Waves: What Are They?

Physics/Geography 182: Homework
DUE at the beginning of class Monday

In lab next week, you will begin the study of waves. Carefully complete each part of the homework activity in order.

What Do You Think Questions

The first thing you need to do is consider what you already think about waves. Therefore, answer these "what do you think" questions before moving on to the next part of the homework.

1. Think for a moment about water waves and your experience with water waves.
    a. From your previous observations and experiences, do you think the water is moving along with the wave and at the same rate as the wave?

    b. If you place an object in the water, do you think the object will move along with the wave?

    c. Explain your thinking to parts a and b above.

2. What do you think a wave does?

Activity 1: Water Waves and Floating Objects

For this activity, you will be carefully observing a floating object in a bowl of water as you add drops that form ripples in the water.

Materials

You will need to gather the following supplies to complete this activity:

1. Medium to large bowl approximately 8 inches (20 cm) in diameter. If all you have are rectangular bowls, that is fine, make sure it is at least 8 inches (20cm) on each side. NOTE: A sink full of water will work… just clean up any mess you make!
2. Water – enough to fill the bowl to within an inch of the top (or below the drain hole, if you're using a sink.)
3. A small object that floats such as a bead, cork, bottle cap, etc.
4. An item that will allow you to add drops of water to the bowl (e.g. an eye dropper, spoon, wet towel, etc.) and a source of water to fill the item with water during the activity.

Apparatus Set Up and Procedures

Once you have all your supplies, set up your apparatus as follows:

1. Fill the bowl with water to within approximately 1 inch of the top.
2. Place the floating object in the bowl and allow to sit undisturbed until the water has no ripples.
3. Prepare your materials for adding drips of water to the bowl with the floating object.

Procedures: Now that your apparatus is prepared, complete the following steps making careful observations

1. Drop a single drop of water into the bowl of water. As you watch the ripple move across the tank, observe what happens to the ripple and what happens to the floating object.
2. Repeat the above procedure four (4) more times.
3. Be sure to write all observations in the observations section below.

Observations

Write/type your observations below. Be sure to carefully discuss what happened to the ripples of water paying particular attention to any motion in the object.

Results

Answer the following questions

1. Based upon your observations, describe how the object moved with respect to the water.

2. Based upon your observations, do you think the water was moving at the same rate as the wave? Explain your response.

Activity 2: A Ship Adrift in High Seas

For this activity, you will be watching a video found on YouTube entitled, "Dramatic Video of Clelia II Antarctic Cruise Ship Slammed by Giant Waves." [You may either click on the title or enter the following url to get to the video: https://www.youtube.com/watch?v=eDTbopUYg20].

Procedures and Observations

Carefully watch the video paying particular attention to the movement of the waves and the movement of the ship. Write your observations below.

Results

Answer the following questions

1. Based upon your observations, describe how the object moved with respect to the water.

2. Based upon your observations, do you think the water was moving at the same rate as the wave? Explain your response.

Activity 3: Waves in Water – What really happens?

Carefully review the YouTube video entitled, "Waves on the Surface of Water HD." [You may either click on the title or enter the following url to get to the video: https://www.youtube.com/watch?v=7yPTa8qi5X8]. This animation shows how water molecules (and objects that float in water) move in relation to one another in response to wave action. Answer the following questions in relation to your previous observations as well as this new video.

1. Examine your responses to the questions posed in the results sections for Activity 1 and Activity 2. Using the information from this video, carefully describe how water and objects within water move in relationship to one another as a wave passes.

2. Based upon all your observations and this last video, explain why it makes sense that water does not actually move with the wave as the wave crosses the ocean.

3. Unlike typical ocean waves produced by winds moving over the water, a tsunami wave does result in much water moving onto shore. However, it works in the same way as all water waves. To answer the following question, you might want to review the Japan Earthquake video [url is: https://www.youtube.com/watch?v=w3AdFjklR50]. Why do you think the tsunami moves so much more water onto shore than a typical ocean wave? [What is the key difference between a tsunami and a typical ocean water wave? Where does the wave begin? What is the wavelength? How do these issues impact the water?]

Conclusions

1. Now that you have completed all the activities, explain how has your thinking has changed with respect to the way waves impact water?

2. You know waves impact water; you know waves move through water; you saw that objects also move somewhat as a wave passes by. So, based upon everything you have done in these activities, how would you describe a wave – What does a wave do? What is moving? [No textbook definitions, this should be your own response based upon what you observed in this set of activities.]