Metallic Bonding and Conductivity

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

A model of metallic bonding shows positive ion cores held together by attraction to delocalized valence electrons.

1 Which particles move through a solid metal to carry electric current in the model?

(1) Protons from the nuclei

(2) Delocalized electrons

(3) Neutral metal atoms

(4) Neutrons from the nuclei

2 Explain how delocalized electrons help hold a metal together. [1]

Answer and work

_____

_____

3 A metal strip bends without immediately breaking. Which description fits the metallic bonding model?

(1) The nuclei change into a different element.

(2) The delocalized electrons can still attract the cores as layers shift.

(3) All the electrons leave the strip.

(4) The metal must become an ionic solution.

4 Explain why a solid ionic crystal and a solid metal can differ in electrical conductivity even though both contain charged particles. [1]

Answer and work

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_____

Comparing Conducting Strips

Use the information below to answer the questions.

A lab records the resistance of three strips of the same length and cross-sectional area, measured at the same temperature. These are model readings. Lower resistance means better conductivity for these equal-sized strips.

Strip material	**Resistance (Ω)**
Copper	0.20
Aluminum	0.32
Iron	1.20

5 Which strip conducts electricity best in this comparison?

(1) Copper

(2) Aluminum

(3) Iron

(4) All three conduct equally.

6 How many times as great is the measured resistance of the iron strip as that of copper? Show your calculation. [1]

Answer and work

7 Which change would make a new comparison harder to attribute to material alone?

(1) Keep all lengths the same.

(2) Use the same temperature for all strips.

(3) Use a thinner iron strip than the other strips.

(4) Repeat each measurement with the same meter.

8 What mobile charge carriers allow both copper and iron to conduct? Give the measured resistance of each strip. [1]

Answer and work