



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

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Project Title Current State of Batteries	
Objectives/Goals Buying a battery these days is very confusing. There are so many different brands and types of batteries and all seem to claim to be the best or the most economical. This experiment was performed to try to determine the longest lasting battery and the most cost effective battery. I wanted to provide usable information to clarify the process of buying batteries. Abstract The AA batteries tested included: Energizer Ultimate Lithium, Energizer Max, Energizer Eco, Duracell, Duracell Rechargeable, Walmart Generica Alkaline, and Panasonic Heavy Duty. Each battery tested was placed in a battery holder, attached to a resistor, and the voltage was measured using a voltage meter. The time was measured to deplete each battery to 1 volt and 0.85 volts. This was done to simulate how long each battery may last in an acutal device. The current delivered was calculated using Ohm's law. Two different resistors were used to measure the mAmp hours under high and low load conditions. Finally, the mAmp hours per dollar were calculated to determine the most economical battery. Methods/Materials The AA batteries tested included: Energizer Ultimate Lithium, Energizer Max, Energizer Eco, Duracell, Duracell Rechargeable, Walmart Generica Alkaline, and Panasonic Heavy Duty. Each battery tested was placed in a battery holder, attached to a resistor, and the voltage was measured using a voltage meter. The time was measured to deplete each battery to 1 volt and 0.85 volts. This was done to simulate how long each battery may last in an acutal device. The current delivered was calculated using Ohm's law. Two different resistors were used to measure the mAmp hours under high and low load conditions. Finally, the mAmp hours per dollar were calculated to determine the most economical battery. Results OVERALL CAPACITY: Under both loads, the Energizer Ultimate Lithium battery had the most capacity at 2793 and 2129 mAh respectively. LONGEST LASTING: The Energizer Ultimate Lithium gave over 6 hours at low load, and 3 hours at high load to total (0.85V) depletion and lasted the longest. MOST ECONOMICAL: The Walmart Generic Alkaline battery gave 3671 and 1109 mAh/\$ spent at low and high loads respectively and was the most economical. Conclusions/Discussion This experiment provided guidance to the confusing process of purchasing a battery. In situations where the longest lasting battery is needed, the Energizer Lithium was superior to the all the batteries tested. For the best overall value in AA batteries, however, I will by the Walmart Generic Alkaline batteries in the future.	
Summary Statement I tested commercial AA batteries to determine which one lasted the longest and was the most economical.	
Help Received My father, John Anderson, helped me with my experimental design and analysis.	