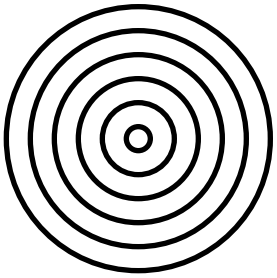
Ripple While You Work...



Purpose

The purpose of this activity is to observe wave phenomena in a ripple tank.

Materials

Ripple tank and normal accessories, including light source, screen, paraffin (wax) blocks, large flat glass or plastic plate, dowel, large diameter rubber tubing or parabolic reflector, motor driven rippler, hand stroboscope discs (optional), medicine droppers.

Procedure

1. Turn on the light. Observe reactions on the screen at the base of the tank, as you produce a pulse by touching your finger or pencil tip to the water surface.

   a) What is the shape of the pulse?

   b) Does the speed of the pulse seem to be the same in all directions? Why or why not?

2. Now place the dowel in the water and produce straight waves by rolling the dowel forward, with the flat of your hand, about 1 cm.

   a) What is the shape of the pulse?

3. Place a straight barrier (paraffin blocks) in the tank. Generate pulses that strike the barrier straight on.

   a) What do the waves do when they reach the barrier?

   b) After striking the barrier, what is the new direction of the wave?

4. Change the angle at which the waves strike the barrier.
   a) What is the shape of the reflected pulse?

5. Produce circular waves with water drops from the medicine dropper.

   a) How do they reflect from a straight barrier?

   b) From where do the reflected pulses appear to be originating?

6. Bend a length of large diameter rubber hose to the shape of a parabola or use the metal parabolic reflector.

   a) What do you observe when you use this parabola as a reflector for straight pulses?

7. Find the focus of the parabola (the point at which the reflected waves meet) from the reflection of straight pulses and mark it on the screen with your finger. Now generate circular waves with the dropper held above the focus of the parabola.

   a) What is the shape of the reflected pulse?

b) Are there other points which will give the same results? Explain.

8. Put a piece of glass on the bottom of the tank and so that its top is just covered with the water. Arrange the glass so that incoming waves are parllel to the boundary of the glass.

   a) What happens as low frequency waves pass from deep water to shallow? Check with a stroboscope (optional).

9. Now turn the glass so that the boundary of the glass is no longer parallel to the incoming waves.

   a) Are the waves straight (both outside and over the glass)? Explain.

   b) How do the speeds compare?

10. Place paraffin blocks across the tank until they reach from side to side with a small opening in the middle. Use the dowel to generate continuous straight waves or use the motor driven rippler to produce straight waves.

    a) How does the straight wave pattern change as it passes through the slit (opening)?

    b) Generate incident waves that have a wavelength longer than the slit width. What is the effect? Explain.

    c) Generate incident waves that have a wavelength shorter than the slit width. What is the effect? Explain.

    d) Make two narrow slits in your barrier quite close together (4 cm). Continue to generate the straight waves and allow them to pass through the pair of slits. Now what do you observe?

11. Start your motor driven rippler to produce straight waves. Place a paraffin barrier halfway across the middle of the tank. Observe the waves that both strike the barrier and pass by it. Adjust the frequency of the rippler so that the incoming and reflected pulse appear to stand still (standing wave).

    a) How does the distance between the two bright bars in the standing wave compare with the distance between two bright bars in the traveling wave?

12. Place one paraffin block in the middle of the tank. Use the Motor driven rippler to generate straight waves.

    a) By adjusting the frequency of the rippler, determine what effect, if any, long or short wavelengths have on the ability of the waves to "bend" (diffract) around the edges of the paraffin block. What is the effect?

    b) Based on your observations, what could carry further: a sound of high frequency, one of low frequency, or both equally well. Explain.

13. Put the two point sources on the rippler bar. Allow the rippler to vibrate and produce circular waves.

    a) What pattern(s) do you now observe?

    b) Increase the distance between the point sources. What is the effect on the observed pattern?

    c) Decrease the distance between the point sources. What is the effect?

Questions: see overhead

Summary: