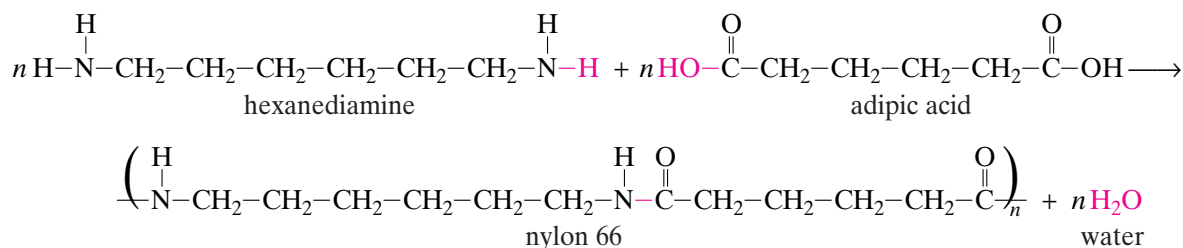


Condensation Polymers

A *condensation polymer* is a polymer formed by condensation reactions. Monomers of condensation polymers must contain two functional groups. This allows each monomer to link with two other monomers by condensation reactions. Condensation polymers are usually copolymers with two monomers in an alternating order.

Polyamides and Polyesters

One example of a condensation polymer is shown below. A carboxylic acid with two carboxyl groups, adipic acid, and an amine with two amine groups, hexanediamine, react with each other to form water.



The product is a polyamide and contains the adipic acid monomer and the hexanediamine monomer. This copolymer is known as nylon 66 because each of the monomers contains six carbon atoms. Nylon 66 is one of the most widely used of all synthetic polymers.

Polyesters are another common type of condensation polymer. They are formed from dialcohols and dicarboxylic acids, which undergo a condensation reaction to form an ester group, linking the alcohol end of a monomer to the acid end of a monomer. Polyesters have many uses, such as in tires, in food packaging, and as fibers in permanent press fabrics.

SECTION REVIEW

1. Can an addition reaction occur between chlorine and ethane? Why or why not?
2. Does an addition reaction increase or decrease the saturation of a molecule?
3. The condensation reaction between two amino acids has a water molecule as one product. Which functional groups are the sources of the atoms in the water molecule?
4. Explain how elimination reactions could be considered the opposite of addition reactions.
5. Why can a molecule that has only one functional group *not* undergo a condensation reaction to form a polymer?

6. Would it be possible to have an addition polymer synthesized from a monomer that has only single bonds? Why or why not?

Critical Thinking

7. **APPLYING MODELS** Polyvinyl chloride (PVC) is a polymer that is widely used in pipes and flooring. It is an addition polymer made from chloroethene, commonly known as *vinyl chloride*.
 - a. Draw the structure of vinyl chloride. Then, look up the structure or check it with your teacher.
 - b. Write the reaction for the polymerization of vinyl chloride to form polyvinyl chloride (PVC).