



**CALIFORNIA STATE SCIENCE FAIR  
2011 PROJECT SUMMARY**

<b>Name(s)</b> Sean D. Brennan	<b>Project Number</b> <b>J1304</b>
<b>Project Title</b> <b>A Study of the Relationship between Heat Energy and Density</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The objective of my project was to determine if density affects the ability of a substance to absorb heat, and if so, to what extent. I hypothesized that a substance with a high density will have greater number of particles per unit volume and thus absorb heat better. <b>Methods/Materials</b> Five metal samples with various densities, (from 2.7g/cm <sup>3</sup> to 11.3 g/cm <sup>3</sup> ), were collected. Five styrofoam calorimeters were each filled with 100mL of water and their temperatures were recorded. Each of the metal samples was heated in boiling water, immediately placed inside a calorimeter filled with water, and cooled to equilibrium. This process was repeated three times for each metal sample. The initial and final temperatures for each calorimeter were recorded. The heat absorption of the metal samples was then calculated from their average temperature changes and masses. <b>Results</b> The metal sample with the lowest density consistently yielded the highest heat absorption, while the metal sample with the highest density consistently yielded the lowest heat absorption. <b>Conclusions/Discussion</b> My conclusion is that the density of a substance does not in fact increase its ability to absorb heat. As the negative association between density and heat absorption demonstrated, the true influences of a substance's ability to absorb heat is indeed more complex than I originally assumed. Heat absorption of a substance is possibly related to the unique molecular structure of the material.	
<b>Summary Statement</b> The premise of my project is to investigate the relationship between the density and heat capacity of a substance.	
<b>Help Received</b> Mr. Edwards, my science instructor, provided materials and advice on data analysis; my father supervised my experiment.	