

BONDING IN METALS

Sturman Key

23316 (+3)

Section Review

Objectives

- Model the valence electrons of metal ions
- Describe the arrangement of atoms in a metal
- Explain the importance of alloys

Vocabulary

- metallic bonds
- alloys

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

- Metals consist of closely packed 1 that are surrounded by a sea of 2. This arrangement constitutes the 3 bond. The electron mobility accounts for the excellent 4 conductivity of metals and helps explain why metals are 5 and 6. Metal atoms are commonly packed in a 7 cubic, a 8 cubic, or a 9 arrangement. When two or more elements, at least one of which is a metal, are mixed together, the resulting mixture is called an 10.
- Cations
 - electrons
 - metallic
 - electrical
 - malleable
 - ductile
 - body-centered
 - face-centered
 - hexagonal close-packed
 - alloy

Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

- AT 11. In a body-centered cubic structure, each atom has 12 neighbors.
ST 12. Metallic objects are formed from pure metals.

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- ST or AT 13. Metals that are good conductors of electricity are said to be ductile.
- AT 14. Drifting valence electrons insulate cations from one another and contribute to the malleability of a metal.
- AT 15. Metals are good conductors of electricity because electrons can flow freely in them.

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A

- d
- e
- b
- c
- a

Column B

- an alloy whose component atoms are different sizes
- a mixture of two or more elements, at least one of which is a metal
- can be hammered or forced into shapes
- can be drawn into wires
- the attraction of valence electrons for positive metal ions

Part D Questions and Problems

Answer the following in the space provided.

21. Explain the physical properties of metals, using the theory of metallic bonding.
Closely-packed cations surrounded by free moving e⁻ allow metals to be good conductors of electricity, malleable, + ductile. When subjected to pressure the cations slide easily past each other.
22. Explain why the properties of alloys are generally superior to their constituent components.
Superior properties result from cumulative properties of all the constituents of the alloy. i.e. mixture for best durability, malleability.