

Reactions of Functional Groups

In organic chemistry, drawing reactions and reaction mechanisms is an important part in communicating what we know about the behaviour of organic molecules.

It is important to draw molecules accurately to show where atoms are attached on a molecule, to illustrate geometry, the location of unbound electron pairs and to illustrate polarity.

In the drawing of reactions, curved arrows are often used to show where a molecule is attacking another molecule and to keep track of where electrons are being flow during that reaction.

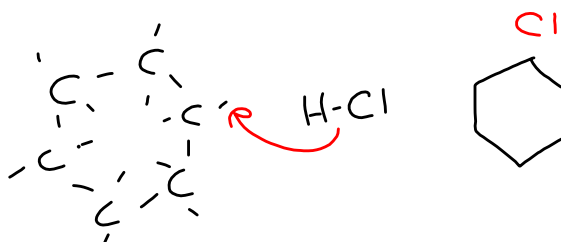
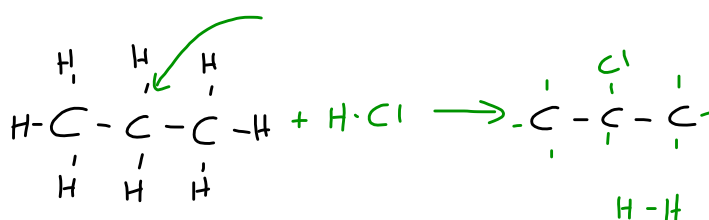
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1.0 Alkanes

1.1 Combustion Reactions

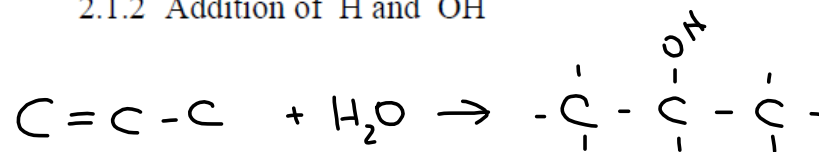


1.2 Substitution Reactions (halogenation) to form halo alkanes

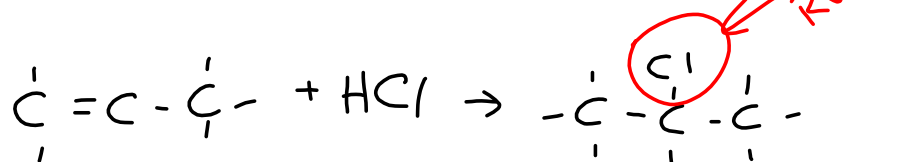


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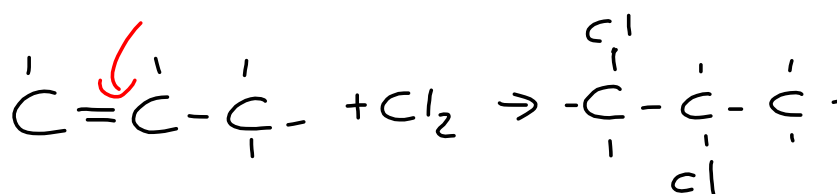
2.1.2 Addition of H and OH



2.1.3 Addition of halogens and hydrogen

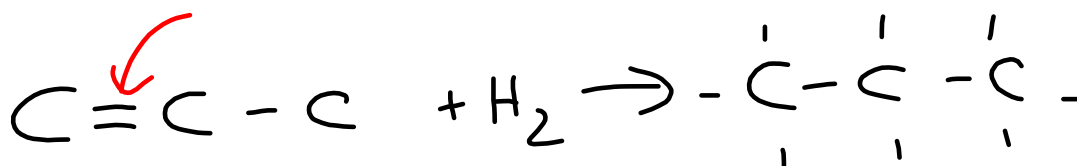


2.1.4 Addition of two halogen atoms



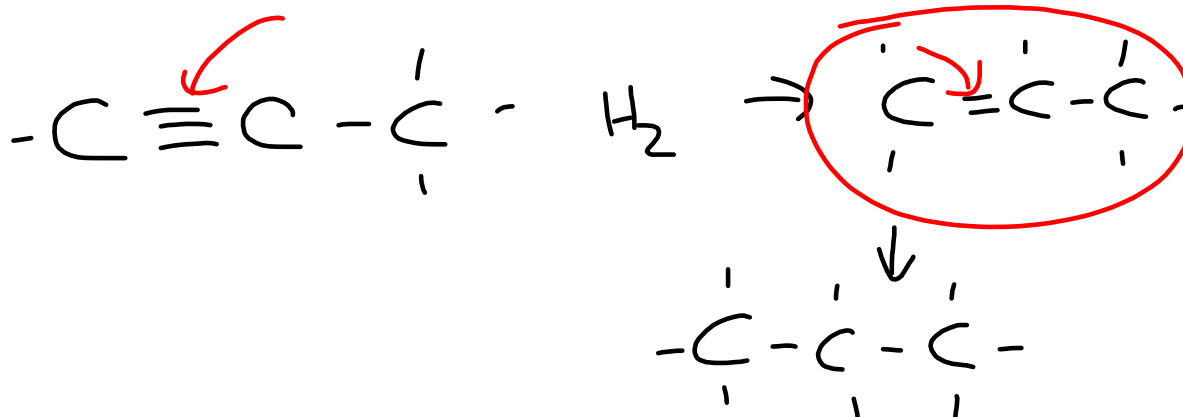
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2.1.5 Addition of two hydrogen atoms



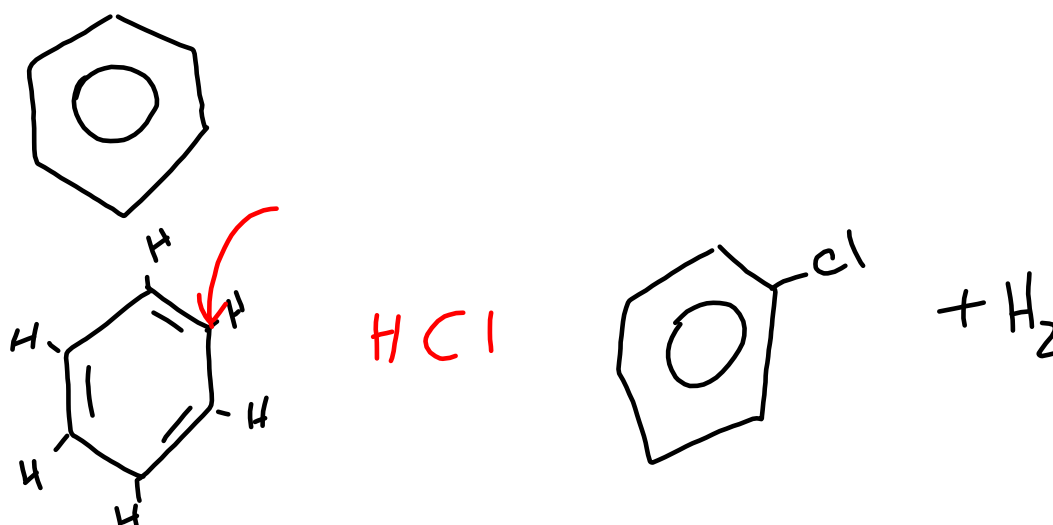
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- Addition to alkynes will follow the same rules, however the process can take place two times. Once to move from a triple – double bond between carbon atoms, and a second time in order to go from a double to single bond.



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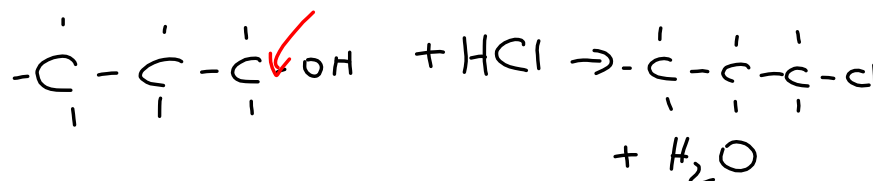
- Aromatic compounds can undergo substitution but not elimination reactions.



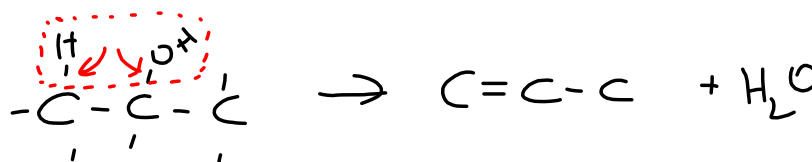
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3.0 Alcohols

3.1 Substitution Reactions: reacting alcohols with hydrogen halides to form alkyl halides.

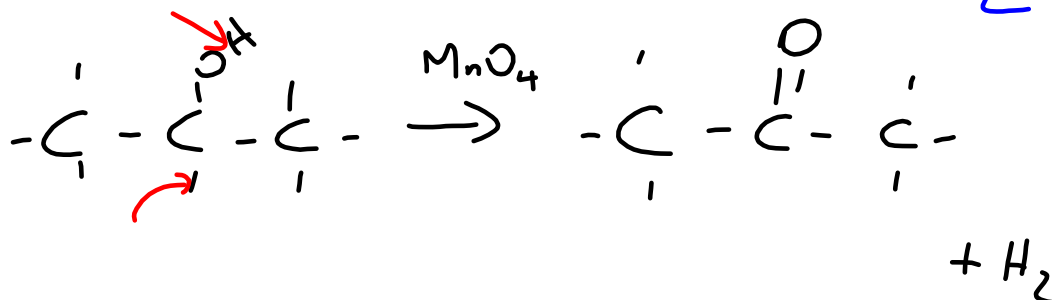
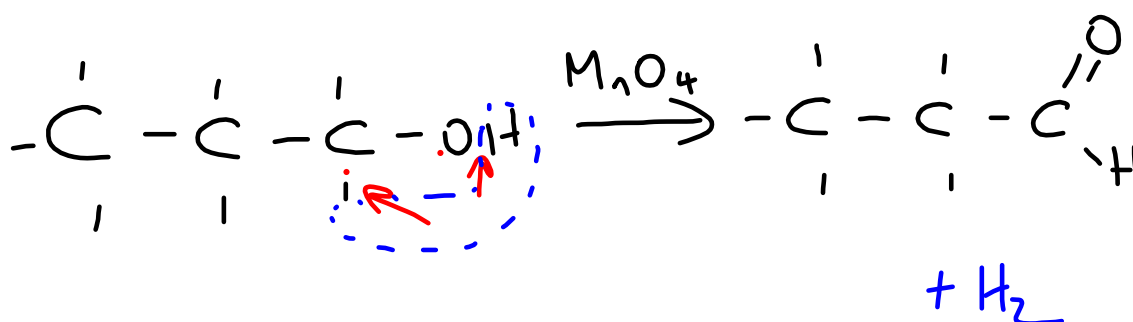


3.2 Elimination Reactions: Removal of the hydroxyl group by way of heat and catalysis to form an alkene



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3.3 Oxidation Reactions: Removal of two hydrogens, one from the hydroxyl and one from the carbon to form a carbonyl functional group.



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Q: What are the different products that will form through the oxidation of primary, secondary and tertiary alcohols?

$1^\circ \rightarrow$ aldehyde

$2^\circ \rightarrow$ ketones

$3^\circ \rightarrow$ N.R.

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** The oxidation of alcohols is how the human body metabolizes alcohol. The by-products formed are toxic and in high concentrations can be fatal. A build up of aldehydes in the body will cause you to be nauseated and give you a headache.

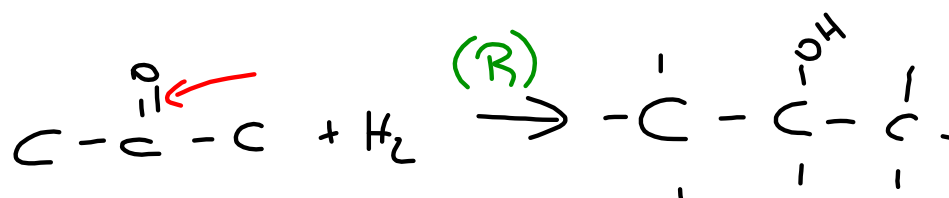
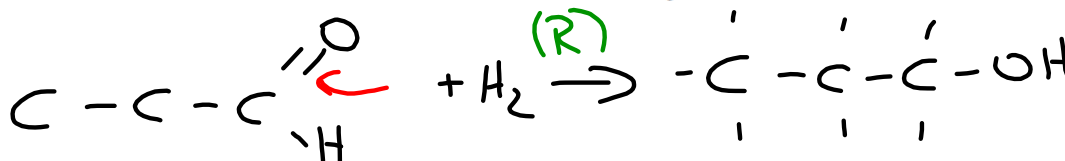
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4.0 Aldehydes and Ketones

4.1 These compounds are formed by the oxidation of alcohols. The compound produced will depend on the location of the hydroxyl group.

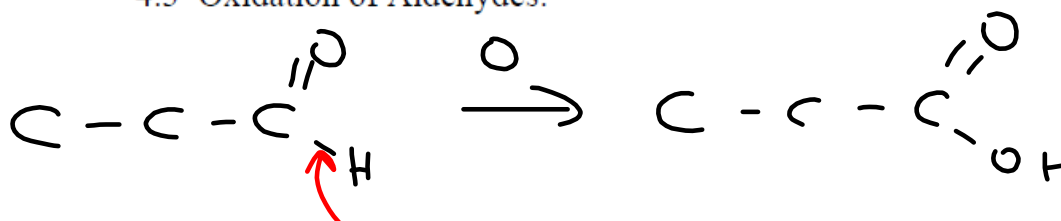


4.2 What will reduction reactions of aldehydes and ketones form?



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4.3 Oxidation of Aldehydes:

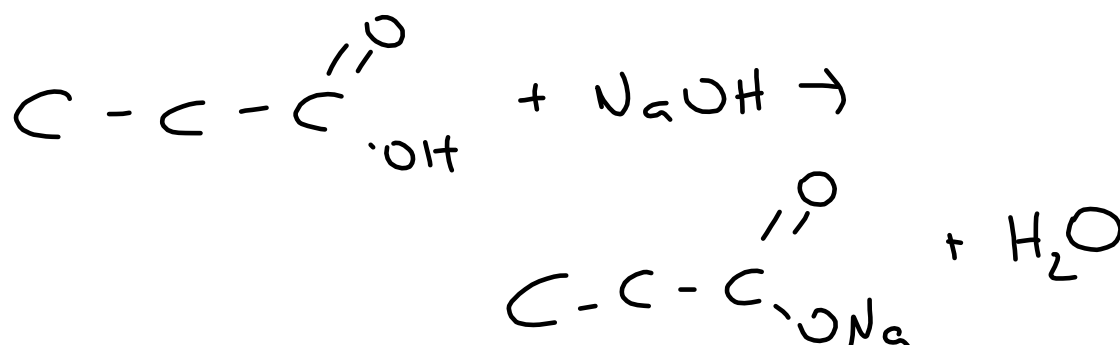


** The oxidation of aldehydes is the same metabolic process which exists in humans that continues the processing of an alcohol into a carboxylic acid. Antabuse is a prescription drug that can be taken to stop the metabolic processing of aldehydes causing them to build up in the blood and will result in unwanted side effects. This will hopefully deter a patient from using alcohol inappropriately.

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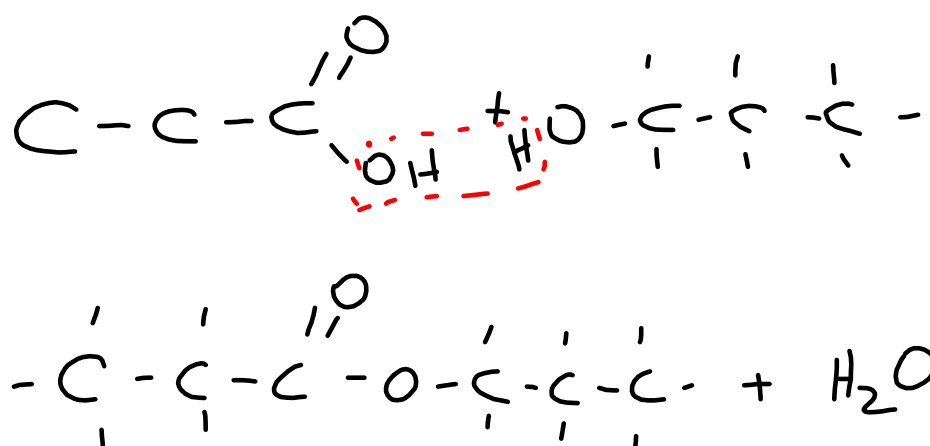
5.0 Carboxylic Acids

5.1 Neutralization: reaction of acids and bases



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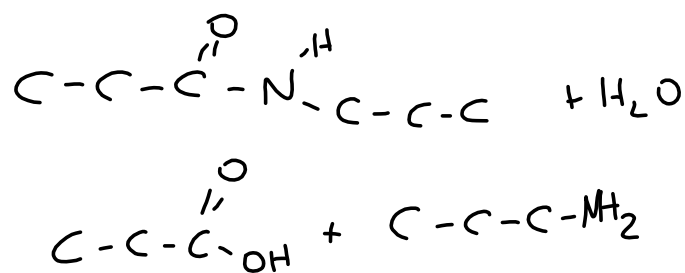
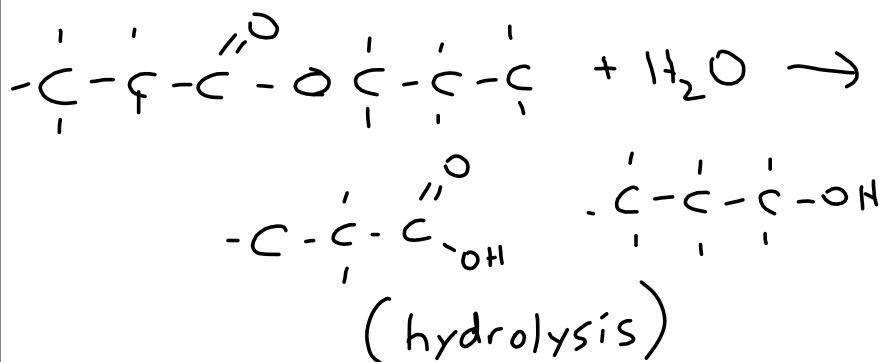
5.2 Esterification: Reaction with an alcohol in the presence of heat and a catalyst.



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6.0 Esters and Amides

6.1 Both will undergo hydrolysis to form their original components with the help of heat and a catalyst.



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