



CALIFORNIA STATE SCIENCE FAIR  
2012 PROJECT SUMMARY

<b>Name(s)</b> Jeremy Kwak; James Yoon	<b>Project Number</b> <b>S1809</b>
<b>Project Title</b> <b>The Effect of Different Cup Holders on the Cooling Rate of Hot Black Coffee</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> To find efficiency of different kinds of cup holders depending on their volume of air pockets</p> <p><b>Methods/Materials</b> Part I: Preparation for the experiment Gather materials: Paper cup Metric measuring cup Metric ruler Electronic thermometer(Xplorer PASPort) Cup holders(Peet;#s Coffee&amp;Tea, Starbucks, The Coffee Bean, Panera)</p> <p>Part II: Testing the cup holders 1. The coffee was boiled to 68.0°C 2. Using the metric measuring cup, 200mL of coffee was poured to the paper cup with cup holder(Peet;#s Coffee&amp;Tea) 3. Temperature of coffee was measured every minute for 10 minutes 4. The steps were repeated for other cup holders</p> <p>Part III: Measuring the volume of air in air pockets 1. The volume of the air pockets had a cylinder shape; height and radius were measured 2. The volume of the air pockets were found by the formula <math>V = \pi r^2 h</math>, then divided by 2(Exception: Peet;#s Coffee&amp;Tea, Panera) 3. The volume of the air pockets were then multiplied by the number of the air pockets</p> <p><b>Results</b> The volume of air in the air pockets greatly affected the cooling rate. The cup holder with greater volume of air in air pockets had low cooling rate Important data values: average deviation, percent deviation, reported value</p> <p><b>Conclusions/Discussion</b> The hypothesis was correct that the most efficient cup holder will have more volume of air in the air pocket.</p>	
<b>Summary Statement</b> The most efficient cup holder had the most volume of air in the air pocket	
<b>Help Received</b>	