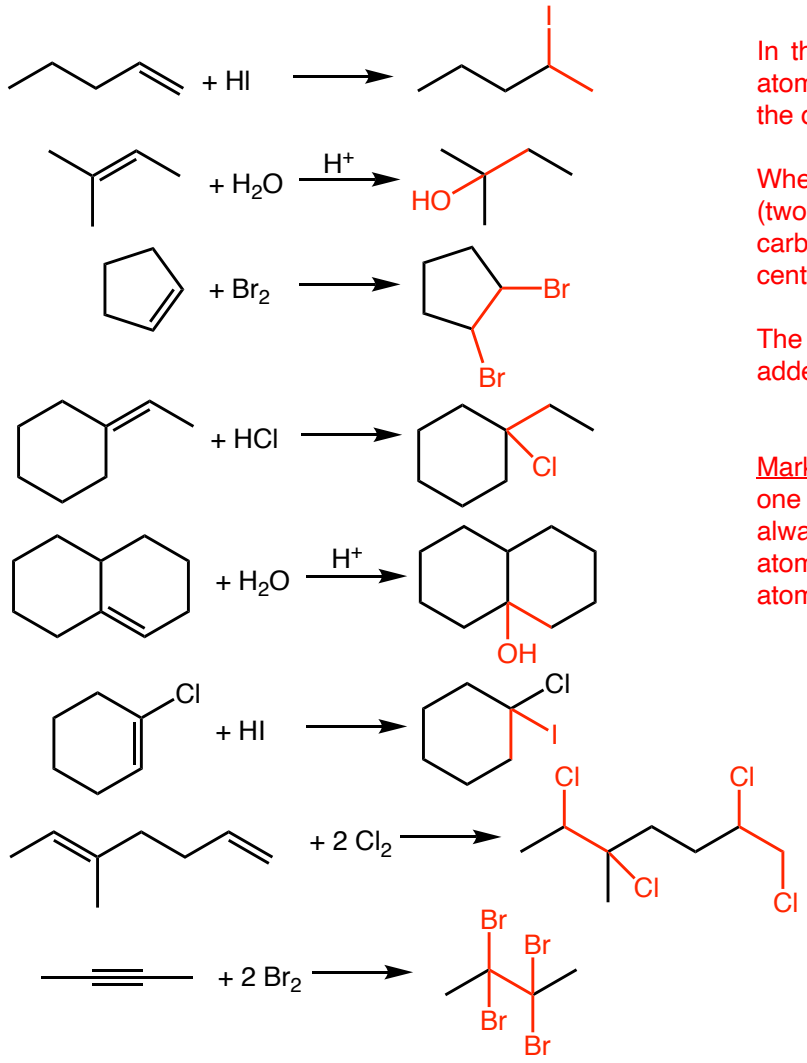
Alkene Reactions: Predict the product for the following reactions.



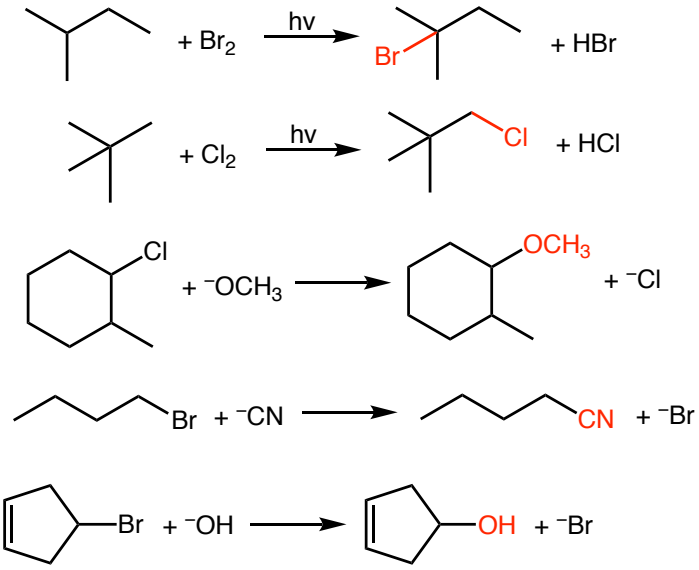
In these types of reactions, we are adding atoms/groups to the carbons that make up the double bond.

When we do this, we turn the double bond (two sp^2 carbons) into a single bond (two sp^3 carbons) and add one atom to each carbon center.

The relevant bonds (new or changed) and added atoms/groups are shown in red.

Markovnikov's Rule: If adding a hydrogen to one of the two carbons, the hydrogen will always add to the least substituted carbon atom (i.e. the carbon with more hydrogen atoms attached to it).

Alkane Reactions: Predict the product for the following reactions.

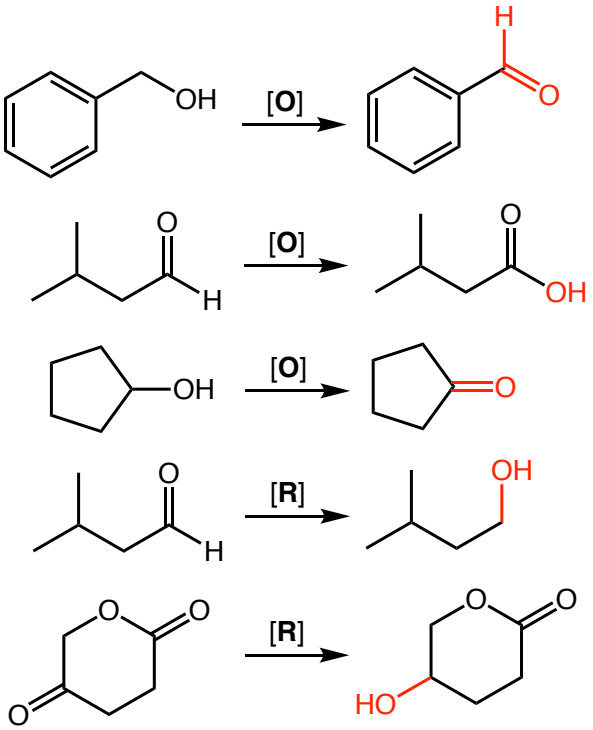


In the first reaction, we are substituting a hydrogen atom for a halogen group on the more substituted carbon center. The new bond is shown in red.

In the second reaction, the most substituted carbon is the tertiary carbon, but there is no hydrogen to substitute, so we turn to the second-most substituted carbon.

The latter three examples are called nucleophilic substitution reactions.

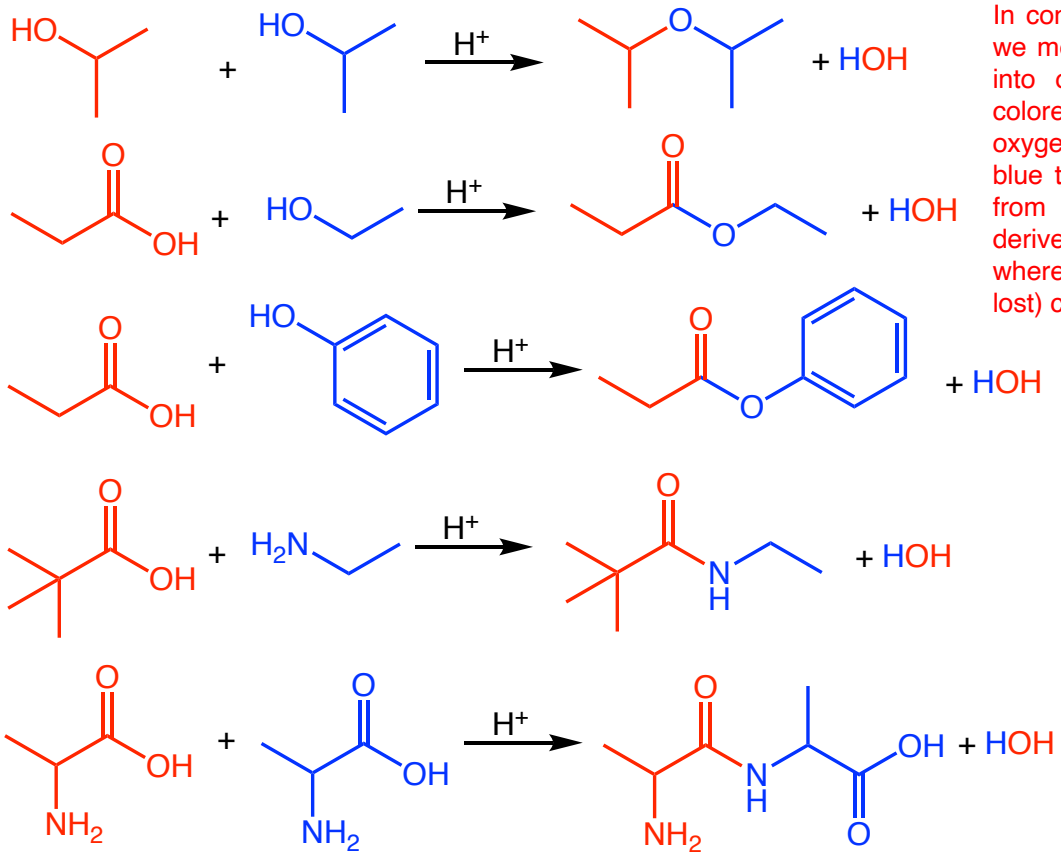
Redox Reactions: Predict the product for the following reactions.



In these reactions, we oxidized the carbon atom that is attached to the alcohol group. These groups and their transformations are shown in red.

In the last two reactions, we reduced the carbon containing the aldehyde and ketone (or carboxylic acid, but I'm not showing that example here) into an alcohol. The relevant groups and transformations are shown in red.

Condensation Reactions: Predict the product for the following reactions.



In condensation reactions, we merge two oxygenates into one oxygenate. I've colored the combined oxygenate with red and blue to show the moieties from which they are derived, and also to show where the water (which is lost) comes from.