

Chapter 14 Section 3 Waves

Bellringer

For each pair of terms, explain how the meanings of the terms differ.

- whitecap and swell
- undertow and longshore current



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Objectives

- **Identify** the parts of a wave.
- **Describe** how ocean waves form and move.
- **Classify** types of waves.

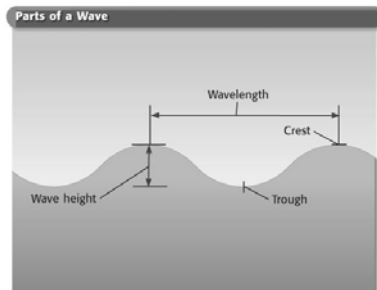


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Anatomy of a Wave

- Waves are made up of crests and troughs
- A crest is the highest point of a wave.
- A trough is the lowest point of a wave.

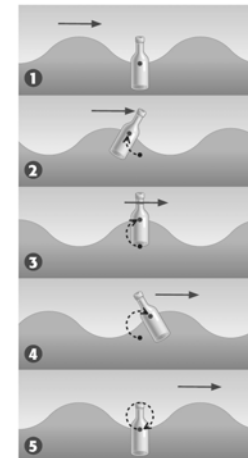


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Wave Formation and Movement

- Most waves form as wind blows across the water's surface and transfers energy to the water.
- As the energy moves through the water, so do the waves. But the water itself stays behind, rising and falling in circular movements.

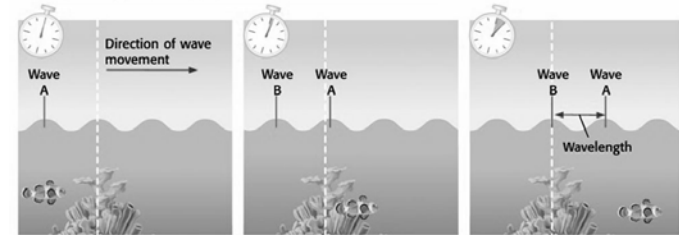


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Specifics of Wave Movement

- Wave period is the time between the passage of two wave crests (or troughs) at a fixed point.

Determining Wave Period



- 1 Notice that the waves are moving from left to right.
- 2 The clock begins running as Wave A passes the reef's peak.
- 3 The clock stops as Wave B passes the reef's peak. The time shown on the clock (5 s) represents the wave period.

Specifics of Wave Movement

- Waves not only come in different sizes but also travel at different speeds. Wave speed is calculated by using the following equation:

$$\frac{\text{wavelength (m)}}{\text{wave period (s)}} = \text{wave speed (m/s)}$$

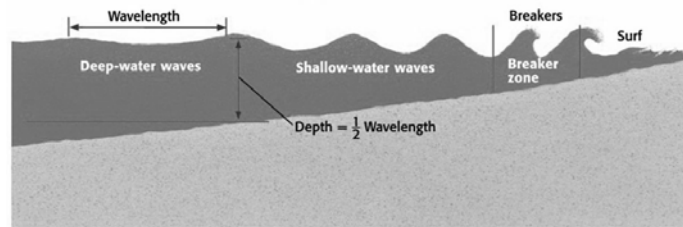
Types of Waves

- **Deep-water waves** are waves that move in water deeper than one-half their wavelength.
- When deep-water waves begin to interact with the ocean floor, the waves are called **shallow-water waves**.
- A breaker is a heightened water wave that breaks into foam near the shore or against a rock or other object.
- The surf is the area between the breaker zone and the shore.

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How Deep-Water Waves Become Shallow-Water Waves

Deep-water waves become shallow-water waves when they reach depths of less than half of their wavelength.



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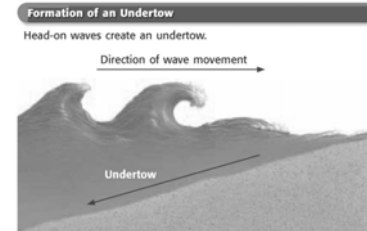
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Types of Waves

- When waves crash on the beach head-on, the water they moved through flows back to the ocean underneath new incoming waves.

- This movement of water forms a subsurface current that pulls objects out to sea and is called an **undertow**.



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Types of Waves

- **Longshore Currents** are water currents that travel near and parallel to the shore line.

- Longshore currents form when waves hit the shore at an angle.

- Longshore currents transport most of the sediment in beach environments



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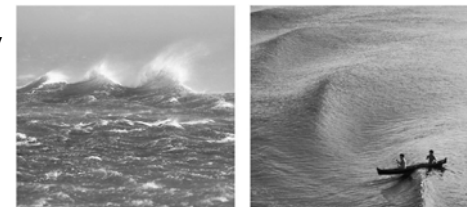
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Types of Waves

- White, foaming waves with very steep crests that break in the open ocean before the waves get close to the shore are called **whitecaps**.

- Rolling waves that move steadily across the ocean are called **swells**.



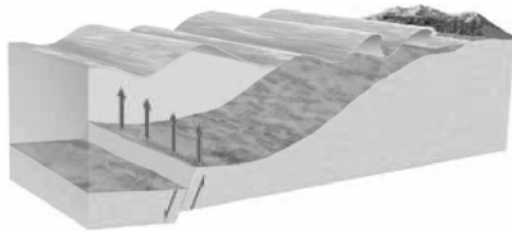
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Types of Waves

- **Tsunamis** are waves that form when a large volume of ocean water is suddenly moved up or down. This movement can be caused by underwater earthquakes, as shown below.



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Types of Waves

- **Storm Surges** are local rises in sea level near the shore that are caused by strong winds from a storm.
- Winds form a storm surge by blowing water into a big pile under the storm. As the storm moves onto shore, so does the giant mass of water beneath it.

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Section Summary

- Waves are made up of two main parts—crests and troughs.
- Waves are usually created by the transfer of the wind's energy across the surface of the ocean.
- Waves travel through water near the water's surface, while the water itself rises and falls in circular movements.
- Wind-generated waves are classified as deep-water or shallow-water waves.
- When waves hit the shore at a certain angle, they can create either an undertow or a longshore current.
- Tsunamis are dangerous waves that can be very destructive to coastal communities.

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