

My Science Project: Citrus Fruit Batteries

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Grade 5

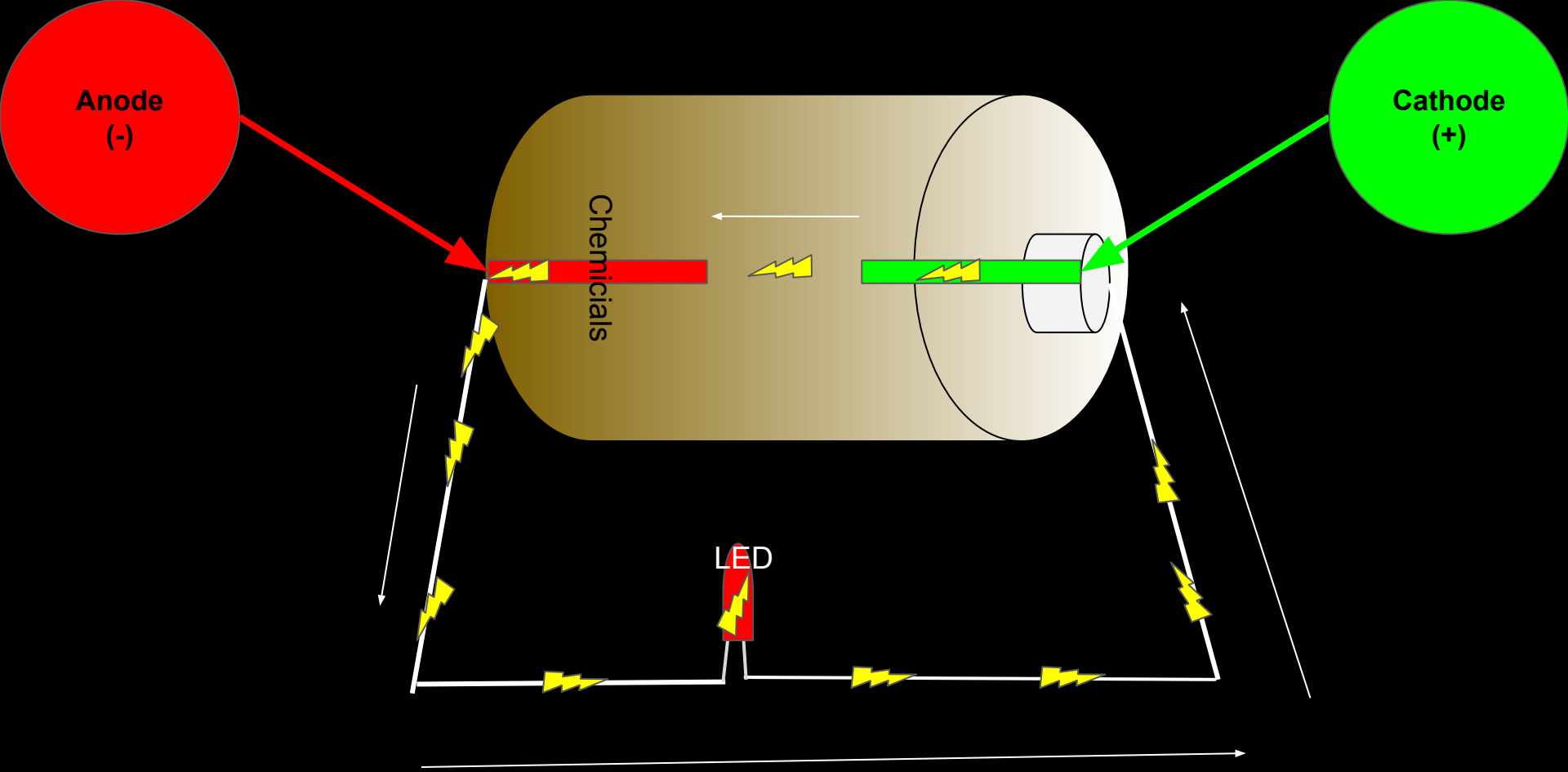


What Citrus
Fruit Makes the
Best Battery?

The image features a dark blue background with the text 'What Citrus Fruit Makes the Best Battery?' in a large, white, sans-serif font. The text is arranged in three lines. In the bottom right corner, there are several overlapping, semi-transparent green geometric shapes, including triangles and polygons, which serve as a decorative element.

Background Info

Batteries store chemical energy. There are two types of batteries, primary, and secondary. Primary batteries can't be recharged. Secondary batteries can, but they aren't as strong as primary batteries. The battery separates the electrons from the atoms in itself. It has two terminals, the anode and cathode. The anode (-) releases electrons which move to the cathode (+). These must be connected by a wire outside of the battery. Chemical reactions at the anode and cathode keep the battery working. Its cells are filled with electrolytes. Electrolytes are mixes of chemicals which can be made of soluble salts, acids, or other bases. I decided to look into batteries with citric acids. They are a liquid or paste. If the anode and cathode touch, then the battery will not work. Not all batteries use citric acid, like the car battery which uses sulphuric acid. This is the same acid a potato battery uses! Fruit batteries work because of their acid. When making fruit batteries, ripe ones are less effective.



This is a diagram of a battery. In our case, the fruit is the battery and we use a voltage meter, not a LED light.

Hypothesis

If I were to make batteries out of citric fruits, then the lemon would work the best.



Why do I hypothesize that lemon batteries would work the best?

Lemon batteries have the highest acidity of the fruits we are testing. A lower pH level means it is more acidic.

Fruit	PH Level
Lemon	2.3
Grapefruit	3.38
Tangelo	3.9
Orange	3.3
Lime	2.4



Materials:

- Various citrus fruit (we used an orange, lime, lemon, grapefruit and tangelo)
- Copper penny (Canadian penny from 1983 or older)
- Galvanized nail
- Voltage meter
- Alligator clips (2)
- Steel wool (optional)

Procedure

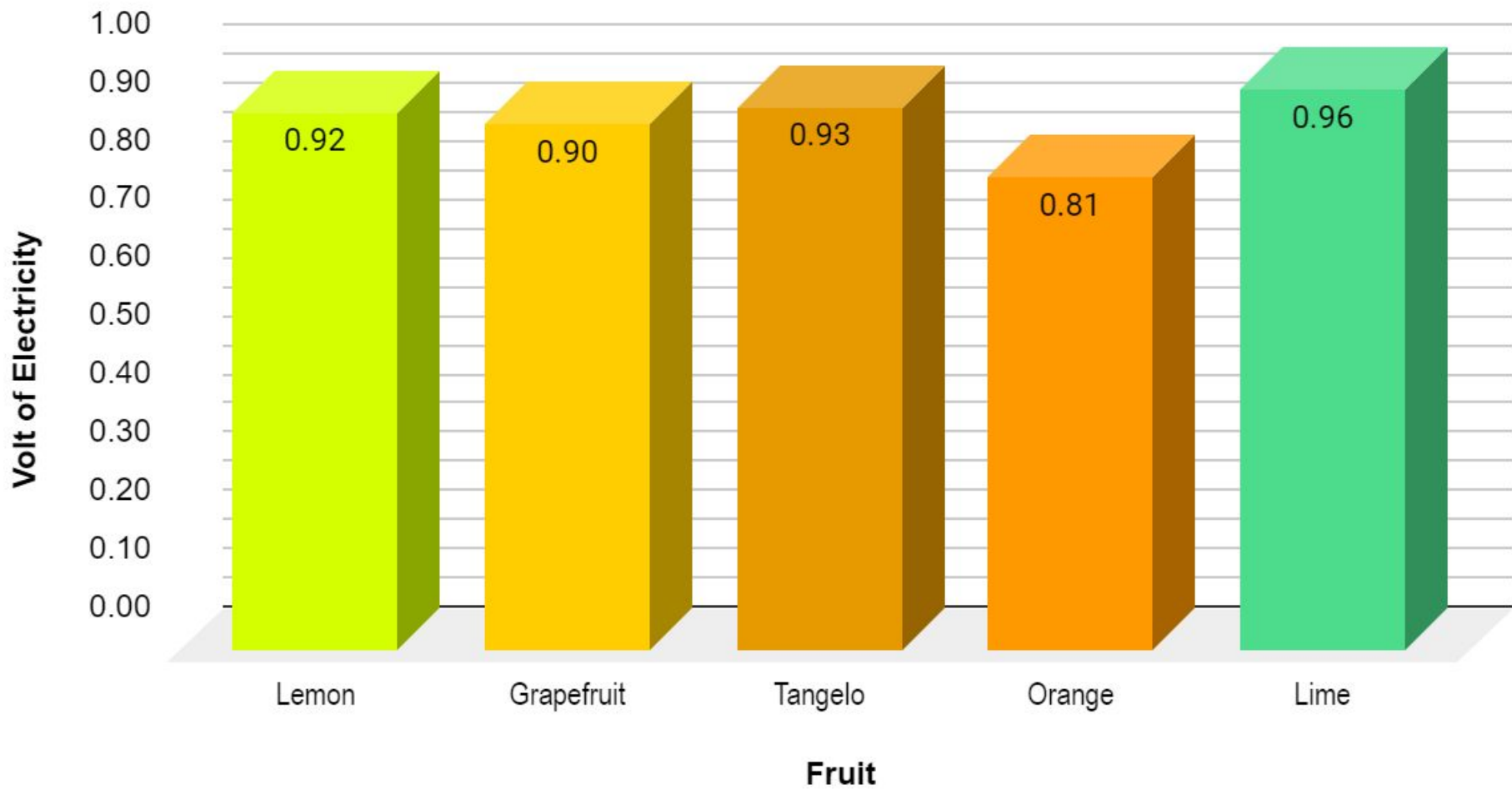
First, we rubbed the penny with steel wool. This gets most of the dirt off the penny. Next, we set our voltage meter to volts. Then, we made a line in the fruit with the nail and stuck the penny in. We pushed it down. Next, we stuck the nail in and pushed it down too. Finally, we attached the alligator clips on, the positive (red) on the penny, and the negative (black) on the nail. These are attached to the voltage meter and we see how much electricity the fruit produces!

A decorative graphic on the left side of the slide, consisting of two overlapping green arrow shapes pointing to the right. The top arrow is a lighter shade of green, and the bottom arrow is a darker shade, creating a layered effect.

Results

I measured each fruit's electricity levels and I was surprised when the lime made a better battery than the rest. One possible reason is that the lime may not have been as fresh as the lemon. Just because they were bought on the same day, doesn't mean they were picked on the same day. In the end, the orange was the worst battery. See the next page for more details.

How Much Electricity Citrus Fruits Make



Conclusion

Limes seem to make the best battery of the citrus fruits. The lemon surprisingly got right in the middle, and the grapefruit and lime were higher. The grapefruit surprised me more than the lime. The lime only had 0.1 more pH. The grapefruit had 1.08 more.

	Mean	Median	Range
Voltage	0.904	0.92	0.15
PH Level	3.056	3.3	1.6



Bibliography

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