Question:

Can a potato generate enough electricity to power an LED?

Purpose:

The purpose of this experiment was to show how simple low-cost materials are able to generate electricity, further exploring the concepts of alternative energy sources. The question above is important because it helps show how a inexpensive materials like a potato can be used to generate electricity, further expanding people’s knowledge of alternative energy source

Background Research:

- The electrical energy is provided by a chemical reaction between two metals, zinc and copper (Finio, 2024).
- Potatoes produce around 0.5 to 0.9 volts (How Much Electricity Does a Potato Produce, 2025)
- Each potato functions as a small battery, resulting in more energy being produced as more potatoes are added.

Hypothesis:

If a potato generates electricity, then it should produce enough to power a small LED light.

Variables:

Independent V: Amount of potatoes
Dependent V: Electricity generated
Control V: same type of potato (russet), same multimeter, same alligator clips

Materials:

- 3 russet potatoes
- Copper
- Zinc
- Multimeter
- Wires with alligator clips
- Paper or computer to graph data
- Ruler
- LED light

Procedures:

1A. Insert one piece of copper and one piece of zinc into each of the three potatoes. With a ruler, make sure that on each potato, the piece of metal are 2 inches apart so they aren't touching each other.

1B. Connect two alligator clips to the copper and zinc of only one potato. The alligator clip connected to the copper should be connected to the red probe of the multimeter and the one connected to the zinc should be connected to the black probe. Measure the voltage.

1C. Disconnect the alligator clips from the multimeter and connect them to the LED. The longer (positive) side should be connected to the copper and the shorter (negative) side should be connected to the zinc alligator clip

2A. Repeat process 1B with another potato and add that voltage to the voltage that resulted from the first potato. This will be the total voltage of both potatoes.

2B. Disconnect the alligator clips from the multimeter. Connect the copper alligator clip from the first potato to the positive side of the LED. Next, connect both the zinc alligator clip of the first potato and the copper alligator clip of the second potato together to form a series. Lastly, connect the zinc alligator clip of the second potato to the negative side of the LED.

3A. Once again, repeat step 1B with the third potato and add the voltage to the voltage of the previous potatoes. This result will be the total voltage of all three potatoes.

3B. Disconnect the alligator clips from the multimeter. Connect the copper alligator clip from the first potato to the positive side of the LED. Connect both the zinc alligator clip of the first potato and the copper alligator clip of the second potato together. Take the zinc alligator clip of the second potato and connect it with the copper alligator clip of the third potato. To finish off, take the zinc alligator clip of the third potato and connect it to the negative side of the LED to finish the series and close the circuit.

Results:

Potatoes	Volts	Total Voltage	Did the LED turn on?
Trial 1: One potato	0.87 V	0.87 V	No
Trial 2: 2 potatoes in series	First: 0.87 V Second: 0.87 V	1.74 V	Very dim
Trial 3: 3 potatoes in series	First: 0.87 V Second: 0.87 V Third: 0.85 V	2.59 V	Yes, more brighter than trial 2.

An observation I noticed from my experiment was that each potato generated around the same voltage, approximately 0.8 to 0.9 volts. One potato couldn't generate enough to turn on the LED. But when two potatoes were connected in series, the LED managed to turn on. The voltage generated was approximately 1.7 volts. A trend I noticed was that as more potatoes were added, the voltage kept increasing further.

Conclusion/Abstract:

According to my results, in order for the LED to light up, at least two potatoes should be used, around 1.7 volts. This means that my hypothesis of only one potato being needed wasn't supported. One problem that I encountered while experimenting was trying to find a copper source. I originally planned to use pennies but after further research, "To reduce costs, the Mint changed the composition to 97.5% zinc with a thin copper coating" (Robert, n.d). This meant that I had to find another source of copper for my experiment. One thing I could probably do differently next time I try this experiment is also place the potatoes in parallel. This could help me find more accurate results from the battery's performance. Other ways this experiment could be performed is by using other fruits and vegetables instead of only using potatoes. Even though potatoes produce little electricity, it's an interesting and fun way to know how electricity flows and how circuits work.

Resources:

Finio, B. (2024, October 1). *How to turn a potato into a battery*. Science Buddies. Retrieved December 10, 2025, from https://www.sciencebuddies.org/science-fair-projects/project-ideas/Energy_p010/energy-power/potato-battery

Biology Insights. (2025, August 22). *How much electricity does a potato produce?* Retrieved December 10, 2025, from https://biologyinsights.com/how-much-electricity-does-a-potato-produce/

Robert. (2025). *The Secret History of Copper Pennies*. CV Coins & Collectables. Retrieved December 10, 2025, from https://chulavistacoins.com/copper-penny-history/