Name _____ Class _____ Date _____

2.1 The Nature of Matter

Lesson Objectives

- Identify the three subatomic particles found in atoms.
- Explain how all of the isotopes of an element are similar and how they are different.
- Explain how compounds are different from their component elements.

BUILD Vocabulary

A. The chart below shows key terms from the lesson with their definitions. Complete the chart by writing a strategy to help you remember the meaning of each term. One has been done for you.

Term	Definition	How I'm Going to Remember the Meaning
Atom	The basic unit of matter	
Compound	A substance formed when two or more elements combine in definite proportions	
Covalent bond	A bond formed when atoms share electrons	
Electron	A negatively charged particle located outside the nucleus of the atom	
Element	A pure substance made up of only one type of atom	
Ion	A charged atom	***A lion may charge a person if he is angry. If you place I before ion, you have a lion, so an ion is a charged atom.***
Ionic bond	A bond formed when electrons are transferred from one atom to another atom	

Continued on next page ▶

Name _____ Class _____ Date _____

2.2 Properties of Water

Lesson Objectives

Discuss the unique properties of water.

- Differentiate between solutions and suspensions.
- Explain what acidic solutions and basic solutions are.

BUILD Vocabulary

A. The chart below shows key terms from the lesson with their definitions. Complete the chart by writing a strategy to help you remember the meaning of each term. One has been done for you.

Term	Definition	How I'm Going to Remember the Meaning
Acid	Any compound that forms H^+ ions in solution	
Adhesion	The attraction between molecules of different substances	
Base	A compound that produces hydroxide (OH^-) in solution	
Cohesion	Attraction between molecules of the same substance	
Hydrogen bond	The attraction between the oppositely charged regions of two molecules	
Solute	A substance that is dissolved	

Continued on next page ▶

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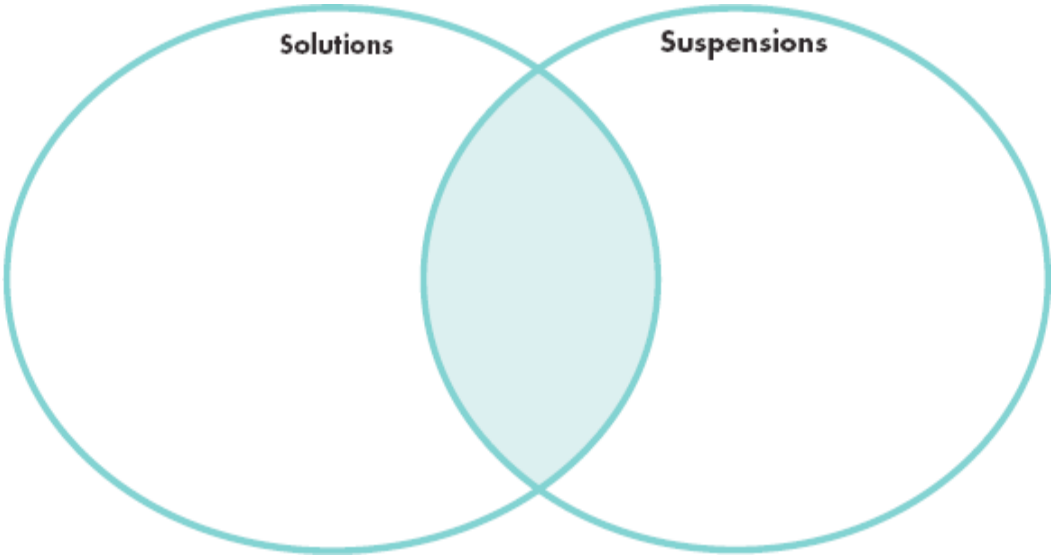
Term	Definition	How I'm Going to Remember the Meaning
Solution	A mixture of solute dissolved in a solvent	
Solvent	The substance in which the solute dissolves	
Suspension	A mixture of water and undissolved material in which the solute is evenly distributed	***A student who undergoes a suspension from school is not allowed to mix with the other students. A suspension is a material that does not mix with water.***

B. As you work through this lesson, you may find these terms in the activities. When you need to write a key term or a definition, **highlight** the term or the definition.

BUILD Understanding

Venn Diagram A Venn diagram is made up of overlapping circles. It is a useful tool for comparing two or even three topics. In each circle, write one of the topics that you want to compare. In the space where the circles overlap, write the features that the topics share. In the space where the circles do not overlap, write the features that are unique to each topic.

Use the Venn diagram to compare solutions and suspensions.



Name _____ Class _____ Date _____

2.3 Carbon Compounds

Lesson Objectives

- Describe the unique qualities of carbon.
- Describe the structures and functions of each of the four groups of macromolecules.

BUILD Vocabulary

A. The chart below shows key terms from the lesson with their definitions. Complete the chart by writing a strategy to help you remember the meaning of each term. One has been done for you.

Term	Definition	How I'm Going to Remember the Meaning
Amino Acid	Compound with an amino group on one end and a carboxyl group on the other end; building block of proteins	
Carbohydrate	Compound containing carbon, hydrogen, and oxygen in a 1:2:1 ratio that is used by living things for energy	***Runners eat lots of "carbs" before a big race: a carbohydrate is a high energy compound.***
Lipid	A polymer, such as fats and oils, composed of mostly carbon and hydrogen atoms, with less oxygen than other organic compounds	
Monomer	A small unit that joins with other small units to form polymers	
Nucleic Acid	A polymer, such as DNA, that contains carbon, hydrogen, oxygen, nitrogen, and phosphorus and that stores cellular information	
Polymer	Large compound that is made from monomers linked together	

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Name _____ Class _____ Date _____

Term	Definition	How I'm Going to Remember the Meaning
Protein	A polymer that contains nitrogen as well as carbon, hydrogen, and oxygen, and that acts as a building material for cells and makes up enzymes.	

B. As you work through this lesson, you may find these terms in the activities. When you need to write a key term or a definition, **highlight** the term or the definition.

BUILD Understanding

Compare/Contrast Table Use a compare/contrast table when you want to see the similarities and differences between two or more objects or processes. Complete the table below comparing and contrasting carbohydrates, lipids, nucleic acids, and proteins.

	Carbohydrates	Lipids	Nucleic Acids	Proteins
Elements that compose the macromolecule	***carbon, hydrogen, and oxygen (1:2:1 ratio)***			
Use of the macromolecule	***used in living things as the main source of energy and some organisms use it for structural purposes***		***store and transmit hereditary information***	
Examples of the macromolecule	***polysaccharides such as glycogen, starch, cellulose***		***DNA, RNA***	

CHAPTER
MYSTERY

Ghostly Fish You have been hired to prepare drawings for a children's science book. Divide the box into two halves. On the left, draw and color an ice fish. On the right, write a short description of the characteristics of an ice fish.

Macromolecules

Amino acids are the monomers of proteins. Each amino acid has three distinct parts: an amino group, an R group, and a carboxyl group. An amino group has the formula $–NH_2$, a carboxyl group is –COOH, and the R group varies from one amino acid to another. Two amino acids are joined in a chemical reaction that links them by a peptide bond.

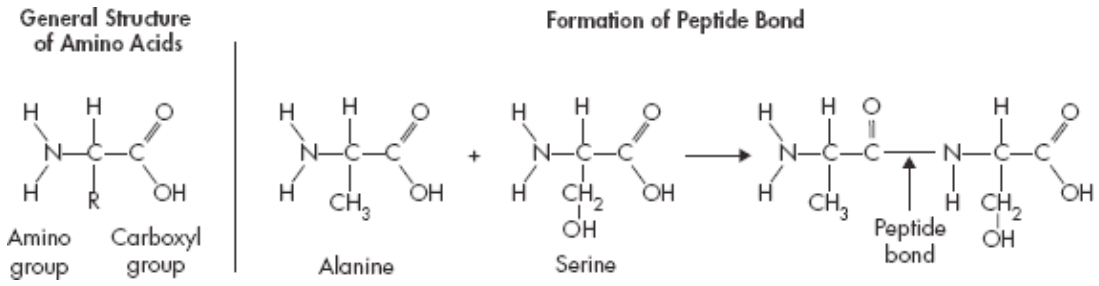
Follow the directions. Then answer the questions.

1. Look at the diagram of the general structure of an amino acid. Color the amino group green.

2. Color the carboxyl group blue.

3. Color the R group red.

4. Color the same groups in the amino acids alanine and serine.



5. How many oxygen atoms are found in the carboxyl group?

A. 1 **C.** 3

B. 2 **D.** 4

6. What is the R group found in alanine?

A. CH_3 **C.** H_2O

B. CH_2OH **D.** COOH

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2.4 Chemical Reactions and Enzymes

Lesson Objectives

- Explain how chemical reactions affect chemical bonds.
- Describe how energy changes affect how easily a chemical reaction will occur.
- Explain why enzymes are important to living things.

Lesson Summary

Chemical Reactions Everything that happens in an organism is based on chemical reactions. A **chemical reaction** is a process that changes one set of chemicals into another set of chemicals.

- The elements or compounds that enter into the reaction are the **reactants**.
- The elements or compounds produced by the reaction are the **products**.
- Chemical reactions involve changes in the chemical bonds that join atoms in compounds.

Energy in Reactions Some chemical reactions release energy; others absorb energy.

- Chemical reactions that release energy often occur on their own.
- Chemical reactions that absorb energy require a source of energy. The energy needed to get a reaction started is called the **activation energy**.

Enzymes An **enzyme** is a protein that acts as biological catalyst. A **catalyst** is a substance that speeds up the rate of a chemical reaction. Catalysts work by lowering a reaction's activation energy.

- In an enzyme-catalyzed reaction, the reactants are known as **substrates**. Substrates bind to a part of an enzyme called the active site and remain bound to the enzyme until the reaction is complete, when the products are released.
- Temperature, pH, and regulatory molecules can affect the activity of enzymes.

Chemical Reactions

1. What is a chemical reaction?

_____

2. Complete the table about chemicals in a chemical reaction.

Chemicals in a Chemical Reaction	
Chemicals	**Definition**
Reactants	
Products	

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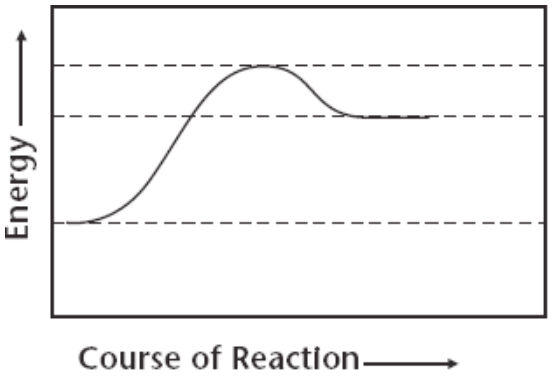
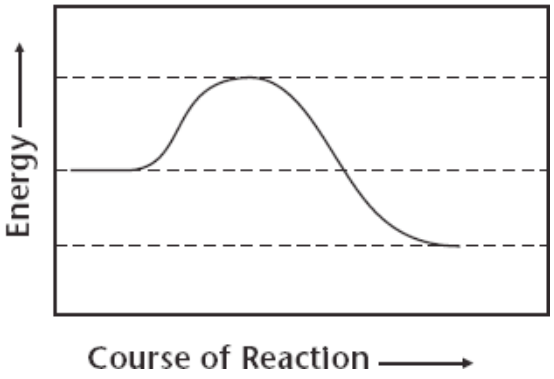
Energy in Reactions

3. **THINK VISUALLY** The graphs below show the amount of energy present during two chemical reactions. One of the reactions is an energy-absorbing reaction, the other is an energy-releasing reaction. Label the type of reaction for each, label the energy level for the reactants and products, then draw an arrow on each to show the energy of activation.





Type of reaction: _____ Type of reaction: _____

4. What is released or absorbed whenever chemical bonds form or are broken?

_____

5. What is the energy of activation?

_____

6. Of the two reactions shown, which one is more likely to start spontaneously and why?

_____

_____

Enzymes

7. How does the addition of a catalyst affect the energy of activation of a chemical reaction?

_____

_____

8. What type of catalysts affect biochemical reactions?

_____

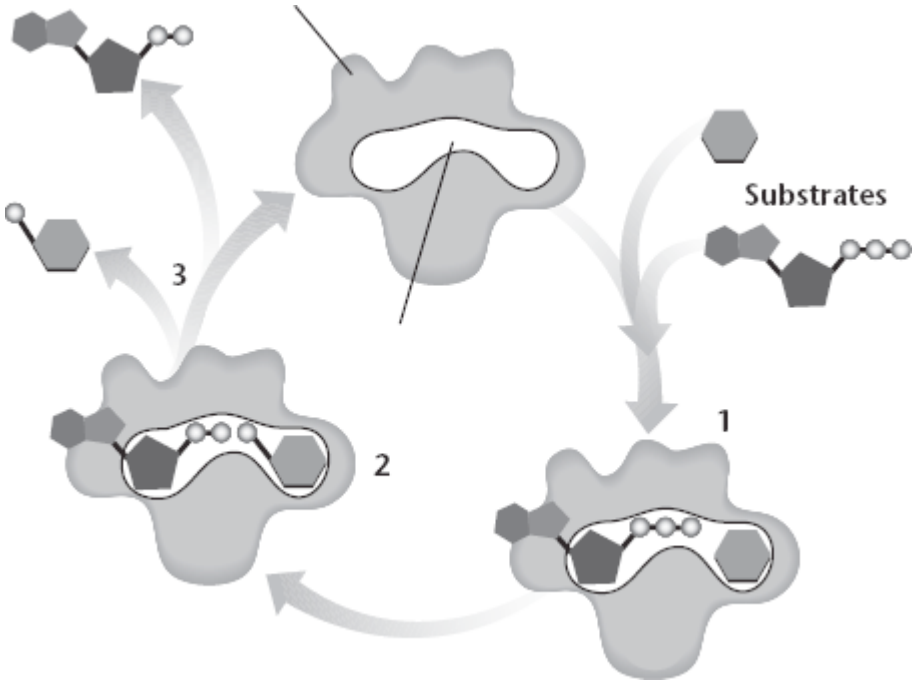
9. What makes proteins the ideal types of compounds to act as enzymes?

_____

_____

_____

Use the diagram to answer Questions 10–11.



10. **THINK VISUALLY** Label the enzyme, the active site, and the products in the diagram.

11. Write what is happening at each numbered part of the diagram.

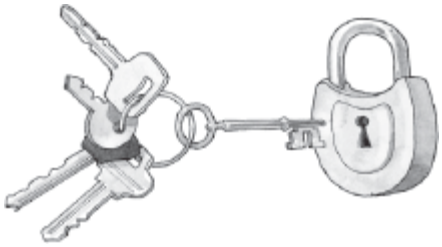
(1) _____

(2) _____

(3) _____

For Questions 12–13, refer to the Visual Analogy comparing the action of enzymes to a lock and key.

12. **VISUAL ANALOGY** How is a substrate and its enzyme like a lock and its key?



_____

_____

_____

_____

13. What is being unlocked in this analogy?

_____

Apply the Big idea

14. In terms of an organism and how it interacts with its environment, what is the benefit of having controls on the chemical reactions that take place in its body?

_____

_____

_____

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2.4 Chemical Reactions and Enzymes

Lesson Objectives

- Explain how chemical reactions affect chemical bonds.
- Describe how energy changes affect how easily a chemical reaction will occur.
- Explain why enzymes are important to living things.

BUILD Vocabulary

A. The chart below shows key terms from the lesson with their definitions. Complete the chart by writing a strategy to help you remember the meaning of each term. One has been done for you.

Term	Definition	How I'm Going to Remember the Meaning
Activation energy	Energy needed to get a reaction started	
Catalyst	Substance that speeds up the rate of a chemical reaction	
Chemical reaction	A process that changes or transforms one set of chemicals into another	
Enzyme	A protein that acts as a biological catalyst to speed up a chemical reaction	
Product	An element or compound produced by a chemical reaction	
Reactant	An element or compound that enters into a chemical reaction	***The word act is found in the word reactant, and during a reaction, the reactants act together to form the products.***

B. As you work through this lesson, you may find these terms in the activities. When you need to write a key term or a definition, **highlight** the term or the definition.

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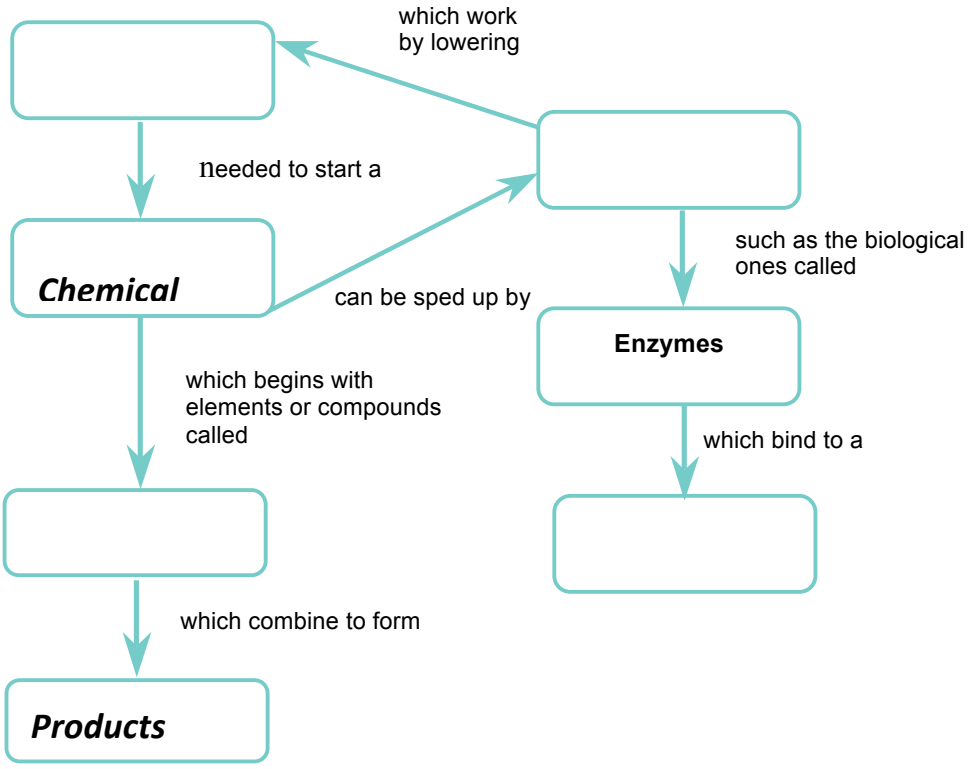
BUILD Understanding

Concept Map A concept map can help you organize information and show how ideas are connected.

The concept map below shows the relationship between vocabulary terms in this lesson. The terms and phrases that go in the concept map are listed in the box below.

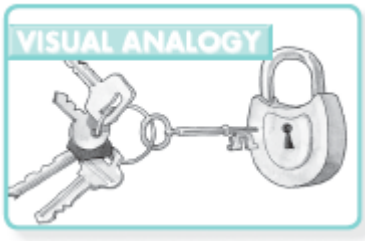
As you read the lesson, complete the concept map. Some terms have been placed in the concept map for you.

activation energy	**chemical reaction**	**products**	**substrate**
catalysts	**enzymes**	**reactants**	



BUILD Connections

Lock and Key An analogy takes two things that seem to be different and shows how they can be similar.



1. How does the analogy of a lock and key to an enzyme and its substrate help you to understand how enzymes function in the body?

_____

_____

_____

2. Find a partner. Using the analogy, explain to your partner what the expression "enzymes are specific" means.

_____

_____

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Chapter Vocabulary Review

Crossword Puzzle *Use the clues below to fill in the spaces in the puzzle with the correct words.*

Across

1. element or compound that enters into a chemical reaction

4. process that changes one set of chemicals into another

7. positively charged subatomic particle

8. substance formed by the chemical combination of elements

11. positively or negatively charged atom

12. carbon compound that stores and transmits genetic information

14. the center of an atom

16. bond formed when electrons are shared between atoms

17. macromolecule formed when monomers join together

Down

2. negatively charged subatomic particle

3. compound that forms hydroxide ions in solution

5. bond formed when one or more electrons are transferred from one atom to another

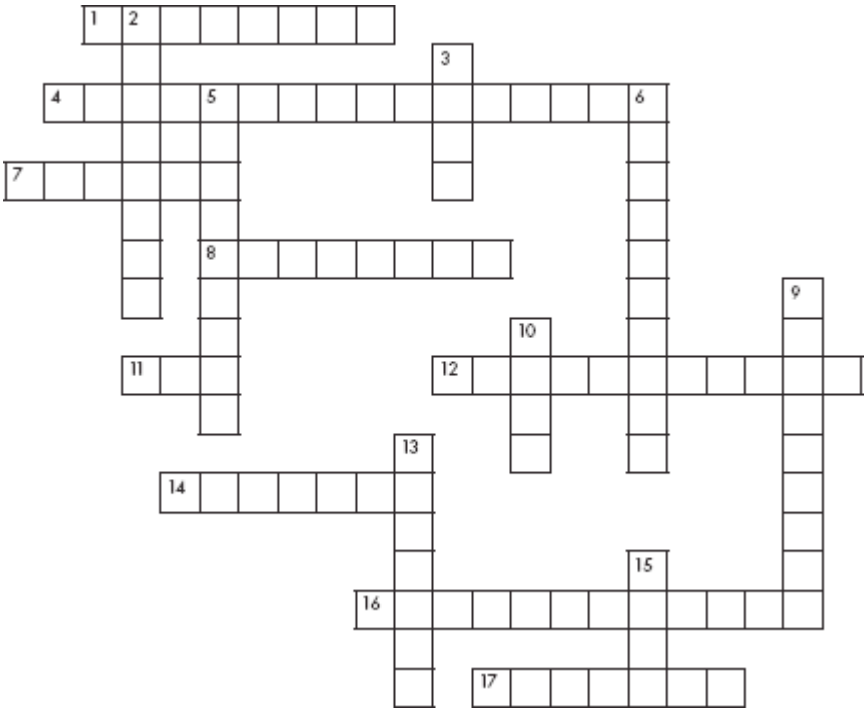
6. monomer of nucleic acid

9. monomer of protein

10. compound that forms hydrogen ions in solution

13. atom of an element that differs in the number of neutrons compared with other atoms of the same element

15. basic unit of matter



Self-Test

Practice what you have learned by answering the questions. Read the question and think of an answer. Then read the answer choices and circle the answer that is the best match.

1. The positively charged particle in an atom is called a

A. neutron.

B. ion.

C. proton.

D. electron.

2. Two or more different atoms are combined in definite proportions in any

A. symbol.

B. isotope.

C. element.

D. compound.

3. Proteins are polymers formed from

A. lipids.

B. amino acids.

C. carbohydrates.

D. nucleic acids.

4. Nucleotides consist of a phosphate group, a nitrogenous base, and a

A. fatty acid.

B. 5-carbon sugar.

C. 6-carbon sugar.

D. lipid.

5. In a chemical reaction, a reactant binds to an enzyme at a region known as the

A. catalyst.

B. product.

C. substrate.

D. active site.

6. Which of the following molecules is made up of a glycerol molecule combined with fatty acids?

A. lipid

B. sugar

C. starch

D. nucleic acid

Short-Response Question

Answer the following question in two or three sentences.

8. Changing the temperature or pH can change the shape of an enzyme. How might changes in temperature or pH affect the function of an enzyme?