



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

Name(s) Kylon Dax C. Magat	Project Number J0520
Project Title How Can Freezing Make Something Warmer?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this project is to determine how and why the solution of water and sodium acetate freezes the way it does. I will also investigate why the solution heats up when it freezes. In order to reach my goals, I will have to find out how the change from a liquid to a solid state produces heat. I also want to find out if it is possible to create a solution that will produce similar effects, using vinegar and baking soda.</p> <p>Methods/Materials I made and tested eight different solutions. Four solutions were made from water and sodium acetate and the other four from vinegar and baking soda. The solutions were purposely created using different proportions to see if the different proportions produced different effects.</p> <p>Results All of the solutions produced the same effects, increasing about 40 degrees Fahrenheit in temperature. The solutions of vinegar and baking soda behaved exactly like the solutions of sodium acetate and water. As soon as I introduced a tiny amount of sodium acetate to the solutions, the solution began to freeze outwards from where the sodium acetate came into contact with the surface of the liquid. In a few seconds the entire solution was frozen and had noticeably become warmer.</p> <p>Conclusions/Discussion The solutions I made of sodium acetate and water were all supersaturated and supercooled. This made each solution very unstable. The sodium acetate also raised the temperature of the water from room temperature to about 110 degrees Fahrenheit. I concluded that when the solutions freeze, an exothermic process takes place in which heat is given off. The solution has to heat up in order to reach its freezing temperature and as it is freezing, it releases energy, which causes it to feel warm.</p>	
Summary Statement In this project I hope to find out how and why the solution of sodium acetate freezes the way it does and why it significantly warms up when it does freeze.	
Help Received Mother helped in purchasing the materials I needed.	