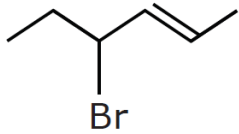
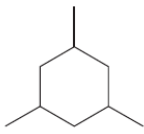
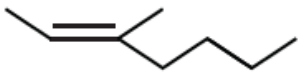
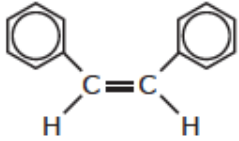


1. Reactions of Organic Molecules

Saturated vs. Unsaturated

- Saturated = no room for other atoms to bond to the carbon skeleton
- Unsaturated = room for other atoms to bond to the carbon skeleton

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

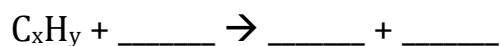
	$\begin{array}{c} \text{CH}_3-\text{CH}_2-\text{CH}-\text{CH}_2-\text{CH}_3 \\ \\ \text{CH}_3-\text{CH}_2-\text{C}-\text{CH}_2-\text{CH}_3 \\ \\ \text{CH}_3-\text{CH}_2-\text{CH}-\text{CH}_2-\text{CH}_3 \end{array}$	
$\begin{array}{c} \text{Cl} \\ \\ \text{CH}_3-\text{C}-\text{Cl} \\ \\ \text{Cl} \end{array}$	$\begin{array}{c} \text{H} \quad \quad \text{H} \\ \diagdown \quad \diagup \\ \text{C} = \text{C} \\ \diagup \quad \diagdown \\ \text{H} \quad \quad \text{H} \end{array}$	
$\begin{array}{c} \text{H} \quad \quad \text{CH}_2-\text{CH}_3 \\ \diagdown \quad \diagup \\ \text{C} = \text{C} \\ \diagup \quad \diagdown \\ \text{CH}_3-\text{CH}_2-\text{CH}_2 \quad \text{H} \end{array}$		$\begin{array}{c} \text{Cl} \quad \quad \text{Br} \\ \quad \quad \\ \text{CH}_3-\text{CH}-\text{CH}_2-\text{CH}-\text{CH}_3 \end{array}$

Reaction Types

(A) Combustion Reactions

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

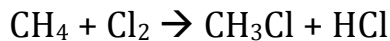
In general:



(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

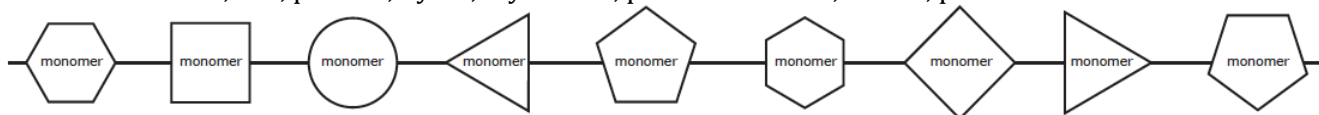
Example 1: An elimination reaction

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

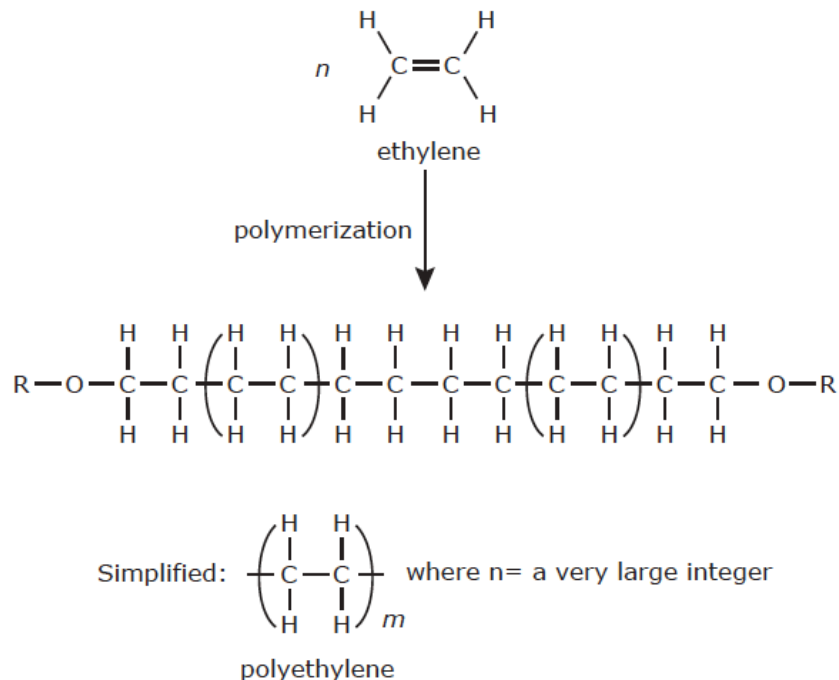
Example 2: Dehydration or condensation reaction

(E) Polymerization

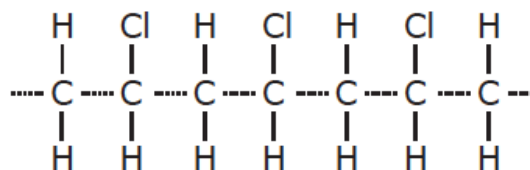
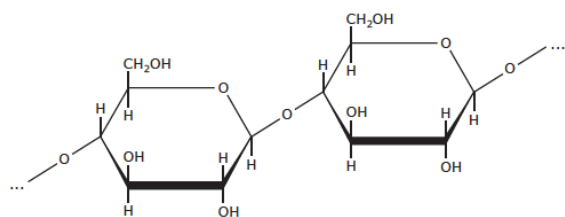
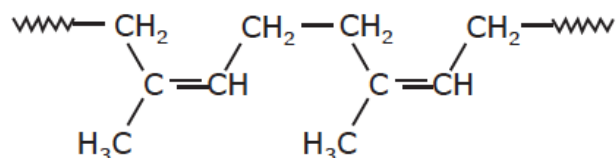
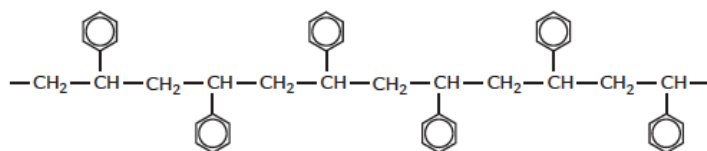
- “Polymer” means “many parts”
- Polymers are found in nature and in many useful materials made synthetically
- Ex: rubber, silk, plastics, nylon, Styrofoam, pharmaceuticals, Teflon, paints



- 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):

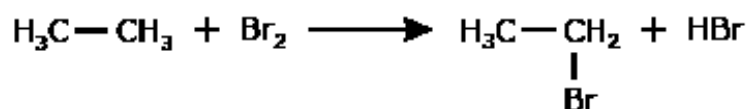


Practice: Classify the following type of reactions as combustion, substitution, addition, elimination or polymerization:

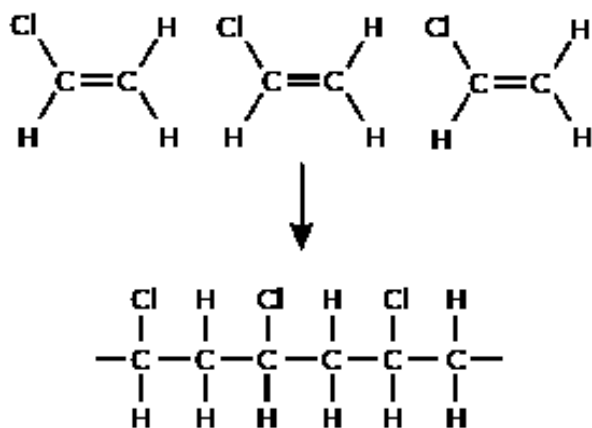
1.



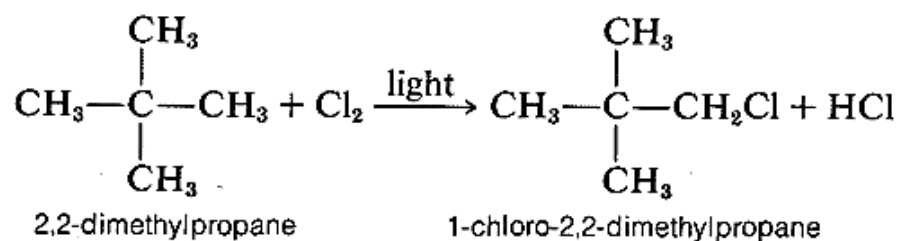
2.



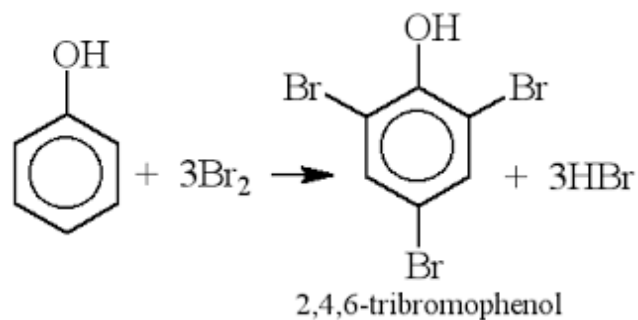
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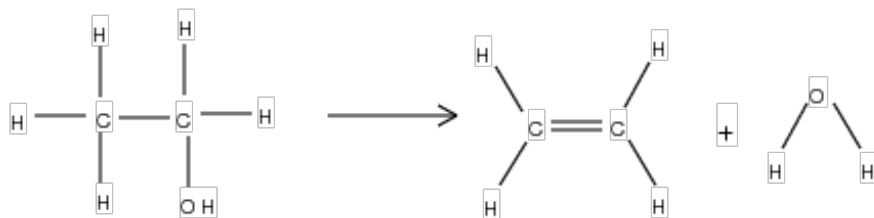
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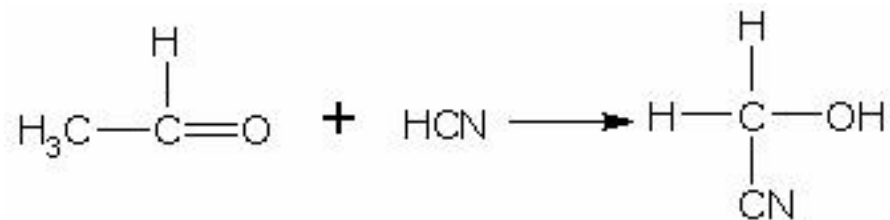
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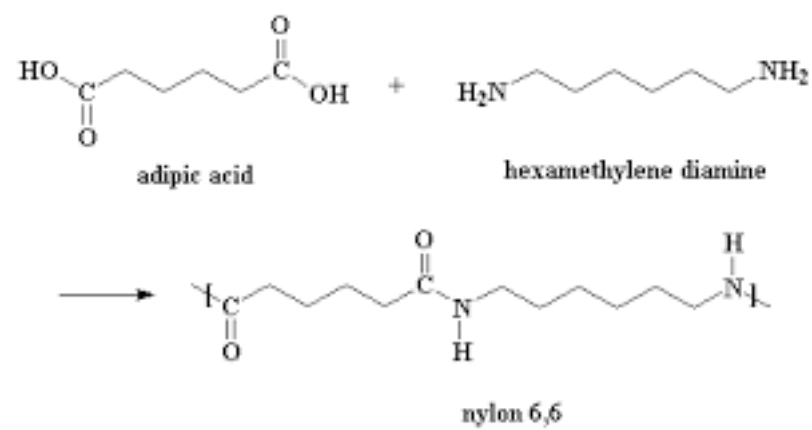
6.



7.



8.



1. Addition 2. Substitution 3. Addition and polymerization 4. Substitution 5. Substitution 6. Elimination 7. Addition
8. Addition