



# Electricity and Circuits

## Activity 2: Measuring Current and Voltage of a MudWatt

### NGSS Alignment

#### CORE IDEAS

##### Core Idea PS1: Matter and Its Interactions

PS1.A: Structure and Properties of Matter

##### Core Idea PS3: Energy

PS3.A: Definitions of Energy

#### CROSS CUTTING CONCEPTS

- Patterns
- Cause and effect: Mechanism and explanation
- Scale, proportion, and quantity
- Systems and system models
- Energy and matter: Flows, cycles, and conservation**
- Structure and function
- Stability and change

#### PRACTICES

- Asking questions (for science) and defining problems (for engineering)**
- Developing and using models
- Planning and carrying out investigations**
- Analyzing and interpreting data**
- Using mathematics, information and computer technology, and computational thinking**
- Constructing explanations (for science) and designing solutions (for engineering)**
- Engaging in argument from evidence**
- Obtaining, evaluating, and communicating information**

## Activity 2: Measuring Voltage and Current of a MudWatt

In this experiment you will be measuring the voltage of the MudWatt when no electrons are flowing. This is called the “Open Circuit Voltage” and it represents the maximum EMF that your MudWatt can build up (think of the water in the hose analogy building up pressure with no water able to escape).

However, when you are measuring current in this experiment, you are measuring the electron flow when there are no restrictions blocking it anymore (in our hose analogy, think of the nozzle just being opened completely, allowing water to flow freely).

### Time

15 minutes

### Materials

- MudWatt Science Kits
- Soil
- Multimeter

### Procedure

#### Measuring voltage

1. Set the multimeter to the millivolts setting (For most multimeters, this is the “2000m” within the “V” section on the face of the multimeter).
2. Connect the positive (red) wire of the multimeter directly to the cathode wire (orange) of the MudWatt.
3. Connect the negative (black) wire of the multimeter directly to the anode wire (green) of the MudWatt.
4. Record the voltage of the MudWatt in the data table.
5. Make recordings of the voltage over time

#### Measuring current

1. Connect the wires, light bulb and battery to complete a circuit. The light bulb should illuminate.
2. Disconnect two wires and connect them to various object to determine whether electricity flows through them (conductor) or not (insulator).
3. Make a data table in your science notebook to record which objects are conductors and which ones are insulators like the one shown below.

## Activity 2: Measuring Voltage and Current of a MudWatt

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Date and Time	Voltage (microVolts)	Current (microAmps)

### Questions:

1. Did the voltage change over time? If so, in what way did it change?
2. Did the current change over time? If so, in what way did it change?
3. Did the values change during the time that you were taking the measurement? If so, why? (Think of the hose analogy).
4. If you added any special ingredients to your MudWatt, how did that affect the voltage and current over time? Explain.