

Physical Science for Teachers

Wave Properties Lab

Light Waves: Reflection

Name _____ Date _____

Partners _____

Stuff you need:

Two inexpensive flat mirrors; a flat mirror and block of wood; printed material such as a book or newspaper; quarter; overhead transparency sheet; transparency pen.

Steps you do:

1. Place two mirrors together at right angles at a common edge and tape them at the corner (on the back) to hinge them in this position. (If you have the folding mirrors, just use them instead.)
2. Place a quarter in front of the mirrors in the corner between the hinged part of the mirrors. What do you observe?
3. Slowly move the two unhinged ends of the mirrors towards each other so the angle becomes smaller. What do you observe?

Why it works:

Let's learn more about reflection.

4. Place the mirror(s) on edge so they are upright on a printed piece of material. Place the mirror along the edge of one of the lines of print.
5. Compare the size and shape of the actual print with the reflection that you observe in the mirror? How are they alike?

6. Observe the reflection of the printed letters. How are they different from the actual printed material?

7. Draw a circle (about the size of a quarter) on the paper about two inches from the mirror. Observe the placement of the actual circle on the paper with respect to the edge of the mirror and where the circle appears to be in the mirror:

8. Print the word "REVERSAL" on the transparency sheet with the pen. Hold it up in front of the mirror so that you can read it directly. Compare what you see with what you see in the mirror. Describe what you see.

Why it works:

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Light Waves: Refraction #1

Name _____ Date _____

Partners _____

Stuff you need:

Opaque cup; water; coin.

Steps you do:

1. Place a penny in the bottom of the empty cup. Use a folded piece of transparent tape under the penny to keep it from moving later.
2. Stand and slowly back away from the cup until the edge of the cup blocks your view of the penny. (So that you can't see the penny any more.)
3. Keep your head in this position while a partner slowly pours water into the cup. What do you observe?

4. What fraction of the cup is filled when the edge of the penny first comes into view?

5. What fraction of the cup is filled when you are able to see the whole penny. (Some may not be able to see the whole penny at any time. If so, record that fact instead.)

Why it works:

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Light Waves: Refraction #2

Name _____ Date _____

Partners _____

Middle School

Stuff you need:

Transparent glass or cup; pen, pencil or ruler; water

Steps you do:

1. Fill the cup or glass about $\frac{2}{3}$ full with water.
2. Observe the pen, pencil or ruler when it is in the air.
3. Place the pen in the glass of water so that it rests at an angle .
4. Observe the pen by looking at it with your eye lined up with the pen. Notice what you see at the water level. Compare how the pen looks now and how it looked before you placed it in the water. Describe what you see.
5. Hold the pen vertical in the water and observe it as you move it left and right. Compare the part above the water level with the part below the water level. Describe what you see.
6. Hold the pen vertical and move it towards your eye and away from your eye. Describe what you observe.

Why it works: Let's see if we can figure it out.....

A. What do our eyes use from the sun or lamps in order to see everything and anything around us?

B. As that light moves through the air, glass and water so that we can see the pen, observe the type of materials it is moving through and circle the correct description:

opaque translucent transparent

C. Light travels at 186,00 miles per second (300,000 kilometers per second) in a vacuum. This is the fastest possible speed for anything to move. How do you predict the speed of light differs when it moves through the transparent water? (Circle)

Moves slower in water Moves faster in water

D. Check out your above prediction: What happens to light is similar to how your movement changes when you run along the beach (through air) and then continue your running in the water.

E. So as the light moves from the glass and water to the air in the glass, what happens to the speed of the light?

Slows down Stays the same Moves faster

F. See if you can put all this together and figure out an explanation for what you saw.

Why it works: (How much did you figure out?)

Physical Science for Teachers

Wave Properties Lab

Musical Straws

Name _____ Date _____

Partners _____

Stuff you need:

Plastic drinking straws, scissors

Steps you do:

1. Make a "musical" instrument by flattening one end of the straw (between your teeth) and then cutting it to a point with the scissors. The end should look like this:



2. Pull the end through your teeth to flatten it a little more, and then place it between your lips so your lips are about at the end of the notched section.

3. Blow into it to get a "musical" tone. (The cut end should vibrate between your lips. You may have to experiment and move the straw in or out a little to get it to work.)

4. As you are blowing your straw and producing a tone, quickly snip an inch off the end of the straw. Record what happens to the tone.

5. Continue to produce a tone while you snip off more and more of the straw. Record what happens to the tone.

What you see: (or in this case, "hear")

The tone produced by the straw depends on the length of the straw. What is the relationship?

Why it works:

The length of the straw is half a wavelength of the sound. So when we shorten the straw, what happens to the wavelength?

What then happens to the frequency?

As a result of this, what will happen to the pitch we hear?

How does this relate to a musical instrument like a clarinet??