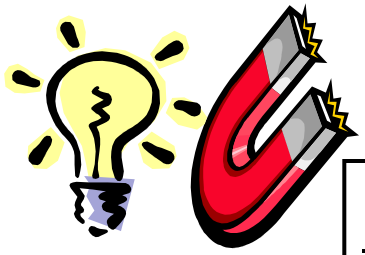
Science 10-Electricity & Magnetism

Activity 5

Activity 3F—Voltage and Current for a Resistor



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Name _____

Due Date _____

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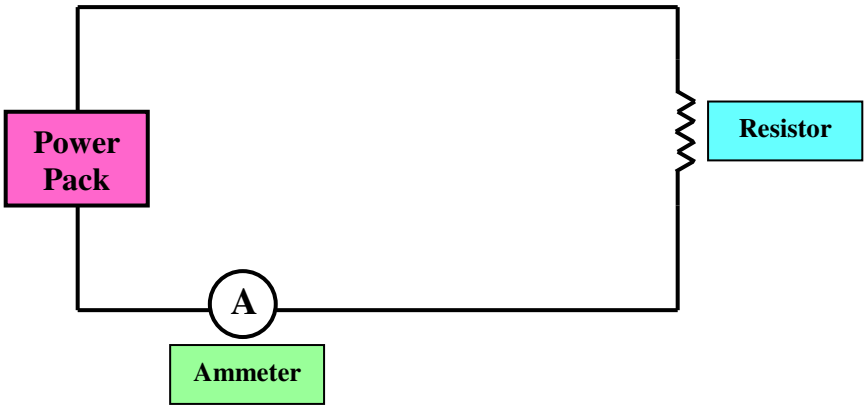
Purpose:

To find out how changing the **voltage** affects the **current** through a resistor.

Procedure:

1. Obtain a power pack, wires, an ammeter and a resistor (10 – 30 Ω preferred).
   Put together the equipment as shown in this circuit diagram. Make sure the positive terminal (**red**) on the power pack is connected to the positive terminal (**red**) on the ammeter. Your teacher will tell you which terminal on the ammeter to use for a particular resistor. **DO NOT** turn the power pack on until you show the teacher your circuit!



2. Look on the resistor and find the **resistance** value. (Ask your teacher if you need help). **Record** the value of the resistance where it says "_____Ω" **right at the top** of the data table on the next page.
3. When you have had your circuit checked, turn the knob on the power pack to the **lowest** setting – 1.5 volts. Then turn the "ON" switch on while watching the meter. If the needle goes close to the end, quickly turn it off again and connect the wire to a less sensitive terminal. If the needle moves backwards, turn it off and switch the wires around.
   Once you have selected the correct terminal, record the current in milliamperes (mA) on the data table on page 2 of this lab. The first voltage to use is **1.5 volts**. **Don't worry** about the **current in amperes** or **the ratio of Voltage/Current** yet. Those will be filled in later!

Record Resistance Value Here

Table 1 – Voltage and Current for Resistor # 1 _____Ω

Voltage (V) (volts)	**Current (I) (mA)**	**Current (I) (Amperes)**	**Ratio: V (volts) / I (Amps)**
0.0	0.0	0.0	
1.5			
3.0			
4.5			
6.0			
7.5			
9.0			

4. Now turn the switch on the power pack to the position which gives **3.0 volts**. Read and record the current in mA.
   Turn the switch to a the next voltage position (**4.5 volts**) and record the current. Any time the needle gets close to the top of the scale, switch to a less sensitive terminal before you try the next voltage.
   Remember, when you switch terminals, you have to start reading from a different scale.
   Ask the teacher for help if you have trouble reading the meter.
   Keep turning the voltage up and **recording the current** until you reach **9.0** volts.

5. After you have finished the 9.0 volt reading, touch the resistor. Is it warm, cold or room temperature? _____ A resistor converts electrical energy into _____ energy.

6. Remove the resistor and replace it with one of a different resistance value.
   Record the resistance of this resistor on the top of "Table 2—Voltage and Current for Resistor # 2 _____Ω on the next page.

7. **Repeat steps 3-4** for the new resistor, recording the values on Table 2, on the next page…

Record Resistance Value Here

Table 2 – Voltage and Current for Resistor # 2 _____Ω

Voltage (V) (volts)	**Current (I) (mA)**	**Current (I) (Amperes)**	**Ratio: V (volts) / I (Amps)**
0.0	0.0	0.0	
1.5			
3.0			
4.5			
6.0			
7.5			
9.0			

8. After you have finished making your current readings, check them quickly with the teacher to make sure they are reasonable.

9. For both tables: Change the current mA values into **Amperes** (A) and fill in the "Amperes" column:

   eg) 335 mA x $\frac{1\text{ A}}{1000\text{ mA}}$ = **0.335 A**

10. Next, for **both** tables, calculate the ratio of **V(volts) / I (Amperes)** for each voltage setting.

    Do this by taking a calculator and dividing the Voltage (in volts) by the Current (in Amps) for each reading. Round your calculator answer off to 1 decimal point and write it in the last column of the table.

    For example: *If, for a certain reading, V = 1.5 volts and I = 0.0993 A*

    Then the ratio **V / I** = $\frac{1.5\text{ volts}}{0.0993\text{ A}}$ = 15.1

11. When you are finished, look at the values for the ratio **V / I** for each resistor and compare those numbers with the value of the resistance written on top of the table.

    Do you see any relationship between V / I and the resistance of the resistor?

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