

2.4 Structure of Metals and Alloys Worksheet

- 1) Which compound from each set is covalent? Explain.
 - a. CO or LiF
 - b. ZnS or SO₂
 - c. BF₃ or Fe₂O₃
- 2) Which bond from each set is most covalent? Explain.
 - a. Cl – Cl or Al – F
 - b. N – O or C – O
 - c. Ca – O or N – O
- 3) Which bond from each set is most ionic? Explain.
 - a. Al – O or Na – O
 - b. K – Cl or Zn – Cl
 - c. Fr – F or B – F
- 4) Which compound from each set is most ionic? Explain.
 - a. Al₂O₃ or NaCl
 - b. KCl or FeO
- 5) Which is the most polar bond in each set? Explain.
 - a. C – F or C – O
 - b. P – O or P – F
 - c. As – S or As – F
- 6) Are ionic solids malleable? Justify your answer. Create a visual representation to assist with your justification.
- 7) Create a visual representation of a particulate model of a ionic solid in two dimensions. In any ionic solid, cations and anions are always arranged so that Coulombic forces of attraction between oppositely charged ions are maximized and repulsive forces between like charged ions are minimized. Keep the periodic trends for the relative sizes on anions and cations in mind.
- 8) Create a visual representation of a metallic solid that can be used to explain the electron sea model of metallic bonding. Use that representation to help you explain the factors that make metals good conductors of heat and electricity?

- 9) The following questions pertain to a pure sample of iron and a sample of steel.
- Create an illustration of pure iron which shows the iron atoms and provides a visual representation of the electron sea model.
 - Create a representation of steel that shows the iron and carbon atoms.
 - In what way have some of the bonds changed when this alloy was formed?
 - What type of alloy is steel?
 - Identify four properties that change when carbon is added to pure iron in order to make steel?
 - Explain how carbon changes the properties outlined in part e.
- 10) A 1.0 mole pure sample of molten tin is dissolved in a 5.0 mole pure sample of molten copper. The solution is set aside to cool and solidifies. The atomic radius of tin is 140 pm and the atomic radius of copper is 128 pm.
- Identify the type of alloy that is formed. Justify your answer.
 - Identify the solvent in this solution. Justify your answer.
- 11) The macroscopic properties of a pure sample of an unknown solid were examined in order to determine the type of bonding between particles. The solid is very hard. When it is broken, the fragments form similar three dimensional shapes. When dissolved in water the resulting solution conducts electricity. Make a prediction about the type of bonding in this compound. Justify your answer.
- 12) The macroscopic properties of a pure sample of an unknown solid were examined in order to determine the type of bonding within the particles. The solid is soft and can be cut with a knife. It starts melting at 35°C. It does not dissolve in water – instead it floats on the surface. Make a prediction about the type of bonding in this compound. Justify your answer.
- 13) The macroscopic properties of a pure sample of an unknown solid was examined in order to determine the type of bonding between the particles. When hit with a hammer, it dents. When cleaned with steel wool it becomes very shiny. The solid conducts electricity but does not dissolve in water. Make a prediction about the type of bonding in this compound. Justify your answer.