



# CALIFORNIA STATE SCIENCE FAIR 2006 PROJECT SUMMARY

<b>Name(s)</b> <b>Rebecca D. Hicks</b>	<b>Project Number</b> <b>S1509</b>
<b>Project Title</b> <b>Slow Flow: A Study of the Effect of Temperature on Viscosity</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The order of the liquids from lowest viscosity to highest viscosity will be olive oil, motor oil, and corn syrup; the viscosity of a liquid is inversely proportional to its temperature; the liquids will decrease in viscosity and the temperature increases, or increase in viscosity as the temperature decreases, in a common manner; the magnitude of the effect that temperature will have on a liquid's viscosity is directly proportional to the average viscosity of the liquid.</p> <p><b>Methods/Materials</b> Falling ball viscometers were assembled. Transparent PVC pipes were cut into three lengths of about 1.1 meters each and capped on one end with plastic caps using purple primer and PVC pipe cement, filled with a liquid and a ball bearing each, and capped on the other end. An equation derived using Stoke's Law of Laminar Flow was found to calculate the viscosity of the liquids based on the time it took the ball bearing to fall through a certain length of the tube. The viscometers were placed in a bathtub filled with water of a known and cooling temperature, and the time it took the ball bearing to fall through the tube was measured at intervals of 0.5 degrees C. This time was used with each temperature, the diameter of the ball bearing, the acceleration due to gravity, the densities of the ball bearing and the liquid, and the length through which the ball bearing fell in the afore mentioned equation to calculate the coefficient of viscosity for each liquid at each measured temperature. The recorded data was entered into tables for analysis.</p> <p><b>Results</b> As the temperature of the liquids increased, the viscosity of the liquids decreased. Olive oil was the least viscous, corn syrup was the most viscous, and motor oil was in between these two. The trend of the viscosity versus temperature curve does not appear to be common among the liquids. Corn syrup showed the greatest change in viscosity over the temperature range, motor oil showed the least change, and olive oil was between these two.</p> <p><b>Conclusions/Discussion</b> The data support that the order of the liquids from least viscous to most viscous is olive oil, motor oil, and corn syrup, and that viscosity shares an inverse relationship with temperature; the data do not support the existence of a universal viscosity v. temperature curve or that the effect that temperature will have on a liquid's viscosity is directly proportional to the average viscosity of the liquid.</p>	
<b>Summary Statement</b> The project is about the effect of temperature on the viscosity of a liquid and the possibility of a universal relationship between the liquid viscosities and temperature.	
<b>Help Received</b> Materials were lent by Mr. Mark Grubb for use; other materials were located by father; father assisted in the construction of the falling ball viscometers	