



**CALIFORNIA STATE SCIENCE FAIR  
2006 PROJECT SUMMARY**

<b>Name(s)</b> <b>Joshua M. Arreola</b>	<b>Project Number</b> <b>J0702</b>
<b>Project Title</b> <b>The Electrical Freeze</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The objective is to determine if exposing Duracell batteries to freezing temperatures for short periods of time will cause them to die faster than Duracell batteries that are not exposed to freezing temperatures. <b>Methods/Materials</b> To start, ten size-D Duracell batteries and twenty 15-centimeter long electrical wires were used. With wire scissors, cut 1 to 1 ½ centimeters off the edges so the inside wires are exposed. Then with a soldering gun, solder two of the wires to the positive and negative sides of each battery. In the first group, the five batteries that are going to be exposed to freezing temperatures (0 degrees Celsius), are labeled as A, B, C, D, and E. In the second group, the other five batteries left at room temperature (20 degrees Celsius) are labeled as A2, B2, C2, D2, and E2. Place the first group of batteries into the freezer at the same time. Take A out in 20 min., B out in 25 min., C out in 30 min., D out in 35 min., and E out in 40 min. Leave the second group of batteries alone at room temperature. After removing the first group of batteries from the freezer, take all ten batteries and solder on ten 2.47 volt light bulbs to the other ends of the wires, with one wire being soldered on the bottom of the light bulb, and the other wire being soldered on the side of the light bulb. Observe the light bulbs every ten hours, and once the light bulbs start to dim, check more frequently. After all the light bulbs die, record how long each battery lasted in the observation log. Transfer data to a graph. <b>Results</b> According to my graphs, the batteries that were exposed to freezing temperatures for short periods of time lasted longer than the batteries that were not exposed to freezing temperatures. <b>Conclusions/Discussion</b> My data shows that my hypothesis was incorrect. The batteries from the freezer actually lasted longer than the batteries left at room temperature. Even for short periods of time, it appears that batteries placed in the freezer can help the batteries last longer.	
<b>Summary Statement</b> The purpose of this project was to determine whether freezing temperatures would have an affect on a battery's life span.	
<b>Help Received</b> Mrs. Bloom, my teacher, for explaining things I did not understand. My Dad for showing me how to use a soldering gun. My Mom for helping me with ideas for my project.	