Name(s)	Project Number
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Project Title

Refraction Action

Abstract

Objectives/Goals

The purpose of my project was to determine if increasing the sugar concentration in water would increase the index of refraction. My hypothesis was that as the percent of sugar increased in the water, the index of refraction would also increase.

Methods/Materials

I tested five different sugar solutions of various concentrations (5%, 10%, 15%, 25%, and 50%) three times each. Using six 1x3" glass microscope slides, I constructed a watertight equilateral triangular prism. I positioned the prism perpendicular to a wall. Using a 532nm green laser pointer, I measured the angle of minimum deviation of each solution by measuring the change in position of the laser beam made from an empty prism to one filled with a solution. I tested all five of my solutions in this way, making sure to control all the vital angles and distances. Using the angle of minimum deviation, I calculated the index of refraction with the dispersion equation. I then analyzed all my data.

Results

From my data, I found that the index of refraction increased incrementally, as the sugar concentration increased. My results are consistent with my background research, and conformed my hypothesis.

Conclusions/Discussion

My results happened the way they did because when I increased the sugar concentration, I increased the density of the water. From my research, I found that refraction occurs when light passes through the boundary separating two mediums of different density. Refraction is caused by the change in speed of light as it travels through the mediums. The index of refraction is the measure of the bending of the light. I used Snell's Law and basic geometry to derive the dispersion equation which I used to calculate the index of refraction. Snell's Law, and the concept of refraction are used in a variety of real-world applications. These applications include x-rays, cellphones, radiation therapy, infrared technology, and sonar. The next step in my experimentation would be to test a variety mediums. I would analyze the data, and try to find a mathematical model that would directly relate the index of refraction to the density of a medium.

Summary Statement

The goal of this project was to investigate whether increasing the sugar concentration would increase the index of refraction.

Help Received

I received help from my Dad, my teacher Ms. Skiles, and our family friend Mrs. Rickard.