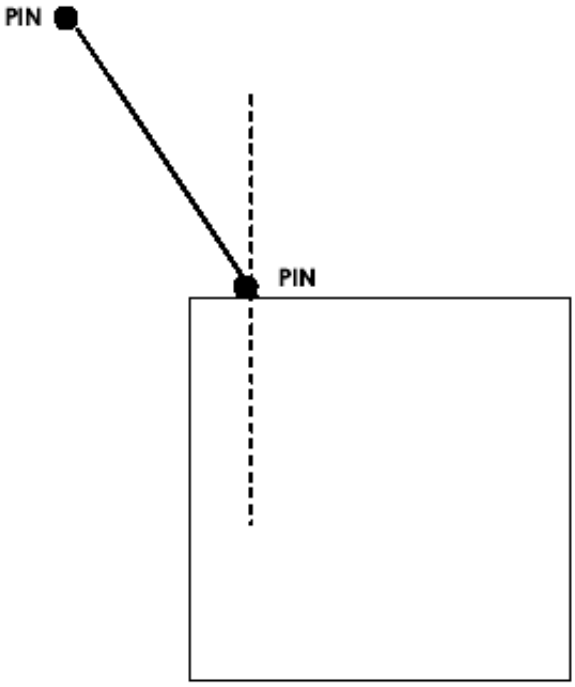
Refraction of light in a glass

Purpose: To use Snell's Law to determine the index of refraction (n) of a piece of glass and to use it to find the speed of light in that glass.

Procedure: Check off each procedure upon completion

1. _____ Place your glass in the middle of a piece of loose leaf and sketch its outline with a pencil.

2. _____ Remove the glass and draw a normal line about 1 cm from the end of the glass as illustrated below



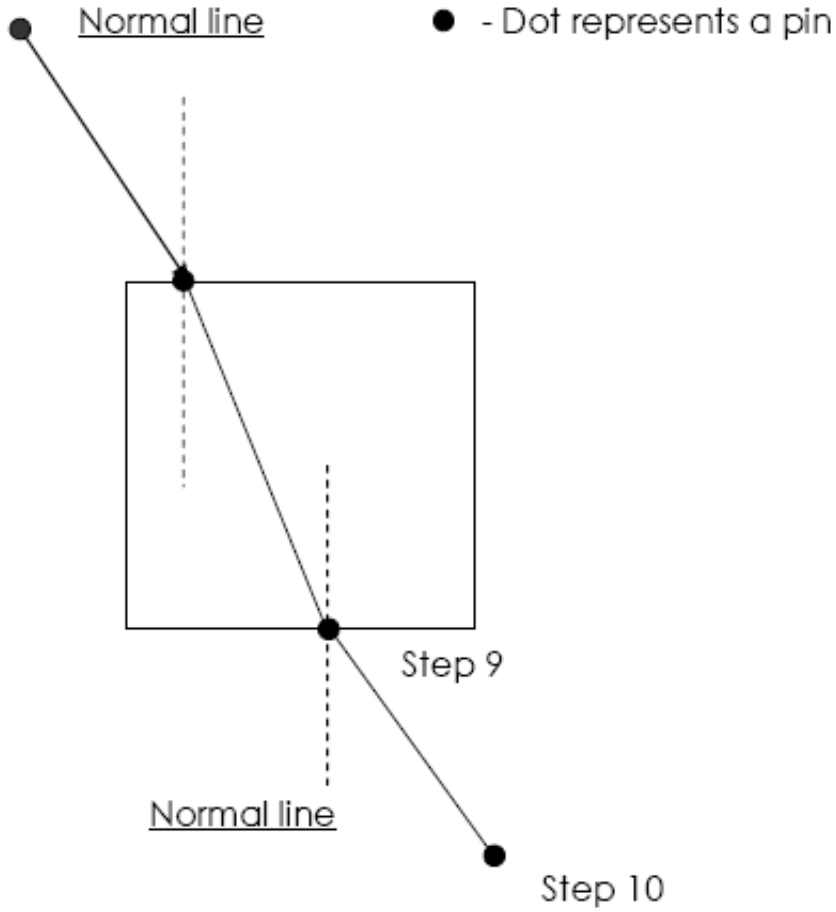
3. _____Draw an arrow 30 degrees from the normal. **(** Put the zero degree guideline of your protractor on normal line**)**

4. _____Put a piece of cardboard underneath your loose leaf.

5. _____Place a pin at each end of the line you just drew **(see illustration)**

6. _____ Carefully place your glass on the square you just drew

7. _____ Kneel down and view the two pins **through the glass**.



8. _____While looking through the glass, move your eyes from left to right until the two pins appear to line up.

9. _____Place a pin **near the edge of the glass** to mark where the pins line up.

10. _____Look through the glass again and place a 4^{th} pin so it lines up with the way the other three pins appear through the glass. **(Place the 4^{th} pin as far out as possible.)**

11. _____Remove all the pins and connect the pin hole dots with a pencil

12. _____ Add 2 normal lines to your drawing in accordance with the diagram above

On the back of your loose leaf: Repeat steps 1 through 12 using an angle of incidence of 45 degrees

Name _____ # _____ Date _____

Section _____ Lab Partner_____

Refraction and the Velocity of Light

Part I - Analysis of Refraction Diagram

Questions:

1. Why did the pins ***appear*** to line up when you looked at them through the glass but don't line up when you view them through air? **(10 points)**

2. For each trial, **label** the **angle of incidence** and the **angle of refraction** at the air/glass and glass/air boundary. Show the measured value for each of the angles **(2 points each)**

3. What is the angle of refraction at the air/glass boundary for trial 1?

Angle of incidence = 30. degrees | Angle of refraction = _____ **(5 points)**

4. What is the angle of refraction at the air/glass boundary for **trial 2**?

Angle of incidence = 45 degrees | Angle of refraction = _____ **(5 points)**

5. Define *index of refraction* (n) **5 points)**

6. Use Snell's law and your angles from question 2 to find the index of refraction **(**n_2 **)** for your glass.

Trial One - Angle of incidence = 30. degree – Regents Rules!!

NOTE: n_1 for air = 1

Air Glass

$n_1 \sin\Theta_1 = n_2 \sin\Theta_2$

Answer _____ **(7 points)**

(Show substitution 3 points)

Trial Two - Angle of incidence = 45 degree

Air Glass

$n_1 \sin\Theta_1 = n_2 \sin\Theta_2$ Answer _____ **(7 points)**

Average index of refraction from trial 1 and 2 _____

5. Turn to the Index of Refraction table on your reference table. There are probably a few materials in the table that have an index of refraction that come close to the one you calculated. List two materials listed on the table that might be the material you used? **(10 points)**

6. Use the average index of refraction (n) you found to calculate the speed in light in your medium.

Show equation **(2 points)** Substitute with units **(2 points)** Answer with units **(4 points)**

_____ _____ _____ **(SCIENTIFIC NOTATION)**

7. Use your average *index of refraction* to find the angle of refraction that would be produced if light entered your glass at an angle of incidence of 60. degrees. **(10 points) Show all work**

Equation (2 points) Substitution (4 points) Answer (4 points)

Part II - Refraction Video

1. Whic angle from the normal never produces refraction? **(3 points)**

2. Whenever there is refraction there is always _____ **(2 pt)**