Name: _____Sherrie__Heath_____

CASE

Activity 5.2.4 Resistance is Futile

Purpose

When you open an electronic device and look inside, you will find multiple components that impact the flow of electricity. What is the purpose of each component? What happens if you wire them incorrectly?

One of the most important components in electrical devices is a resistor. Resistors change the electricity in a circuit so the correct current is available for a piece of equipment. All electrical devices require a specific current to operate. Computers, stoves, and electric sensors in a greenhouse are examples of equipment that need resistors. As the resistance in a circuit increases, the voltage goes up and the electrical current (amperage) goes down.

How do resistors affect voltage and amperage? Why is the path of the electrical current important to understand when using a resistor?

Materials

Per pair of students:

- LabQuest2
- 2 D batteries
- Vernier circuit board
- Wires with alligator clips
- Vernier voltage sensor
- Vernier current sensor
- #48 lightbulb (tall)

Per student:

- Pencil
- *Agriscience Notebook*

Procedure

You and your partner will use resistors to change the electrical current in a circuit. Then you will observe the affect the resistor has on a lightbulb.

Part One – 10 Ohm Resistor

1. Obtain materials from your teacher. Be sure the switch (SW1) on the circuit board is in the off position.
2. Attach a red wire to the 1 terminal (+) on the circuit board and the 2 terminal by the 10 ohm resistor.
3. Attach a black wire to the 35 terminal (-) on the circuit board and the 3 terminal by the 10 ohm(Ω) resistor.
4. Setup the LabQuest2.
    - Turn on the LabQuest2.
    - Plug in the voltage sensor to Channel 1.
    - Plug in the current sensor into Channel 2.
5. Turn on the switch.

6. Use the voltage sensor to measure the voltage going through the resistor by attaching the red clip of the sensor to terminal 2 and the black clip to terminal 3. Note how you attached the sensor. Measure voltage by attaching the sensor parallel to the circuit.
7. Record the voltage of the 10Ω circuit in Table 1.
8. Disconnect the voltage sensor from the circuit board.
9. Remove wire between terminal 1 and terminal 2
10. Use the current sensor to measure the amperage going through the resistor by attaching the red clip of the current sensor to terminal 1 and the black clip to terminal 2. Note how you attached the sensor. Measure amperage by attaching the sensor in series to the circuit.
11. Record the amperage of the 10Ω circuit in Table 1 of *Activity 5.2.4 Student Worksheet*.
12. Disconnect the current sensor and remove all wires.

Part Two – 51 Ohm Resistor

1. Predict if the amperage and voltage will go up or down by increasing the resistance to 51Ω in Table 1.
13. Attach a red wire to the (+) 1 terminal on the circuit board and the 6 terminal by the 51Ω resistor.
14. Attach a black wire to the (-) 35 terminal on the circuit board and the 7 terminal by the 51Ω resistor.
15. Turn on the switch.
16. Use the voltage sensor to measure the voltage going through the resistor.
17. Record the voltage of the 51Ω circuit in Table 1.
18. Disconnect the voltage sensor.
19. Disconnect the wire between terminal 1 and terminal 6.
20. Use the current sensor to measure the current going through the resistor by attaching the red clip of the current sensor to terminal 1 and the black clip to terminal 6.
21. Record the amperage of the 51Ω circuit in Table 1.
22. Disconnect the current sensor.
23. Shut off the switch and disconnect the wires.

Part Three – Resistance and Light

You will construct two electrical circuits with resistors and lamps. The first will be a series circuit and the second will be a parallel circuit.

1. Answer prediction questions on *Activity 5.2.4 Student Worksheet*.
2. Complete the series schematic on *Activity 5.2.4 Student Worksheet* connecting the battery, 51Ω resistor, and lamp in series. (Hint: you can only use three wires.)
3. Have your teacher check the schematic.
4. Once your teacher approves the schematic, attach the wires to the circuit board meeting the specifications of the schematic.
5. Turn on the circuit board.
6. Use the LabQuest2 and voltage sensor to measure the voltage in the resistor and the lightbulb and record in Table 2 of the student worksheet.

7. Observe the brightness of the lightbulb and record the observations in Table 2.
8. Repeat Steps 2 – 7 to construct a circuit with a 51Ω resistor and lamp in parallel (Hint: you will use four wires).
9. Answer analysis questions on the student worksheet.

Conclusion

1. How does resistance affect the electricity on the circuit?

Resistance decreased current so less electricity is flowing

2. Why would a resistor not work in a parallel circuit?

because the electricity is by-passing the resistor

3. What would happen to the brightness of a lightbulb in a series circuit if a resistor is added to it? Why do you believe so?

the lightbulb will dim

4. If you placed a 10Ω and 51Ω resistor in series, what would be the total resistance in the circuit? How could you test your hypothesis?

the total resistance should be 61….we could test them by connecting them in a series circuit & using the voltage sensor.

Actvity 5.2.4 Student Worksheet

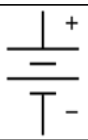
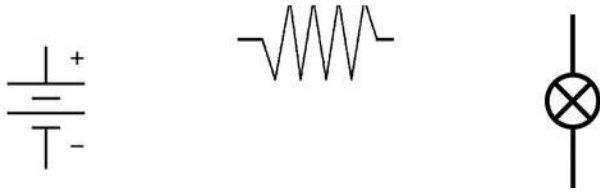
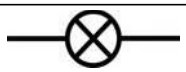
Table 1. ***Resistor Test***

	10Ω Resistor	51Ω Resistor	51Ω Prediction
Voltage	1		
Amperage			

Prediction Questions

- How will the resistor affect the light when it is wired in series with the light? Why?

- How will the resistor affect the light when it is wired in parallel with the light? Why?

Key		Series Schematic
	Battery	
	Resistor	
	Lamp	
Teacher Signature:		

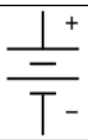
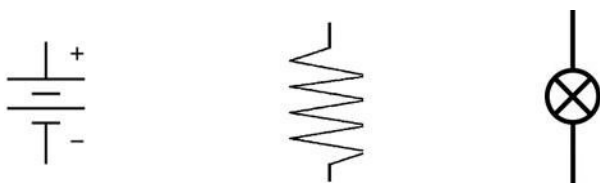
Key		Parallel Schematic
	Battery	
	Resistor	
	Lamp	
Teacher Signature:		

Table 2. ***Circuit Comparison***

Circuit	Lamp Voltage	51Ω Resistor Voltage	Lamp Brightness
Series			
Parallel			

Analysis Questions

- How does a resistor affect the electrical current?

- How should you wire a resistor to be effective? Why?