

10-5 What are ocean waves?

Objective

Identify the properties of an ocean wave.

Key Terms

wave: regular up-and-down movement of water

crest: highest point of a wave

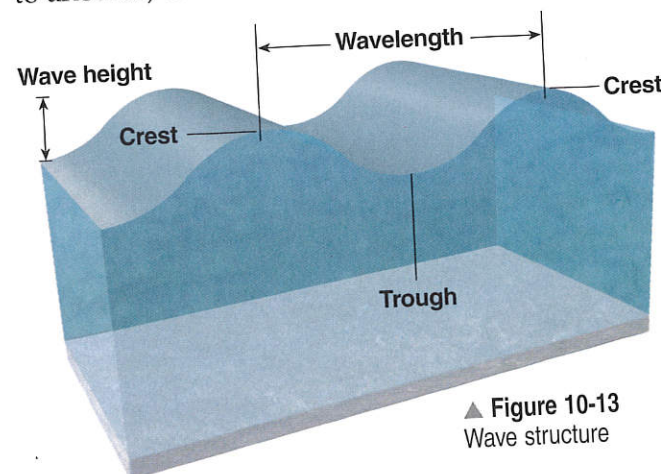
trough (TRAWF): lowest point of a wave

How Waves Form When a wind blows across the water, waves are formed. A **wave** is a regular up-and-down movement of water. On a windy day at the beach, the ocean water gets rough. The waves are high when the wind is strong. On a calm day, the waves are not as high.

1 DEFINE: What is a wave?

Wave Shape A wave has a high point and a low point. The highest point, or top of a wave, is the **crest**. The lowest point of a wave is the **trough**. The height of a wave is the distance from crest to trough. Waves can reach heights of more than 15 m. However, eventually a wave reaches a point when it becomes too high and topples over. A white cap is then formed.

As you watch waves move across the water, you see one crest following another. The distance from one crest to another crest (or from one trough to another) is the wavelength of the wave.



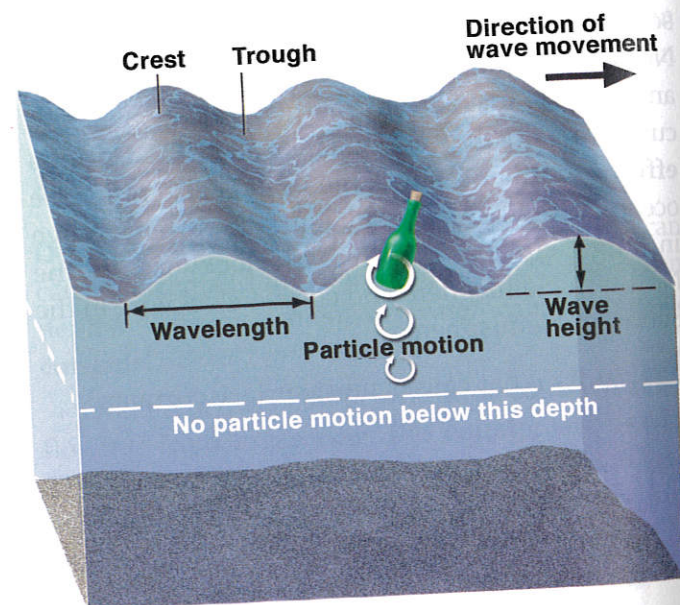
▲ Figure 10-13 Wave structure

2 EXPLAIN: How is wave height measured?

Water Movement in Waves In deep water, the water in a wave does not move forward as the wave moves. Only the energy in the wave moves forward.

You can see the movement of water by watching a floating object. As a wave moves by, the object moves slightly forward. As the wave passes, the object falls back about the same distance. The object appears to be moving up and down in the same place.

As a wave moves across the ocean, water particles in the wave move in circles. At the surface, the size of the circles is the same as the height of the waves.

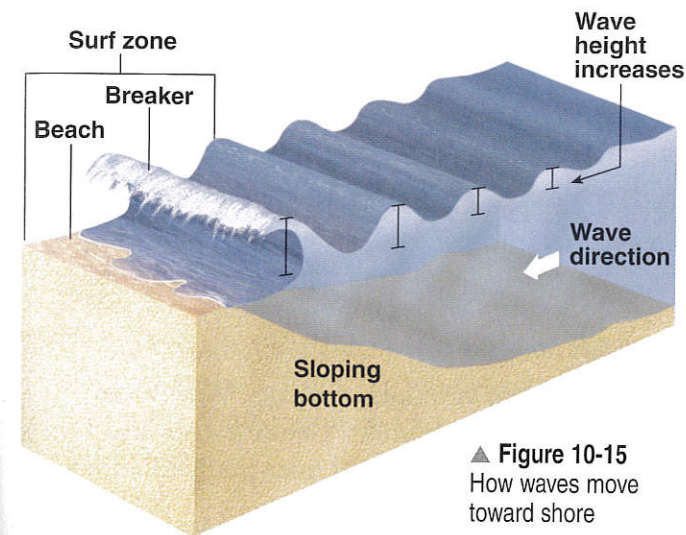


▲ Figure 10-14 Particle motions in waves

3 DESCRIBE: How do water particles move in a wave?

Breaking Waves As waves move through deep water, they are not affected much by the depth of the water. However, the shallow waters of the shoreline drag on the wave and cause it to slow down.

As a wave slows down, its height rises until a certain critical height is reached. At this critical point, the wave breaks. The energy contained in the wave up until then changes form. The wave no longer moves in an up and down motion. It advances up the shore as a sheet of water.



▲ Figure 10-15 How waves move toward shore

4 EXPLAIN: Why does a wave slow up in shallow water?

CHECKING CONCEPTS

- Most waves are caused by _____.
- The top of a wave is the _____.
- The distance between crests is the _____.
- Only the _____ of a wave moves forward.

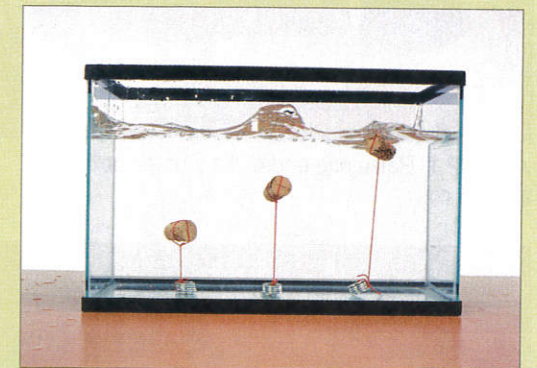


Hands-On Activity

MODELING WAVE MOTION

You will need an aquarium tank, metal washers, and four or five corks.

- Fill the aquarium tank about 3/4 full of water.
- Tie enough metal washers to a cork so that it floats about 3 cm from the tank bottom.
- Repeat Step 2 with more corks so that they float 9 cm from the bottom, 15 cm from the bottom, and so on, until the last cork floats on the surface.
- Make small, steady waves in the tank by moving your hand up and down in the water. Note what happens to each cork.
- Repeat Step 4, but increase the height of the waves by moving your hand faster.



▲ STEP 4 Make small, steady waves in the tank.

Practicing Your Skills

- ANALYZE:** How does increasing the wave height affect the motion of each cork?
- OBSERVE:** What features of a wave did you observe in this activity?



THINKING CRITICALLY

- MODEL:** Draw a wave and label it.
- INFER:** Early in the day, the water at the beach is fairly calm. Later in the day, the water begins to get rough. What do you think might be causing this?

Web InfoSearch

Tsunamis A tsunami (soo-NAH-mee) is an ocean wave. However, unlike other ocean waves, tsunamis are not caused by wind. Tsunamis carry a great deal of energy. They can be very destructive.

SEARCH: Use the Internet to find out more about tsunamis. What causes them? What happens as they approach the shore? To find out, start your search at www.conceptsandchallenges.com. Some key search words are **tsunamis**, **how tsunamis form**, and **underwater earthquakes**.