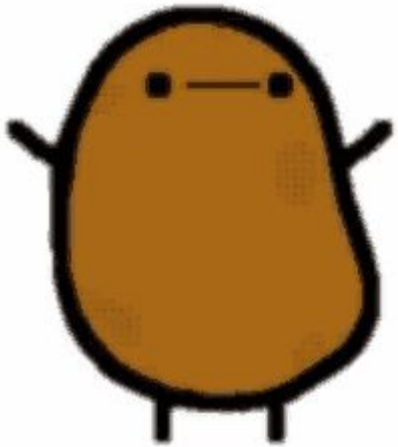
You Say Potato, I Think Electricity



Science Fair Project by Chase Hengen

Testable question

If a potato battery works, will multiple potatoes, anodes, or cathodes in a circuit make the LED brighter?

Hypothesis

The more potatoes, anodes, and cathodes in a circuit will make the LED light brighter because the bigger the chemical reaction, the brighter the LED will be.

Procedure

This was my procedure:

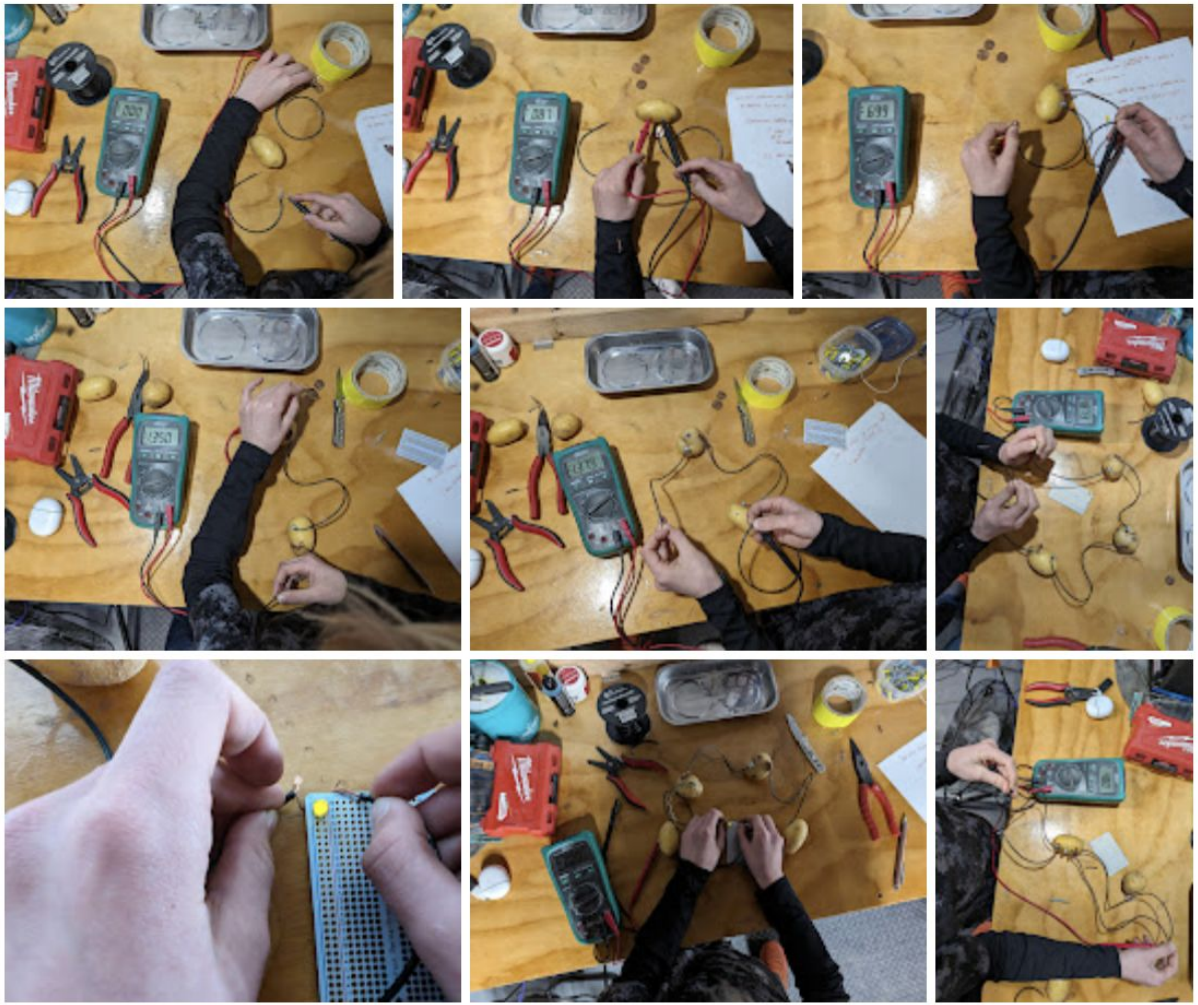
- Get a couple of pennies, nails, some electrical wires, a voltage tester, and small potatoes.
- Attach the nail to the wire. Attach a penny to a separate wire, and stick the penny and nail into the potato.
- Grab your voltage tester. Attach the open end of the wire to one part of the volt tester and the other wire to the other side of it. Your voltage tester should now show you your voltage. (Don't forget to turn it on!) Your voltage should range from 0.03 to 1.0 if you are using a small potato.
- Then you put it in a series circuit of 2 potatoes (you attach the nail and penny to the potato and attach the potatoes together). Your voltage should be around 1.04 - (it's like adding) volts. Record your voltage.
- Now you double the circuit to make it a circuit of 4 potatoes.
- Now you will be ready for your LED. It may be a very faint light but if you wanted a very bright one you could have a series of any number of potatoes that you would like!, as long as you have enough potatoes.
- Now to answer the next part of the question: If I doubled the *anodes* and *cathodes* (nail and copper) would there be a bigger voltage? To do this add another nail and another penny.

Background

I was always interested in the potato battery and the citrus battery, and now there was an opportunity for a science fair to try it out and I was like: AWESOME LET'S DO IT! So I did indeed do this project and I am very happy with how this is turning out. Science dreams come true. I always knew it would work but I wanted to know why. And here I am knowing about all this crazy science stuff.

Trials

Try 1: One potato, one anode and one cathode. I got a score of 0.699 volts which is NOT enough to power a LED let alone a lightbulb.
Try 2: Two potatoes, two anodes, two cathodes. Still not enough to power a LED. Voltage of 1.379.
Try 3: Three potatoes, three anodes, three cathodes. It was a very, very tiny, faint light. Voltage of 1.87.
Try 4: Four potatoes, four anodes, and four cathodes. IT LIT IT UP!!!!!!!!!! Voltage of 2.1.

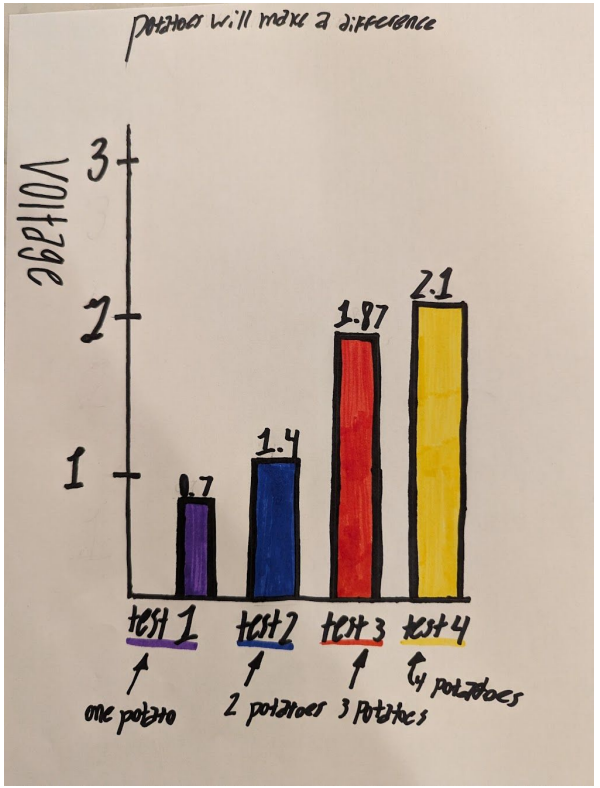


Constant Conditions

Independent Variable:
Number of anodes, cathodes, and potatoes

Dependent Variable:
Voltage

Data



Anodes

Anodes are the ones who give electrons to cathodes.

In this project the object that is the anode is the nail and it is giving electrons to our friend the penny (copper). The thing that transports the electrons are the electrolytes. The anode is the electrode where oxidation occurs. Oxidation is the loss of electrons. You may be thinking, well when the anode runs out of electrons then what happens? Well it doesn't really just run out of electrons, it really just gets very disassembled and can’t function anymore. This isn’t a rare occurrence though I wouldn’t think of it as a popular one. If you make a big potato battery it can last for over a month.

CATHODES

Cathodes are the ones who accept or take electrodes from anodes. However strong the anode wants to give away an electrode to a cathode is called the Standard Reduction Potential or for short, S.R.P.

Copper has a + .34 reduction potential and Zinc has a -0.76 potential. In my project the cathode is the penny.

Typically a fresher penny will work better with the project because it will have a fresher copper coating. The cathode will always be the positive and the anode will always be the negative.

The process is this: -the anode wants to give away its electrons.

-The electron flows through the wire.

-The cathode gets it.

CONCLUSION

Testable question answer to: IF A POTATO BATTERY WORKS, WILL MULTIPLE POTATOES MAKE IT BRIGHTER? Yes. If you put multiple potatoes into a circuit then the LED will light up a little bit brighter with each potato.

My hypothesis was correct. I think it would be interesting to see how different sized potatoes made a difference or stronger anode or stronger cathode.

REFLECTION

Overall I learned a ton, and accomplished the feat of doing a science fair. I also am thinking: lemons, and potatoes could be used as energy for our world instead of wasting fossil fuels and destroying our environment.

BIBLIOGRAPHY

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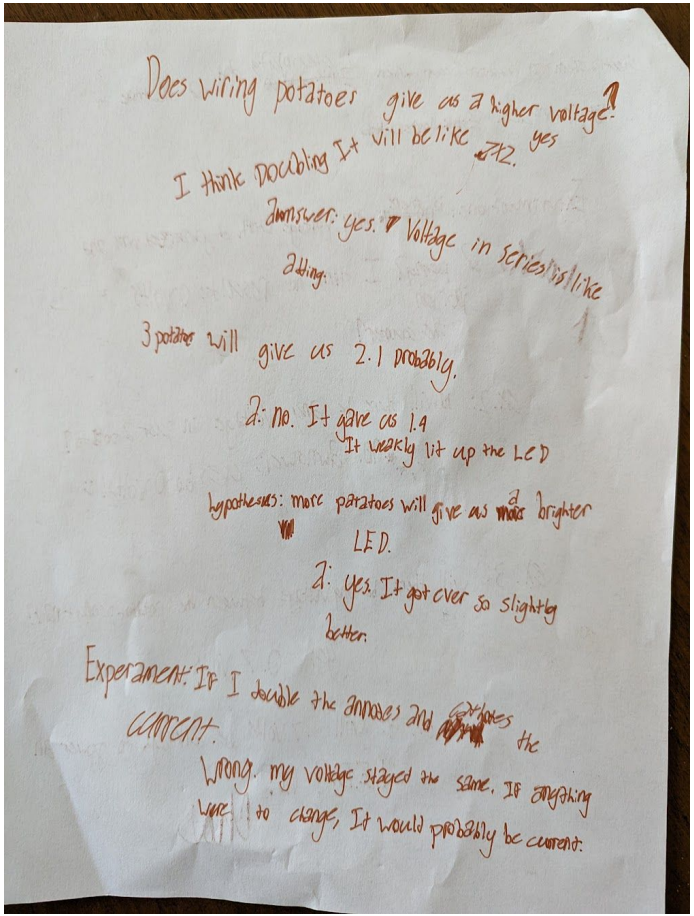
https://www.youtube.com/watch?v=GZiLVqGd9JY&t=183s

Potato Battery Science Project by Science Buddies
https://www.youtube.com/watch?v=GWIzEp2FZJE&t=83s

This battery is made from 3,000 LEMONS - Guinness World Records by Guiness Book of World Records
https://www.youtube.com/watch?v=IMc7HQj3gVE

LOG BOOK



Does wiring potatoes give us a higher voltage?

I think doubling it will be like 1.2. yes

Answer: yes. Voltage in series is like adding.

3 potatoes will give us 2.1 probably.

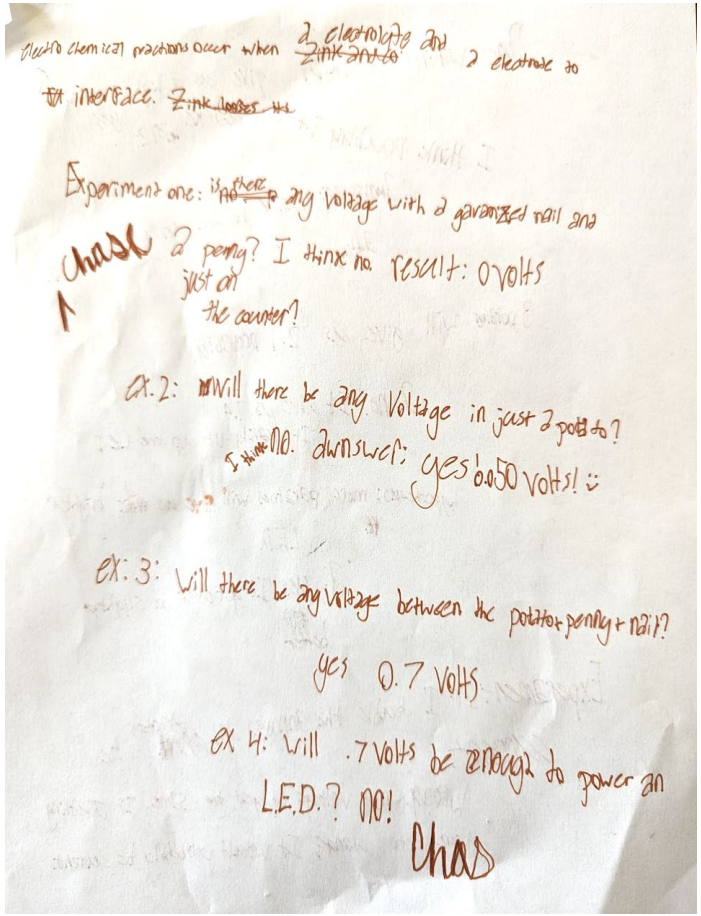
2: no. It gave us 1.4
It weakly lit up the LED

hypothesis: more potatoes will give us a brighter LED.

2: yes. It got over so slightly better.

Experiment: If I double the ampheres and ~~potatoes~~ the current.

Wrong. my voltage stayed the same. If anything were to change, it would probably be current.



Electro chemical reactions occur when 2 electrolyte and 2 electrode to ~~the~~ interface. ~~Zink loses its~~

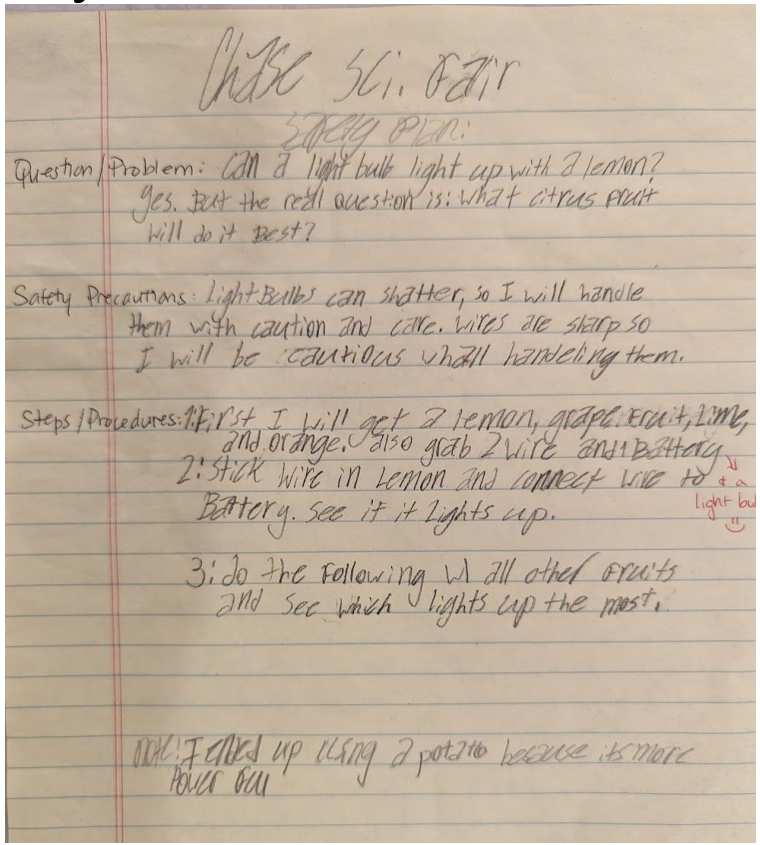
Experiment one: is there any voltage with a galvanized nail and a penny? I think no. result: 0 volts
Chase
just on the counter!

ex. 2: will there be any voltage in just 2 potatoes?
I think NO. answer: yes! 0.050 volts! :)

ex: 3: Will there be any voltage between the potato penny + nail?
yes 0.7 volts

ex 4: will .7 volts be enough to power an L.E.D.? NO!
Chas

Safety Plan & Research



Chase Sci. Fair

Safety Plan:

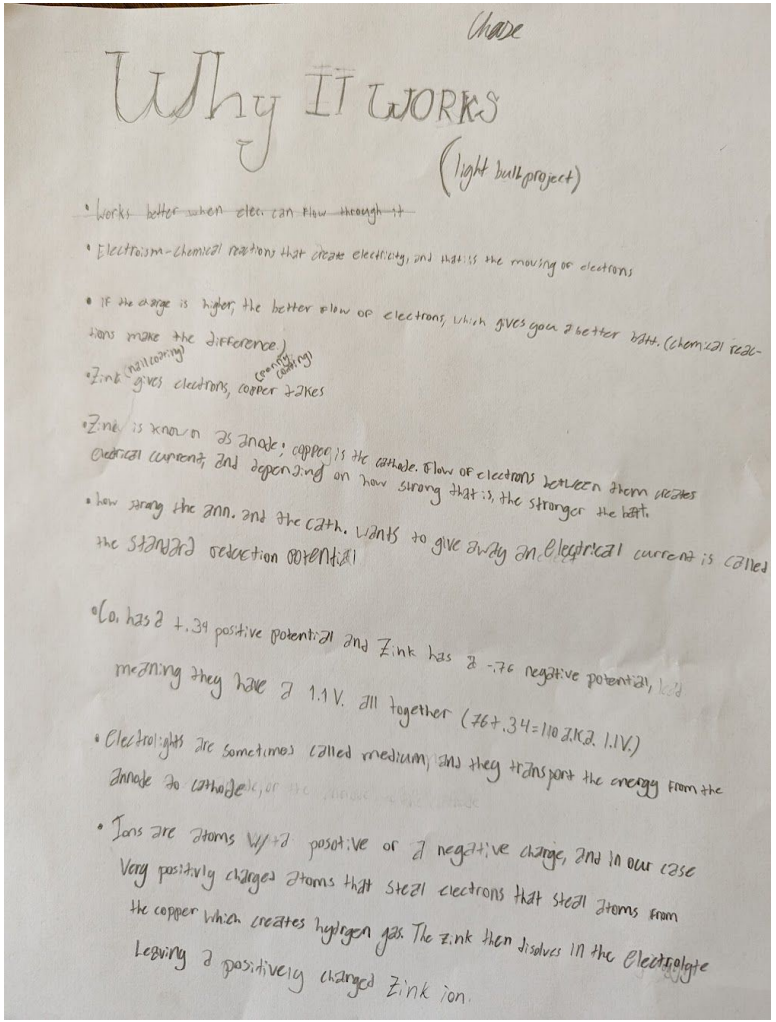
Question/Problem: Can a light bulb light up with a lemon? yes. But the real question is: what citrus fruit will do it best?

Safety Precautions: Light Bulbs can shatter, so I will handle them with caution and care. Wires are sharp so I will be cautious whall handeling them.

Steps/Procedures: 1: First I will get a lemon, grape fruit, lime, and orange. Also grab 2 wire and a Battery
2: Stick wire in lemon and connect wire to + a Battery. See if it lights up. Light bu

3: Do the following wi all other fruits and see which lights up the most.

Note: I called up using a potato because its more Power full



Chase

Why It Works

(light bulb project)

- ~~Works better when elec. can flow through it~~
- Electrisim - Chemical reactions that create electricity, and that is the moving of electrons
- If the charge is higher, the better flow of electrons, which gives you a better batt. (Chemical reactions make the difference)
- Zink (nail coating) gives electrons, copper (coating) likes
- Zink is known as anode; copper is the cathode. Flow of electrons between them creates electrical current, and depending on how strong that is, the stronger the batt.
- how strong the ann. and the cath. wants to give away an electrical current is called the standard reduction potential
- Co. has a +.34 positive potential and Zink has a -.76 negative potential, meaning they have a 1.1 V. all together (.76+.34=1.10 aka. 1.1V.)
- Electrolights are sometimes called medium, and they transport the energy from the anode to cathode, or
- Ions are atoms w/ a positive or a negative charge, and in our case Very positivly charges atoms that steal electrons that steal atoms from the copper which creates hydrogen gas. The zink then dissolves in the electrolyte leaving a positively charged Zink ion.