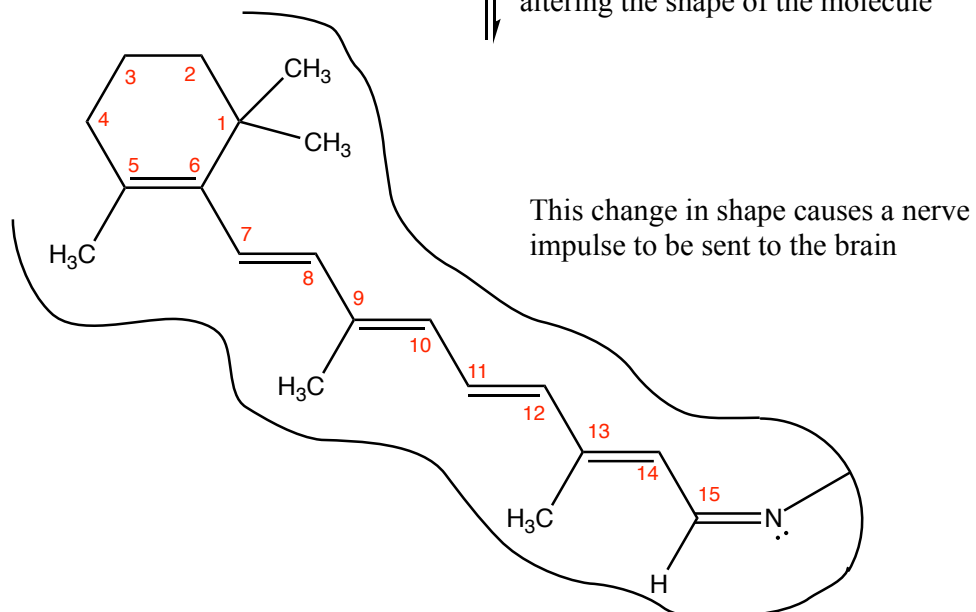
what is it doing in a mammal?

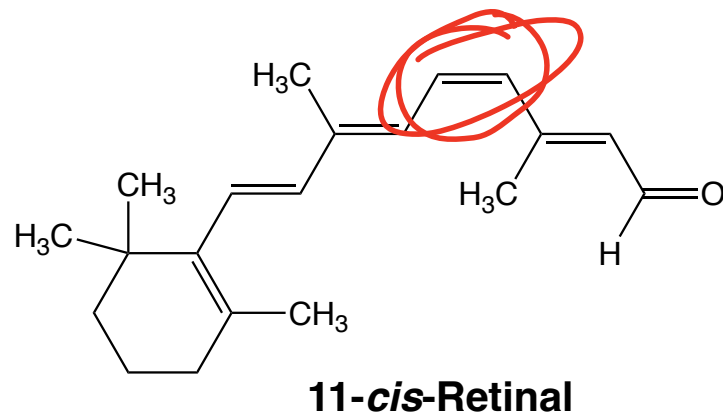
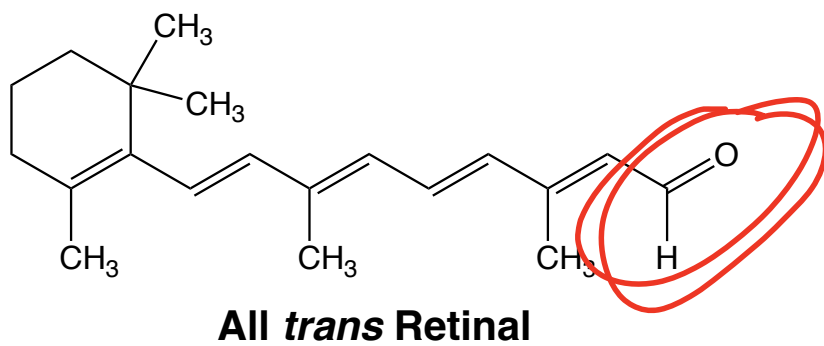
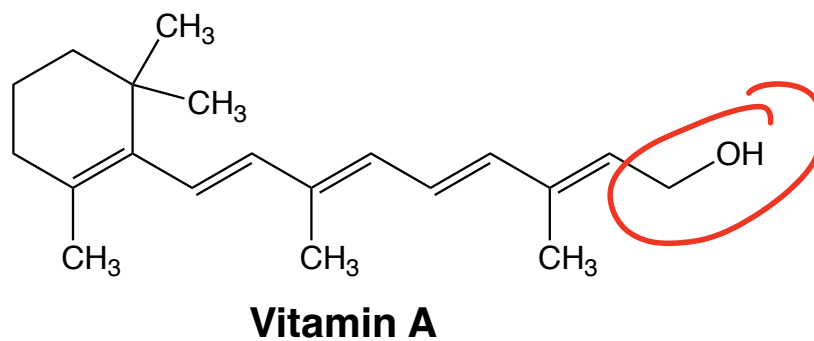
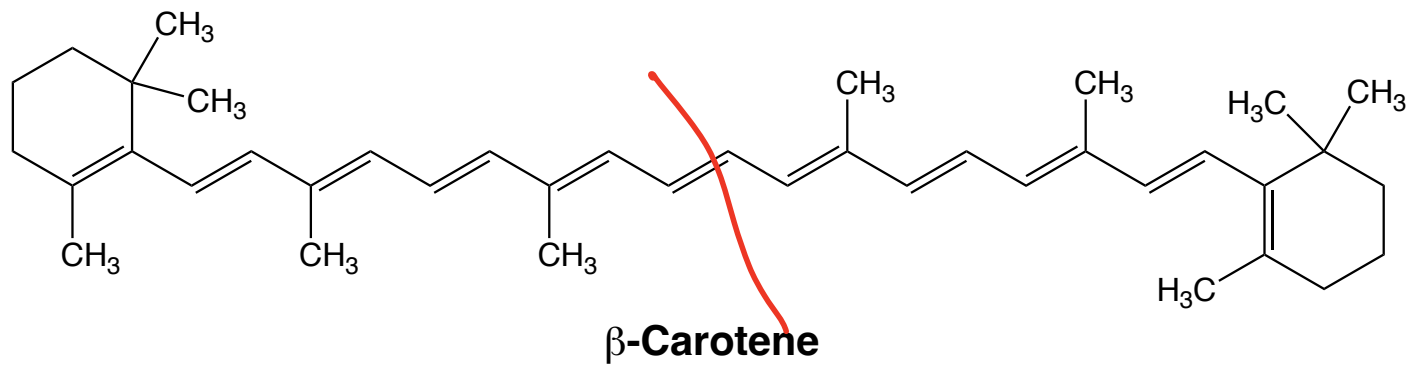


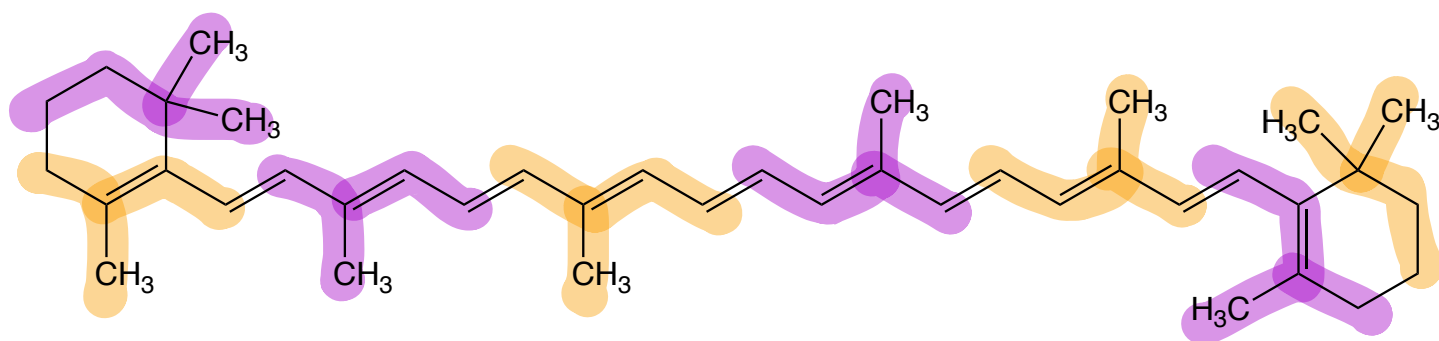
$\text{H}_2\ddot{\text{N}}$  )  
↓  
Binds to an -NH<sub>2</sub> group from the amino acid lysine in the protein opsin



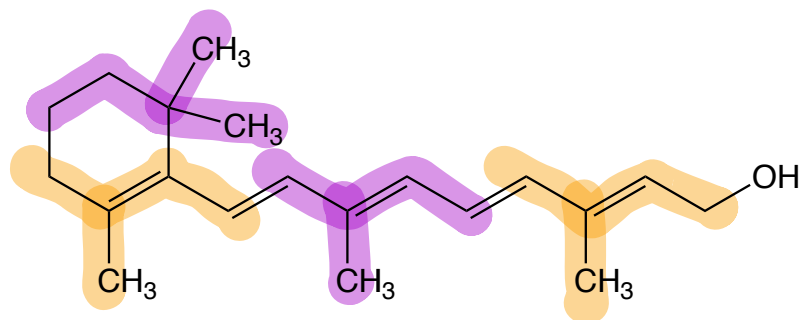
Molecule resets  
↕  
A photon of visible light is absorbed by the retinal, isomerizing the *cis* bond to *trans*, dramatically altering the shape of the molecule



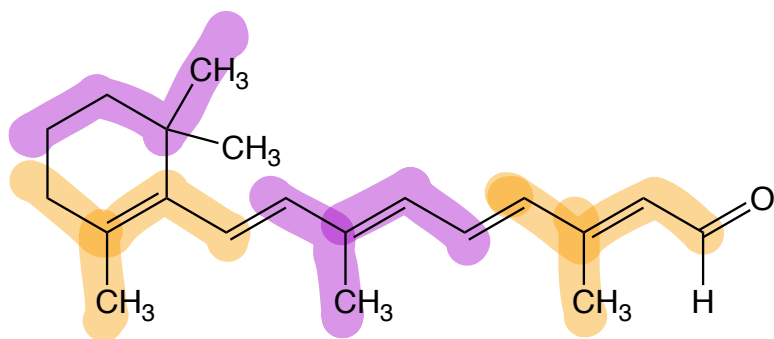




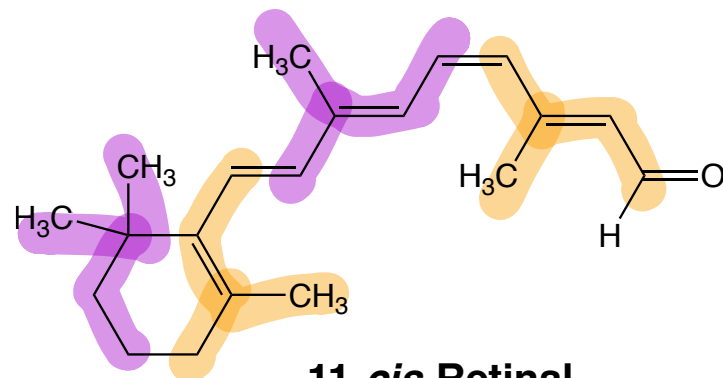
**$\beta$ -Carotene**



**Vitamin A**



**All *trans* Retinal**



**11-*cis*-Retinal**

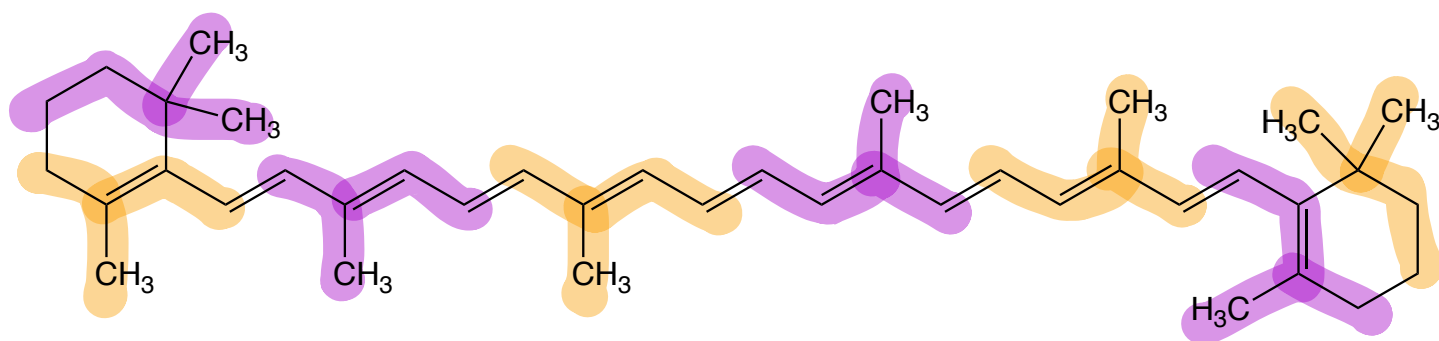




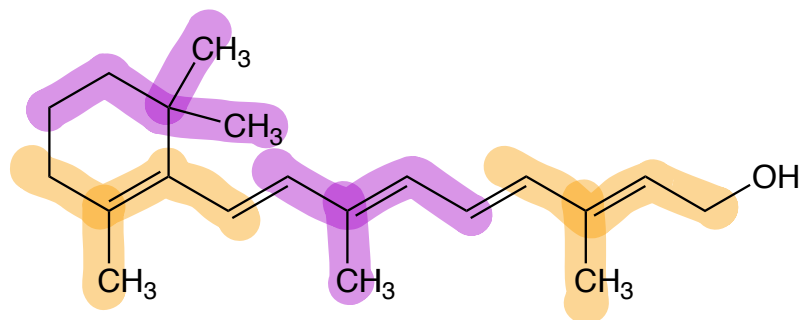


"Catching the O Chem Wave"

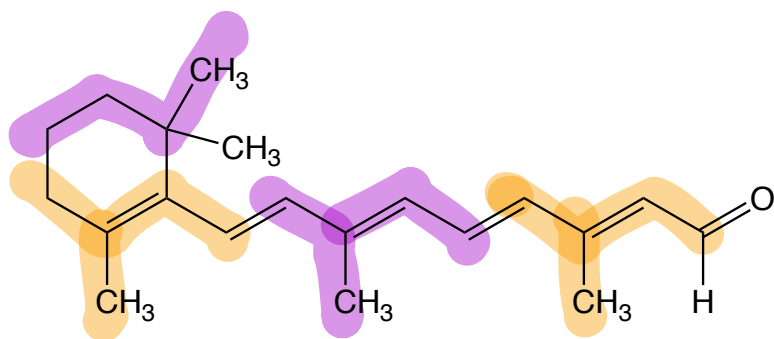




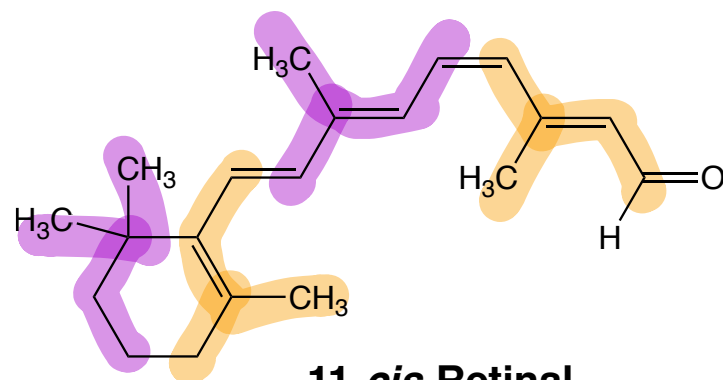
**$\beta$ -Carotene**



**Vitamin A**



**All *trans* Retinal**



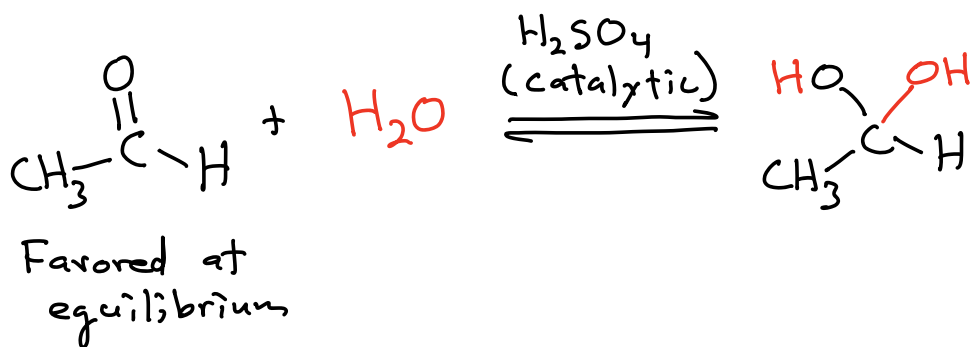
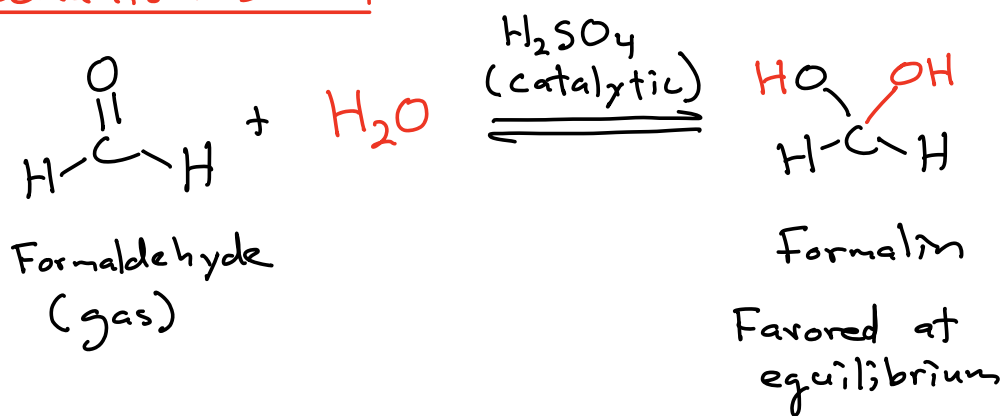
**11-*cis*-Retinal**



From last Thursday...

# Geminal Diols: $\text{H}_2\text{O}$ instead of $\text{ROH}$

Same mechanism as hemiacetal formation:  
Mechanism D



The geminal diol is in equilibrium with aldehydes and ketones, but it is only favored for the case of formaldehyde/formalin

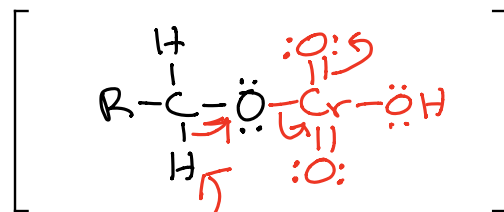
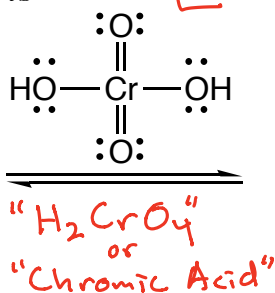
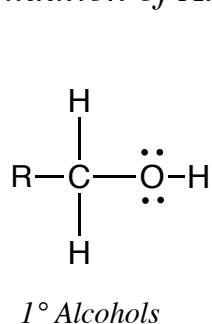


From last semester...

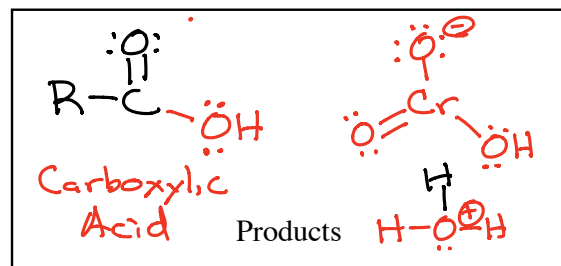
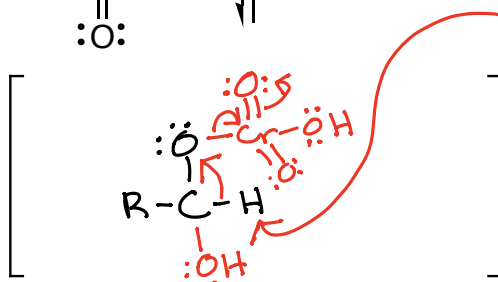
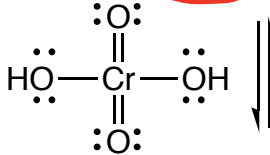
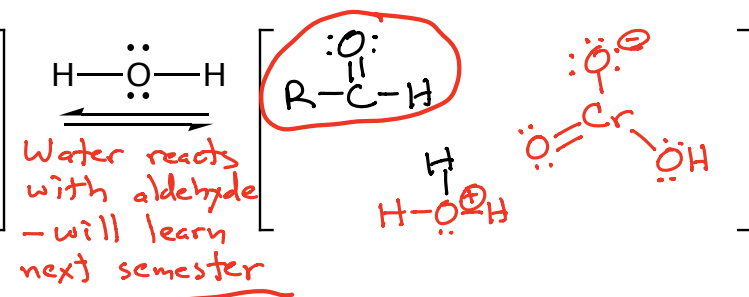
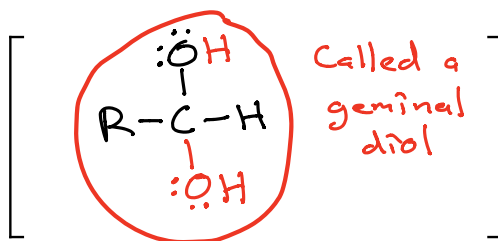
Called "Jones Reagent"  $(\text{CrO}_3 + \text{H}_2\text{O})$  or  $\text{K}_2\text{CrO}_7 + \text{H}_2\text{SO}_4$

### Chromic Acid Oxidation of Alcohols

Not responsible for first step



Not responsible for this step



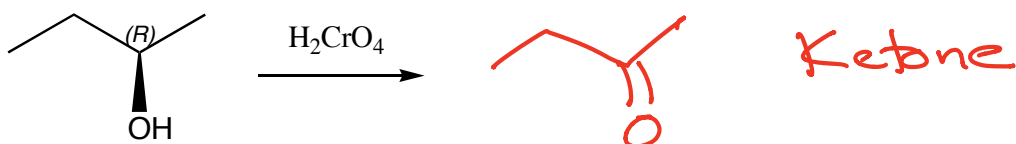
Summary:

- 1° alcohols  $\Rightarrow$  Carboxylic Acid  $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$
- 2° alcohols  $\Rightarrow$  Ketone  $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{R}$
- 3° alcohols  $\Rightarrow$  NO REACTION

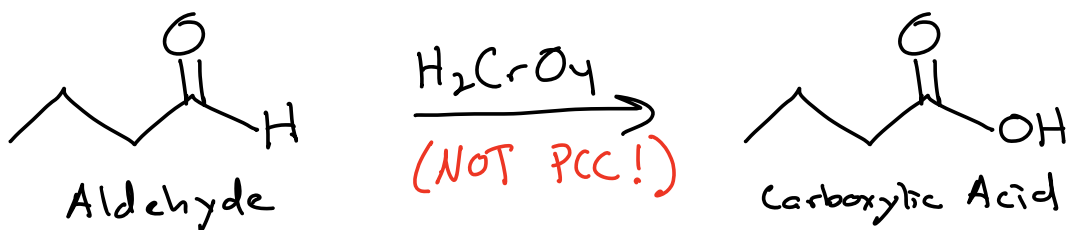
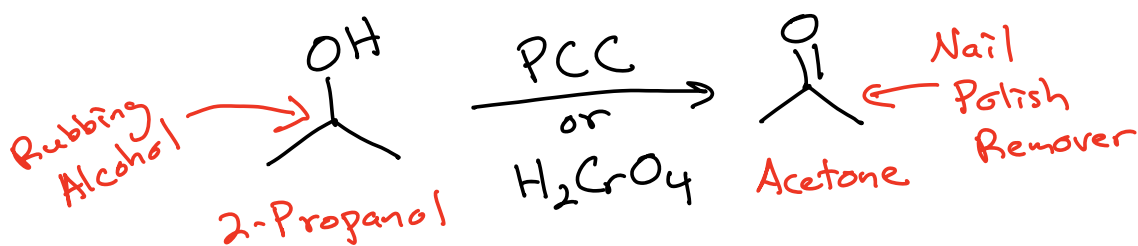
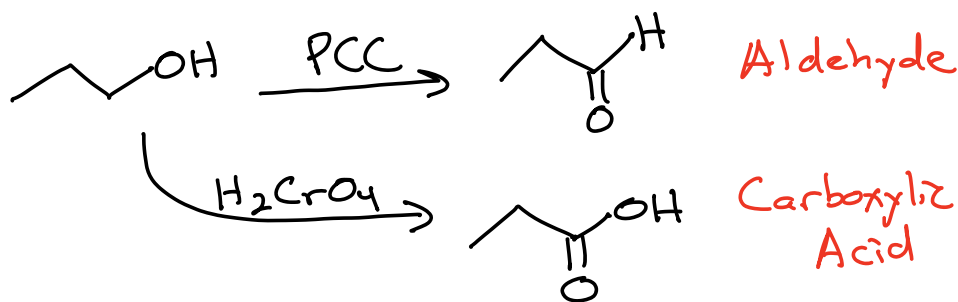
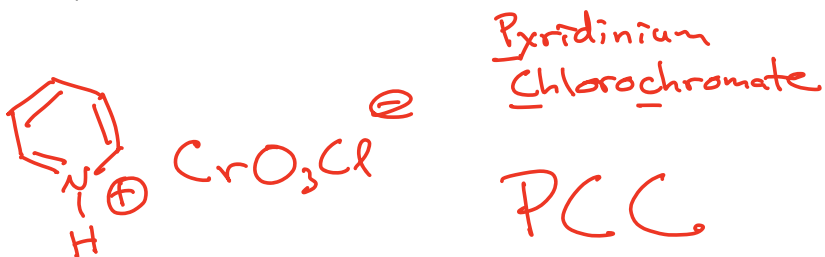
Regiochemistry: N/A

Stereochemistry: N/A

Example:



A chromic acid-like reagent WITHOUT WATER will stop at the aldehyde when using a primary alcohol as starting material



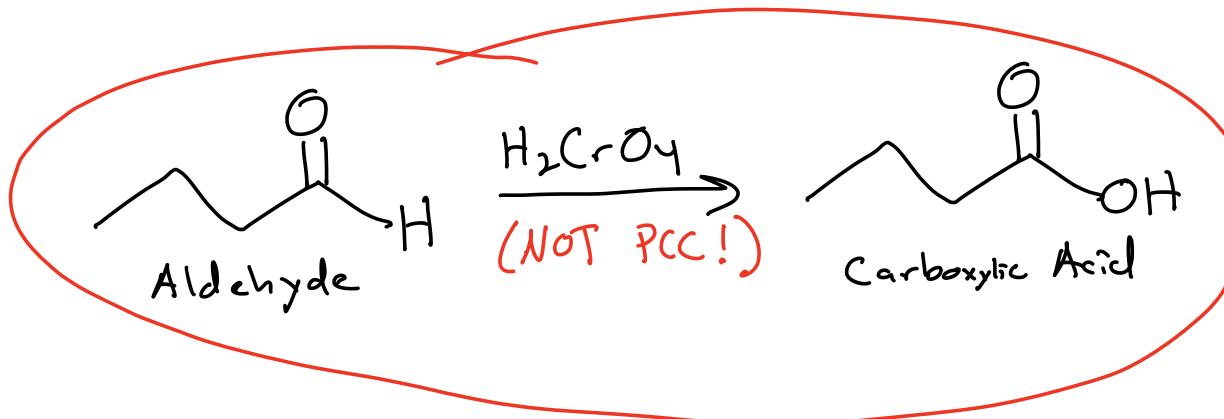
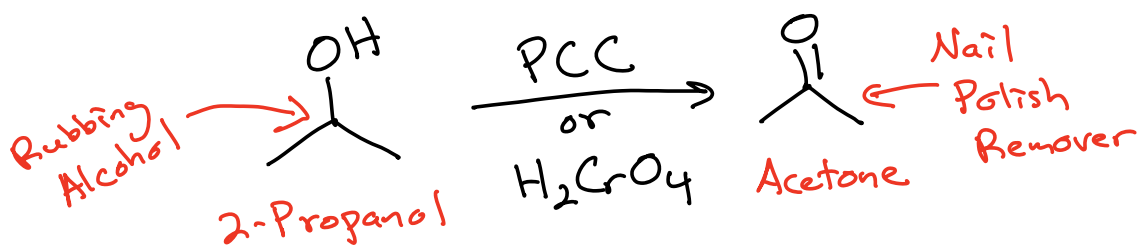
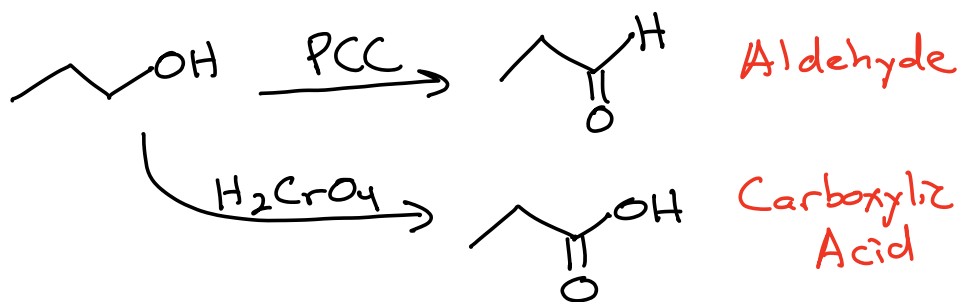
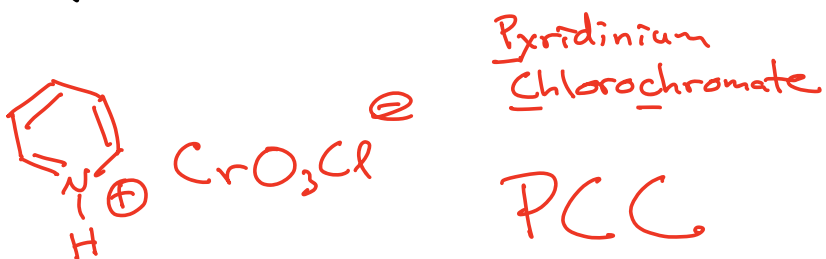




"Catching the O Chem Wave"



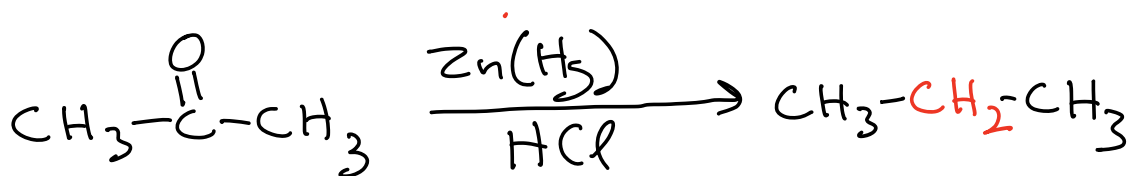
A chromic acid-like reagent WITHOUT WATER will stop at the aldehyde when using a primary alcohol as starting material



Conversion of ketone and aldehyde C=O groups to -CH<sub>2</sub>-

In acid

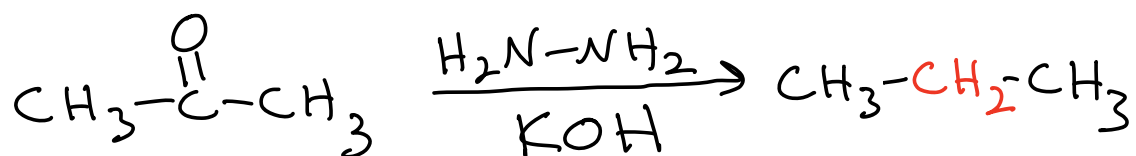
Clemmenson Reduction → you are not responsible for the mechanism  
⇓  
Relatively harsh conditions



↳ Strong acid - cannot be used with acid-sensitive groups like 3° alcohols (they dehydrate to give alkenes)

In base

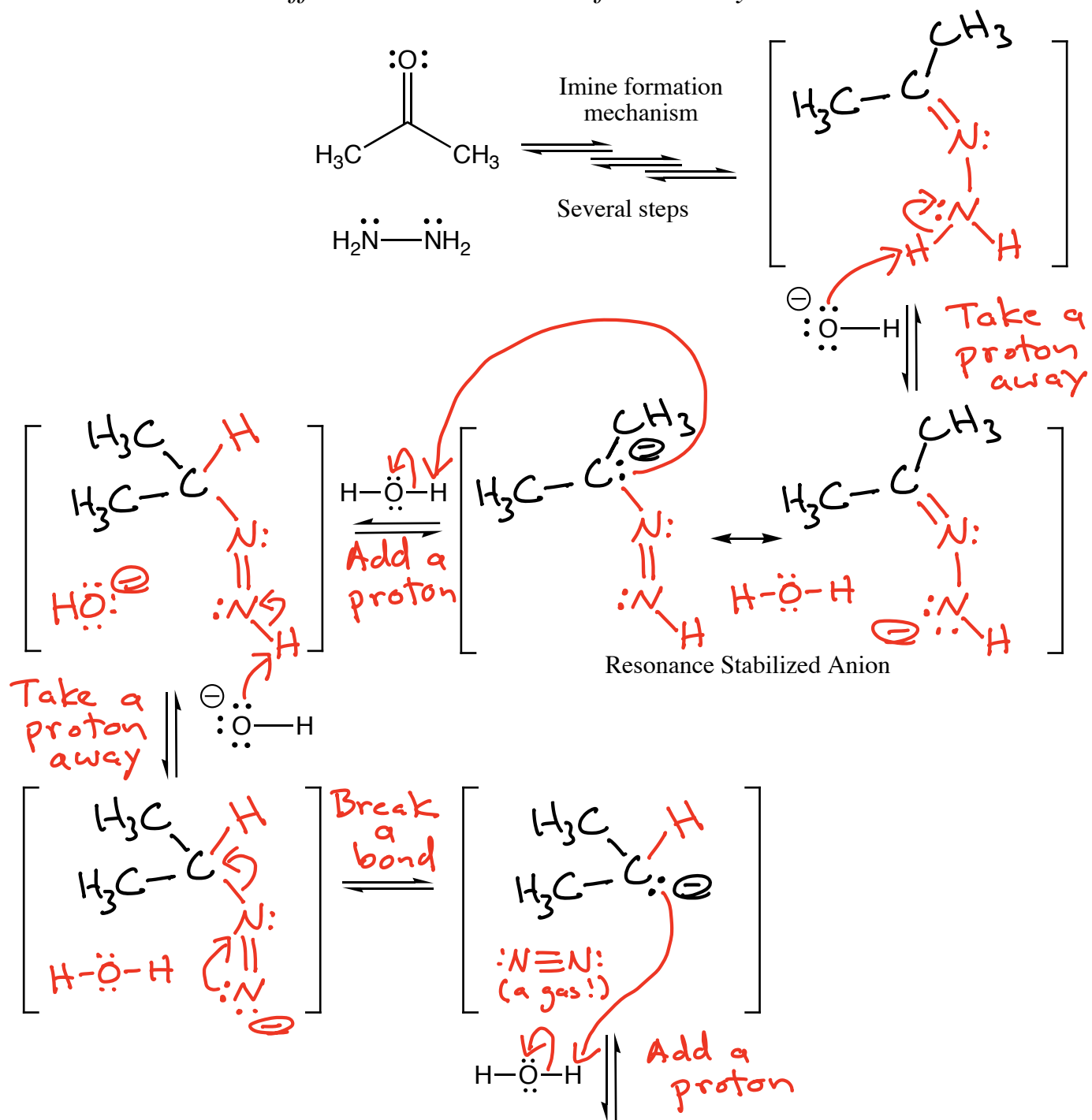
Wolff-Kishner Reduction



Used when there are acid-sensitive groups on a molecule

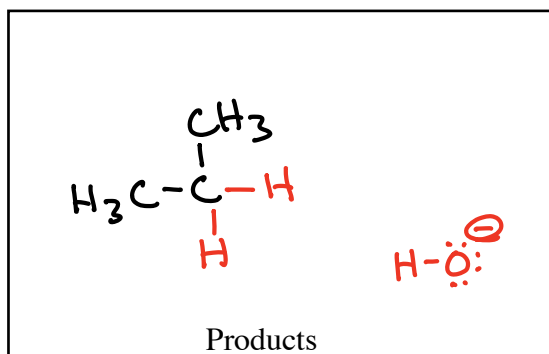
VERY COOL MECHANISM

## Wolff-Kishner Reduction of an Aldehyde or Ketone



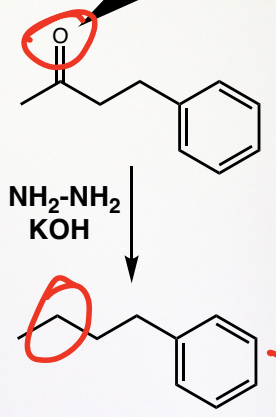
Key Recognition Element (KRE):

-CH<sub>2</sub>- group where there was a carbonyl of a ketone or aldehyde





Eek! Don't bite my head off!



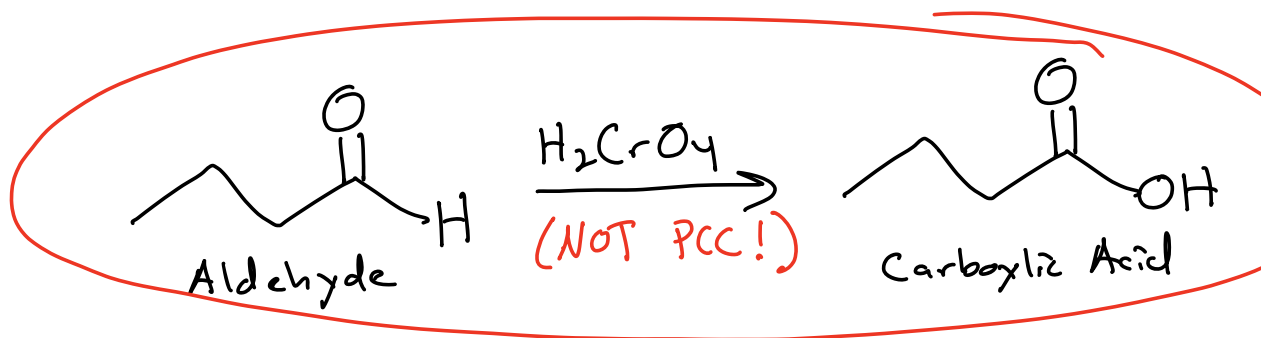
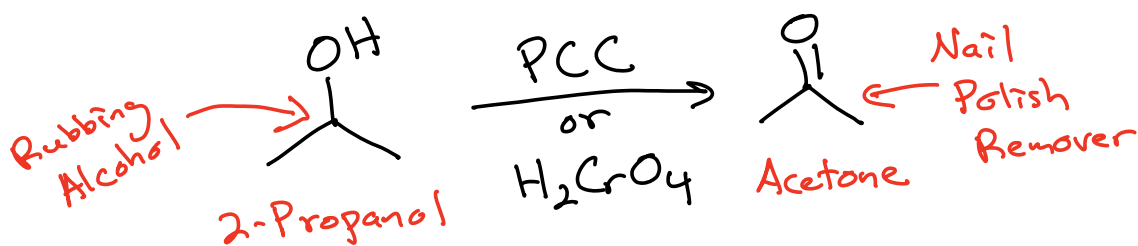
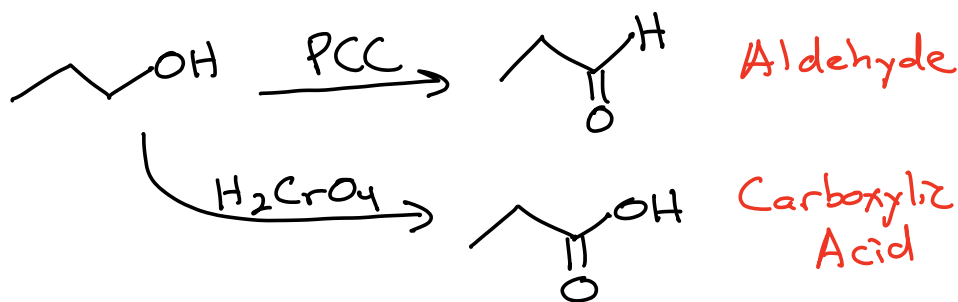
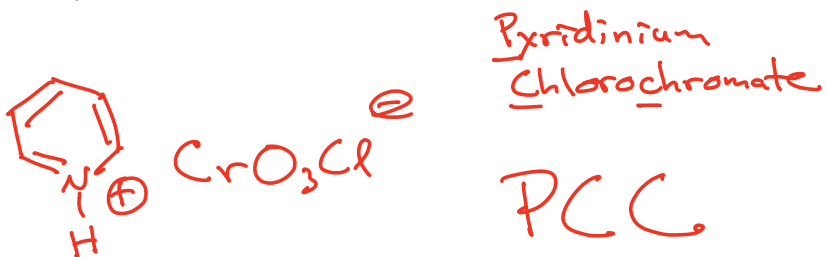


"Catching the O Chem Wave"



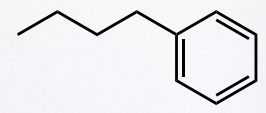
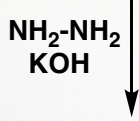
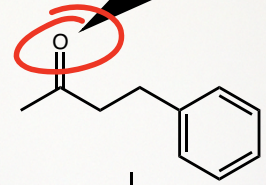


A chromic acid-like reagent WITHOUT WATER will stop at the aldehyde when using a primary alcohol as starting material





Eek! Don't bite my head off!



Putting these **oxidation** and **reduction** reactions to work in synthesis

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