CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
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Project Number
J0110

Project Title
Stoked on Viscosity

Abstract

Objectives/Goals
The objective was to determine how changing the size of ellipsoids along one axis changes the speed at which they fall through liquids of varying viscosity and how the non-spheroid ellipsoids are inputted into Stokes' Formula for calculating viscosity. It is hypothesized that the most elongated ellipsoid (3.5 cm) will fall slowest, and that an average of the two radii of each ellipsoid will work best for inputting into Stokes' Formula.

Methods/Materials
Five spheres of an identical approximate mass were created out of Sculpey#. Each ellipsoid was rolled out along one axis longer than the last. Several sugar/water solutions of different specific proportions were prepared. Each ellipsoid was dropped five times in each solution and the time it took to reach the bottom of a graduated cylinder was recorded.

Results
All data showed a general trend of the 3.5 cm ellipsoid, the longest ellipsoid, dropping slowest in each sugar solution and the 1.5 cm sphere dropping fastest. There was an exponential jump in speed between the 50% and 70% solutions for all ellipsoids, probably due to the high number of hydrogen bonds between the sugar and water molecules. The line graphs of the 1.5 cm sphere and of the 3.5 cm ellipsoid are nearly identical in shape, suggesting that the short radius of any ellipsoid elongated along an axis will yield the most accurate results in Stokes' Formula, except in highly viscous fluids.

Conclusions/Discussion
The hypothesis was only partially supported by the results of the experiment. The longest (3.5 cm) ellipsoid did fall slowest, taking an average of 9.125 seconds in the 70% sugar solution, but the difference between the average drop speeds of the ellipsoids was small enough that using the shortest radius of an ellipsoid will work best in Stokes' Formula. It is most likely that the cause of the short radius being most accurate in Stokes' Formula is the way fluid flows around the ellipsoid. Almost none of the fluid actually goes around the long radius of the ellipsoid; it takes the short way and flows along the short radius.

Summary Statement
I explored the effect that changing the size of ellipsoids along one axis has on the speed that they fall through fluids of varying viscosity, and how the non-spheroid ellipsoids are inputted into Stokes' Formula for calculating viscosity.

Help Received
Grandpa helped me come up with the idea to use non-spheroid ellipsoids in my experiment. Dad helped me sculpt and weigh the ellipsoids. Mom procured the materials used, oversaw the cooking of the sugar solutions, and assisted with the dropping of each of the ellipsoids in the various sugar solutions.