**Bioplastics Extension Lab**: **Using Molecular Models to Make Polymers**

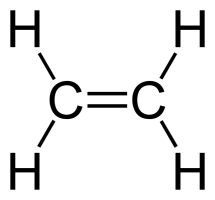
Learning Target: I can simulate a polymerization reaction using molecular model kits

Materials: molecular model kit

NOTE: Chemists use the following color/symbol codes when using molecular model kits.

**Black** = carbon (4 bonds) **Red** = oxygen (2 bonds) **Yellow** = hydrogen (1 bond) **Green** = chlorine (1 bond)

* Springs are used for double bonds
* Short sticks are used for C-H or O-H bonds
* Long sticks are used for C-C single bonds

Part I. Ethene Monomer

The basic structural unit of a polymer is the **monomer**, and the simplest monomer is ethene (ethylene), C2H4. Use the molecular model kit to make a model of ethene. Note the double bond between the carbon atoms—use springs to make double bonds.

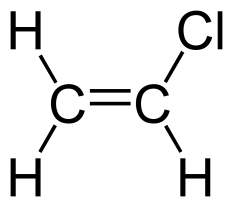
Make two more ethene (ethylene) molecules.

Note that the carbon atoms in ethene cannot make any more bonds due to the double bond. To make more bonds, you have to break the double bond first. Remove the springs between the carbon atoms and replace with a single bond (long stick). You now have one more bonding site available for each carbon atom.

Use the long sticks to link the three ethene (ethylene) monomers together. This reaction is called ADDITION POLYMERIZATION.

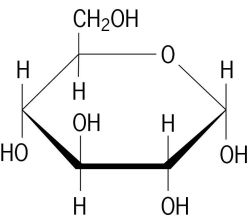
1. Draw the structural formula of the polymer below.
2. How many ethene (ethylene) monomers were added together?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What is the name of the polymer you just made? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Part II. Vinyl Chloride Monomer

Remake the three ethene monomers. Replace ONE hydrogen atom on each monomer with a chlorine atom to make three vinyl chloride (C2H3Cl) monomers.

To make the polymer, break the double bonds between carbon atoms again and replace with a single bond between the carbon atoms. Use the long sticks to link the three vinyl chloride monomers together.

1. Draw the structural formula of the polymer below.
2. What is the name of the polymer you just made? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Part III. Glucose Monomer

Look at the structure of the amylose polymer on your lab sheet. The monomer in amylose is the glucose molecule, C6H12O6. Use your model kit to make one molecule of glucose. Ask me to sign off below indicating that you successfully made the molecule.

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1. Using the diagram on your lab sheet, explain how the glucose monomers are linked together to form the amylose polymer.
2. This type of polymerization reaction is called a CONDENSATION POLYMERIZATION. Condensation involves the production of water. Explain why the production of amylose from glucose monomers is an example of condensation polymerization, and not addition polymerization.

**Now, start working on your prelab for Bioplastics Lab 1. Each team member will be responsible for one of the 4 trials. Make sure each member understands his/her responsibilities for the upcoming lab.**