

## Measuring Voltage

### Purpose:

Wow- Nighttime is finally here. You decide to go outside but it is too dark. The whole neighborhood is meeting outside to play flashlight tag. You go to grab a flashlight and head outside. You finally join into the game and . . . your batteries are dead. One of your close friends brags that he has a new flashlight that never dies. If the light begins to dim, all he has to do is "crank the juice back into it." How can the hand generator cause changes in the energy in a system? In this investigation, you will explore possible answers to this question.

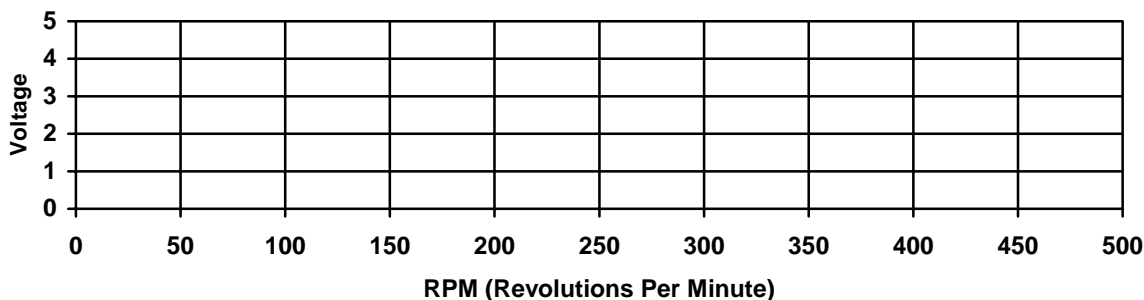
### Materials:

- ☺ 1 Hand Generator
- ☺ Graph Paper
- ☺ Light bulb
- ☺ Bulb holder with positive and negative terminals
- ☺ Clock or watch
- ☺ Voltmeter
- ☺ Wire

### Prediction:

1. How many times, in a minute, will you have to crank the hand generator to produce the same amount of voltage as a 9 volt battery? \_\_\_\_\_
  2. How about to produce enough volts to light up a flashlight? It is going to be possible? Be sure to explain your thoughts. \_\_\_\_\_
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3. Below draw the predicted graph for how much voltage is produce with 60 RPMs, 120 RPMs, and 180 RPMs.

### Voltage for RPM (Prediction)



### Procedures (Observations):

1. Set up a circuit with the hand generator, light bulb, and bulb holder using the wire (alligator clips). Add the voltmeter in parallel with this circuit—make sure the voltmeter is touching the same prongs the clips are attached to.  
→ Take a minute or two to explore how the voltmeter works.
2. Set up and exploration in which you can collect data on 10 different RPM rates and how much voltage is produced. Be sure to include a data table to collect your data in. Record your procedures on your graph paper.
3. Observe and collect data for the next 10 minutes.  
→ Be sure to record your data on your graph paper.

4. Graph your data onto your piece of attached graph paper. Remember--- What all needs to be included on a graph? (Title, axis's titles, etc.)

**Claims:**

5. Based upon your observations, what claims can you make about how RPMs relate to voltage? Is there a pattern?

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**Evidence:**

6. Summarize the evidence you've collected to support your claims.

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**Comparing:**

7. How do your ideas compare with the other students? How do they compare with your textbook (if in your book).  
→Record the results below.

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**Reflection:**

8. How have your ideas changed as a result of this inquiry? What new questions do you have? How does this new information be used to answer the question "How can the hand generator cause changes in the energy in a system?"

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