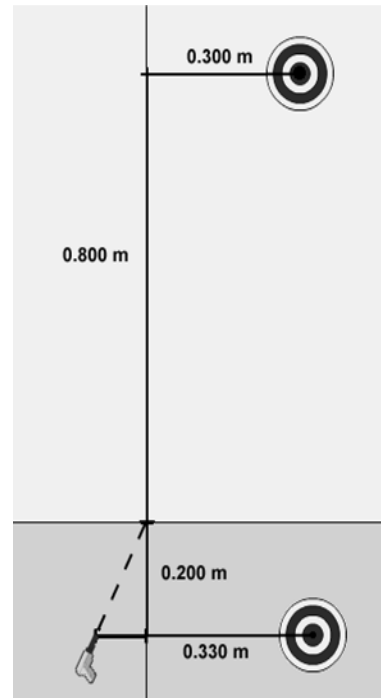


During this interactive you are going to explore and experiment with the refraction of light as it encounters the interface between two distinct mediums.

1. Why does light bend when it changes mediums? Is this due to the particle or wave nature of light? (Show your understanding.)

2. Given the situation shown to the right, predict what is going to happen when you fire the laser pistol from the fluid. The fluid has a higher index of refraction than the air. It is safe to assume that in this case you are firing at an angle less than the critical angle. Be specific about what happens to the laser beam at the interface. Include a sketch on the diagram of what you would see.



3. The index of refraction of the fluid is 1.60 and of the air is 1.00. At what angle do you need to fire the pistol to hit the upper target, a hit only counts if the beam passes through the black center of the target? **Show all work and equations including substitution with units.**

The laser pistol is designed so its beam always hits the interface between the fluid and the air at the same point. You move the pistol from side to side to change its angle of incidence. How far the pistol is below the surface is a value that stays constant.

4. From your calculation in #3 what should be the horizontal distance between the pistol and where its beam passes through the interface to hit the upper target? **Show all work and equations including substitution with units.**

Open the shortcut **IL Refract** on one of the lab stations.

Open the simulation contained in this section. **Do Not follow the directions in the simulation follow these instructions.**

Input the value you calculated in #4 into the simulation. You can do this by either dragging the pistol, using the arrows on the gauge or a combination of these methods.

5. Record all trials here indicating which ones were successful.

6. What is the critical angle between 2 mediums? (Show your understanding)

7. Given what you know of the 2 mediums in this interactive; calculate the critical angle when passing from the fluid to the air. **Show all work and equations including substitution with units.**

8. Calculate the horizontal distance between the pistol and where its beam intersects the interface for the critical angle. Test this calculation in the simulation to see if it works. Record all trials below your calculation including describing what you observe about the path of the beam. (If the measurement in between the measurements possible in the simulation use one that is higher and one that is lower noting what you observe about the path of the beam at these two angles.) **Show all work and equations including substitution with units.**

Observations about the path of the beam.

9. Calculate the horizontal distance between the pistol and where its beam intersects the interface to hit the lower target. **Show all work and equations including substitution with units.**

Hit **RESET** in the simulation. Input the value you calculated in #9 into the simulation. You can do this by either dragging the pistol, using the arrows on the gauge or a combination of these methods.

10. Record all trials here indicating which ones were successful.

11. Given what you know of the 2 mediums in this interactive; calculate the critical angle when passing from the air to the fluid. **Show all work and equations including substitution with units.**

12. What do you understand better now as compared to before you preformed this interactive?
