Name _____ Date _____ Class _____

What Are Waves?

Key Concepts

- What causes mechanical waves?
- What are two types of waves and how are they classified?

A **wave** is a disturbance that transfers energy from place to place. In science, **energy** is defined as the ability to do work. When a wave in water passes under an object floating on the water's surface, the energy from the wave moves the object up and down.

The material through which a wave travels is called a **medium**. Gases (such as air), liquids (such as water), and solids (such as ropes) can all be mediums. Waves that require a medium through which to travel are called **mechanical waves. Mechanical waves are produced when a source of energy causes a medium to vibrate.** A **vibration** is a repeated back-and-forth or up-and-down motion.

Mechanical waves are classified by how they move. There are two types of mechanical waves: transverse waves and longitudinal waves.

When you make a wave on a rope, the wave moves from one end of the rope to the other. The rope itself, however, moves up and down or from side to side. Waves that move the medium in a direction perpendicular, or at right angles, to the direction in which the waves are traveling are called **transverse waves**. Transverse means "across." The highest parts of a transverse wave are called **crests**, and the lowest parts are called **troughs**.

Longitudinal waves move the particles of the medium parallel to the direction in which the waves are traveling. If you stretch out a spring toy and push and pull one end, you can produce longitudinal waves. In some parts of the spring, the coils are close together. In other parts, the coils are more spread out. The parts where the coils are close together are called **compressions**. The parts where the coils are spread out, are called **rarefactions**.

To draw transverse waves, think of a rope. The horizontal line the straight rope makes before it is disturbed is the rest position. As the wave passes, the rope goes above or below the rest position. The crests and troughs are the highest and lowest points on the wave.

To draw longitudinal waves, think of the compressions in a spring toy as being similar to the crests of a transverse wave. The rarefactions in the spring toy are like the troughs of a transverse wave. The compressions in the spring toy are like the crests of a transverse wave. By treating compressions as crests and rarefactions as troughs, you can draw longitudinal waves in the same way as transverse waves.

Name _____ Date _____ Class _____

What Are Waves? (pp. 510–514)

This section explains what causes waves and identifies two types of waves.

Use Target Reading Skills

Before you read the passage for each heading, fill in the top box with what you know. After you have read the passage, fill in the bottom box with what you have learned.

What You Know
1. Waves are high and low.
2.
3.
4.
5.

What You Learned
1.
2.
3.
4.
5.

Waves and Energy (pp. 511–512)

1. What is a wave?

_____

_____

2. The material through which a wave travels is called a(n) _____.

3. Circle the letter of each of the following that can act as mediums.
   a. solids
   b. liquids
   c. gases
   d. empty space

What Are Waves? *(continued)*

4. Waves that require a medium through which to travel are called _____.

5. Is the following sentence true or false? When waves travel through a medium, they carry the medium with them. _____

6. Explain what happens to the motion of a duck on the surface of a pond when a wave passes under it.

_____

_____

_____

_____

7. Give an example of a wave that can travel through empty space.

_____

_____

8. Mechanical waves are produced when a source of energy causes a medium to _____

9. What is a vibration?

_____

_____

_____

Types of Waves (pp. 512–514)

10. How are mechanical waves classified?

_____

_____

11. Waves that move the medium at right angles to the direction in which the waves are traveling are called _____.

12. Suppose you move the free end of a rope up and down to create a wave. In that case, the rope is the medium. What is the relationship between the movement of the wave and the movement of the particles of the medium?

_____

_____

_____

_____

13. The highest parts of a transverse wave are called _____.

14. The lowest parts of a transverse wave are called _____.

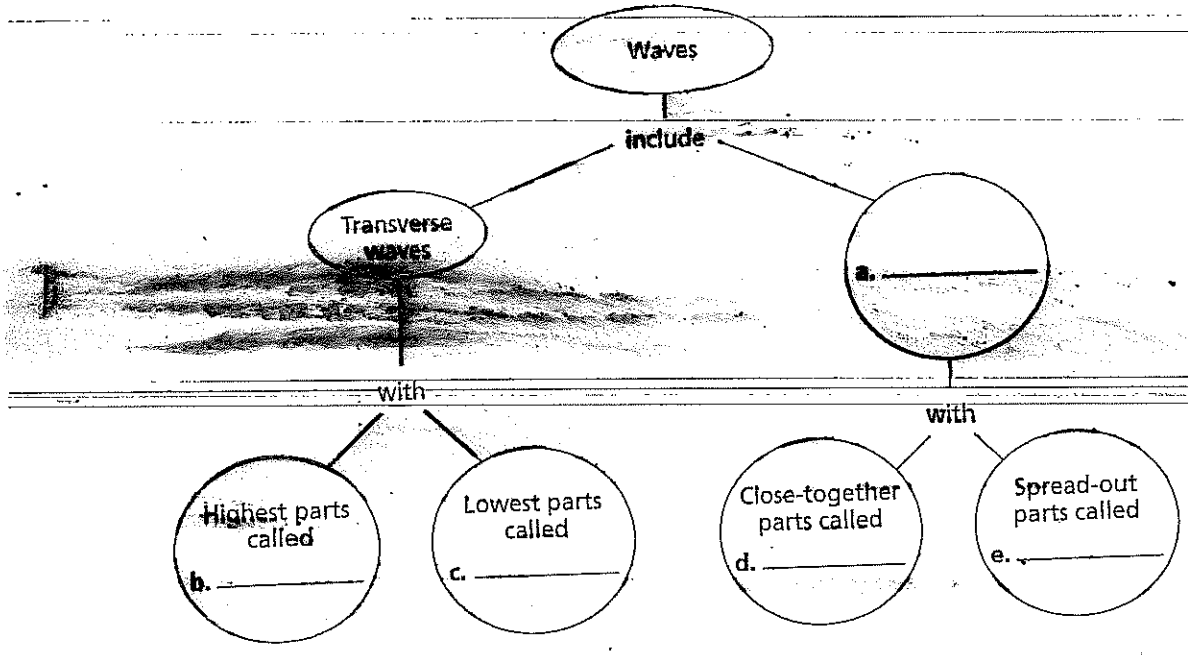
15. What type of waves move the particles of the medium parallel to the direction in which the waves are traveling?

_____

16. In longitudinal waves in a spring, the parts where the coils are close together are called _____.

17. In longitudinal waves in a spring, the parts where the coils are spread out are called _____.

18. Complete this concept map about types of waves.



19. If you were to draw a longitudinal wave, you should think of the compressions as _____ on a transverse wave and the rarefactions as _____ on a transverse wave.