



CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s) Kieran S. Mital	Project Number J1913
Project Title Measuring the Effect of Sugar Concentration on the Refractive Index of Water Using a Home-made Laser Refractometer	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective was to measure the affect of sugar concentration on the refractive index of water as measured using a homemade laser refractometer. The hypothesis was that the refractive index of sugar solution increases as the concentration of sugar increases.</p> <p>Methods/Materials Materials: Laser pointer with built-in level,hollow, plexiglass prism that is 45mm eq. x 45mm, organic cane sugar, precision weighing scale that measures from .1 grams - 100 grams, distilled water, aluminum level ruler that is 1220mm, styrofoam block (320 x 145 x 65mm), cast iron stands (4" x 3"), steel, adjustable clamps (0-160mm), a plastic funnel (Dia30x5mm, depth40mm), glass graduated cylinder (100ml), wooden metric ruler (300mm). Method: Pass the laser light through the hollow prism that has a sugar solution and record where this hits on a vertical metric scale and calculate the refraction distance. Repeat this 3 times for each concentration. In addition, the whole experiment set was repeated a total of three times to get the right resolution for low concentrations.</p> <p>Results 1. In the first experiment set , concentrations <1g/100ml had negligible differences in refraction distance but for concentrations >1g/100ml, the higher the sugar concentration, the higher the refraction distance but the difference between readings was small (about 2mm for every 5g/100ml). 2. In the second experiment set, the higher the concentration, the higher the refraction distance. Also higher resolution was obtained(about 8mm for every 5g/100ml compared to 2mm in Exp Set 1). 5. In the third experiment set, the higher the concentration, the higher the refraction distance even for <1g/100ml with significantly higher resolution (about 8mm for every 1g/100ml)</p> <p>Conclusions/Discussion 1. The higher the sugar concentration, the more light bends (higher refractive index). The refractive index is increasing because the solution is getting #thicker# creating a denser medium with a higher refractive index. 2. The resolution of the refractometer increases with Projection Distance. The relevance of these conclusions is that this kind of setup could be used in mass production of soft drinks and other liquids with dissolved sugar. Such a refractometer could be part of the pipes that the liquid flows through and measures the amount of sugar continuously. If there is too much, it signals to add more water, if there is too little, it signals to add more sugar.</p>	
Summary Statement The refractive index of light was shown to increase with sugar concentration using a home-made laser refractometer which has important industrial applications.	
Help Received My Mother helped with my board and my Father helped with the apparatus setup and using Excel for graphs	