

PhET Wave Simulation

Introduction

Because wind is almost always acting on the sea surface, the patterns of waves observed on the ocean surface are complex and ever-changing. However, these patterns can be investigated by reference to the characteristics of ideal waves. The pattern exhibited by an ideal ocean wave can be uniquely described by a number of characteristics including length, height, period, and speed. These characteristics are determined by the factors that generate the wave.

Waves in the area of generation and still under the force of generation are called forced waves or sea. The size of waves produced by the wind increases with wind speed, wind duration, and fetch, the distance over which the wind blows. The size of waves produced by the wind does have limits. Eventually, the wave becomes unstable and breaks, forming whitecaps. In a fully developed sea, the wind energy input is balanced by energy lost by the breaking waves.

Waves that have traveled beyond the area of generation are called free waves or swell. Once formed, these waves may travel very long distances. As the waves travel, they transfer energy through ocean waters without a significant horizontal transport of the water itself. Because deep-water waves do not interact with the ocean bottom as they travel, their speed is independent of the water depth.

Activity

You will use the PhET simulation lab to explore water waves:

https://phet.colorado.edu/sims/html/waves-intro/latest/waves-intro_en.html

Complete the following worksheet and answer all questions

Part 1 Introduction

Define each of the following:

Wavelength:

Amplitude:

Frequency:

Part 2 Inquiry

1. **Choose the water option for the simulation.**
2. **Change the view to “side view.”**
3. **Click the green button to start the water.**
 - a) In which direction is the wave traveling compared to the disturbance (water drops), perpendicular or parallel?
4. **Check the Graph box**
 - a) As the wave moves along the graph, what happens as it approaches 5 cm?
 - b) What happens as it approaches 10 cm?
 - c) Why do you think this happens?
5. **Play with the Frequency, moving from min to max.**

Play with changes in frequency. Changing frequency affects? (Highlight your answer)

 - Wavelength
 - Energy
 - Amplitude
6. **Play with the Amplitude, moving from min to max.**

Play with changes in amplitude. Changing amplitude affects? (Highlight your answer)

 - Wavelength
 - Energy
 - Frequency

Part 3 Analysis

1. What is the difference between frequency and amplitude?
2. How are wavelength and frequency related?
3. How are wavelength and amplitude related?
4. Describe the relationship between frequency and amplitude. Use what you have observed in the simulation to justify the relationship.
5. In the ocean, there isn't a faucet dropping water into the water to make waves. How do waves form in the open ocean?
6. In the simulation the waves became smaller the further they got from the point of origin, would this happen in the ocean? Why or why not?
7. What did you find most interesting about this simulation?