

Lesson Self-Check

CAN YOU EXPLAIN IT?

FIGURE 23: Hydrochloric acid is highly acidic. It is present in your stomach and can break down food matter very quickly.

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In the digestive system, several organs work together to break down food into simpler molecules. Digestion begins in the mouth, continues in the stomach, and is completed in part of the small intestine. In the mouth, mechanical digestion begins as you start chewing. Your teeth shred and grind the food into smaller pieces. As you chew your food, salivary glands secrete the enzyme amylase that begins the breakdown of complex starch molecules into glucose.

Once food has been chewed and mixed with saliva, the tongue pushes it to the back of the mouth to swallow. The food moves down to the stomach where digestion continues. In the stomach, your stomach lining secretes gastric juice containing hydrochloric acid (HCl) and the digestive enzyme pepsin. Proteins are digested in the stomach and small intestine, but fats and sugars are digested only in the small intestine where other enzymes, including maltase, continue the process.

Whenever you eat, your stomach produces hydrochloric acid. This acid has a pH of about 1.5. Cells in the stomach lining produce a layer of mucus that protects the cells from damage by the acid.



Explain Refer to the notes in your Evidence Notebook to explain how matter, such as a hamburger, is changed in a chemical reaction. Use evidence and models to support your claim, and address the following questions:

- How can matter be arranged, and how do we model the arrangement of matter?
- How does matter and energy change in chemical reactions, and how can these changes be modeled?
- How do the properties of water and the ability to modify the rates of chemical reactions enable living things to carry out functions necessary for life, such as digesting food?

CHECKPOINTS

Check Your Understanding

1. What does all matter have in common?
 - a. It is liquid at room temperature.
 - b. It is made up of atoms.
 - c. It is visible.
 - d. It is neutral.

2. Which statement best describes compounds?
 - a. Compounds are collections of several atoms of the same element.
 - b. Compounds are made up of atoms of one or more elements bonded together.
 - c. Compounds rarely occur in nature and are often synthesized by humans.
 - d. Compounds are composed of atoms that are not likely to react with one another.

3. Which of the following are examples of matter? Select all correct answers.
 - a. heat
 - b. sunlight
 - c. water
 - d. grass
 - e. air

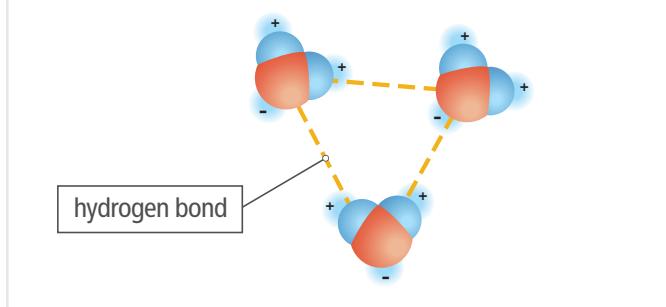
4. An animal's stomach contains enzymes that break down food into smaller molecules that the animal's cells can use. Enzymes perform this function by
 - a. participating in chemical reactions
 - b. increasing the reaction temperature
 - c. decreasing the activation energy
 - d. lowering the pH

5. A chemical reaction proceeds until it reaches an equilibrium. Which statement is true when the reaction is at equilibrium?
 - a. All the reactants are used up.
 - b. The reaction is completed and will not change.
 - c. One reactant is used up, but one or more of the other reactants are still present.
 - d. Both products and reactants are present.

6. How do the properties of elements compare to the properties of the compounds they form?
 - a. The properties of the elements may differ from the properties of the compounds they form.
 - b. The properties of the compound are always the same as the elements that are in the compound.
 - c. The properties of the compound will change only if the elements in the compound are exposed to heat.
 - d. The properties of the compound are the same as the properties of the individual atoms in the compound.

7. Which of the following is *not* a property of water?
 - a. high specific heat
 - b. cohesion
 - c. relatively low boiling point
 - d. adhesion

8. How do temperature and pH affect an enzyme that a chemical reaction depends on?
 - a. They can break down the reactants.
 - b. They can break down the products.
 - c. They can change the shape of the enzyme.
 - d. They can cause the chemical reaction to reverse.

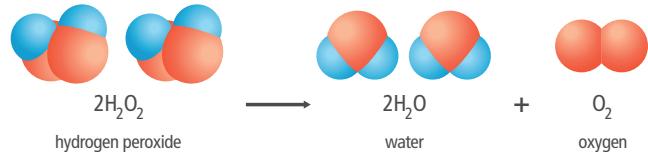
FIGURE 24: Hydrogen bonds form between water molecules.

9. How does the structure of a water molecule result in hydrogen bonding? Use evidence from Figure 24 to support your answer.

10. You may have noticed that water sticks to surfaces such as glass. Which property of water is responsible for this phenomenon?

11. Explain why the formation of hydrogen bonds between water molecules is important for the survival of living things.

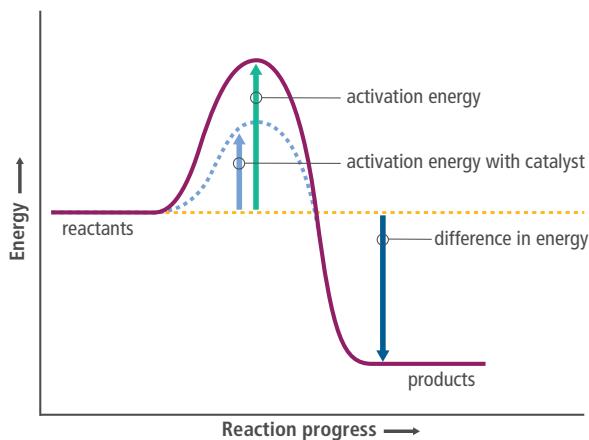
FIGURE 25: Hydrogen peroxide breaks down into water and oxygen.



Use Figure 25 to answer questions 12–13.

12. Describe what is happening in terms of atoms and bonds in this chemical reaction.
13. Explain how this model of a chemical reaction demonstrates that matter is conserved.

FIGURE 26: A reaction progresses with the help of a catalyst.



Use Figure 26 to answer questions 14–15.

14. Which statement is true regarding a catalyst?
 - a. A catalyst increases the activation energy for a chemical reaction.
 - b. A catalyst decreases the difference in energy for a chemical reaction.
 - c. A catalyst allows the reactants to start at a higher energy level.
 - d. A catalyst lowers the activation energy for a chemical reaction.
15. Is this graph depicting an exothermic or endothermic chemical reaction? Use evidence to support your answer.

16. Which of these statements about enzymes is true? Select all correct answers.
- a. Enzymes can help break chemical bonds.
 - b. Enzymes always change their shape when they bind to a molecule.
 - c. Enzymes can break down a variety of different substances.
 - d. An enzyme's shape is related to the shape of the substrate it binds to.

MAKE YOUR OWN STUDY GUIDE



In your Evidence Notebook, design a study guide that supports the main ideas from this lesson:

Living things and the nonliving materials they use are all made of matter.

In chemical reactions, bonds are broken and new bonds are formed. Atoms are rearranged, but not created or destroyed.

Changes in matter keep living things alive and help them maintain homeostasis.

Remember to include the following information in your study guide:

- Use examples that model main ideas.
- Record explanations for the phenomena you investigated.
- Use evidence to support your explanations. Your support can include drawings, data, graphs, laboratory conclusions, and other evidence recorded throughout the lesson.

Consider how matter changes during chemical reactions and how external conditions affect these changes.