Waves Activity 3 Name:_____

5-11-20 to 5-18-20

Read the attached textbook pages (Prentice Hall: chapter 1, section 3.)

Answer the section review questions

1. What is the difference between a transverse wave and a longitudinal wave?

2. What is a compression? A rarefaction?

3. Describe a surface wave.

4. Describe an example of a transverse wave that gives rise to a longitudinal wave.

the rope again. If you move your hand slowly, the rope vibrates slowly. Perhaps you will create one new wave every two or three seconds. If you move your hand rapidly, the rope vibrates rapidly. This way, you may create several waves each second. Try it and see!

Frequency, which is often used to describe waves, is an important characteristic. Frequency is used to distinguish one color of light from another, as well as one sound from another. For example, red light is different from blue light because red light has a lower frequency. A dog can hear a whistle that you cannot hear because dogs can hear sounds at higher frequencies than humans can.

1–2 Section Review

1. Define three basic characteristics of a wave.
2. What is the unit of wave frequency? How is it defined?
3. If the horizontal distance from a crest to a trough is 1.0 m, what is the wavelength?

Critical Thinking—*Making Calculations*

4. Suppose you notice that 20 waves pass a point in 5 sec. What is the frequency? How many waves would pass a point in 1 sec if the wave frequency were two times greater?

Guide for Reading

Focus on this question as you read.

▶ *What is the difference between a transverse wave and a longitudinal wave?*

1–3 Types of Waves

You learned that mechanical waves require a medium through which to travel. Although they share this characteristic, all mechanical waves are not the same. Ocean waves are a different type of wave from sound waves. Why? Although they both transfer energy through a medium, the movement of the disturbance, or wave, through the medium is quite different. Depending on the motion of the medium as compared to the movement of the wave, waves are classified as either transverse or longitudinal.

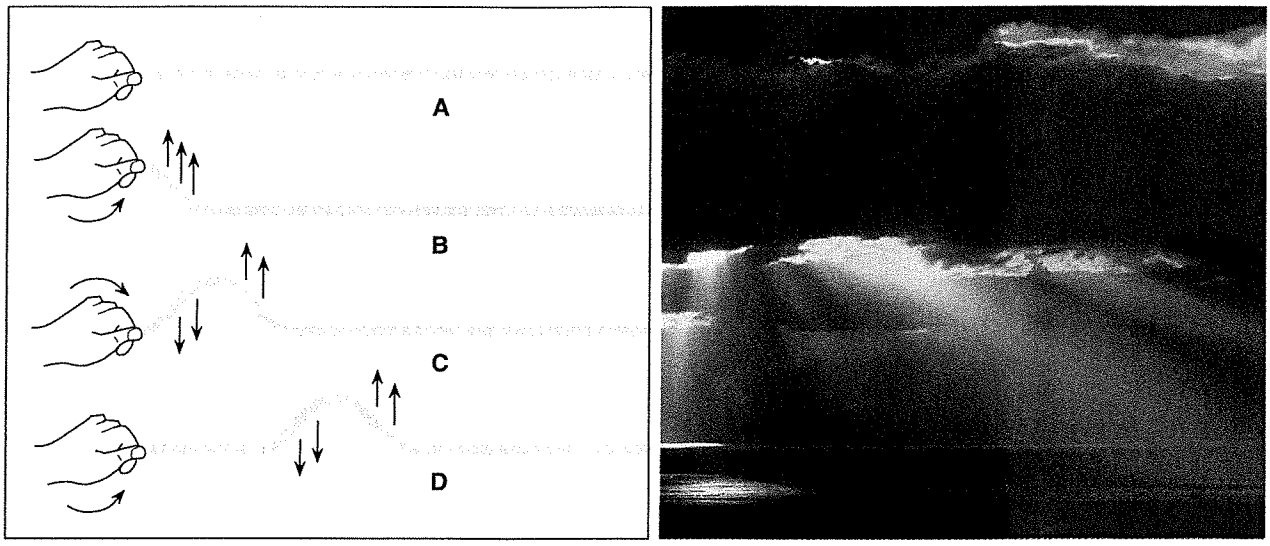


Figure 1–10 *A wave on a rope is the same type of wave as a wave that carries sunlight to your eyes. What type of wave is it?*

Transverse Waves

When one end of a rope is jerked, energy is given to the nearby particles of rope. These particles start to move up and down (vertically) as a result of the energy. As they move, they transfer energy to neighboring particles, which in turn move up and down. As each neighboring rope particle begins to move up and down, energy is transferred from one place to another (horizontally). Each particle moves up and down, but the wave moves horizontally along the rope. Thus the movement of the particles is vertical while the movement of the wave is horizontal. The two movements are at right angles to each other. **A wave in which the motion of the medium is at right angles to the direction of the wave is called a transverse wave.** A wave on a rope is a **transverse wave**. Light and other electromagnetic waves are transverse waves.

Longitudinal Waves

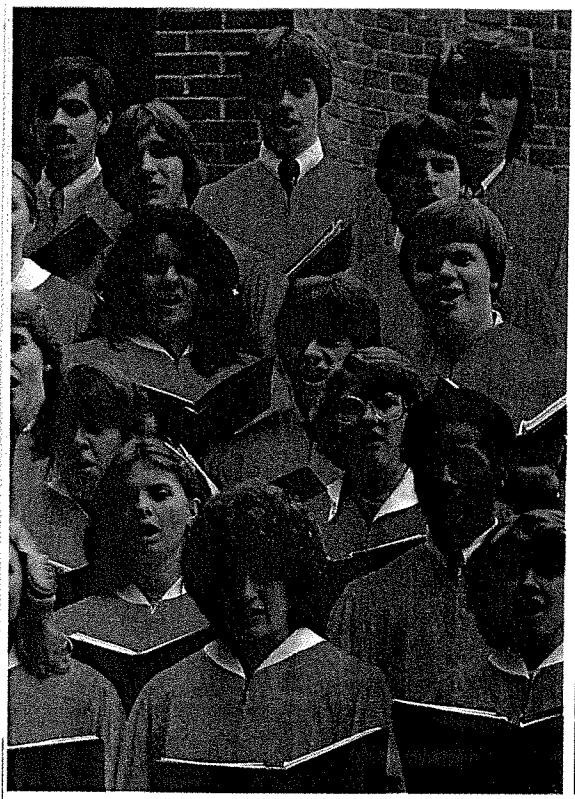
Clap your hands together near your face. Do you hear a clap? Do you also feel air striking your face? When you clap your hands, you move the particles of air away from their resting positions and crowd them together. A space in the medium in which the particles are crowded together is called a compression (kuhm-PREHSH-uhn). Because you give the particles energy, they begin to vibrate back and forth.

ACTIVITY

READING

Mysteries of the Sea

The wonders of the sea have been the topic of many beautiful works of art and literature throughout time. Obtain and read "Sea Songs" by Myra Cohn Livingston. This is a wonderful poem about the magic and mysteries of nature.



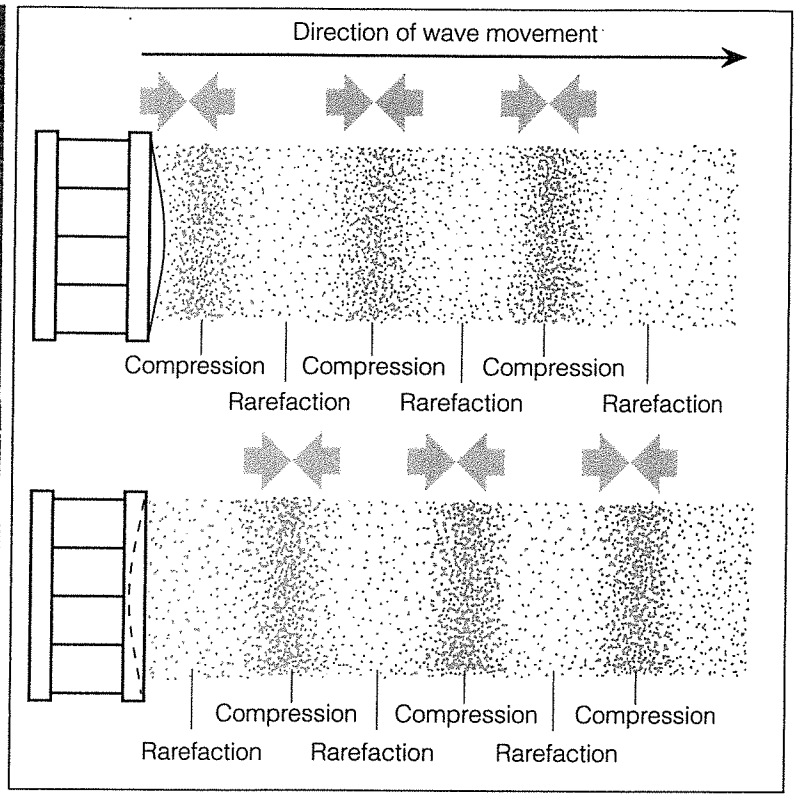


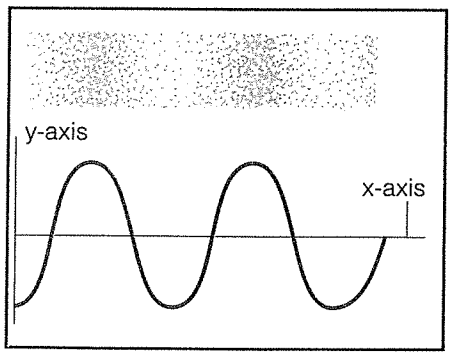
Figure 1–11 *The vibration of a drum head produces compressions and rarefactions in the air. So do the melodious voices of singers in a choir. What type of a wave is a sound wave?*

See Figure 1–11. As the particles of air move to the right, they pass their resting positions and collide with the particles of air next to them. These particles also become compressed. Then the first set of air particles moves to the left while the second set of particles begins to vibrate and moves to the right. This leaves a space that contains many fewer particles. A space in the medium in which there are fewer particles is called a rarefaction (rair-uh-FAK-shuhn).

Each layer of particles pushes the next layer as the compressions move forward through the medium. Each compression is followed by a rarefaction. So rarefactions also move forward. As the layers of particles move back and forth through a medium, compressions and rarefactions develop and move in a regular, repeating way. Energy is transmitted as a wave. A wave that consists of a series of compressions and rarefactions is a **longitudinal** (lahn-juh-TOOD-uh-uhl) **wave.**

As you can see, longitudinal waves are quite different from transverse waves. **In a longitudinal wave, the motion of the medium is parallel to the direction of the wave.** In other words, the particles of the medium move in the same direction in which the wave moves. Sound waves are longitudinal waves.

Figure 1–12 *Longitudinal waves can be represented on a graph. The crests of a longitudinal wave represent the compressions. The troughs represent the rarefactions.*



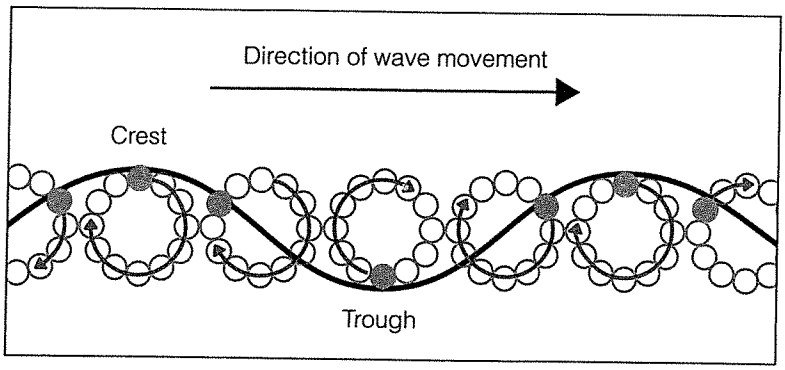


Figure 1–13 *The particles affected by a surface wave move in circular patterns. The energy of the wave is transmitted without the movement of the medium as a whole.*

Longitudinal waves can be represented on a graph in the same way transverse waves can. The crests represent the crowded areas, or compressions. The troughs represent the least crowded areas, or rarefactions. The wavelength of a longitudinal wave is the distance between compressions or rarefactions. Frequency is the number of compressions or rarefactions that pass a point per second.

Combinations of Waves

Some waves cannot be described as only transverse or longitudinal. That is because these waves are a combination of the two types of waves. An example of such a wave is a **surface wave**. Surface waves (as their name implies) occur at the surface between two different mediums. Water waves on the surface of the ocean are an example of surface waves. They travel between water and air. The motion of each particle is neither up and down nor back and forth. It is a combination of both movements. The combination produces a wave in which each particle moves in a circle.

1–3 Section Review

1. What is the difference between a transverse wave and a longitudinal wave?
2. What is a compression? A rarefaction?
3. What is an example of a transverse wave? Longitudinal wave?
4. Describe a surface wave.

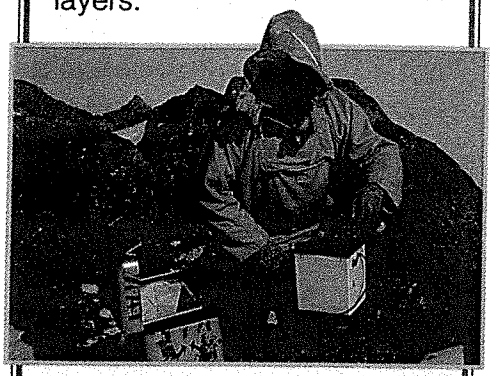
Critical Thinking—*Making Connections*

5. Describe an example of a transverse wave that gives rise to a longitudinal wave.

CAREERS

Geophysicist

Scientists who study and map out the Earth's layers and discover its treasures are called **geophysicists**. A common technique used by geophysicists is to send sound waves downward through rock. The sound waves are reflected from the rock layers back to the surface. By recording the time it takes for the waves to travel through the various regions, geophysicists can determine the components of the rock layers.



A college degree in geology is required to become a geophysicist. For more information, contact the American Geophysical Union, Meetings and Members Program, 2000 Florida Avenue, NW, Washington, DC 20009.