**Lab Science** **Name_____**

**Refraction Lab** **Date _____ Period_____**

## Background

We have discussed in class how the path of light rays can be bent as it moves from one material into another. This is called refraction and it is caused by light rays slowing down as they move into a new medium at an angle. The amount that a light ray bends depends upon 2 things: the angle at which the light moves into the new material (angle of incidence), and the materials in which the light is moving. In this laboratory activity, you will be investigating the refraction of light as it moves from air into various liquids. You will measure the angle of the incoming rays of light (angle of incidence) and the angle at which it moves through the new material (angle of refraction). Both of these angles are measured to a reference line called the normal line which is perpendicular to the surface between the two materials.

## Materials for Lab

There will be several stations set up around the lab with the following equipment: a piece of cardboard, 2 straight pins, a protractor, and a semi-circular plastic tank filled with a common liquid such as soap, water, corn syrup, etc.

In addition to the materials found at each station you will need a pencil and 5 refraction papers.

## Procedure

You and a partner will move around to at least 5 different lab stations and perform the following procedure.

1. Write down the name of the liquid on your refraction paper.

2. Place one of your refraction papers on the piece of cardboard and stick one of the pins in the dot in the incidence area of the paper.

3. Carefully place the tank with the liquid on the semicircle on the refraction paper so that the flat side is lined up with the line on the paper and the marker line on the tank is located at the intersection of the 2 lines on the paper.

4. With your face at table level, look through the tank from the refraction area and locate the pin. Move the cardboard back and forth until the pin is lined up with the marker line on the tank.

5. With the 1$^{st}$ pin lined up with the marker line, place the 2$^{nd}$ pin in the cardboard so that it is lined up with the 1$^{st}$ pin and the marker line as you look through the liquid.

6. Carefully remove the tank from the refraction paper and the pins from the cardboard.

7. Use the straight edge of the protractor to draw a straight line from the 1$^{st}$ pin hole to the intersection of the lines printed on the paper. Do the same for the 2$^{nd}$ pin.

8. Use the protractor to measure the angle of incidence and the angle of refraction and write the measurements in the appropriate place on the refraction paper. Remember that these angles are always measured to the normal line.

9. Repeat the procedure for at least 4 more liquids.  You must do at least 5 total liquids.

## Questions

1. Explain how a material's index of refraction is related to the speed of light in that material.

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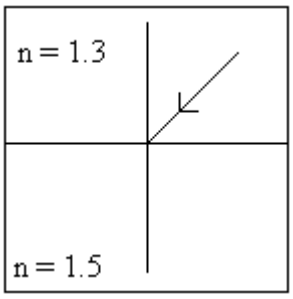
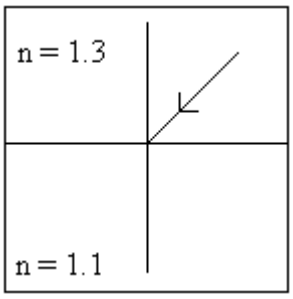
2. In each of the following diagrams, draw the expected path of the refracted ray as it enters the new medium.




3. In this experiment, why should all of the angles of refraction be smaller than the angles of incidence?

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4. In which of your 5 liquids would light travel the slowest? How do you know?

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5. In which of your 5 liquids does light travel the fastest?  How do you know?

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