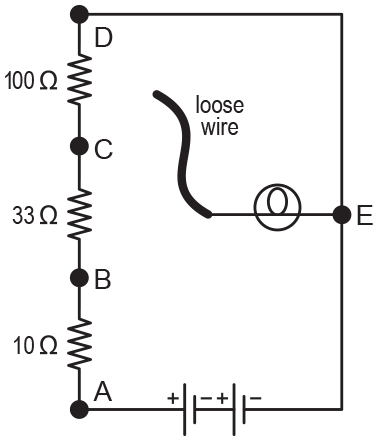
# **Investigation: Variable Resistance**

**Essential question: How does a variable resistor work?**

Common batteries provide voltages in 1.5 V increments. This is fine if you want voltages with values of 1.5 V, 3.0 V, 4.5 V, and so on, but what if you wanted a voltage in between those values? This can be done by varying the resistance in a circuit. In this investigation, you build circuits with variable resistances using a voltage divider and a variable resistor (potentiometer).



Part 1: Voltage divider

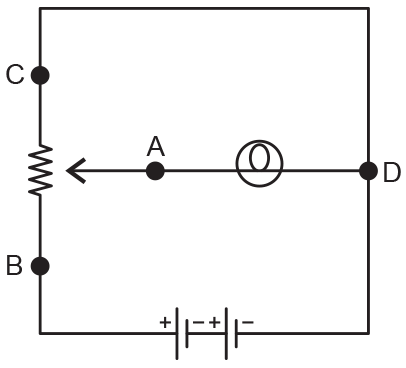
1. Build the circuit shown in the diagram.
2. Use a wire to connect the light bulb to point A and note the brightness of the bulb. Repeat for points B, C, and D, noting the brightness of the bulb in each case.
3. Open the experiment file **VariableResistance** then connect the voltage sensor to your software.
4. Connect the black probe of the Voltage Sensor to point E.
5. Connect the red probe to point A and record the voltage. Repeat for points B, C, and D.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Point | A | B | C | D |
| Voltage (V) | 3.18 | 2.96 | 2.23 | 0 |

Questions

1. What happened to the voltage as you progressed from points A through D? Why?

1. What happened to the brightness of the bulb as you progressed from points A through D? Why?
2. Mix up the order of the resistors and repeat the experiment. Try at least two different combinations. What results are similar to the original experiment? What is different? Explain.

Part 2: Variable resistor (potentiometer)

1. Build the circuit shown in the diagram.
2. Connect the black probe of the voltage sensor to point D.
3. Connect the red probe of the voltage sensor to point A. Turn the knob of the potentiometer and observe the voltage and the brightness of the bulb.
4. Repeat the experiment for points B and C.
5. Replace the bulb with the motor and repeat the experiment.
6. Remove the branch of the circuit between C and D and repeat the experiment.

Questions

1. What happened to the voltage at point A as you turned the knob of the potentiometer?
2. What happened to the bulb as you turned the knob of the potentiometer? The motor? Why?
3. How does the potentiometer relate to the voltage divider? What advantages does a potentiometer have over a voltage divider?
4. What happened to the voltage at points B and C as you turned the potentiometer knob? Why?
5. What happened to the voltage at point A and the bulb when you removed the branch between C and D? What was the same? Different? Why does this difference exist?
6. What other applications could a potentiometer be used for in addition to controlling light bulbs and motors?