Wave Reflection and Absorption

Estimated Time: 45 minutes

SUMMARY: Waves are all around us in the form of light waves, radio waves, and sound waves to name a few. One wave that many of us are familiar with is energy waves that travel through water. In this activity, we are going to look at how waves behave by examining waves as they travel through water.

WHAT YOU'LL LEARN

- Components of a wave including: amplitude, wavelength, crest, and trough
- Wave reflection and absorption

Materials Used

- Clear glass or plastic container that can be used to hold water and make waves. Aquaria, 9 x 13 in baking dish, etc., will work well. Square containers are better than round ones.
- Flat, solid object that fits the span of the container where you will be making the wave,
- Water: enough to fill the container to make waves.
- Paper towel or reusable cloth towel.
- Smartphone or tablet that can record video.
- Various objects that can get wet and fit in the container.

WHAT TO DO

1. Let's first look at a wave and the parts of a wave. In your glass or plastic container, add water so there is enough to produce a wave, but not too much so that the wave overflows the edge of the container.
2. Use a flat, solid object that spans the depth of the aquarium or container and place the object vertically into the aquarium, spanning the depth, to generate a wave. This object could be a cutting board or cookie sheet—anything that is relatively flat that spans the container's depth.
3. Generate a wave with the flat object by moving the edge sticking out of the water towards the opposite side of the container. This should generate a wave. Once you generate the initial wave, ask the students what they observe. Now using a smartphone or tablet, video record another wave and play it back in slow motion so the student can see how the wave travels in the water. Using figure one, have the student identify the components of the waves.
4. In the video, the student should be able to identify the crest, or the highest point of the wave, and the trough, or the lowest point of the wave. The wavelength, the distance between two adjacent crests (maximum points) or troughs (minimum points), may be a little more difficult to identify, but see if the student can recognize two adjacent crests.

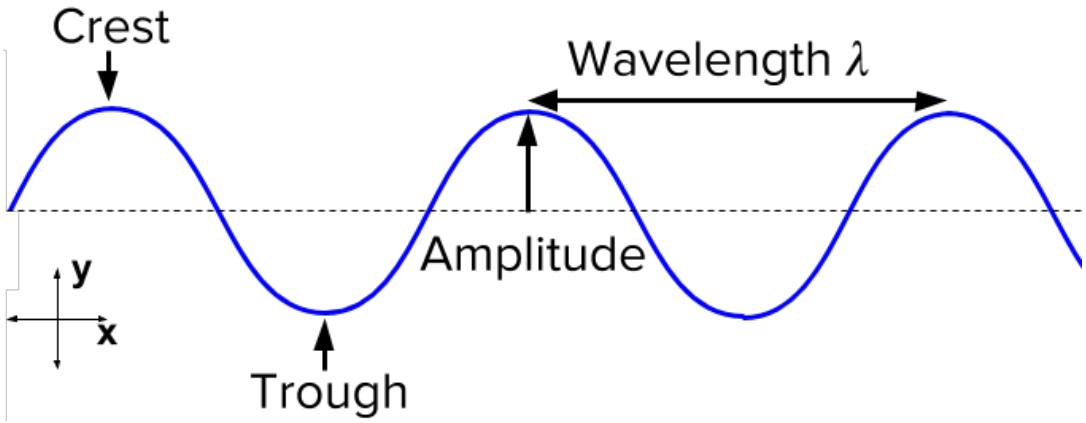

Figure 1. Components of a sound wave.
Source: https://www.khanacademy.org/science/high-school-physics/waves-and-sound/wave-characteristics/a/wave-characteristics-review-ap-physics-1

5. The amplitude, or the maximum amount of displacement from its resting position, can be tricky to spot in just one wave demonstration. Make another wave with a little more energy behind it. This larger wave will have a greater amplitude. Waves with greater crests will have greater amplitudes.
6. After making the initial wave, insert another flat, solid object that spans the distance of the container. Ask the students what will happen when the wave encounters the flat, solid surface. What is their reasoning for this prediction?
7. Produce the wave, making sure students are noting their observations. The flat solid object should reflect the wave, sending it back towards the other side of the container. Discuss if their predictions were consistent with what they observed.
8. Now, insert a soft object, like a large sponge, into the container. Ask the students what will happen to the wave when the sponge is in the container. Have them record their predictions. The soft object should absorb the energy from the wave, causing the wave to dissipate. Produce the next wave and have the students record their observations.
9. Ask the students what they have observed in the container. What they observed is waves being reflected by the solid surface in the tank and absorbed by the soft surface in the tank.

TIPS

- Another way to demonstrate this activity is to use sound waves. Sound waves will reflect off a hard surface, like a wall, but will be absorbed by a soft surface like a pillow or a blanket.
- Try this using different objects in the container to see how the wave responds. See how waves move around a small object and how differently shaped objects reflect or absorb a wave.
- Try moving the flat surface to a different angle rather than having the wave hit the flat surface directly. What happens when the wave hits the surface at an angle?
- Check out this video to see how waves look in a ripple tank.