Circuit Material Clues

Use property patterns to sort solid elements

8.4.a "Analyze and interpret data to differentiate among elements based on their properties and classify the elements as metals, nonmetals, or metalloids."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the property patterns that describe metals, nonmetals, and metalloids. Circle two results in each table row that help you classify that element.

What Belongs in the Circuit?

1. A repair lab needs to choose materials for a circuit, but its sample tray holds four different solid elements. Students compare the samples instead of trusting color alone. They test how each one carries electric current, what happens when it is tapped with a hammer, and its mass for a given volume. Their results appear below.

TESTS OF FOUR SOLID ELEMENTS

Element	Electrical conduction	Hammer test	Density (g/cm³)
Copper	High	Flattens	8.96
Aluminum	High	Flattens	2.70
Silicon	Low, rises greatly when warmed	Cracks	2.33
Sulfur	Very low, stays very low when warmed	Cracks	2.07

2. Metals usually carry electric current well and can be shaped without breaking. Many solid nonmetals carry current poorly and crack when struck. Metalloids often crack like nonmetals, but their ability to carry current can change greatly when they are warmed. These are useful patterns, not rules for every possible sample.

3. Density can help tell two samples apart even when both fit the same group. It is not, by itself, a reliable test of whether a sample is a metal. To classify an element, look for a combination of properties. Then consider why a different group is a poorer match for the evidence.

2 ANSWER WITH EVIDENCE

Use the passage

1. Classify aluminum as a metal, nonmetal, or metalloid. Which two test results support your choice?

2. Copper and aluminum fit the same group. How does the density data tell them apart without changing that grouping?

3. Classify sulfur. Use its hammer test and electrical results to explain your choice.

4. Classify silicon. Why is its electrical behavior an important clue when comparing it with sulfur?

3 YOUR TURN

Your own words

Two new solids are labeled R and T. R flattens and carries current well; T cracks and carries current poorly when cool but much better when warmed. Classify both, explain how two observations support each choice, and name one measurement from the table you would use to check whether R could be copper.

ANSWER KEY

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GRADE 8 · 8.4.a

PART 1 · READ AND MARK

Underline the property patterns that describe metals, nonmetals, and metalloids. Circle two results in each table row that help you classify that element. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Classify aluminum as a metal, nonmetal, or metalloid. Which two test results support your choice?	**Aluminum is a metal. It conducts electricity well and flattens instead of cracking.**
2	Copper and aluminum fit the same group. How does the density data tell them apart without changing that grouping?	**Copper is denser than aluminum, 8.96 compared with 2.70 g/cm^3. Both still fit the metal pattern because they conduct well and flatten.**
3	Classify sulfur. Use its hammer test and electrical results to explain your choice.	**Sulfur is a nonmetal. It cracks when struck and carries electric current very poorly, even when warmed.**
4	Classify silicon. Why is its electrical behavior an important clue when comparing it with sulfur?	**Silicon is a metalloid. Both elements crack, but silicon's conduction rises greatly when warmed, while sulfur's stays very low.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

R is likely a metal because it flattens and carries current well. T is likely a metalloid because it cracks but carries current much better when warmed. I would measure R's density and compare it with copper's density of 8.96 g/cm^3.

Accept classifications supported by the stated property patterns. A density match would not prove that R is copper; density is one clue to compare.