

Ripple Tank Activity

Purpose: To become familiar with the wave characteristics of reflection, refraction, interference and diffraction. The relationship between frequency and wavelength will be addressed as well as wave speed and an application of refraction, lenses.

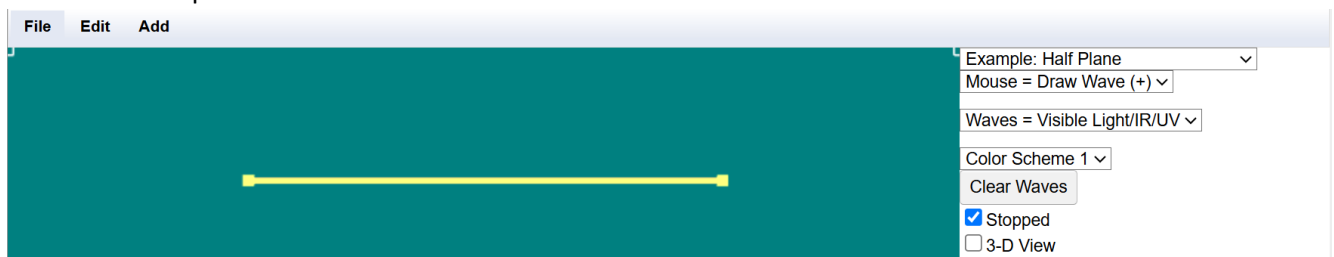
GO TO <http://www.falstad.com/ripple/>

Procedure 1: Frequency vs. Wavelength

1. Draw the wave pattern you see running on the applet.
2. On your drawing, indicate the length of one wave (wavelength). This is the distance from one concentric dark line to the next; or from one concentric bright line to the next.
3. Now vary the frequency of the wave generator by sliding the frequency bar on the right of the screen
4. Observe what happens to the wave pattern. Draw a wave pattern of both a higher and lower wave frequency. Label each.
5. Write down your observation of the relationship between frequency and wavelength in complete sentences.

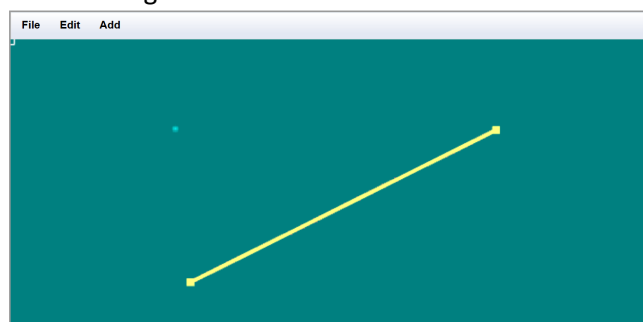
Procedure 2: Reflection

1. Click "STOPPED" in the menu on the right
2. Switch the **Example** to **HALF PLANE** by selecting it from the top menu bar on the right. **PAUSE** the simulation
3. **MOVE** the plane so it looks like this



Record your observations for what happens to the waves after they hit the wall. You may want to toggle with the 3D view as well so you can see the height of the waves before and after hitting the wall.

4. Now, vary the angle between the barrier and the waves by pausing the simulation and dragging one corner of the wall so its on a diagonal



5. If #3 was not clear enough for you to observe, change the set up to **Internal Reflection ONLY** record your observations as they relate to the DARK BLUE part of the simulation.
6. Determine, from your observations, a general statement that relates the directions between the

incoming wave front and the reflected wave front. (Think back to the mirror lab!)

Procedure 3: Refraction

1. Choose the **REFRACTION** example.
FYI: Light Blue = Shallow Water Dark Blue = Deep water
2. Observe what happens to the wave front as it passes from the shallow into the deep. **A wave moves more slowly in water that is shallow than in water that is deep. As the wave** This change in wave speed causes the wave to do something...what is it? If it is difficult to see, pause the simulation.
3. Based on your observations, what is the relationship between the direction of a wave and its speed as it passes from a medium through which it travels quickly, deep water, into one through which it travels more slowly, shallow water?

Procedure 4 Diffraction

1. Select the **OBSTACLE** set up
2. Observe what happens to the wave pattern on the other side of the small barrier. You may draw this pattern, but also, describe it in words.
3. What is happening at the **CORNERS** of the wall?
4. Now vary the frequency. What is the impact that frequency has on wave shape at the corners?
5. Now select the **SINGLE SLIT** set up. This is like having two barriers.
6. Vary the frequency of the wave and observe how the frequency changes the fanning out.
7. Next, vary the slit width and observe how the width impacts the fanning out.

This fanning out or ability of a wave to bend around barriers is called diffraction.

Procedure 5 Interference or Superposition

1. Select the **TWO SOURCES** setup.
2. Draw the interference pattern that you see.
Notice the regions in the tank marked by alternating dark and light lines. These regions are where the crests of the waves of one source are meeting the crests of the waves of the other source. Similarly, troughs are meeting troughs. These are regions of constructive interference, or antinodal lines. The regions in the tank that appear to be undisturbed are nodal lines. On nodal lines, the crests of the waves of one source are meeting with the troughs of the waves of the other source.
3. Vary both the distance between the sources (you can click and drag with the mouse) and the frequency to find the effects they have on the number of nodal and antinodal lines. Draw your observations and describe them with a few sentences.