



**CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY**

Name(s) Katrina I. Paras	Project Number S0623
Project Title The Effect of Water Temperature on the Ability of a Surfactant to Minimize the Surface Tension of Water	
Abstract	
Objectives/Goals The objective was to determine the effect of water temperature on a surfactant's ability to decrease the surface tension of water.	
Methods/Materials Materials for the homemade balance were a cardboard tube, wire, two wood blocks, aluminum foil, needle, sewing thread, and a small piece of modelling clay. Other materials were distilled water, Tide laundry detergent, small pieces of paper clips, a quadra-beam balance, a liquid thermometer, a bowl, a measuring cup, a refrigerator, a microwave, and a calculator. The single beam balance was constructed, which would be used to lift the needle out of the water. A pan for weights was placed on one end and a needle tied by thread on the other. The distilled water sample was heated or cooled to the desired temperature, and surfactant was added to it. The needle was made to "float" on the solution. Weights were added to the pan until it was heavy enough to lift the needle out of the water. The weights used were massed in a quadra-beam balance to calculate the force in grams needed to lift the needle. These measurements were plugged into a formula to calculate the surface tension. 5 water temperatures were tested, with 8 tests for each.	
Results The average surface tension in milliNewtons per meter was 44.9 mN/m \pm 2.15 mN/m at 10°C, 44.7 mN/m \pm 2.38 mN/m at 15°C, 39.5 mN/m \pm 0.741 mN/m at 23.3°C, 25.1 mN/m \pm 1.85 mN/m at 30°C, and 15.7 mN/m \pm 2.57 mN/m at 35°C. These are the reported values, which show the average surface tension and average deviation.	
Conclusions/Discussion The hypothesis was supported by the data in stating that the surface tension would be highest at 10°C. This was most probably because it is a proven fact that surface tension does tend to be lower with hotter temperatures. The effectiveness of the surfactant had to be concluded based on the data and previous research. It is very likely that the surfactant was more effective at higher temperatures. A possible reason for this is the fact that the detergent used is meant for washing clothes in hot water and would be expected to function best at those temperatures.	
Summary Statement This project was about determining how water temperature and a surfactant affect the surface tension of water.	
Help Received Father helped with constructing balance and taking photographs; Mother helped obtain materials; Mr. Antrim (teacher) provided guidance and materials	