Phet Simulator: Part 2 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Electromagnets & Ohm’s Law! Date: \_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_

**Part C: Magnets & Electromagnets**

Go to the following: <https://phet.colorado.edu/en/simulation/legacy/magnets-and-electromagnets> and click **Play**!

1. Once the simulator window opens, select the **Electromagnet Tab** at the top of the simulator window.
2. **Review**: Notice the circuit that appears in the window. The copper wire is coiled and attached to both ends of the battery terminal, creating a closed circuit and allowing electrical current to begin to flow. This creates a magnetic field!
3. On the right, select the option to ***reduce*** the number of loops (coils) in the copper wire. Decrease and then increase the number of loops/coils and observe what happens to the magnetic field each time. **Describe the apparent relationship between the number of coils/loops and the strength of the magnetic field**:

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1. Notice that you can also change the ***voltage*** by moving the button in the middle of the battery (fuel cell). Describe what happens to the **electrical current and electromagnetic field** when you:
2. decrease the voltage of the fuel cell from **10V to 5V**.

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1. change the voltage of the fuel cell from **5V to 0V**.

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1. **change the direction** of the (+) and (-) terminals of the battery.

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1. Draw two diagrams illustrating when the battery at 10V and is facing BOTH directions. On each diagram, label the:

a) **direction of the flow of electrons** through the circuit and the **magnetic field lines**

b) **positive and negative terminals of the battery** in both positions *(Through which terminal are the electrons leaving?)*

**Part D: Ohm’s Law**

Go to the following: <https://phet.colorado.edu/en/simulation/ohms-law> and click **Play**!

1. Look at the switches on the right. **Bring the Voltage switch up and down** and notice what happens to the fuel cells in the circuit.
2. What is the **maximum** number of volts you can get in your circuit? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What is the **minimum** number of volts you can get in your circuit? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Watch the letters in the equation as you increase and decrease ***voltage***. Which other variable is also affected when the voltage of a circuit is increased or decreased? Think about this and **explain** why this is:

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1. Click **Reset**. Now, **increase and decrease the resistance switch**. Watch the resistor located in the circuit- **describe what you see** as you increase and decrease the resistance. How is this affecting the flow of electrical **current** (Watch the equation as well to confirm if you are correct!) Describe the relationship between resistance and current below:

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1. Think of an analogy or draw some type of comic/cartoon that illustrates how **Voltage, Current and Resistance are all related**! (Ex. cars on a highway, water moving through a pipe, etc.) Label how each of the three terms are represented in your example!
2. a) What are the unit, abbreviation and symbol used for **Voltage**? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What are the unit, abbreviation and symbol used for **Resistance**? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. What are the unit, abbreviation and symbol used for **Current** in THIS simulator? \_\_\_\_\_\_\_\_\_\_ (What does a little “m” mean when placed in front of a unit? Think millimeters versus meters!) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Click **Reset**. Practice using the **V = IR** formula. Then, use the simulator to see if your calculations are correct!
6. If the current in a circuit is **3.2 mA** and the resistance of the wire used in the circuit is **250 Ω**, what is the voltage of the fuel cell being used? Use correct units at all times!

Formula: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Calculation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Answer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. If the voltage of the fuel cell used in a circuit is **9.0 V** and the resistance of the wire used in the circuit is **560 Ω**, what is the current running through the circuit? Use correct units at all times!

Formula: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Calculation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Answer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_