Name Date Class

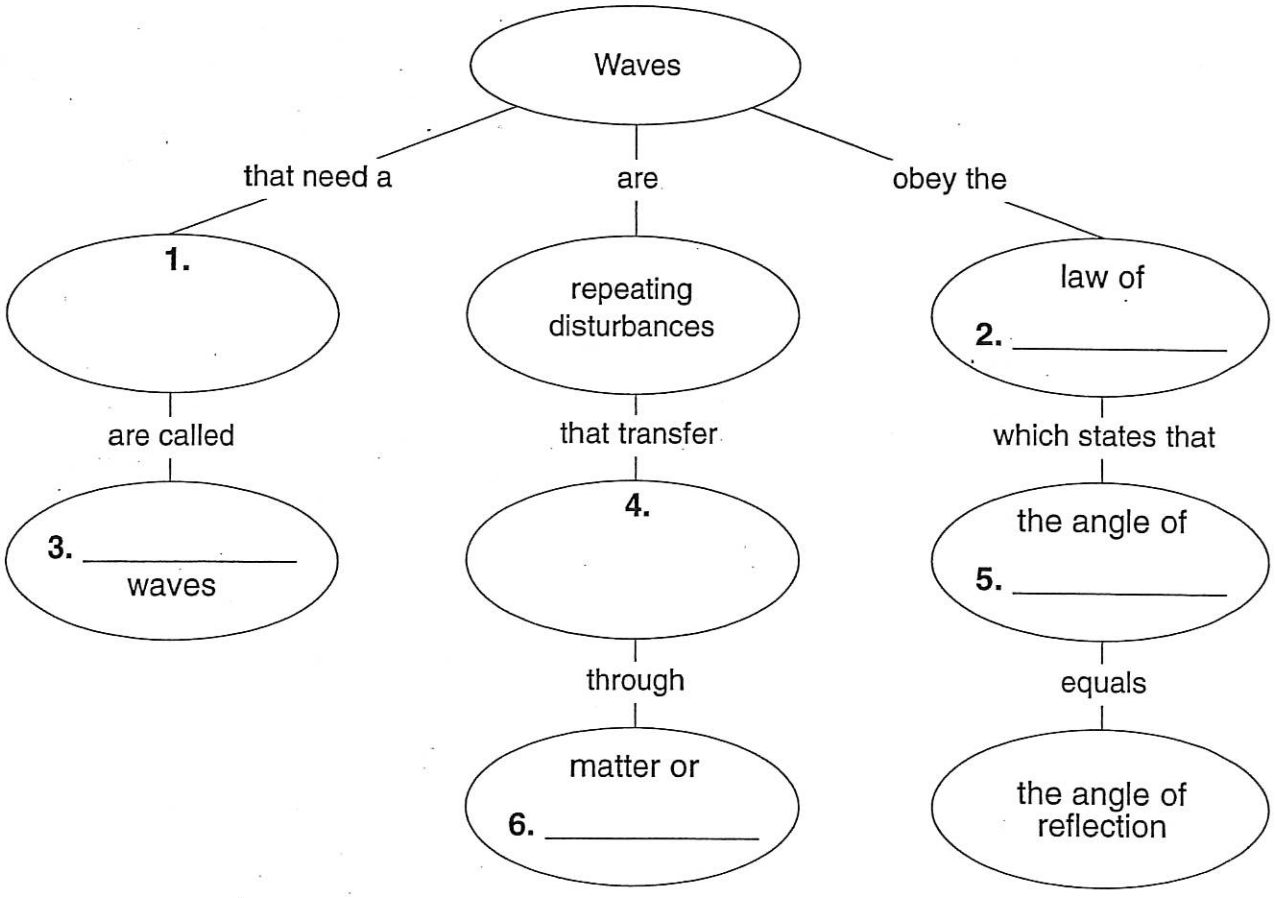
Directed Reading for Content Mastery

Overview Waves

Directions: *Complete the concept map using the terms in the list below.*

reflection **medium** **incidence**

energy **mechanical** **space**



Directions: *For each of the following write the letter of the phrase that best completes the sentence.*

_____ 7. The high point of a transverse wave is _____ .

a. a rarefaction **b.** the frequency **c.** the crest

_____ 8. The less dense region of a compression wave is called _____.

a. a rarefaction **b.** the frequency **c.** the crest

_____ 9. The number of wavelenghts that pass a fixed point each second is _____ of a wave.

a. a rarefaction **b.** the frequency **c.** the crest

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Note-taking Worksheet

Waves

Section 1 The Nature of Waves

A. **Wave**—a repeating disturbance or movement that transfers _____ through matter or space

1. Molecules pass energy on to _____ molecules.
2. Waves carry energy without transporting _____.
3. All waves are produced by something that _____.
4. **Medium**—a _____ through which a wave travels.
   a. May be solid, liquid, or _____
   b. Not all waves need a medium to travel through; example: _____

B. Mechanical waves—waves that can travel only through _____

1. **Transverse waves**—matter in the medium moves back and forth _____ the direction that the wave travels; example: _____
2. **Compressional waves**—matter in the medium moves _____ that the wave travels; example: _____
3. Combinations—not purely transverse or compressional; examples: water waves, _____ waves

Section 2 Wave Properties

A. Ways waves differ

1. How much _____ they carry
2. How _____ they travel
3. How they look
   a. _____ waves have **crests**—the highest points, and **troughs**—the lowest points.
   b. Compressional waves have dense regions called _____ and less dense regions called _____.

B. **Wavelength**—the distance between one point in the wave and _____

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Note-taking Worksheet (continued)

C. **Frequency**—how many _____ pass a fixed point each second

1. Expressed in _____
2. As frequency increases, wavelength _____.
3. The frequency of a wave equals the rate of _____ of the source that creates it.

D. Wave _____, or v, describes how fast the wave moves forward.

1. _____ = wavelength × _____, or $v = \lambda \times f$.
2. Light waves travel _____ than sound waves.
3. Sound waves travel faster in _____ and _____ than in gas.
4. Light waves travel faster in _____ and _____ than in liquids and solids.

E. **Amplitude**—a measure of the _____ in a wave

1. The more energy a wave carries, the _____ its amplitude.
2. Amplitude of _____ waves is related to how tightly the medium is pushed together at the compression.
   a. The _____ the compressions, the larger the amplitude is and the more energy the wave carries.
   b. The less dense the rarefactions, the _____ the amplitude and the more energy the wave carries.
3. Amplitude of _____ waves
   a. The distance from the crest or trough of a wave to the _____of the medium
   b. Example: how high an ocean wave appears above the water level

Section 3 The Behavior of Waves

A. Reflection occurs when a wave strikes an object and _____ of it.

1. _____ types of waves can be reflected.
2. The angle of incidence of a wave is always equal to the angle of _____.
   a. Normal—an imaginary line _____ to a reflective surface
   b. Angle of _____—the angle formed by the wave striking the surface and the normal
   c. Angle of _____—the angle formed by the reflected wave and the normal

Meeting Individual Needs

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SECTION 1 Reinforcement

The Nature of Waves

Directions: *Answer the following questions on the lines provided.*

1. What is a wave?

2. What travels on a wave?

3. How is a wave created?

4. What is a mechanical wave?

5. List the two types of mechanical waves and define them.

   a. _____

   b. _____

6. What type of wave is a sound wave?

7. How does sound travel through a medium?

8. Describe the motion of something floating in water waves.

9. What causes ocean waves?

10. What are seismic waves?

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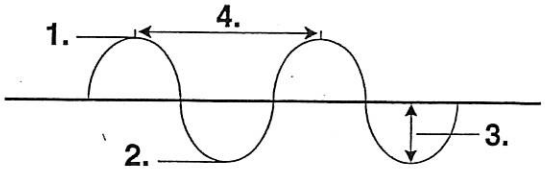
SECTION 2 Reinforcement

Wave Properties

Directions: *Study Figure 1, then identify each part by filling in the blanks below.*

Figure 1



1. _____
2. _____
3. _____
4. _____

Directions: *Answer the following questions on the lines provided.*

5. List three characteristics of a wave that you can measure.

_____

6. What is meant by the frequency of a wave? What is the unit?

_____

_____

7. If the frequency of a given wave increases, what happens to the wavelength?

_____

_____

Directions: *Fill out the following table by describing how to measure each of the quantities for the two types of waves.*

Wave	Wavelength	Amplitude
8. transverse		
9. compressional		

10. What is the velocity of a wave with a frequency of 6 Hz and a wavelength of 2 m?

_____

_____

Meeting Individual Needs

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SECTION 1 Enrichment

Sonic Booms

You have learned that a sound wave is a compression wave. A sound wave's speed is affected by the medium through which the wave travels. Temperature also affects the speed of sound. Higher temperatures increase the velocity of sound waves. At room temperature (about 20°C) the speed of sound is about 343 meters per second.

The Sound Barrier

So what would happen if something, like an airplane, traveled faster than the speed of sound? For years physicists and engineers argued about whether it was even possible to fly faster than sound. Think about this for a moment. If the plane is making a certain sound from the roaring of the jet engines, what would happen when the jet flew faster than the sound it was making? This point, at which something is moving as fast as the speed of the sound it is making, is called the sound barrier. Some people thought that if a plane flew faster than the speed of sound it would explode or break apart from the force it generated. In 1947 a man named Chuck Yeager proved this was not true. He was the first man to fly faster than the speed of sound.

Today all kinds of supersonic jets fly faster than the speed of sound. When a jet breaks the sound barrier, a loud noise or sonic boom is heard. If the plane is close enough to the ground, the boom can break glass and damage property. It is a forceful blast of sound. The reason it is so forceful is because of the compression waves. As the plane flies faster and faster, the air molecules begin to compress on each other. They compress at an increasing rate. Eventually the energy of compressed molecules becomes too great and they explode in all directions. This explosion makes the sound known as the sonic boom.

In the Mach Cone

The explosion continues to occur as the plane moves along, but you can only hear it as it passes over you. You are in what scientists call the Mach cone. The faster the plane goes, the narrower the Mach cone becomes. If the plane is flying high enough you will not be in the Mach cone and will not hear any boom. Supersonic planes are told to fly high enough to avoid causing any damage from their sonic booms. That's why we hear fewer sonic booms these days.

1. What is the sound barrier?

2. Describe what happens when a jet flies faster than the speed of sound.

3. How does a sonic boom happen?

4. What is a Mach cone?

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