Name: _____ Period: _____ Date: _____

PhET: Snell's Law and Refraction MiniLab

Use the directions and simulation found at the bottom of the StickMan Physics Light page with a direct ling here:

- **https://www.stickmanphysics.com/stickman-physics-home/electromagnetic-waves/refraction-of-light/#PhETrefraction**

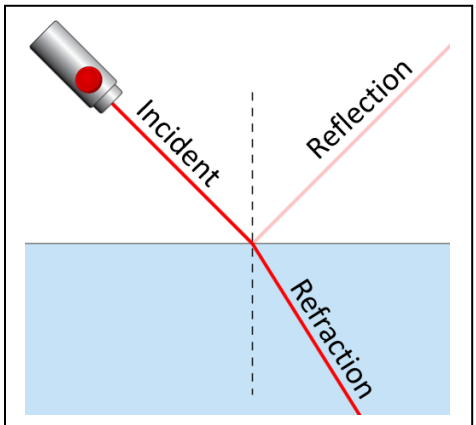

Figure 1

A. Click on Intro in the PhET animation and turn on the laser by pressing the red button. You will see the incident ray, a reflected ray bouncing back, and a refracted ray going through (Figure 1).

1. Use the intensity checker to check the intensity of the reflection and refraction as it compared to the original (Figure 2). Add the intensity of the reflection to the refraction. What does the reflection and refraction add to? _____ + _____ = _____

Figure 2

Notice in Figure 3 how to place the protractor and how to read the angle of incidence (Θ_i) and angle of refraction (Θ_r) from the normal line.

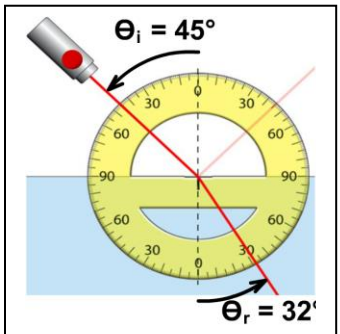

Figure 3

2a. Is light bending toward or away from the normal line in figure 3?

2b. What does light bending the way it does in figure 3 mean about the speed of light in water compared to air?

B. Now keeping everything the same, change the incident material to glass (Figure 4) and place the protractor in place (as in figure 3 with the 0° point of the protractor on the normal line). Keep the laser in place with the angle of incidence (Θ_i) still at 45°

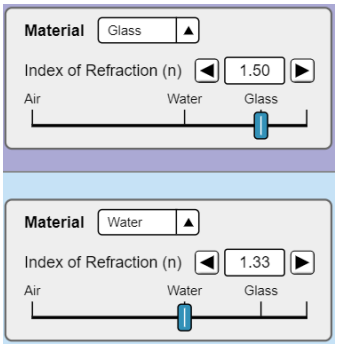

Figure 4

3a. What does the index of refraction of glass (n_i=1.50) tell you about the speed of light in glass compared to water (n_r = 1.33)? It is

3b. What is the angle of refraction (Θ_r) from glass to water when the angle of incidence (Θ_i) is 45°?

C. Now make the incident material Air and the refraction side <u>Mystery A</u> (Figure 5). Use the protractor and measure the (Θ_r) when Θ_i = 45° knowing that the index of refraction of air side is 1.00

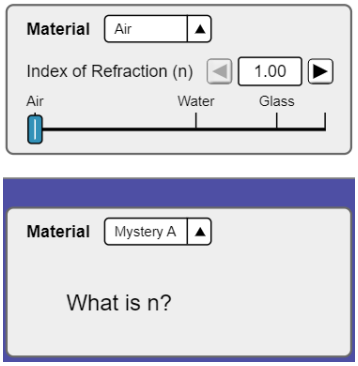

Figure 5

n_i = <u>1.00</u> Θ_i = <u>45°</u> n_r = <u>?</u> Θ_r = _____

4. Use Snell's Law **(n_i)(sin Θ_i) = (n_r)(sin Θ_r)** to solve for the index of refraction of mystery A:

n_r = _____

D. Now make the incident material Air and the refraction side <u>Mystery B</u> (Figure 6) Use the protractor and measure the (Θ_r) when Θ_i = 45° knowing that the index of refraction of air side is 1.00

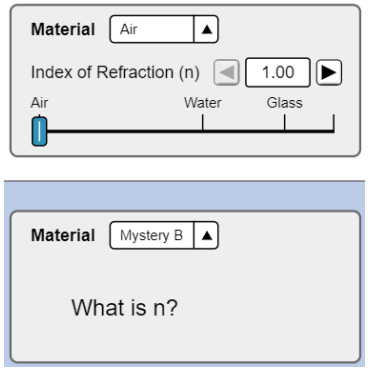

Figure 6

n_i = <u>1.00</u> Θ_i = <u>45°</u> n_r = <u>?</u> Θ_r = _____

4. Use Snell's Law **(n_i)(sin Θ_i) = (n_r)(sin Θ_r)** to solve for the index of refraction of mystery B:

n_r = _____