

Potato Batteries

This project is fun and educational. The boys can take the materials home and experiment with other vegetables and fruits.

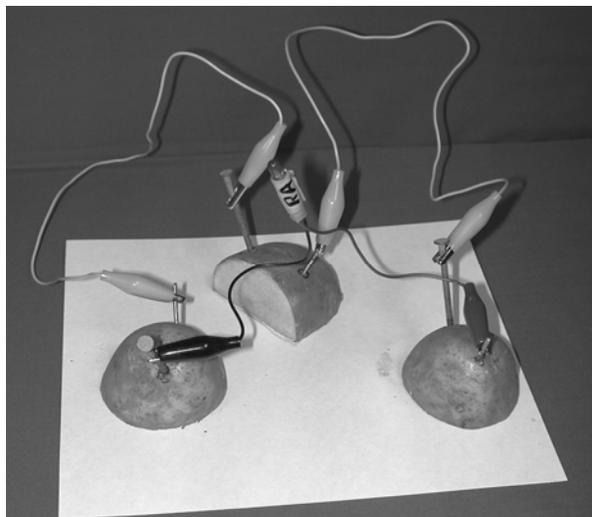
Materials needed:

1. Potato for each boy.
2. 4 – 6p galvanized nails per person
3. 4 pieces of 22 gauge copper wire (6-8" long).
4. Digital voltmeter
5. (optional) Radio Shack® LED light (276-307 is best, or 276-330 is ok).
6. (optional) Radio Shack alligator clips (red, black).

Before the meeting:

1. Gather supplies.
2. Solder wires to LED and alligator clips to the wires to make a "tester light".

Given the proper supervision, older boys could solder the alligator tips onto the wires.



Assembly at the meeting:

1. Cut potato into 3 or 4 pieces.
2. Push a galvanized nail into each of the 4 potato pieces.
3. Push one end of the copper wire into each of the 4 potato pieces.
4. Tie the free end of the copper wire to a nail on another potato piece (in series).
5. Use a voltmeter to measure the voltage between the nail and wire on a single potato. This will be about 0.74 volts. Measure the amperage. It will be very small: 0.100 mA or less.
6. Then put two potatoes in series (connect copper from one potato to the galvanized nail of another potato). Measure the voltage. This will be twice the voltage ($0.74 + 0.74 = 1.48$ volts). Measure the amperage. It will be the same as before (0.100 mA or less).
7. Use their LED "tester light" by attaching the black alligator clip (negative (-) to the galvanized nail (negative pole) and the red clip (positive (+) to the copper wire). With one potato, the LED will not light up because these LEDs light at about 1.7 – 1.8 volts, and you are getting only 0.74 volts from one potato. Then have them try their tester light using 2, 3 and 4 potatoes in series (see photo).

Why it works: Nearly all fruits and vegetables contain acids (ex. ascorbic acid or vitamin C). These acids produce free hydrogen ions (H^+) which seek electrons (e^-) to produce free hydrogen (H_2). The free hydrogen ions remove electrons from the galvanized nail (zinc, Zn) as:
 $Zn \rightarrow Zn^{++} + 2 e^-$ when the $2 e^- + 2 H \rightarrow H_2$ (free hydrogen gas).
 This action is said to oxidize the galvanized nail (Zinc).
 Potato batteries are also little Hydrogen Fuel Cells!