

**Chapter 2 The Chemistry of Life****Section 2-1 The Nature of Matter (pages 35-39)**

*This section identifies the three particles that make up atoms. It also explains how atoms of the same element can have a different number of neutrons and describes the two main types of chemical bonds.*

**Atoms (page 35)**

1. The basic unit of matter is called a(an) \_\_\_\_\_.
2. Describe the nucleus of an atom. \_\_\_\_\_  
\_\_\_\_\_
3. Complete the table about subatomic particles.

**SUBATOMIC PARTICLES**

Particle	Charge	Location in Atom
	Positive	
	Neutral	
	Negative	

4. Why are atoms neutral despite having charged particles? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Elements and Isotopes (page 36)**

5. What is a chemical element? \_\_\_\_\_  
\_\_\_\_\_
6. What does an element's atomic number represent? \_\_\_\_\_  
\_\_\_\_\_
7. Atoms of the same element that differ in the number of neutrons they contain are known as \_\_\_\_\_.
8. How are isotopes identified? \_\_\_\_\_
9. Why do all isotopes of an element have the same chemical properties? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Chemical Compounds (page 37)

10. What is a chemical compound? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

11. What does the formula for table salt indicate about that compound?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### Chemical Bonds (pages 38–39)

12. What holds atoms in compounds together? \_\_\_\_\_

13. Complete the table about the main types of chemical bonds.

#### CHEMICAL BONDS

Type	Formed when . . .
Covalent bond	
Ionic bond	

14. What is an ion? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

15. Is the following sentence true or false? An atom that loses electrons has a negative charge. \_\_\_\_\_

16. The structure that results when atoms are joined together by covalent bonds is called a(an) \_\_\_\_\_.

17. Circle the letter of each sentence that is true about covalent bonds.

- a. When atoms share two electrons, it is called a double bond.
- b. In a water molecule, each hydrogen atom forms a single covalent bond.
- c. Atoms can share six electrons and form a triple bond.
- d. In a covalent bond, atoms share electrons.

18. The slight attractions that develop between oppositely charged regions of nearby molecules are called \_\_\_\_\_.

## Section 2–2 Properties of Water (pages 40–43)

*This section describes the makeup of water molecules. It also explains what acidic solutions and basic solutions are.*

### The Water Molecule (pages 40–41)

- Is the following sentence true or false? A water molecule is neutral. \_\_\_\_\_
- What results from the oxygen atom being at one end of a water molecule and the hydrogen atoms being at the other end? \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
- Why is a water molecule polar? \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
- Circle the letter of each sentence that is true about hydrogen bonds.
  - A hydrogen bond is stronger than an ionic bond.
  - The attraction between the hydrogen atom on one water molecule and the oxygen atom on another water molecule is an example.
  - A hydrogen bond is stronger than a covalent bond.
  - They are the strongest bonds that form between molecules.
- Complete the table about forms of attraction.

#### FORMS OF ATTRACTION

Form of Attraction	Definition
Cohesion	
Adhesion	

- Why is water extremely cohesive? \_\_\_\_\_  
 \_\_\_\_\_
- The rise of water in a narrow tube against the force of gravity is called \_\_\_\_\_.
- How does capillary action affect plants? \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

### Solutions and Suspensions (pages 41–42)

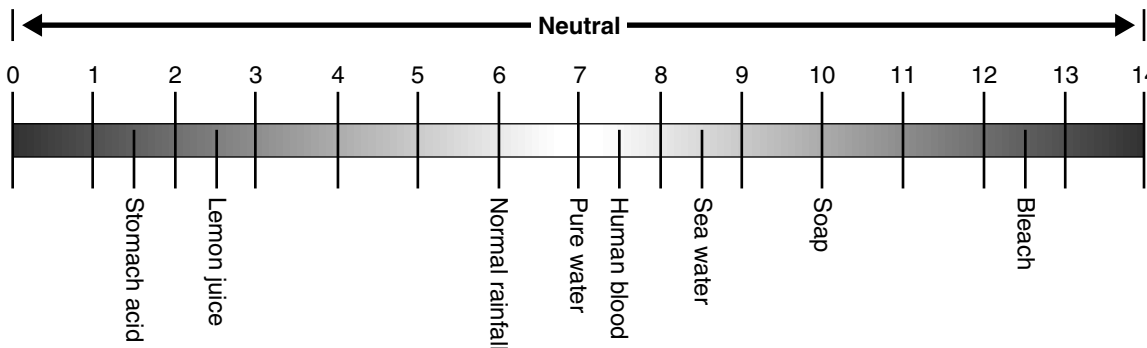
9. What is a mixture? \_\_\_\_\_  
\_\_\_\_\_
10. A mixture of two or more substances in which the molecules of the substances are evenly mixed is called a(an) \_\_\_\_\_.
11. The greatest solvent in the world is \_\_\_\_\_.
12. What is a suspension? \_\_\_\_\_  
\_\_\_\_\_
13. Complete the table about substances in solutions.

#### SUBSTANCES IN SOLUTIONS

Substance	Definition	Saltwater Solution
Solute		
		Water

### Acids, Bases, and pH (pages 42–43)

14. Two water molecules can react to form \_\_\_\_\_.
15. Why is water neutral despite the production of hydrogen ions and hydroxide ions?  
\_\_\_\_\_  
\_\_\_\_\_
16. What does the pH scale indicate? \_\_\_\_\_  
\_\_\_\_\_
17. On the pH scale below, indicate which direction is increasingly acidic and which is increasingly basic.



Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

18. How many more  $H^+$  ions does a solution with a pH of 4 have than a solution with a pH of 5? \_\_\_\_\_

19. Circle the letter of each sentence that is true about acids.

- a. Acidic solutions have pH values below 7.
- b. An acid is any compound that forms  $H^+$  ions in solution.
- c. Strong acids have pH values ranging from 11 to 14.
- d. Acidic solutions contain higher concentrations of  $H^+$  ions than pure water.

20. Circle the letter of each sentence that is true about bases.

- a. Alkaline solutions have pH values below 7.
- b. A base is a compound that produces  $OH^-$  ions in solution.
- c. Strong bases have pH values ranging from 11 to 14.
- d. Basic solutions contain lower concentrations of  $H^+$  ions than pure water.

21. What are buffers? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Section 2–3 Carbon Compounds (pages 44–48)

*This section explains how the element carbon is able to form millions of carbon, or organic, compounds. It also describes the four groups of organic compounds found in living things.*

### The Chemistry of Carbon (page 44)

1. How many valence electrons does each carbon atom have? \_\_\_\_\_

2. What gives carbon the ability to form chains that are almost unlimited in length?

### Macromolecules (page 45)

3. Many of the molecules in living cells are so large that they are known as \_\_\_\_\_.

4. What is the process called by which macromolecules are formed? \_\_\_\_\_

5. When monomers join together, what do they form? \_\_\_\_\_

6. What are four groups of organic compounds found in living things?

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

d. \_\_\_\_\_

### Carbohydrates (pages 45–46)

7. What atoms make up carbohydrates? \_\_\_\_\_

8. Circle the letter of each sentence that is true about carbohydrates.

a. Starches and sugars are examples of carbohydrates.

b. Living things use them as their main source of energy.

c. The monomers in sugar polymers are starch molecules.

d. Plants and some animals use them for strength and rigidity.

9. Single sugar molecules are also called \_\_\_\_\_.

10. Circle the letter of each monosaccharide.

a. galactose      b. glycogen      c. glucose      d. fructose

11. What are polysaccharides? \_\_\_\_\_

12. How do plants and animals store excess sugar? \_\_\_\_\_

**Lipids** (pages 46–47)

13. What kinds of atoms are lipids mostly made of? \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
14. What are three common categories of lipids?  
 a. \_\_\_\_\_ b. \_\_\_\_\_ c. \_\_\_\_\_
15. Many lipids are formed when a glycerol molecule combines with compounds called \_\_\_\_\_.
16. Circle the letter of each way that fats are used in living things.  
 a. As parts of biological membranes  
 b. To store energy  
 c. To give plants rigidity  
 d. As chemical messengers
17. Complete the table about lipids.

**LIPIDS**

Kind of Lipid	Description
	Each carbon atom in a lipid's fatty acid chain is joined to another carbon atom by a single bond.
Unsaturated	
	A lipid's fatty acids contain more than one double bond.

**Nucleic Acids** (page 47)

18. Nucleic acids contain what kinds of atoms? \_\_\_\_\_  
 \_\_\_\_\_
19. The monomers that make up nucleic acids are known as \_\_\_\_\_.
20. A nucleotide consists of what three parts? \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
21. What is the function of nucleic acids in living things? \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

22. What are two kinds of nucleic acids?

- a. \_\_\_\_\_
- b. \_\_\_\_\_

**Proteins** (pages 47–48)

23. Proteins contain what kinds of atoms? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

24. Proteins are polymers of molecules called \_\_\_\_\_.

25. What are four roles that proteins play in living things?

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_

**Reading Skill Practice**

You can often increase your understanding of what you've read by making comparisons. A compare-and-contrast table helps you to do this. On a separate sheet of paper, make a table to compare the four groups of organic compounds you read about in Section 2–3. You might use the heads *Elements*, *Functions*, and *Examples* for your table. For more information about compare-and-contrast tables, see Organizing Information in Appendix A.

## Section 2–4 Chemical Reactions and Enzymes (pages 49–53)

*This section describes what happens to chemical bonds during chemical reactions. It also explains how energy changes affect chemical reactions and describes the importance of enzymes.*

### Chemical Reactions (page 49)

1. What is a chemical reaction? \_\_\_\_\_  
\_\_\_\_\_
2. Complete the table about chemicals in a chemical reaction.

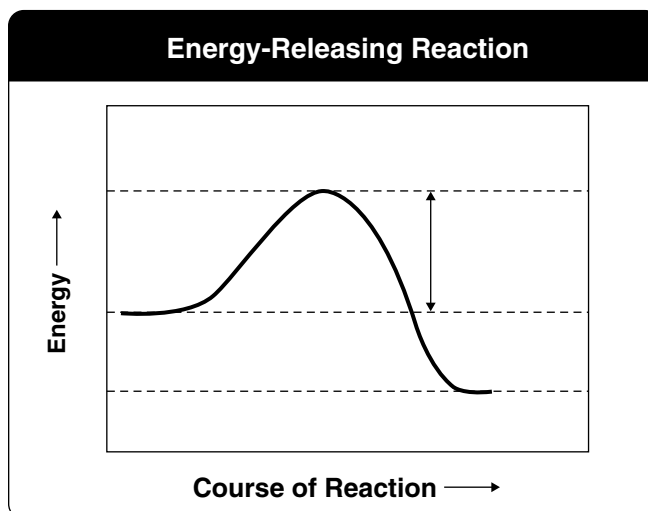
**CHEMICALS IN A CHEMICAL REACTION**

Chemicals	Definition
Reactants	
Products	

3. Chemical reactions always involve changes in chemical \_\_\_\_\_.

### Energy in Reactions (page 50)

4. What is released or absorbed whenever chemical bonds form or are broken?  
\_\_\_\_\_
5. What do chemical reactions that absorb energy need to occur? \_\_\_\_\_  
\_\_\_\_\_
6. Chemists call the energy needed to get a reaction started the \_\_\_\_\_.
7. Complete the graph of an energy-releasing reaction by adding labels to show the energy of the reactants, the energy of the products, and the activation energy.



**Enzymes** (pages 51–52)

8. What is a catalyst? \_\_\_\_\_  
\_\_\_\_\_
9. Proteins that act as biological catalysts are called \_\_\_\_\_.
10. What do enzymes do? \_\_\_\_\_  
\_\_\_\_\_
11. From what is part of an enzyme's name usually derived? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Enzyme Action** (pages 52–53)

12. The reactants of enzyme-catalyzed reactions are known as \_\_\_\_\_.
13. Why are the active site and the substrates in an enzyme-catalyzed reaction often compared to a lock and key? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
14. The binding together of an enzyme and a substrate forms a(an) \_\_\_\_\_.
15. How do most cells regulate the activity of enzymes? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## WordWise

Answer the questions by writing the correct vocabulary term in the blanks.  
Use the circled letter(s) in each term to find the hidden vocabulary word.  
Then, write a definition for the hidden word.

### Clues

What is a negatively charged subatomic particle?

What is the basic unit of matter?

What is a large compound formed from combinations of many monomers?

What is an organic compound called that is used to store energy and forms important parts of biological membranes?

What is an element or compound called that is produced by a chemical reaction?

What is the type of mixture whose components are evenly distributed throughout?

What is an atom called that has a positive or negative charge as a result of gaining or losing electrons?

What is a monomer of nucleic acids called?

### Vocabulary Terms

— — — o — — — —

— — o —

— — — — o — — —

— — o — —

— — o — — — —

— — — o — — — — —

— — o

— — — — — — — — o —

**Hidden Word:** \_ \_ \_ \_ \_

**Definition:** \_\_\_\_\_  
\_\_\_\_\_