Name _____ Date _____ Class _____

Making Waves

Safety

WARNING: Use ground fault interrupter (GFI) outlets if you are using electrical outlets near water and keep water away from outlets.

WARNING: Do not touch the overhead light. It might be hot.

WARNING: Do not put fingers or other objects between the fan blades.

WARNING: Clean up liquid spills immediately to prevent slips and falls.

Materials

electric fan with variable speed and a grounded/polarized plug

overhead light with reflector

ring stand

clamp

white paper (large)

timer

clear, shallow rectangular container

tap water

metric ruler

Waves are created by forces from the wind, or from movement of the Earth's crust. When wind blows, friction transfers the wind energy to the sea surface. This energy moves water molecules in small oscillations, or circles. The water itself is not displaced. Waves are the energy that is moving through the water. As waves move away from the wind source, they lengthen and form swells. Seismic waves, or tsunamis, are created when the Earth's crust shifts. Wind and seismic waves are anatomically the same. The crest is the high point on the wave, and the trough is the lowest, as shown in **Figure 1** below. The distance from one crest to another crest (or one trough to another trough), is called the wavelength. The wave period is the time it takes for one wavelength (two crests) to pass a fixed point in space. Wavelengths are short at the point of origin, and expand over distances (swells). Seismic waves have longer wavelengths and periods than wind-driven waves. As waves near the shore, they are compressed by the decrease in water depth. The water builds up until it eventually breaks and forms surf. When a wave breaks, the energy from the wave is transferred to the shoreline.

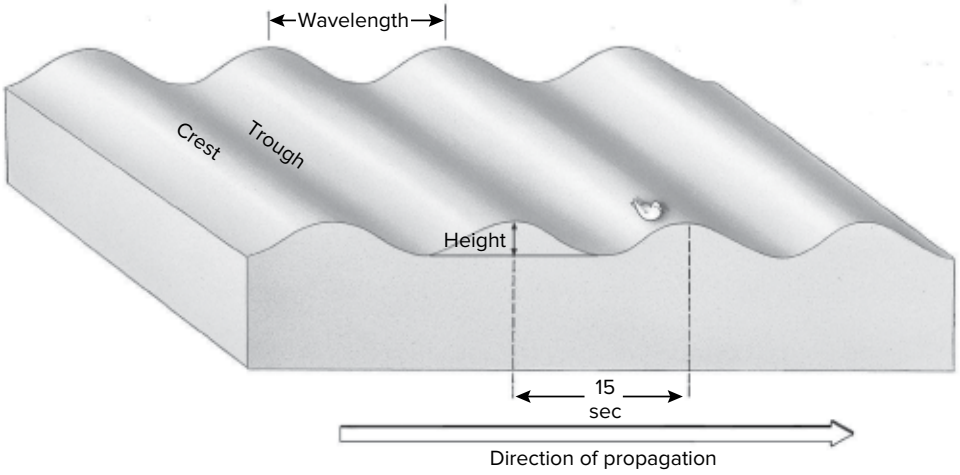

Figure 1 The anatomy of a wave

Question

What factors influence wave height?

Objectives

- **Model** the movement of waves
- **Measure** and record the differences in wave heights
- **Infer** what factors influence wave height

Making Waves *Continued*

Procedure

1. Read and complete the lab safety form.
2. Lay a large sheet of white paper on a flat surface then place the container on top of the paper.
3. Position a ring stand to the side of the container. Clamp a light on the ring stand so that the light shines directly into the container.
4. Fill the container nearly to the top with tap water.
5. Place a fan at one end of the container.
6. Turn the fan on low speed. After 3 minutes, measure the heights of the waves created by the fan. Record your measurements in **Table 1**.
7. Keep the fan on low and carefully observe the shadows of the waves on the white paper. Record your observations in **Table 1**.
8. After 5 minutes, measure and record the heights of the waves again. Record your results in **Table 1**.
9. Repeat steps 6–8 with the fan on medium speed.
10. Repeat steps 6–8 with the fan on high speed.

Data and Observations

Table 1 Making Waves

Fan Speed	Wavelength	Observations
Low, 3 minutes		
Low, 5 minutes		
Medium, 3 minutes		
Medium, 5 minutes		
High, 3 minutes		
High, 5 minutes		

Making Waves *Continued*

Analyze and Conclude

1. Compare the heights of the waves when the fan was on low, medium, and high speeds.

2. Did the heights of the waves change with time? Explain your answer.

3. Describe the movement of the water when the fan was turned off.

4. Based on your results, what factors influence wave height?

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Making Waves *Continued*

5. What do you think would happen if you repeated the experiment using a longer, deeper container?

6. Wave height in the ocean varies greatly. Describe some conditions that might generate high and low ocean waves.

7. If the ocean depth decreases sharply as it approaches shore, do you think that the wave height will increase or decrease? Explain your answer.

8. What happens to wave energy when it breaks onshore?