

Name:

Date:

Class:

What's Your Angle? Worksheet

Objective: To study and understand how different liquids affect refraction of light.

Materials:

- 100-ml beakers (6)
- 20 ml water
- 20 ml ethyl alcohol
- 20 ml clear dish soap
- 20 ml corn syrup
- 20 ml vegetable oil
- one laser pointer (prefer green laser)
- one protractor
- one ruler
- a dry-erase marker or masking tape (to label beakers)

Safety Precautions: Do not look directly into the laser at any time.

Procedure:

1. Take six 100-ml beakers.
2. Label the beakers with the medium name using masking tape or dry-erase markers as described below.
 - i) Beaker 1 - air (leave the beaker empty)
 - ii) Beaker 2 - water
 - iii) Beaker 3 - ethyl alcohol
 - iv) Beaker 4 - clear dish soap
 - v) Beaker 5 - vegetable oil
 - vi) Beaker 6 - corn syrup
3. Add 20 ml of the labeled liquid to beakers 2 through 6.
4. Place the six beakers in the circles on the placemats.
5. Search for the densities of the known liquids online.
6. Place the laser on the placemat. Note the laser should always stay flat on the table.
7. Turn on the laser and aim it toward beaker 1 at an angle.
8. Using a protractor, measure the angle the light from the beaker makes with the normal line (horizontal line).
9. On the opposite side, ask one team member to measure the angle of the refracted light with the normal line.
10. Enter your data into the data table.
11. Repeat the procedure for the rest of the beakers, pointing the laser toward the liquid. Use the same angle of entry for each liquid.
12. Compute the index of refraction for each liquid using the angles from the data using the following formula:

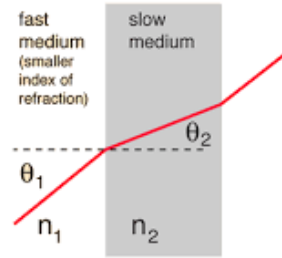
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Snell's Law

$$\frac{n_1}{n_2} = \frac{\sin \theta_2}{\sin \theta_1}$$



13. Find the indices of refraction of the liquids used and enter them into the data table. Remember, because air is the first medium, the index of incidence (n_1) will be 1.00.

Data:

#	Medium	Density	Angle of Entry/Incidence	Angle of Exit/Refraction	Index of Refraction	Known Index of Refraction
1	Air					
2	Water					
3	Ethyl Alcohol					
4	Clear Dish Soap					
5	Vegetable Oil					
6	Corn Syrup					

Analysis/Questions:

1. Why does the light bend when it enters a new medium?

2. How do the exit angles compare with the densities of the liquids?

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3. How do the experimental indices of refraction compare with the known indices of refraction?

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Conclusion:

Write a conclusion for this activity based on your observations.
