

What Brand of Battery Lasts the Longest?

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Acknowledgements

I would like to thank my parents for buying the materials and supporting my experiment. I would also like to thank Notre Dame for letting me do the science fair and having this be in our curriculum. Lastly I would like to thank my wonderful science teacher for helping through the whole experience.

Purpose

The purpose of this experiment was to find out what brand of AAA battery is going to last the longest in a flashlight.

Hypothesis

If I use five of the same flashlights and five different brands of AAA batteries then I think the Duracell would last the longest, because according to research in past science investigations, it does last longest. (scienceprojectideas.org, 2013)

It was a dark and stormy night, Katherine was on her way home from her cabin, in the countryside, and her car created a horrific noise. Shpppsssdpphhhh. Katherine knew she was in deep trouble. She popped the hood of her car and there it was, a drained battery. This problem leads many people to ask just how long will a battery last? As annoying as that sounds, preventing this is not that difficult to do.

First though, where did the battery come from? It all started in 1748 when Benjamin Franklin first coined the term “battery” to describe a display of charged glass plates. Then in the early 1780’s Luigi Galvani demonstrated an experiment with what is now understood to be the electrical basis of nerve impulses and provided the cornerstone of research for later inventors like Volta to create batteries. Alessandro Volta invented the Voltaic Pile in 1800, discovering the first practical method of generating electricity. Alessandro’s voltaic pile was the first "wet cell battery" that produced a reliable and steady current of electricity. (Bellis, 2019)

In 1839 William Robert Grove developed the first fuel cell, which produced electricity by combining hydrogen and oxygen. Bunsen and Grove (two inventors) created improvements to batteries that used liquid electrodes to produce electricity from 1839 to 1842. French inventor, Gaston Plante developed the first reasonable storage lead-acid battery that could be recharged. (1859) This type of battery is mainly used in cars today (Bellis, 2019).

Extra electrons are produced as the reaction occurs, when a battery is discharged. The oxidation of iron to produce rust is an example of a reaction that produces electrons. Iron reacts with oxygen and gives up electrons to the oxygen to produce iron oxide. A battery is made of two metals or compounds with different chemical potentials that separates them with a spongy insulator. The atoms and bonds have chemical potential energy stored in them, which is then imparted to the moving electrons. Batteries today come in many different sizes. For instance, the

big megawatt ones that power a whole facility or the teeny tiny batteries that fit inside a watch. (Alarco and Talbot, 2015)

A device that stores chemical energy that is converted into electricity, is called a battery. What happens, is that batteries are small chemical reactors, with the reaction producing energetic electrons, ready to glide through the external device. In a battery the flow of electrons from one material to another in the external circuit is what happens in the chemical reaction. Charged ions flow through the electrolyte solution that is in contact with both electrodes, to balance the flow of electrons. Different electrodes and electrolytes produce different chemical reactions that affect how the battery works, how much energy it can store and its voltage. (Bhatt et al., 2020)

English inventor David Misell invented the first flashlight in 1899. In a tube that acted as a handle were three D batteries. Batteries powered a small luminous electric light bulb and a simple contact switch turned the light on and off. They were called “flash” lights because they could not produce light for too long and people had to turn them off to “rest” them from time to time. Early flashlights could not last for a longer period of time because they ran on zinc-carbon batteries. First flashlights did not sell too well because of the behaviors of batteries and the carbon-filament electric bulbs were disorganized. (History of a flashlight, 2020)

The flashlights popularity increased and started to change lamps with flammable fuel because they began replacing carbon filament with tungsten, making it a more useful item. By 1922, there were many different designs of the flashlight including: a classic cylindrical type for lightning, a flashlight with greater area of light and a small pocket variant. (History of a flashlight, 2020)

Electricity travels in a loop because circuits, which often use batteries and wires to power devices, can contain current when the circuit is sealed. Resistance is what causes energy to be

used up in a system and can be found in the batteries, wires, lights, and other appliances. When the circuit is closed, current can flow through the circuit, however when the wire is unconnected, current has nowhere to go. This is why sometimes, the light won't turn on. Stripping a wire's metal is important so it can connect to the battery's metal. The coating on the wire is insulation and resists electron flow and blocks the circuit, which makes the coated wire safe to touch when current is flowing through it.(education.com, 2020)

Scientist Michael Faraday discovered that when a magnet is moved inside a coil of wire, an electric current flows in the wire, in 1831. An electricity generator is a device that converts a form of energy into electricity. The relationship between magnetism and electricity determines how the generators operate. Generators that convert kinetic (mechanical) energy into electrical energy produce nearly all of the electricity that consumers use. Using an electromagnet—a magnet produced by electricity— and not a traditional magnet is a common method of producing energy. The series of insulated coils of wire in a generator are what form the stationary cylinder. This cylinder surrounds a rotary electromagnetic shaft. When the electromagnetic shaft rotates, it induces a small electric current in each section of the wire coil, making each section of the wire coil become a tiny, separate electric conductor. The individual currents combine to form one larger current. This current is the electricity that moves through power lines from generators to customers. (U.S. Energy Information Administration, 2020)

Watts are a measurement of power, describing the rate at which electricity is being used at a specific moment. Watt-hours are a measurement of energy, describing the total amount of electricity used over time. How fast the electricity is used (watts) and the length of time it is used (hours) are called Watt-hours. The energy used by households and large devices are measured by Kilowatts and Kilo-hours. Kilowatt-hours are what show up on an electricity bill, describing how

much electricity someone has used. Megawatts are used to measure the product of a power plant and/or the amount of electricity required by an entire city. Large power plants are measured by Gigawatts, which store one billion watts. (Union of Concerned scientists, 2013)

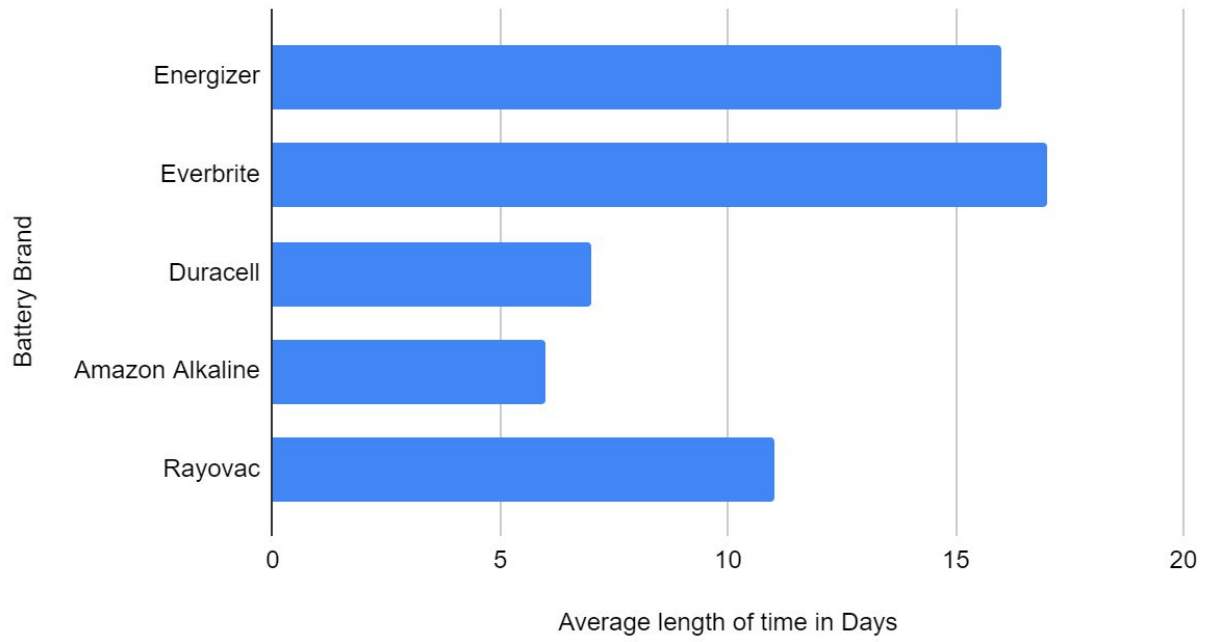
Materials:

5 flashlights - all the same brand
9 AAA Everbrite batteries
9 AAA Duracell batteries.
9 AAA Amazon Alkaline batteries
9 AAA Energizer batteries
9 AAA Rayovac batteries
An Ipad and its charger
A timer
Paper and Pens

Procedure:

1. Gather all materials.
2. Next put the different batteries in the flashlights
3. Ask someone to help turn on all five of the flashlights and timer at the same time
4. Everyday I checked to see if a flashlight went out and if not I would cross out that day.
5. 16 days later, after all the flashlights died out, I tallied all the days and wrote when each of them went out.
6. Lastly, repeat the experiment again.

Average length of time in Days vs. Battery Brand



The hypothesis I came up with was very wrong and if anything it was the opposite of what happened. My hypothesis was that if I used 5 different brands of batteries and 5 of the same flashlights, then the Duracell would last the longest because of an article I read on a website. What ended up happening was that the Duracell flashlight died out first. The Everbrite flashlight lasted the longest. I was completely surprised. In conclusion, the experiment was very enjoyable however my hypothesis was not correct.

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