Circuit Curve Clues

Use voltage and current data to identify device behavior

HS-PSII-5.4 "Define and describe a device as ohmic or non-ohmic based on the relationship between the current passing through the device and the voltage across the device based on the shape of the curve of a current vs. voltage or voltage vs..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the sentences that describe the graph shape for each type of device, and circle both sentences that explain what happens when the axes switch places.

Two Devices on the Test Bench

1. At a bench, a student tests two components. A power supply sets the voltage across each device, and a meter measures the current through it. Each voltage and current pair becomes a point on a graph. Put voltage on the horizontal axis and current on the vertical axis to see how the current changes as the voltage rises.

2. An ohmic device has a constant ratio of voltage to current at a steady temperature. Equal increases in voltage then produce equal increases in current. Its current-versus-voltage points lie on a straight line through the origin, the point where both values are zero. If the axes switch places, the voltage-versus-current graph is still a straight line through the origin.

3. A non-ohmic device does not keep that ratio constant. As voltage rises in equal steps, its current may change by different amounts, making a curved current-versus-voltage graph. Swapping the axes does not turn that curve into a straight line. Use the table to imagine the graphs. All readings were taken under the same test conditions.

CURRENT MEASURED AT EACH VOLTAGE

Voltage (V)	Device A current (mA)	Device B current (mA)
0	0	0
1	2	1
2	4	4
3	6	9
4	8	16

2 ANSWER WITH EVIDENCE

Use the passage

1. If you graph current versus voltage for Device A, what shape will the points make? Is Device A ohmic or non-ohmic? Use the table to explain.

2. If you graph current versus voltage for Device B, what shape will the points make? Is Device B ohmic or non-ohmic?

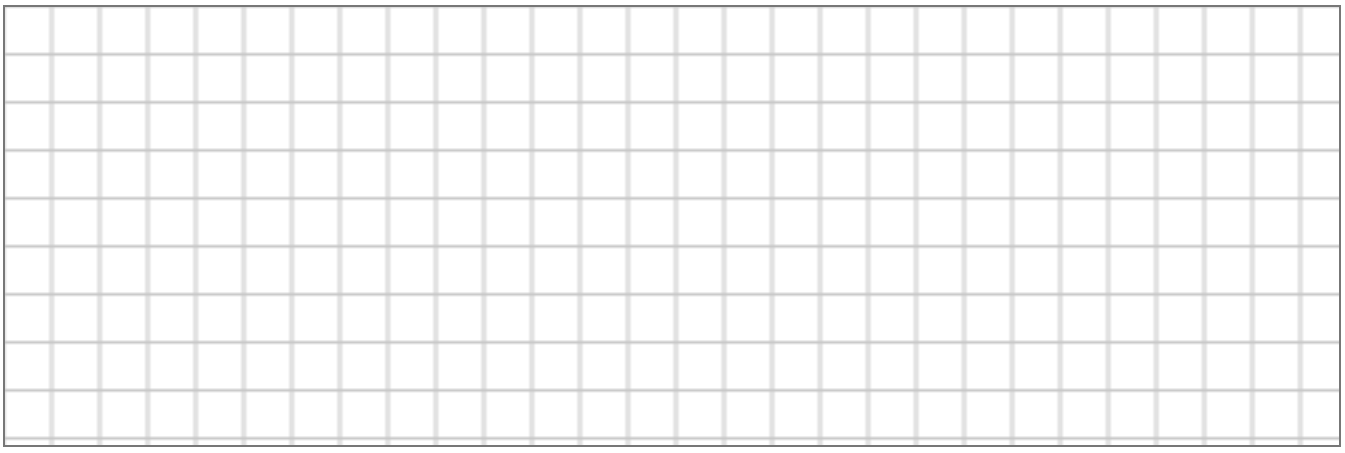
3. For Device B, compare the current increase from 1 to 2 V with the increase from 3 to 4 V. How do these changes support your answer about its graph shape?

4. Now put current on the horizontal axis and voltage on the vertical axis for Device A. What shape will its graph have, and what does that tell you about the device?

3 YOUR TURN

Your own words

On the grid, invent and plot five voltage-current pairs for a different non-ohmic device at 0, 1, 2, 3, and 4 V, starting at 0 mA. Make the current rise by a smaller amount at each step, label both axes, connect the points, and write two sentences explaining the curve and the device's classification.



Circuit Curve Clues

PART 1 · READ AND MARK

Underline the sentences that describe the graph shape for each type of device, and circle both sentences that explain what happens when the axes switch places. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	If you graph current versus voltage for Device A, what shape will the points make? Is Device A ohmic or non-ohmic? Use the table to explain.	**The points make a straight line through the origin, so Device A is ohmic. Each 1 V increase adds 2 mA.**
2	If you graph current versus voltage for Device B, what shape will the points make? Is Device B ohmic or non-ohmic?	**The points make a curve, so Device B is non-ohmic.**
3	For Device B, compare the current increase from 1 to 2 V with the increase from 3 to 4 V. How do these changes support your answer about its graph shape?	**The increases are 3 mA and 7 mA. Unequal current increases for equal voltage steps show that the graph is curved.**
4	Now put current on the horizontal axis and voltage on the vertical axis for Device A. What shape will its graph have, and what does that tell you about the device?	**It will still be a straight line through the origin. Device A is ohmic.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

My graph has voltage (V) on the horizontal axis and current (mA) on the vertical axis, with (0, 0), (1, 4), (2, 7), (3, 9), and (4, 10) connected in a curve that flattens. My device is non-ohmic because each 1 V step adds less current than the step before it.

For the grid task, accept any plotted set that begins at the origin and has positive current increases that get smaller with each 1 V step. The explanation should link the curved graph to non-ohmic behavior.