What is Metallic Bonding?

Worksheet

In metallic bonding, valence electrons are not bound to individual atoms but form a mobile electron sea that holds the metal cations together, giving metals their characteristic properties like conductivity and malleability.

Questions

1. In metallic bonding, what are delocalized?

A) Protons
B) Valence electrons
C) Nuclei
D) Inner electrons

2. Why is metal ductile but ionic crystal brittle?

A) Different atomic sizes
B) Electron mobility vs. fixed charges
C) Higher bond energy
D) Metal atoms are lighter

3. Melting point of Na vs. Mg: which is higher?

A) Na (more electrons)
B) Mg (two valence electrons per atom)
C) Same (same period)
D) Depends on density

4. Can metals conduct electricity in solid state?

A) No, only when molten
B) Yes, electrons move freely
C) No, ions must move
D) Only if they are solutions

5. Why is copper a good electrical conductor?

6. Why can aluminum foil be bent without breaking?

7. Compare melting points: Na (883 K) vs. Mg (923 K). Why is Mg higher?

8. Define: What is metallic bonding?

9. Define: Why are metals good conductors?

10. Define: Why are metals malleable?

Answer Key

1. B) Valence electrons - Valence electrons form a mobile sea throughout the metal structure.

2. B) Electron mobility vs. fixed charges - In metals, atoms can slide while electrons hold them; in ionic crystals, opposite charges repel.

3. B) Mg (two valence electrons per atom) - Mg has two valence electrons stronger electron sea higher melting point.

4. B) Yes, electrons move freely - Metallic solids conduct because valence electrons are mobile.

5. Copper has one valence electron per atom (3d 4s). These valence electrons form a delocalized sea. Electrons move freely high conductivity.

6. Al atoms in the lattice are held by the electron sea. When bent, cations can slide past each other. Electrons stay between them no breaking (malleability).

7. Mg has two valence electrons (more charge in electron sea). Stronger metallic bonding higher melting point. More electrons = stronger electrostatic attraction.

8. The attraction between metal cations and a delocalized sea of mobile valence electrons.

9. Electrons in the electron sea are free to move, carrying charge easily.

10. The electron sea holds cations together, allowing them to slide without breaking.