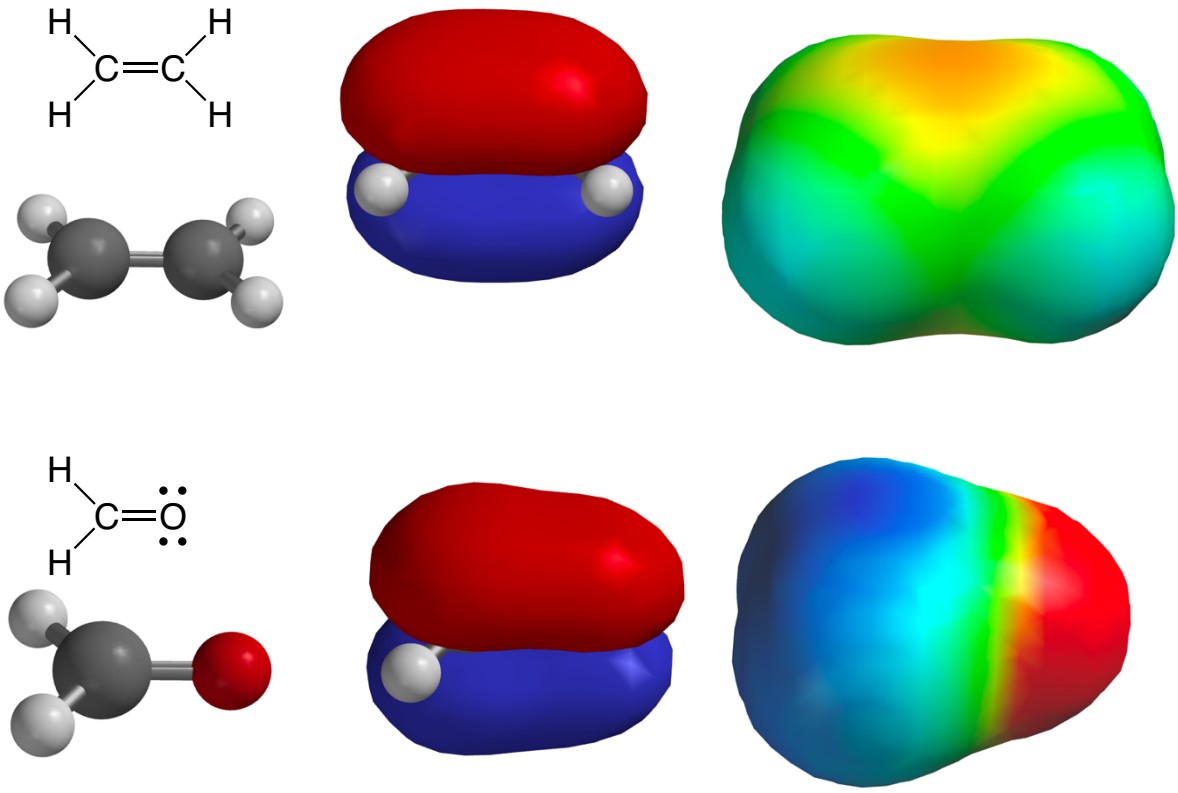
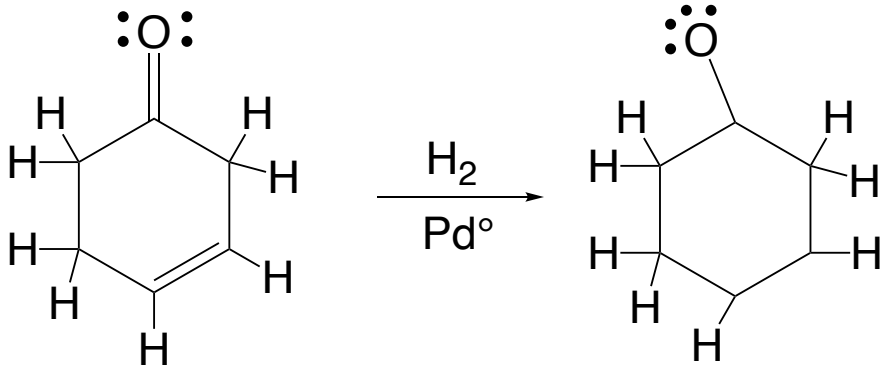
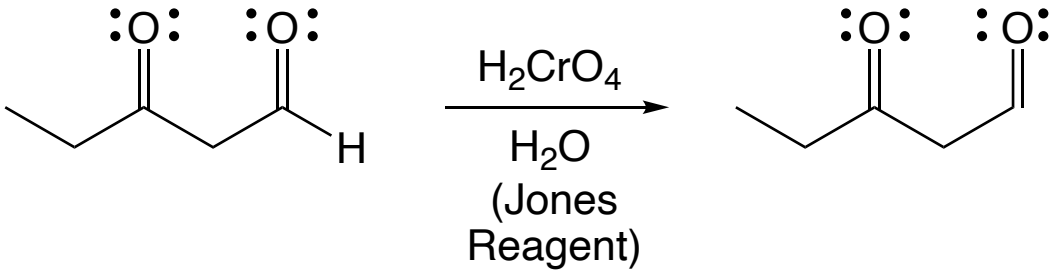
Detour: Hydrogenation and Oxidation of Aldehydes and Ketones



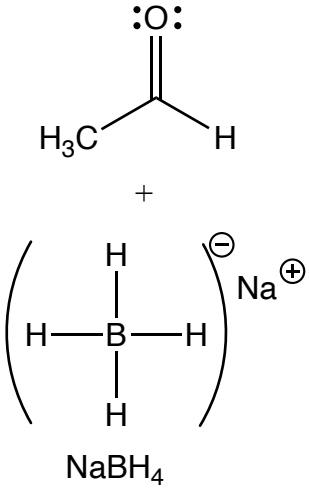
The pi bonds of carbonyls react the same as pi bonds of alkenes with H_2 in the presence of Pt°, Pd° or Ni°

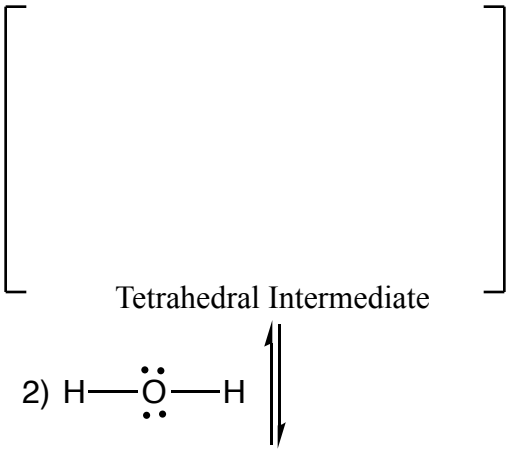


Aldehydes are oxidized to carboxylic acids using the Jones Reagent (H_2CrO_4 in H_2O). Ketones do not react.



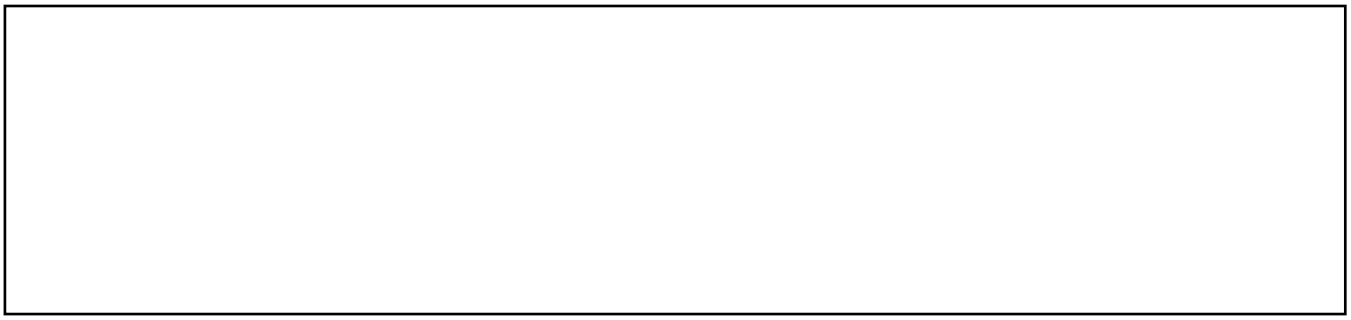
Sodium Borohydride Reacting with an Aldehyde or Ketone

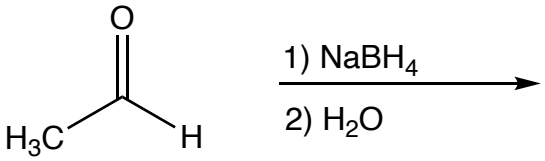


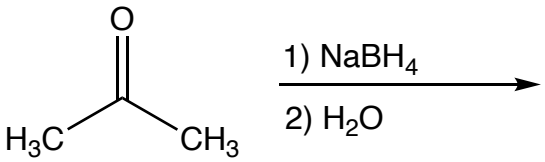


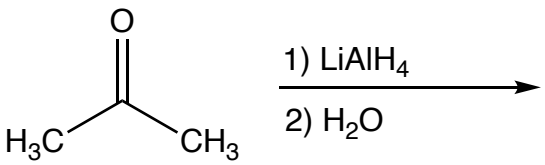
Key Recognition Element (KRE):

Products

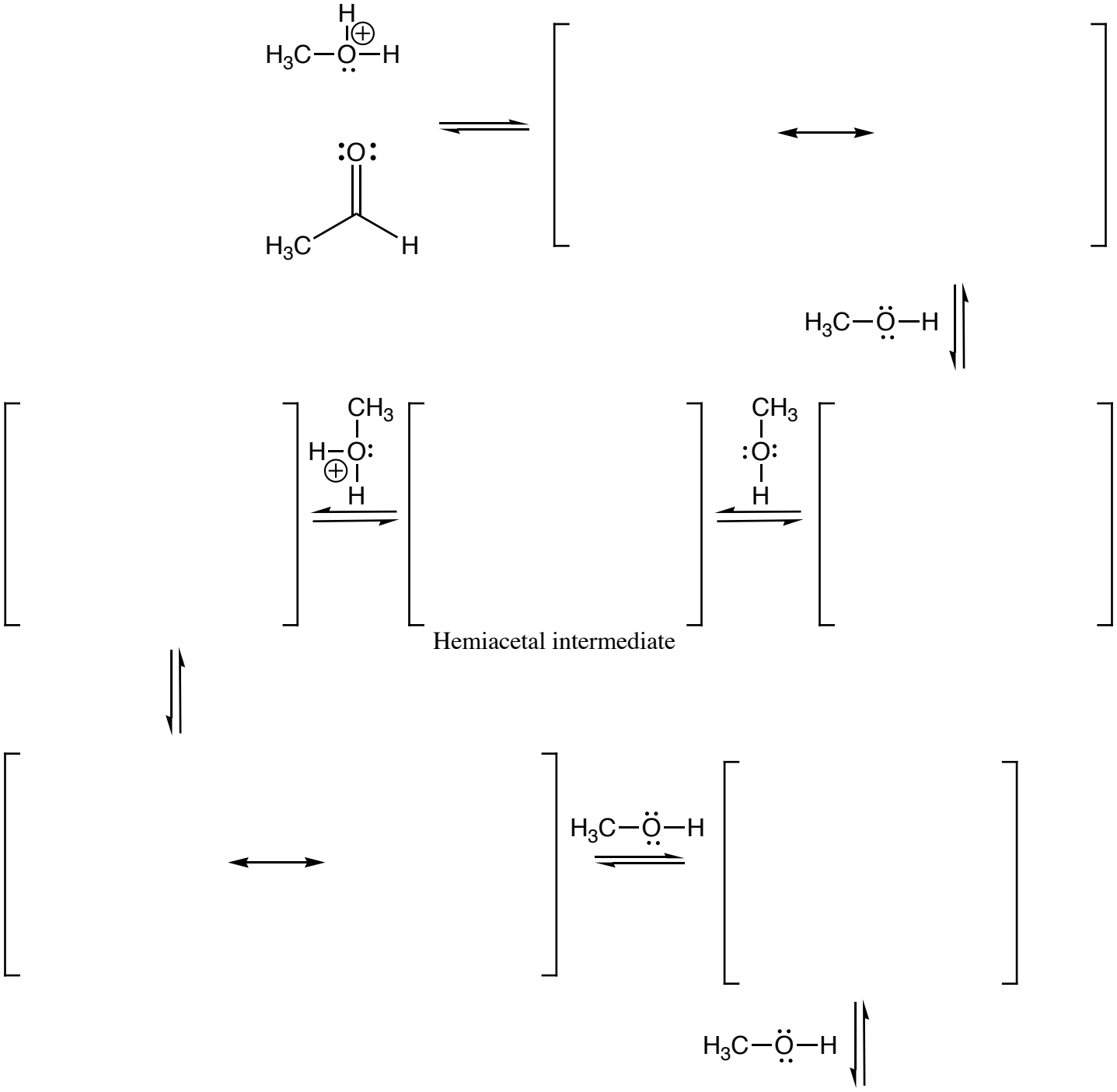








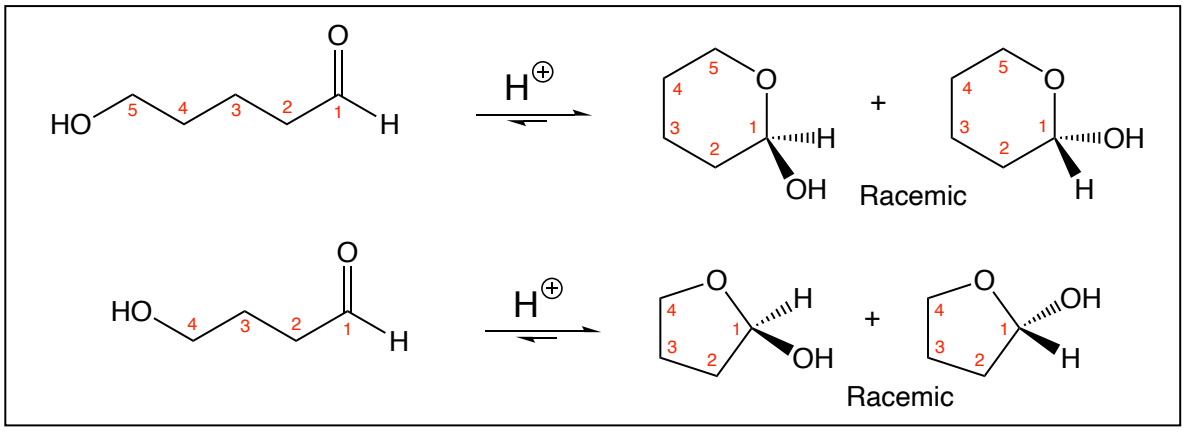
Acid Catalyzed Hemiacetal and Acetal Formation From an Aldehyde or Ketone

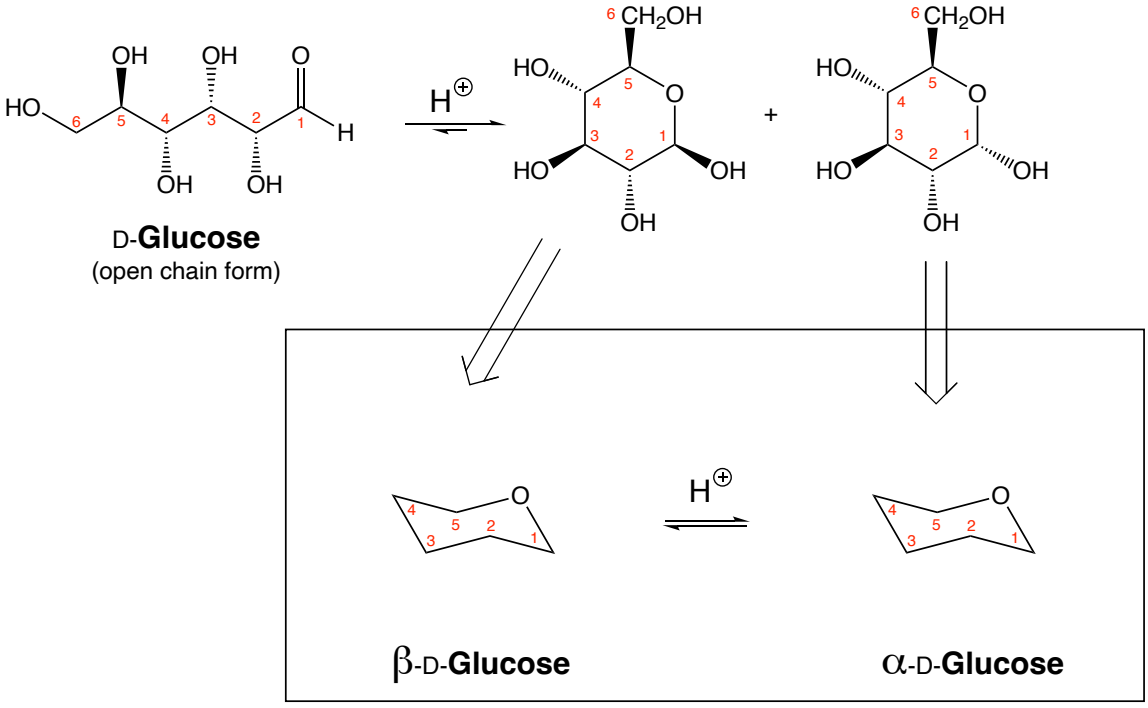


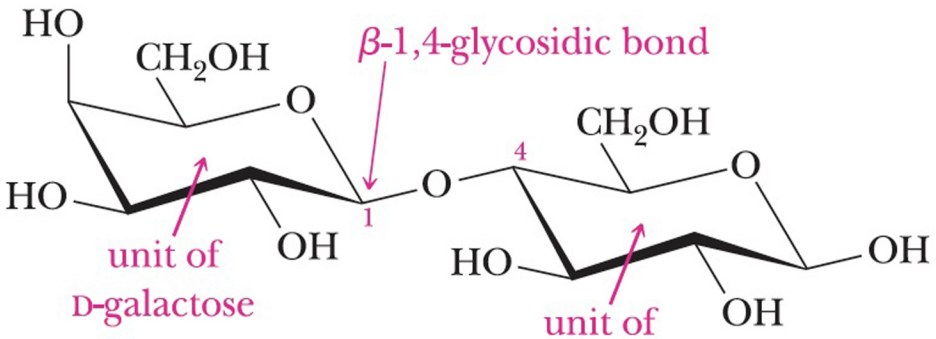
Key Recognition Element (KRE):

Products

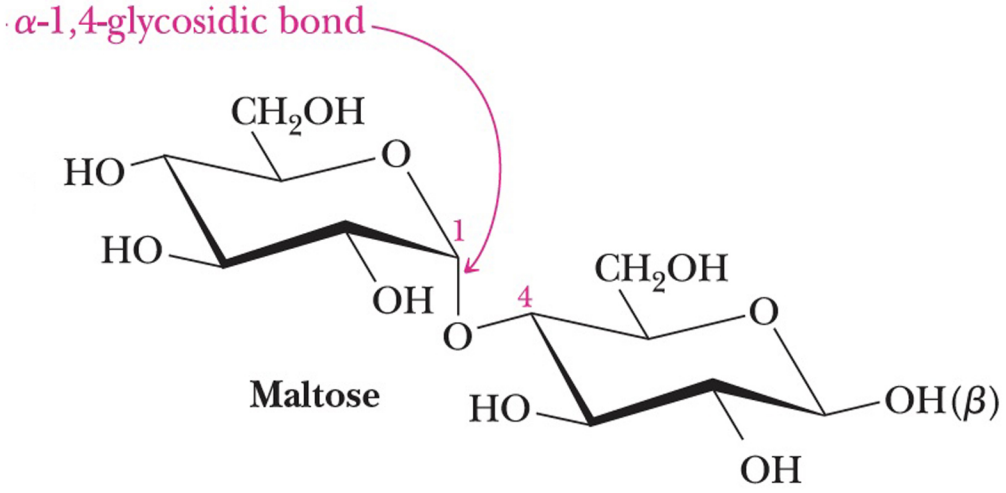
Cyclic Hemiacetals and Carbohydrates



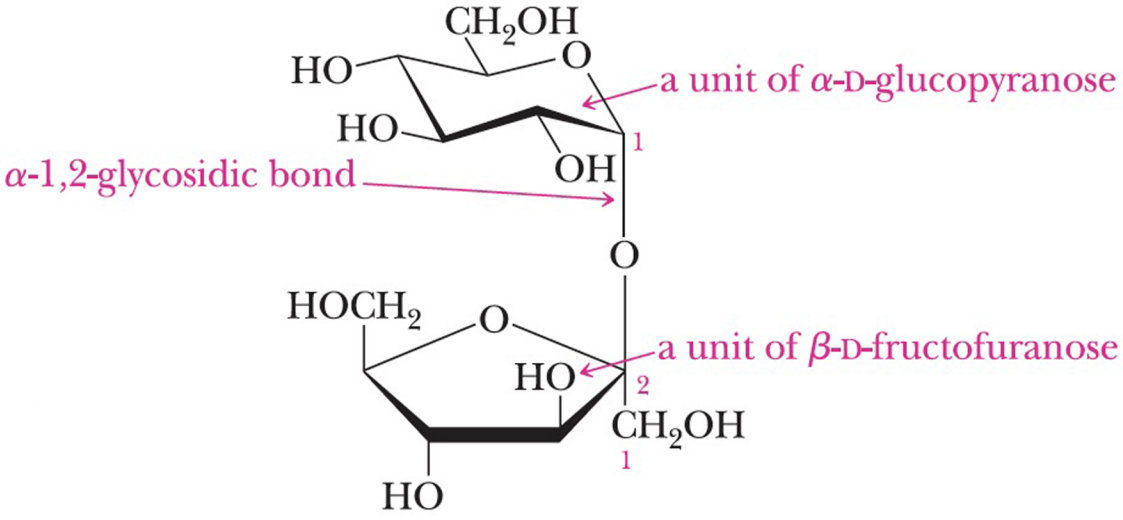




Lactose

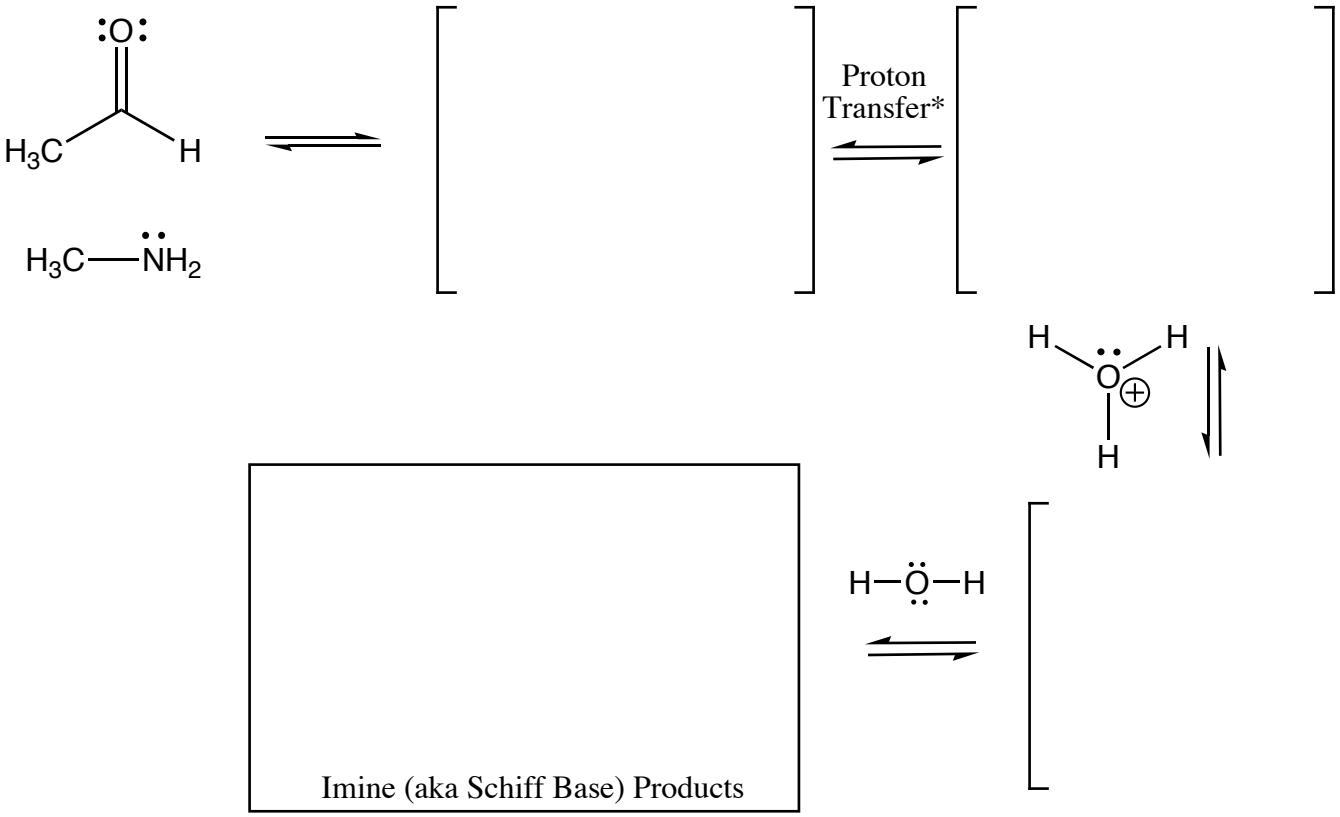


Maltose



Sucrose

Formation if an Imine (Schiff Base) From an Aldehyde or Ketone Reacting with an Amine



Key Recognition Element (KRE):

Note: this last step might actually occur as two steps in some cases.

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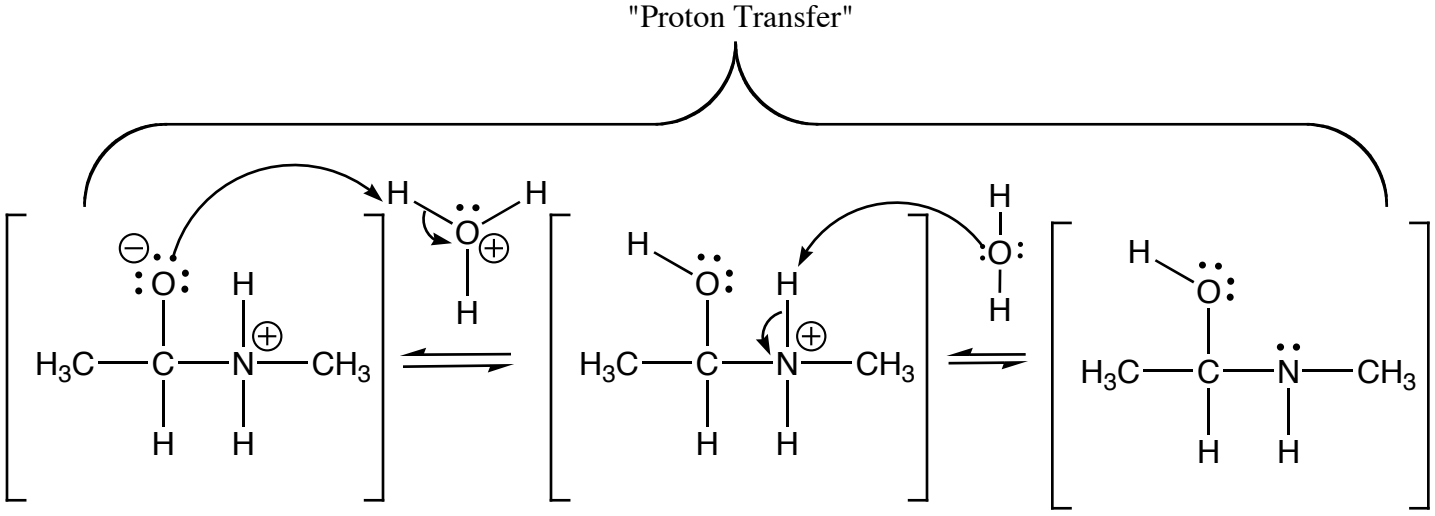
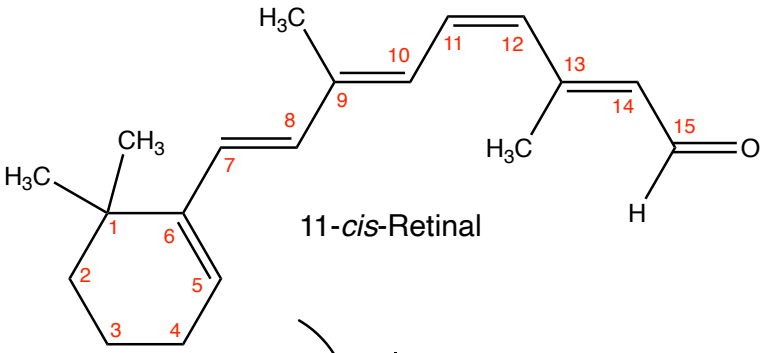
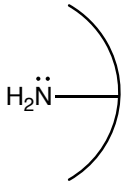
* "Proton Transfer" refers to a situation in which a proton moves from one part of a molecule to another on the SAME MOLECULE. We do not draw arrows for proton transfer steps because that would be deceptive. In some cases, the same proton may move from one part of the molecule to the other directly, but in other cases, solvent molecules may be involved as indicated in the following scheme. To make things even more interesting, the following two steps might even be reversed in some cases. Becuase of all the ambiguity, we just write "Proton Transfer" and do not bother with arrows.

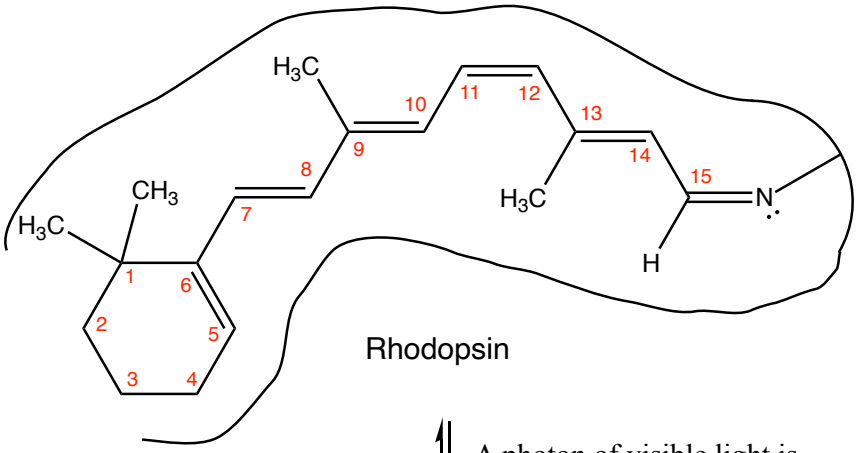


How vision works



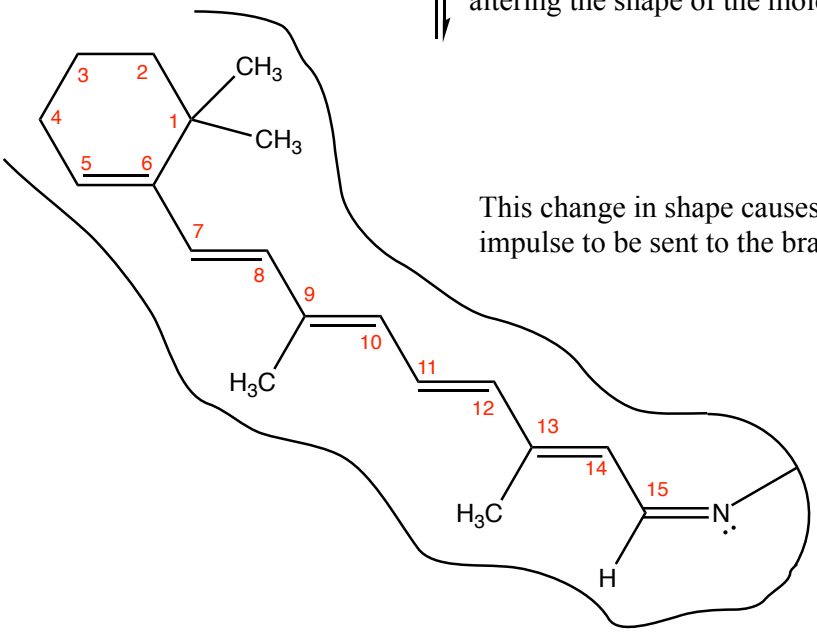


Binds to an -NH_2 group from the amino acid lysine in the protein opsin



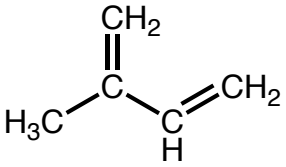
Molecule resets

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

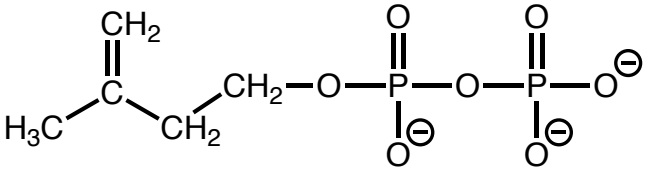


This change in shape causes a nerve impulse to be sent to the brain

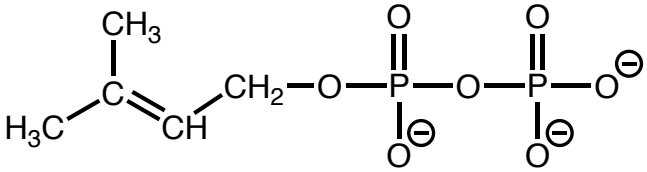
Terpenes



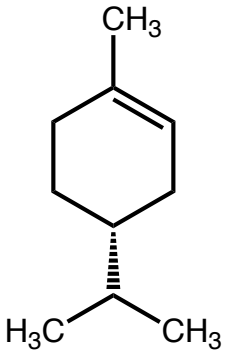
Isoprene



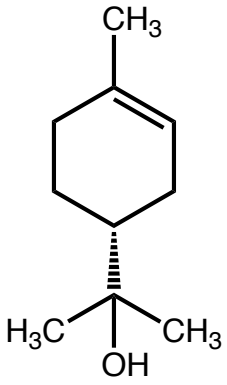
Isopentanyl diphosphate



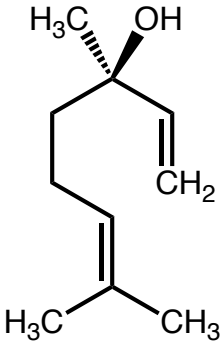
Dimethylallyl diphosphate



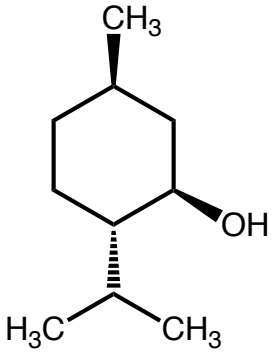
Limonene
(citrus flavor)



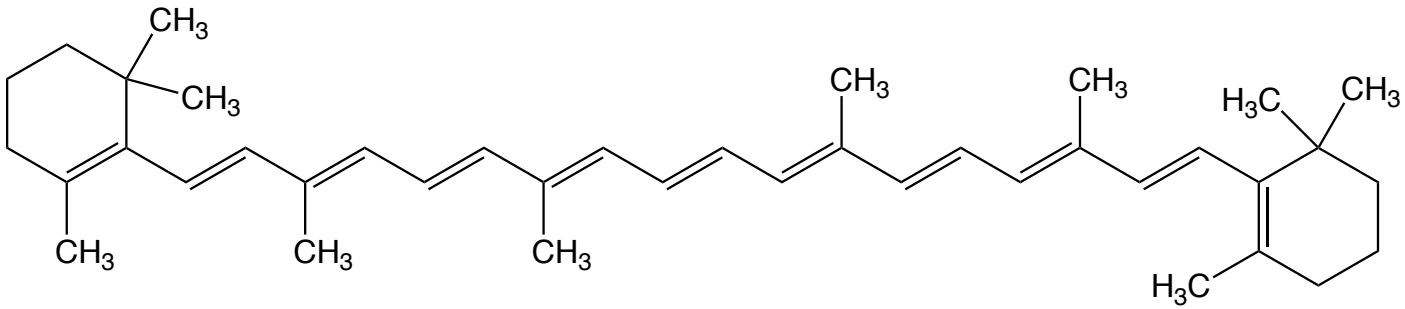
α-Terpineol
(from lilacs, used in perfume)



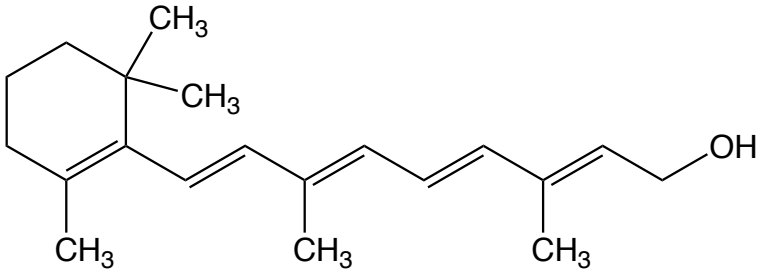
(*R*)-(-)-Linalool
(from lavender, used in perfume)



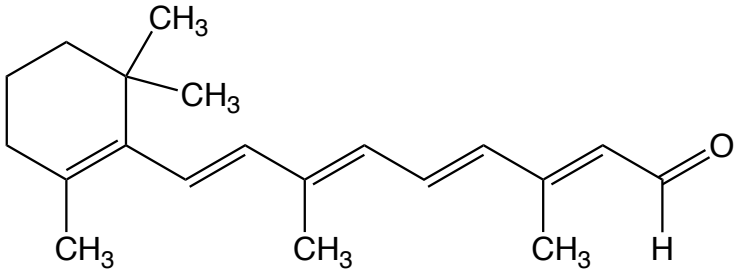
(-)-Menthol
(common flavoring from peppermint)



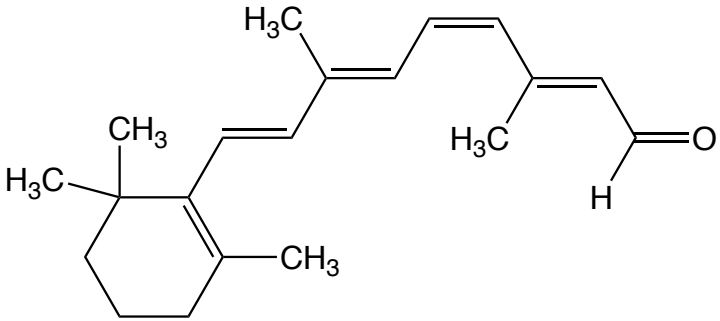
β-Carotene



Vitamin A



All *trans* Retinal



11-*cis*-Retinal