

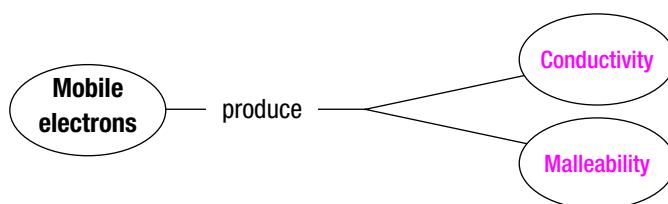
Chapter 6 Chemical Bonds

Section 6.4 The Structure of Metals**(pages 176–181)**

This section discusses metallic bonds and the properties of metals. It also explains how the properties of an alloy are controlled.

Reading Strategy (page 176)

Relating Cause and Effect As you read, complete the concept map to relate the structure of metals to their properties. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.



- Circle the letter of the metal with the highest melting point.
 - gold
 - vanadium
 - titanium
 - tungsten
- Is the following sentence true or false? The properties of a metal are related to bonds within the metal. true

Metallic Bonds (pages 176–177)

- Describe a metallic bond. A metallic bond is the attraction between a metal cation and the cation and the shared electrons that surround it.
- The cations in a metal form a lattice. What holds the lattice in place? The lattice is held in place by strong metallic bonds between the cations and the surrounding valence electrons.
- Is the following sentence true or false? The more valence electrons a metal has, the stronger its metallic bonds will be. true

Explaining Properties of Metals (page 177)

- Some of the properties of metals can be explained by the mobility of the electrons within a metal lattice.
- Name two important properties of metals that can be explained by metallic bonding.
 - Malleability
 - Ability to conduct an electric current

Alloys (pages 178–181)

- Circle the letter of the percentage of gold in jewelry that is labeled 18-karat gold.
 - 18 percent
 - 50 percent
 - 75 percent
 - 100 percent

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9. Is the following sentence true or false? When a metal such as copper is mixed with gold, the gold becomes softer.

false

10. Describe an alloy. An alloy is a mixture of two or more elements, at least one of which is a metal.

11. How do the hardness and strength of bronze compare to the hardness and strength of copper alone and tin alone? Bronze is harder and stronger than either copper or tin alone.

12. Name two factors that scientists can vary to design alloys with specific properties.

- a. The types of elements in the alloy
- b. The amounts of elements in the alloy

13. Complete the following table.

Comparing Bronze and Brass			
Alloy	Component Metals	Comparative Hardness of Bronze and Brass	Comparative Speed of Weathering
Bronze	Copper, tin	Harder	Weathers more slowly
Brass	Copper, zinc	Softer	Weathers more quickly

14. When carbon is added to iron, the lattice becomes harder and stronger than a lattice that contains only iron.

15. Circle the letters of the elements that all types of steel contain.

- a. carbon
- b. chromium
- c. iron
- d. manganese

16. Circle the letters of each correct description of stainless steel.

- a. Stainless steel contains more carbon than chromium.
- b. Chromium forms an oxide that protects stainless steel from rusting.
- c. Stainless steel is more brittle than steels that contain more carbon.
- d. Stainless steel contains more than 3 percent carbon by mass.

17. Explain why pure aluminum is not the best material for the body of a plane.

Although aluminum is lighter than most metals, it bends and dents too easily.

18. What type of alloy is used to make airplane parts that need to be extremely lightweight? an aluminum-magnesium alloy