

ST WILLIAM OF  
YORK 6<sup>TH</sup>  
GRADE  
SCIENCE  
FAIR  
PROJECT

DEAD  
BATTERIES  
AGAIN!!

A “D”-LIGHTFUL  
EXPERIMENT

BY

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CANON

<http://canon.org/ben/science/batteries.pdf>

## ABSTRACT

The purpose of this experiment was to find out if the battery companies are right about their products. Also to see if the more expensive batteries last the longest and cheaper batteries last not as long. The battery companies claim that their product is the best and their batteries last the longest.

I bought three of the exact same type of flashlight and three different brands of batteries. Two with the same price and one was much cheaper. They all had the same expiration month and year. I drilled holes in the bottom of the flashlight and one on the side parallel to the positive end of the flashlight closest to the bulb. I made a graph to take measurements of the batteries' voltage during the test. I included on the chart the battery brands and the times I would test them. I turned each flash light on at the same time. Every four hours I used a volt meter to test the batteries voltage during the test (stick the negative terminal into the bottom hole of the flashlight and the positive terminal into the side hole) and recorded the data onto the graph I made earlier. When the experiment is over I took the data and put it in graph form on a computer.

One of the higher priced batteries lasted the longest and the least expensive batteries lasted the shortest amount of time.

## HYPOTHESIS

More expensive batteries last longer than cheaper ones.

## RESEARCH

Despite what companies say, scientists have proven that most batteries last about the same amount of time. There is a 9% - 15% variance in battery life. From what I found among other similar tests done between Rayovac, Energizer, and Duracell, apparently, Rayovac lasts the longest. Duracell lasts the least amount of time. I looked up three experiments where scientists measured the length of time each battery lasted and also tested the flashlights bulbs to make sure they were working correctly. They left them on overnight and if one went out overnight they would run it during the day so they would be there to see it when it ran out.

I think Energizer will last the longest because it is a higher priced battery. I think the reason why the more expensive batteries last longer is because they can afford to use higher quality chemicals and more of them to keep energy flowing longer.

References:

[www.energyquest.ca.gov/projects/index.html](http://www.energyquest.ca.gov/projects/index.html) Nov. 2006

<http://www.zbattery.com/bestbattery.html> Nov. 2006

## PROCEDURE

I bought three of the exact same type of flashlight and three different brands of batteries with three prices and with the same expiration month and year. I drilled holes in the bottom of the flashlight and one on the side parallel to the positive end of the flashlight closest to the bulb. I made a graph to take measurements of the batteries' voltage during the test. I included on the chart the battery brands and the times I would test them. I turned each flash light on at the same time. Every four hours I used a volt meter to test the batteries' voltage during the test (stick the negative terminal into the bottom hole of the flashlight and the positive terminal into the side hole) and recorded the data onto the graph I made earlier. When the experiment was over I took the data and put it in graph form on a computer.

# MATERIALS

3 Flashlights

2 D batteries of the brands Energizer, Duracell, and Rayovac

1 drill

drill bits

1 volt meter

extra bulbs

paper

computer

clock

# CONTROLS

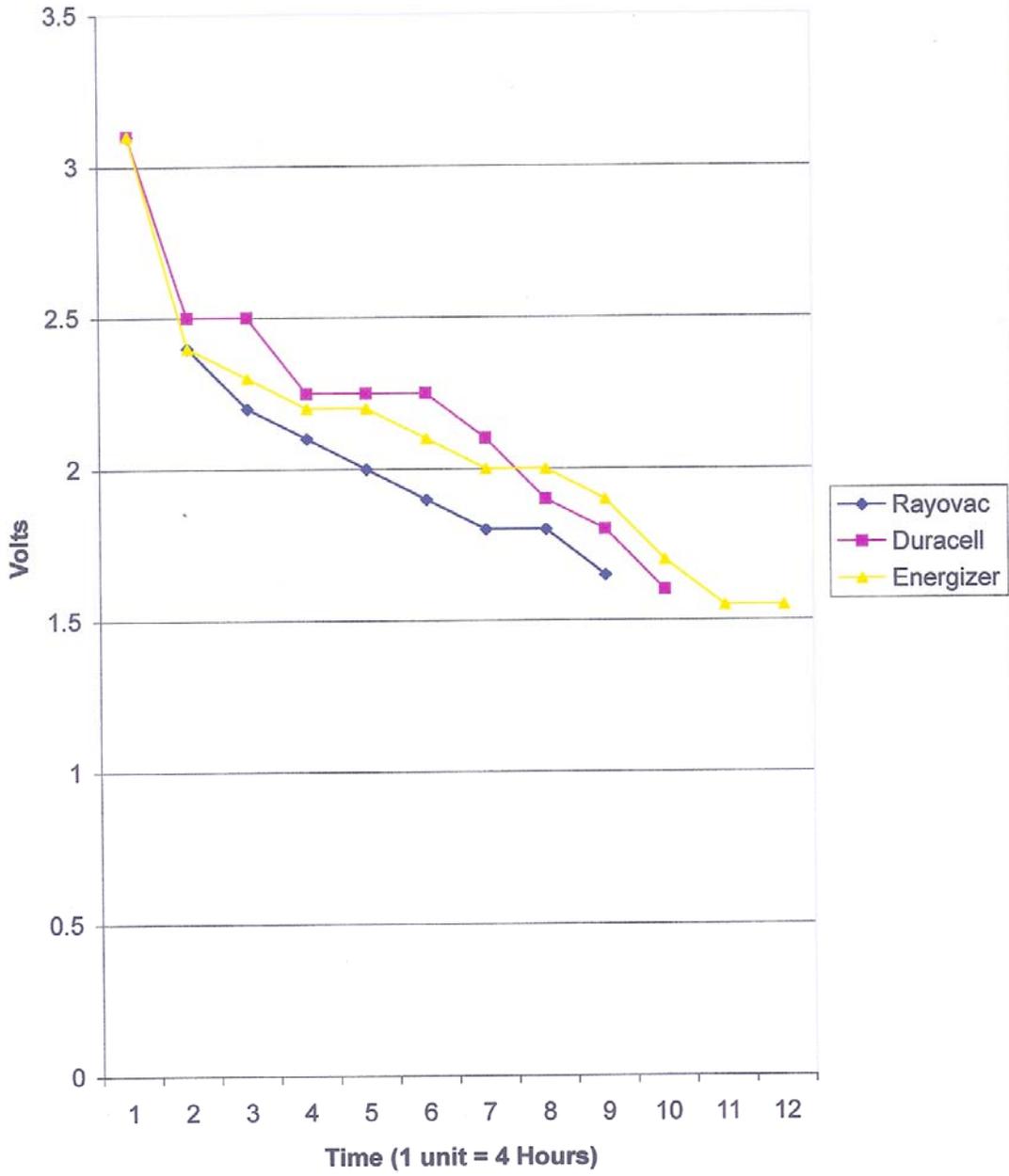
The controls I set were:

- 1) All batteries had the same expiration month and year of Oct 2013.
- 2) All flashlights were the same brand and model.
- 3) The volt meter was calibrated before each test.
- 4) The flashlights were kept indoors with a temperature of 71 degrees F during the test.
- 5) The flashlights were kept lying down on a work pad on the floor so they would not be dropped during the test.

## OBSERVATIONS

I observed that a failure may not always be the batteries. The failure could be the flashlight's bulbs. Batteries lose a lot of their energy in the first few hours and then they gradually lose their energy entirely. I also observed that the volt meter might read voltage from the batteries but that the bulbs will not light with a volt reading under 1.55. Another observation was that the cheapest battery lost energy first. What also was observed was that the calibration of a volt meter is very important.

### Battery Life in Volts



## DATA LOG

Time Unit	Rayovac Volts	Duracell Volts	Energizer Volts	Time
0	3.1	3.1	3.1	4:00 p.m. Saturday
1	2.4	2.5	2.4	8:00 p.m. Saturday
2	2.2	2.5	2.3	12:00 a.m. Sunday
3	2.1	2.25	2.2	4:00 a.m. Sunday
4	2	2.25	2.2	8:00 a.m. Sunday
5	1.9	2.25	2.1	12:00 p.m. Sunday
6	1.8	2.1	2	4:00 p.m. Sunday
7	1.8	1.9	2	8:00 p.m. Sunday
8	1.65	1.8	1.9	12:00 a.m. Monday
9		1.6	1.7	4:00 a.m. Monday
10			1.55	8:00 a.m. Monday
11			1.55	12:00 a.m. Monday

<b>Start time</b>	<b>4 p.m. Saturday</b>
<b>Data check point</b>	<b>Every 4 hours</b>
<b>Rayovac lasted</b>	<b>31.5 hours</b>
<b>Duracell lasted</b>	<b>35 hours</b>
<b>Energizer lasted</b>	<b>43 hours</b>

**Flashlight bulb would not light below the last volt reading.**

## CONCLUSION

The conclusion was that my hypothesis is correct, more expensive batteries last longer. Also, it is better cost-wise because they cost less per hour to use.