Electric Pressure, Current and Resistance

Purpose:

The purpose of this activity is to determine the mathematical relationship between battery voltage (**ΔV**), current (**I**), and resistance (**R**) for a simply circuit.

Getting Ready:

Navigate to the DC Circuit Builder Interactive at The Physics Classroom:

www.physicsclassroom.com => Physics Interactives => Electric Circuits => DC Circuit Builder

or http://www.physicsclassroom.com/Physics-Interactives/Electric-Circuits/Circuit-Builder.

Resize the Interactive using the small handles in the bottom right corner or go full-screen by tapping the icon in the upper left corner. Observe the tools in the Toolbox region below the red Workspace area. Experiment with these tools to create a circuit. Simply select a circuit component and tap on the workspace to add it to the circuit; add wires, resistors, bulbs and ammeters as desired. Tap on a component in the workspace to remove it.

Build, Measure, Analyze

1. Clear your Workspace by clicking on all components; only the battery should remain. Using the tools in the Toolbox area, create a simple circuit consisting of a battery, a bulb, an ammeter (for measuring current in amps), and wires.
2. Select the **Modify** icon (shown at right); observe that the magnifying glass appears over the battery. This indicates that you can change the voltage of the battery. Use the arrows to lower the battery voltage to 6.0 Volts.
3. The ammeter reads the current (**I**) in amps. Record the ammeter reading in Table 1.
4. Repeat steps 2 and 3 until Table 1 is complete. Use the **Modify** icon to increase the voltage of the battery (**ΔV**) for each of these trials.
5. Tap the **Modify** icon and then tap on the light bulb. The resistance (**R**) of the light bulb is displayed. Record this resistance value above Table 1. Then double the value of the light bulb's resistance and repeat the experiment for Table 2. Complete Table 3 with a resistance value that is three times as large.

Modify

Table 1

R = _____ Ω

	ΔV (volts)	I (amps)
1	6.0	
2	8.0	
3	10.0	
4	12.0	
5	18.0	
6	24.0	

Table 2

R = _____ Ω

	ΔV (volts)	I (amps)
7	6.0	
8	8.0	
9	10.0	
10	12.0	
11	18.0	
12	24.0	

Table 3

R = _____ Ω

	ΔV (volts)	I (amps)
13	6.0	
14	8.0	
15	10.0	
16	12.0	
17	18.0	
18	24.0	

For the following questions, make a **claim** (answer) and support it with **evidence** (reference to specific trials) and **reasoning** that explain why those specific trials support the claim.

7. Observe your data tables. What effect does a doubling of the battery voltage (Δ**V**) have upon the current (**I**)? (Be sure to use **claim-evidence-reasoning** format.)

8. What effect does a tripling of the battery voltage (Δ**V**) have upon the current (**I**)? (Be sure to use **claim-evidence-reasoning** format.)

9. What effect does a doubling of the resistance (**R**) have upon the current? (Remember: **CER**)

10. What effect does a tripling of the resistance (**R**) have upon the current? (Remember: **CER**)

11. Inspect your data and write an equation that relates the ΔV to the I and R values. Support your **claim** with **evidence** and **reasoning**.

12. Predict the missing values if the following trials were performed. (No **CER** required)

ΔV = 24 V	R = 10 Ω	I = _____ A
ΔV = 12 V	R = 40 Ω	I = _____ A
ΔV = 6 V	I = 4.0 A	R = _____ Ω