

Index of Refraction for Determining Liquids

Purpose

We are curious in the different refraction indices of sodas and other liquids. Our goal is to predict what an unknown substance is based on its properties, especially its index of refraction.

Formula

Snell's Law: $n_1 \sin \theta_1 = n_2 \sin \theta_2$

Materials

- Laser pointer
- Protractor
- Clear Square Container
- Diet Soda
- Regular Soda
- Oil
- Soap
- Water

Procedure

Use two different liquids. Pour the liquids into clear boxes. For each, measure the angle of refraction, the initial and final angles. Using Mathematica, we will compute and propagate the values with uncertainty. We will create graphics to represent the light's path in Python. Figure out how to use Snell's Law to find the index of refraction. We will then use the Mathematica program and the Python program to predict the index of refraction for two mystery sodas, one with no sugar content and one regular, and then predict which soda is which based on that.

Week 1:

Setting up our Mathematica program so it can be ready to calculate density and error for next time. Measure as much data as we can. First priority will be trying to get our mathematica program working. If we finish that on time we will then start making measurements.

Week 2:

Finish up making any measurements missed during the first period. Then make python graphs to represent our data. Predict an unknown soda and determine its name. Calculate the refraction angles and determine the index of refraction for the unknown soda. Research known values and compare it to our values, attempting to guess the correct soda identity. Using our calculated uncertainty, compare to see if we are within the range of declared values. Graph the indices and the path of the light.

Graphical Model to Recreate

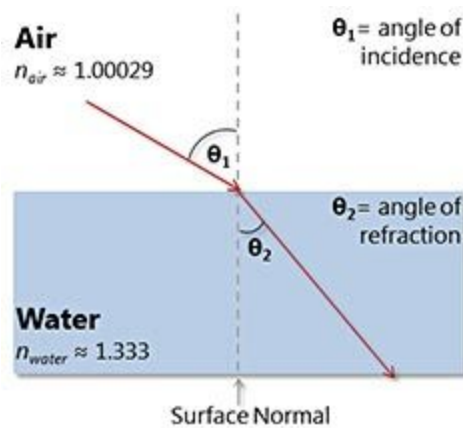


Image from Science Buddies

https://www.sciencebuddies.org/science-fair-projects/project-ideas/Phys_p028/physics/measuring-sugar-content-of-a-liquid-with-a-laser-pointer#background