

## Fruit Battery – Electricity (Voltage Sensor)

Concept: Intro. - Electricity

Time: 30 min.



### EQUIPMENT NEEDED

- Voltmeter
- Several pieces of fruit (or vegetables can also be used)
- Small piece of sand paper
- Copper wire (2 or 3 inches)
- Zinc covered metal (galvanized nail)

### PURPOSE

In this activity you will measure the voltage of a "fruit battery\*" using a voltmeter.

(\*In this activity, the word 'battery' will be used in place of 'cell'.)

### THEORY

One form of energy can be converted into another. For example, the energy stored in a piece of food can be converted into energy that helps you grow and move. The energy stored in certain kinds of food can also be converted into electricity. A piece of fruit such as an apple or orange can produce a voltage when **electrodes** made of different metals are placed into the fruit.

An electrode is made from a material that can conduct electricity.

### PROCEDURE

The Voltmeter has a pair of flexible insulated wires with a pair of leads that can connect to the electrodes on your batteries.

For this activity, the Voltmeter measures the voltage (or potential difference) produced by a piece of fruit that has a copper electrode (copper wire) and a zinc electrode (galvanized nail) in it.

### PREDICTION

Will the voltage from a piece of fruit be as much as the voltage from a D size dry cell battery?

- Predict what the voltage will be from the piece of fruit. Record the type of fruit you are going to use and your prediction.

Type of fruit	Predicted voltage (V)

### **PART I: Equipment Setup**

1. Sand the ends of the copper wire and nail just before you insert them into the piece of fruit.
2. Stick the piece of copper wire and the galvanized nail into the piece of fruit to turn it into a battery.
3. Connect the red end of the lead to the copper wire and the black end of the lead to the nail.

### **PART II: Data Recording**

1. Turn on the voltmeter.
2. Record and compare voltmeter readings, rating the fruits from the most powerful to the least.

### **ANALYZING THE DATA**

1. Create a graph from the data table.

### **DATA TABLE**

Type of Fruit	Maximum Voltage (V)

### **OPTIONAL**

- Try inserting the electrodes to different depths.
- Try inserting the electrodes closer to each other or farther away from each other.
- Try different kinds of fruit.
- Try different sizes of the same kind of fruit.

## **QUESTIONS**

1. How does your prediction compare to the actual value of maximum voltage? (Was your prediction lower, higher, or very close?)
2. If you tried any of the optional activities, what were the results?
  - a. Did changing how far in the electrodes were make the voltage go up, go down, or stay the same?
  - b. Did putting the electrodes closer together make the voltage go up, go down, or stay the same?
  - c. Did putting the electrodes farther apart make the voltage go up, go down, or stay the same?
  - d. Did a different kind of fruit make any difference? If so, what was the kind of fruit, and was its voltage higher or lower than your first piece of fruit?
  - e. Did a different size of your kind of fruit make a difference? If so, did the voltage go up or go down?

**Bonus Activity – arrange your batteries so as to produce a voltage reading that is greater than 2 volts.**

- Explain how you accomplished this task.

### **Equipment Clean Up**

- Check with your instructor about putting away the equipment for this activity.
- Check with your instructor about disposing of the pieces of fruit after you are done with them.