Voltage on the Line

Use measurements to model an ohmic device.

HS-PSII-5.2 "Develop graphical and mathematical representations that describe the relationship between the between the amount of current passing through an ohmic device and the amount of voltage (i.e...."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the equation, circle two current-voltage pairs in the table, and number the graphing steps in the passage so you can use the data to make and interpret a graph.

Testing a Control Panel Component

1 A lighting technician tests a small ohmic component before installing it in a control panel. An adjustable power supply changes the voltage across the component, and an ammeter measures the current through it. The technician records the measurements below. Because the component stays at nearly the same temperature, its resistance remains constant throughout this test.

CONTROL PANEL COMPONENT MEASUREMENTS

Current (A)	Voltage (V)
0	0
0.5	3
1	6
1.5	9
2	12

2 For an ohmic device, voltage and current follow V = IR, where V is voltage in volts, I is current in amperes, and R is resistance in ohms. For example, a different device with a resistance of 10 ohms needs 20 volts to carry 2 amperes. Its resistance does not change when the supply voltage changes.

3 A graph can show the relationship in the table. Put current on the horizontal axis and voltage on the vertical axis. Plot each pair of measurements and draw a straight line through them and the origin. The line's slope, found by dividing a change in voltage by the matching change in current, gives the resistance.

2 ANSWER WITH EVIDENCE

Use the passage

1. Use the 1.5 A measurement to find the component's resistance. Then write an equation for its voltage V in terms of current I.

2. If the current rises to 2.5 A while resistance stays constant, what voltage will the component need? Show your calculation.

3. If the voltage is set to 4.5 V, what current will pass through the component? Show your calculation.

4. If you graph the table with current on the horizontal axis, what shape will the plotted data form? Give two points from the table that support your answer.

3 YOUR TURN

Your own words

A different ohmic device has a resistance of 8 Ω. On the grid, graph its voltage for currents of 0, 0.5, 1, 1.5, and 2 A, label both axes, and draw the line. Below the graph, write its equation and describe what happens to its voltage when current drops from 2 A to 0.5 A.



ANSWER KEY

Voltage on the Line

HIGH SCHOOL · HS-PSII-5.2

PART 1 · READ AND MARK

Underline the equation, circle two current-voltage pairs in the table, and number the graphing steps in the passage so you can use the data to make and interpret a graph. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Use the 1.5 A measurement to find the component's resistance. Then write an equation for its voltage V in terms of current I.	**R = 9 V ÷ 1.5 A = 6 Ω, so V = 6I.**
2	If the current rises to 2.5 A while resistance stays constant, what voltage will the component need? Show your calculation.	**V = (2.5 A)(6 Ω) = 15 V.**
3	If the voltage is set to 4.5 V, what current will pass through the component? Show your calculation.	**I = 4.5 V ÷ 6 Ω = 0.75 A.**
4	If you graph the table with current on the horizontal axis, what shape will the plotted data form? Give two points from the table that support your answer.	**The points form a straight line through the origin. For example, (0, 0) and (2, 12) lie on that line.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Horizontal axis: current (A). Vertical axis: voltage (V). Plot (0, 0), (0.5, 4), (1, 8), (1.5, 12), and (2, 16), then draw a straight line through the points. V = 8I. When current drops from 2 A to 0.5 A, voltage drops from 16 V to 4 V.

Accept equivalent equations that identify a resistance of 6 Ω for the table. For the graph task, check that current is on the horizontal axis, voltage is on the vertical axis, and the line passes through all five correct points.