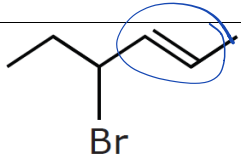
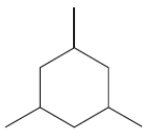
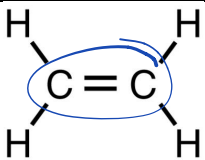

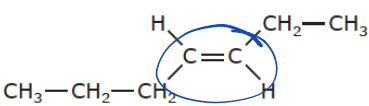
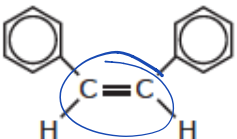


1. Reactions of Organic Molecules

Saturated vs. Unsaturated

- Saturated = no room for other atoms to bond to the carbon skeleton *alkanes (single bonds)*
- Unsaturated = room for other atoms to bond to the carbon skeleton *alkenes (double & triple bonds)*

For each molecule below, determine whether it is saturated or unsaturated

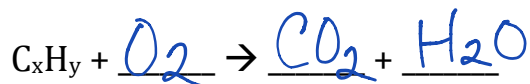
 Br <i>Unsaturated</i>	$\begin{array}{c} \text{CH}_3-\text{CH}_2-\text{CH}-\text{CH}_2-\text{CH}_3 \\ \\ \text{CH}_3-\text{CH}_2-\text{C}-\text{CH}_2-\text{CH}_3 \\ \\ \text{CH}_3-\text{CH}_2-\text{CH}-\text{CH}_2-\text{CH}_3 \end{array}$ <i>Saturated</i>	 <i>Sat.</i>
$\begin{array}{c} \text{Cl} \\ \\ \text{CH}_3-\text{C}-\text{Cl} \\ \\ \text{Cl} \end{array}$ <i>Sat.</i>	 <i>Unsat</i>	 <i>Unsat</i>
 <i>Unsat</i>	 <i>Unsat</i>	$\begin{array}{c} \text{Cl} \quad \text{Br} \\ \quad \\ \text{CH}_3-\text{CH}-\text{CH}_2-\text{CH}-\text{CH}_3 \end{array}$ <i>Sat</i>

Reaction Types

(A) Combustion Reactions

- This is the first type of organic chemical reaction you've learned about!

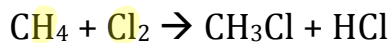
In general:



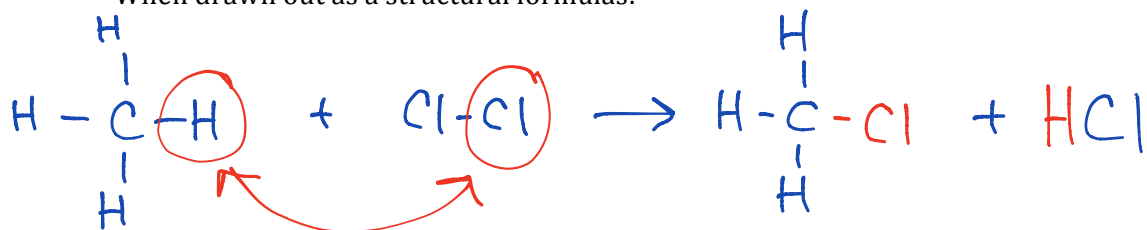
(B) Substitution Reactions

- An atom or group of atoms from a reactant takes the place of an atom or group of atoms on the organic molecule.

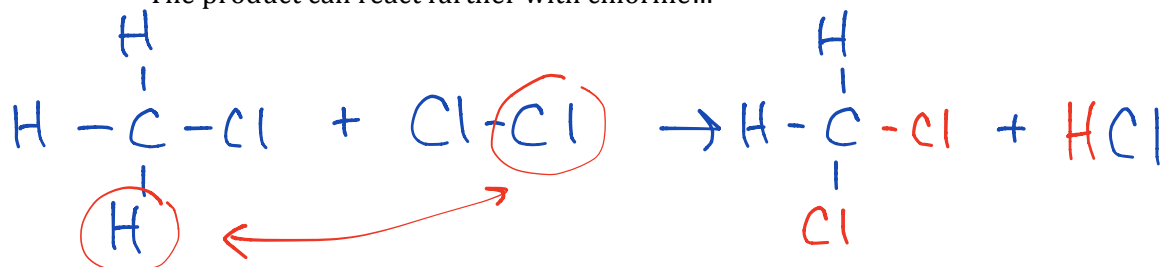
Example 1: Reaction of methane with chlorine:



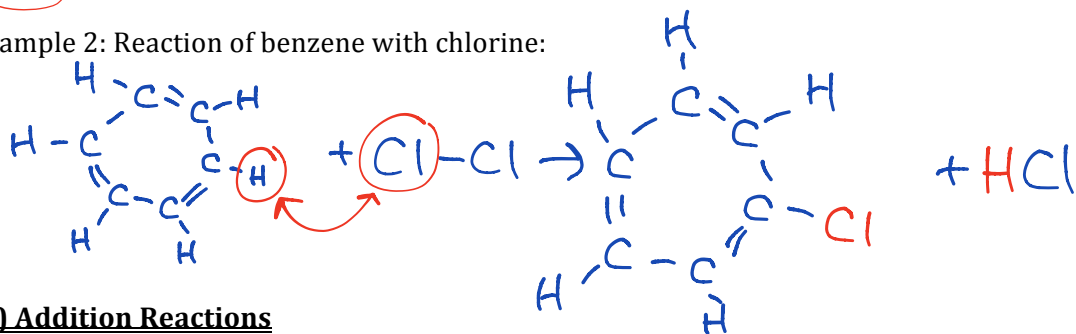
When drawn out as a structural formulas:



The product can react further with chlorine...



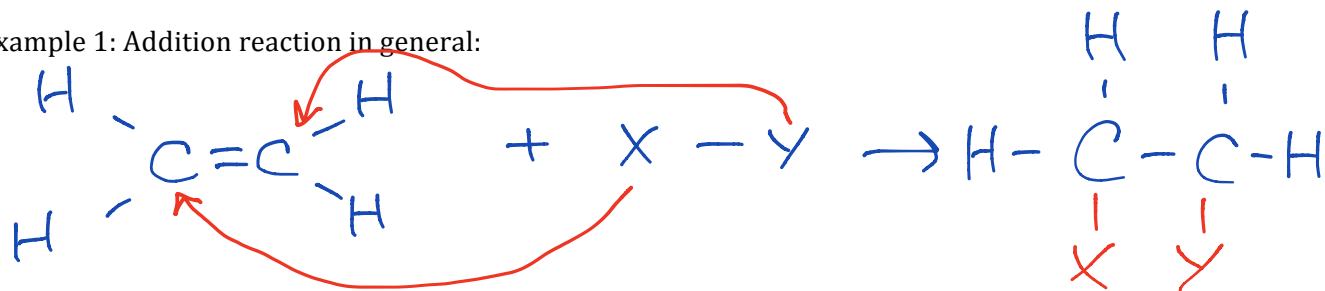
Example 2: Reaction of benzene with chlorine:



(C) Addition Reactions

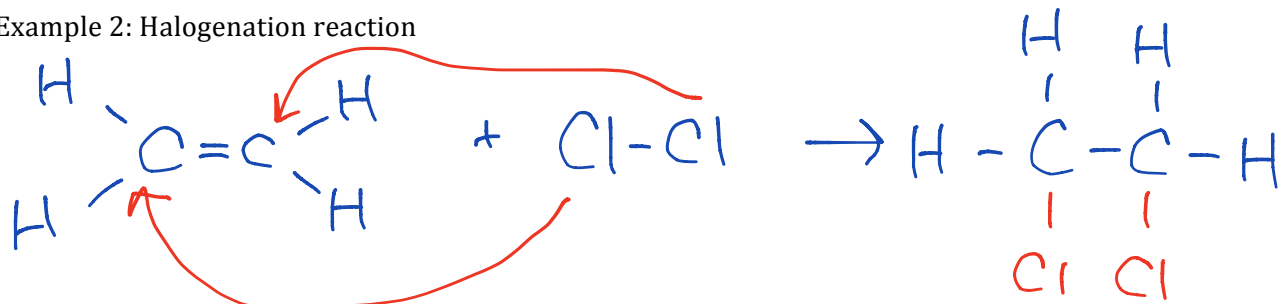
- Occurs when an **unsaturated compound** becomes **saturated**.
- Electrons in the double or triple bond are shared with a reactant molecule
- Double bond becomes single bond
- Triple bond becomes double bond

Example 1: Addition reaction in general:



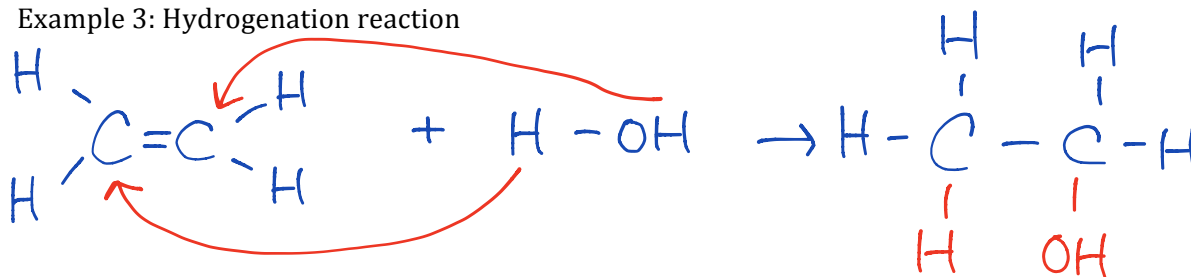
- Halogens are particularly reactive with alkenes and alkynes. This may be called a **halogenation** reaction. See example below:

Example 2: Halogenation reaction

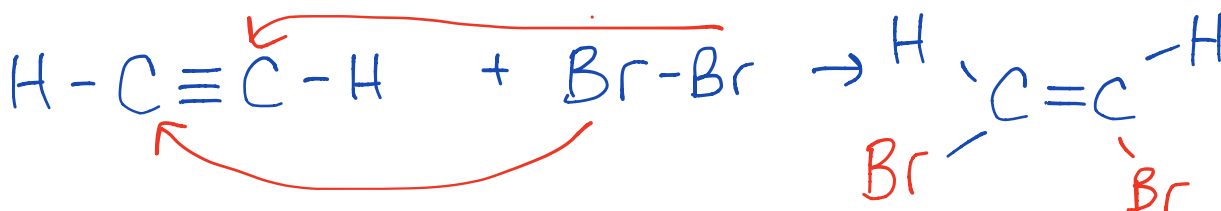


- When the atoms being added to the unsaturated site are hydrogen atoms, the reaction can also be called **hydrogenation**. See example below:

Example 3: Hydrogenation reaction



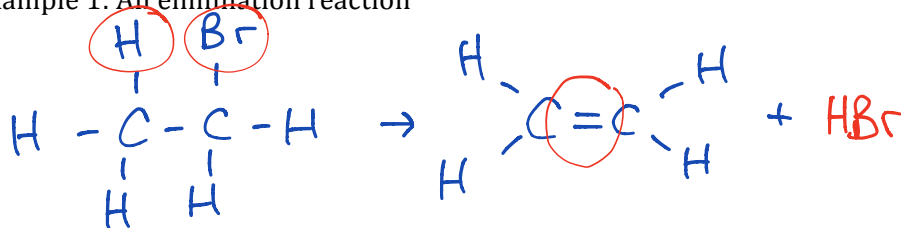
Example 4: Alkyne addition reaction



(D) Elimination Reactions

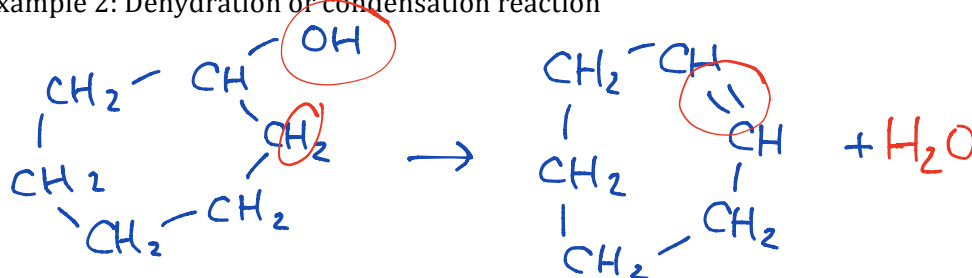
- The opposite of an addition reaction

Example 1: An elimination reaction



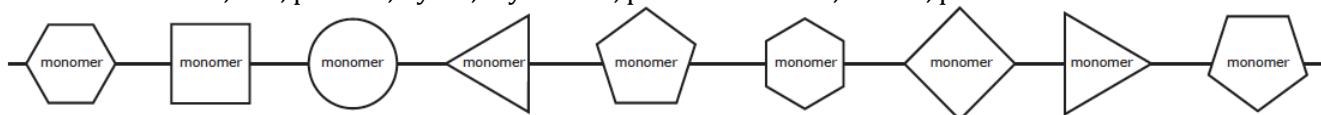
- If water is eliminated, the reaction can be called dehydration or condensation. See example below:

Example 2: Dehydration or condensation reaction



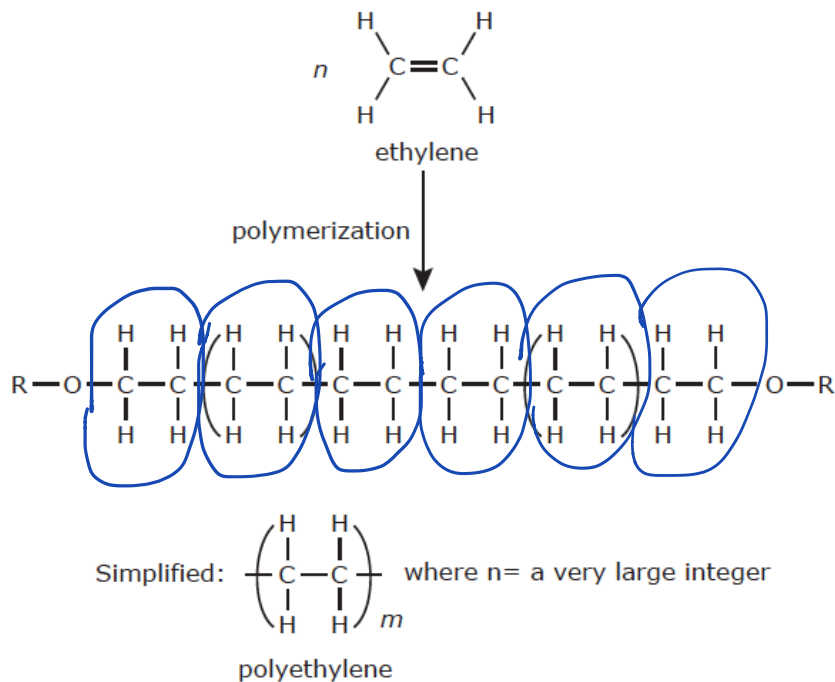
(E) Polymerization

- "Polymer" means "many parts"
- Polymers are found in nature and in many useful materials made synthetically
- Ex: rubber, silk, plastics, nylon, Styrofoam, pharmaceuticals, Teflon, paints

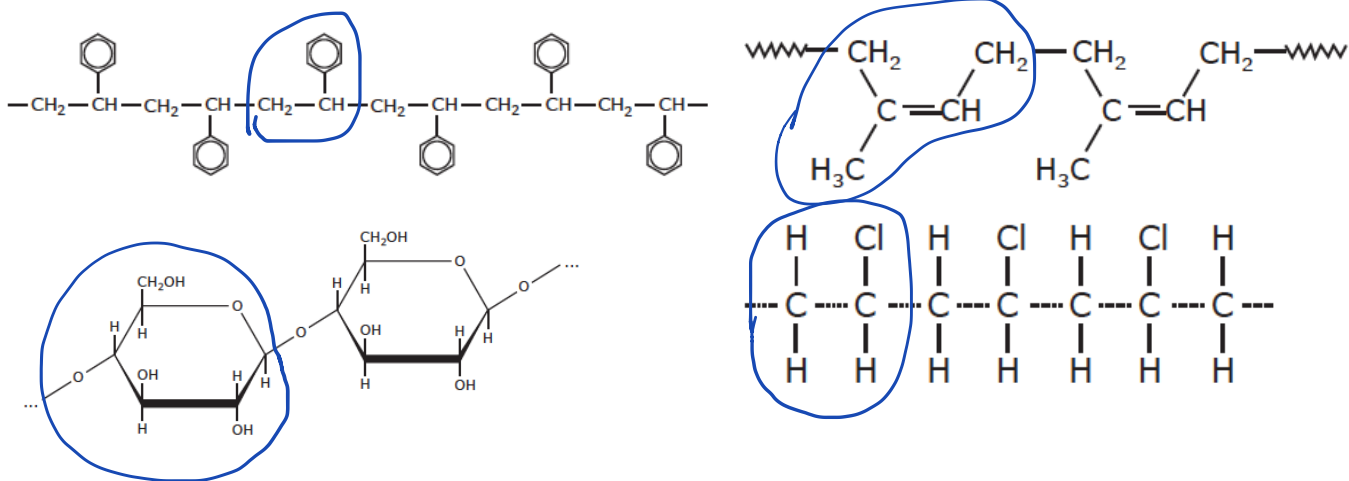


(Type of addition)

- Example 1: Polyethylene
- To make polyethylene thousands of ethane molecules are reacted together in a huge addition reaction

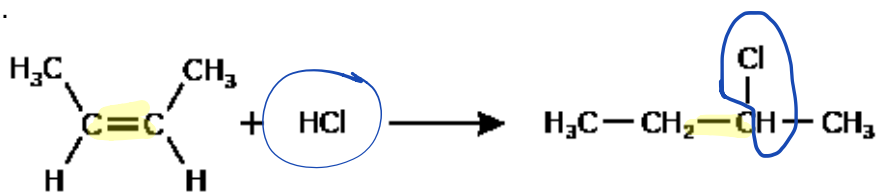


For the following polymers, circle the monomer (the repeating unit):



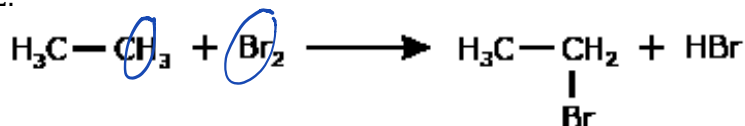
Practice: Classify the following type of reactions as combustion, substitution, addition, elimination or polymerization:

1.



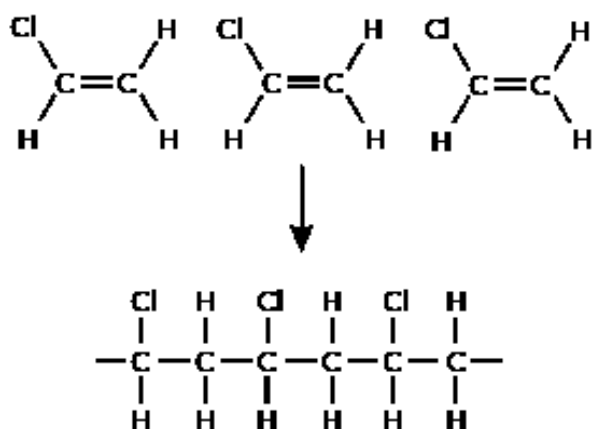
addition

2.



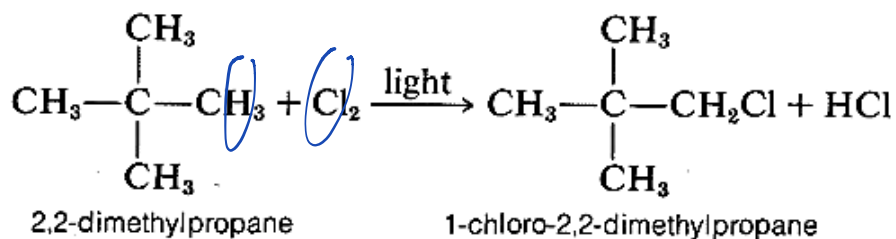
Substitution

3.



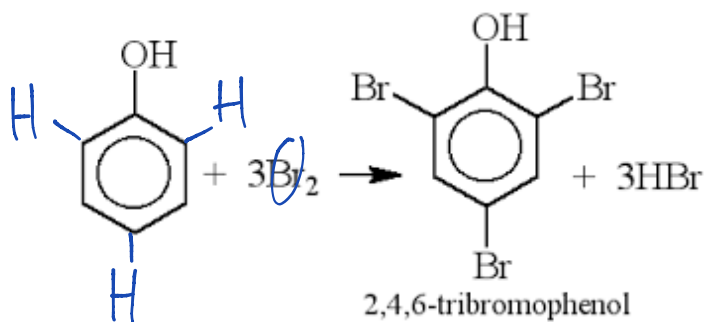
(type of addition)
polymerization

4.



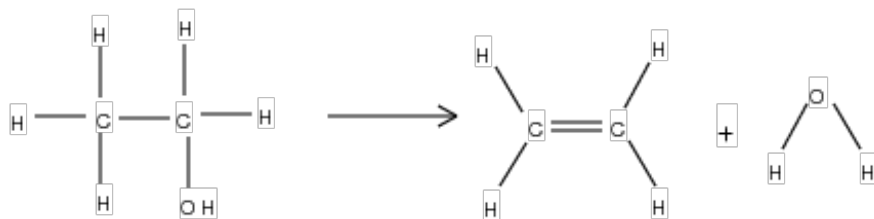
Substitution

5.



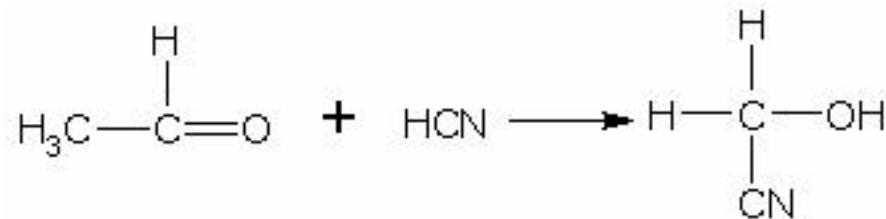
Substitution

6.



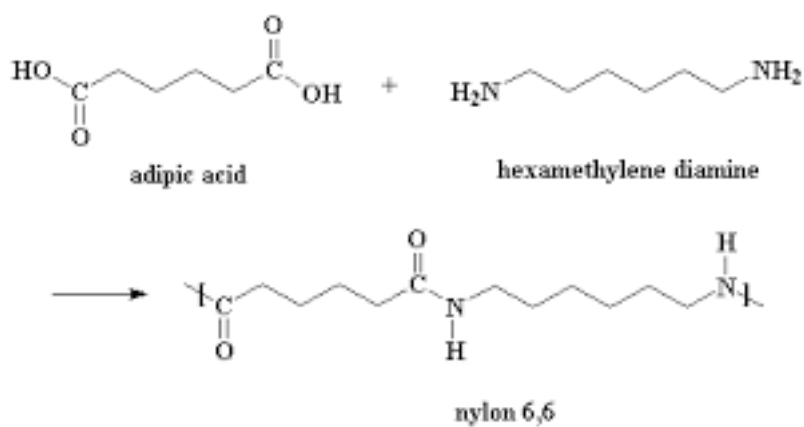
Elimination
(Dehydration)

7.



Addition

8.



Polymerization