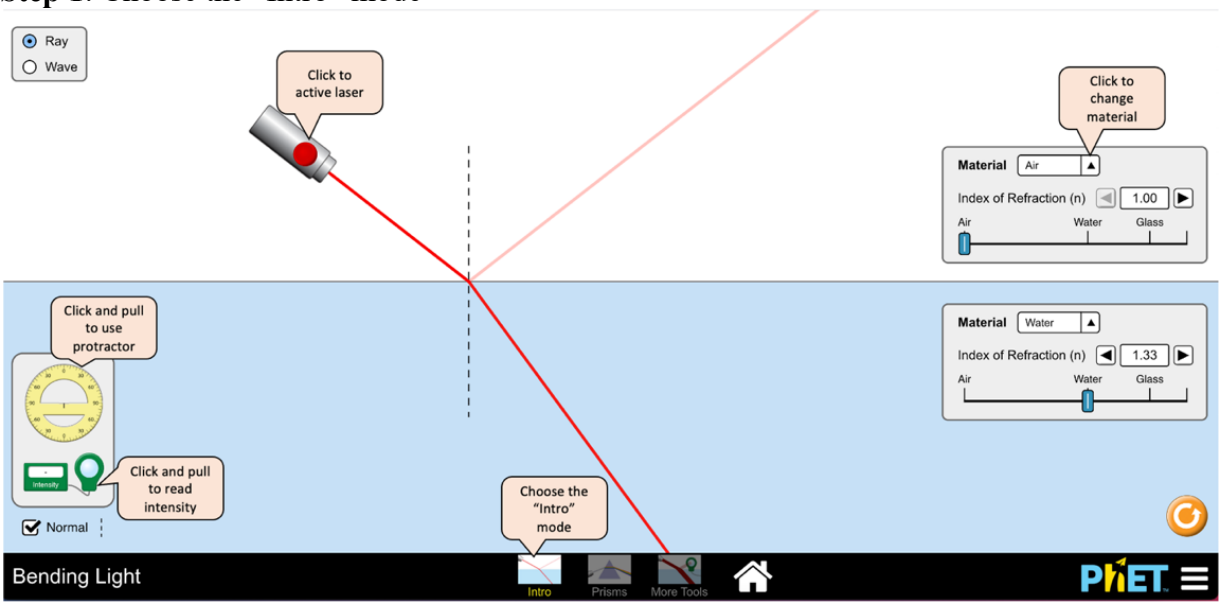
Name_____ **Sec**_____

Prelab-PHYS222
Reflection and Refraction

Before coming to the lab, read OpenStax **University Physics Vol.3** Section 1.2 - 1.4 if your PHYS 212 lecture class hasn't cover reflection and refraction.

First, go to this website and open the PhET simulation: Bending Light: https://phet.colorado.edu/sims/html/bending-light/latest/bending-light_en.html
or you can open that website with this QR code.

Step 1: Choose the "Intro" mode



(3 pts) Step 2: Click the red button to enable the light beam. Move the protractor to the center of the picture, it should measure the initial incident angle as 45 degrees. The indices of refraction n of the two materials are shown in the simulation.
Use Snell's Law (Equation 1.4 in the textbook) to calculate the angle of refraction in this initial setting, and show your calculation below:

_____

_____

_____

Use the protractor in simulation to measure this angle, does it agree with your calculation?

_____

(4 pts) Step 3: Select the material of the lower side to be "Mystery A", select the material of the upper side to be "Water" (which has the index of $n_{water} = 1.33$). Use the same incident angle of 45 degrees.

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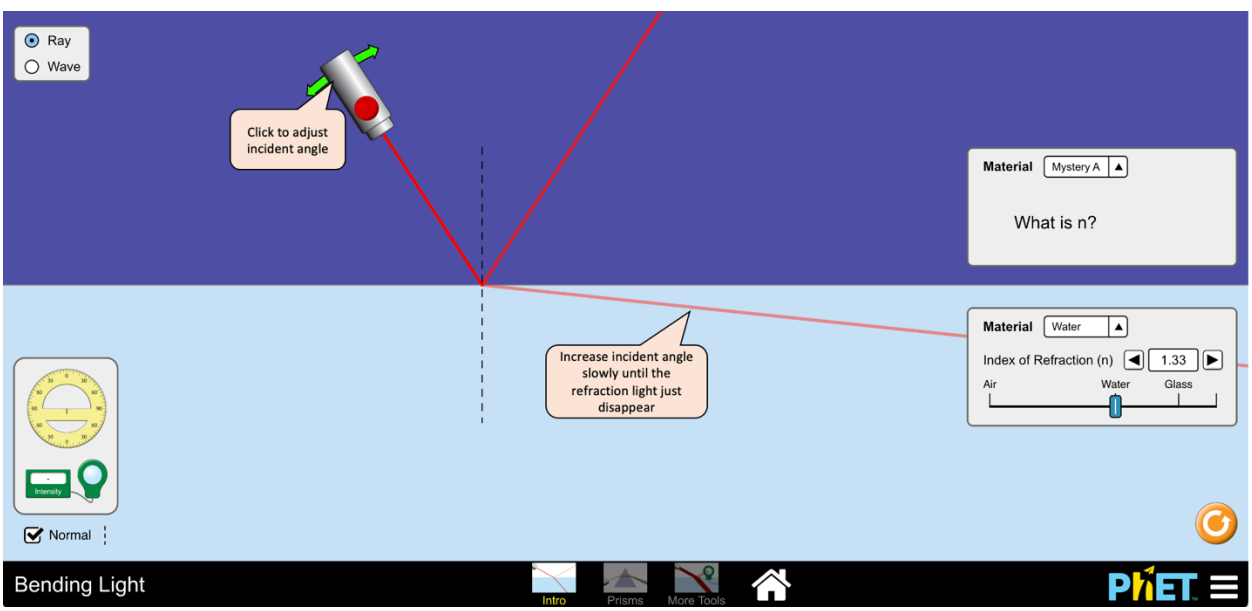
Use the protractor and measure the angle of refraction in this unknown material "Mystery A". What angle do you get? _____ degrees.

Then use Snell's Law to calculate the index of refraction of this "Mystery A" material. What do you get? n_A = _____

Compare this number to the "**Table 1-1 Index of Refraction in Varies Media**" on page 10 of your OpenStax Vol.3 textbook. What type of material do you think is most likely to be this "Mystery A" material?

_____

(3 pts) Step 4: Change the material of the upper side to be "Mystery A", change the material of the lower side to be "Water".
Start from a small incident angle, adjust the position of the incident beam light to find a position where the refracted light just disappears on the contacting surface (This is when the angle of refraction is 90 degrees).
Use the protractor to measure this critical angle of Total Internal Reflection: _____ degrees.



Use **Equation 1.5** from your Vol. 3 textbook $\theta_c = \sin^{-1}\left(\frac{n_2}{n_1}\right)$ for $n_1 > n_2$. and the index of refraction of "Mystery A" that you got in Step 3 to calculate the critical angle of Total Internal Refraction.

What is the calculation value? _____ degrees.

What is the percent error between your measured value and your theoretical value? _____ %