

Covalent Compounds Worksheet

- 1) Based on the properties of the following materials, determine whether they are made of primarily ionic compounds or covalent compounds:
 - a) telephone receiver: _____
 - b) concrete: _____
 - c) gasoline: _____
 - d) candy corn: _____

- 2) Name the following covalent compounds:
 - a) SiF_4 _____
 - b) N_2S_3 _____
 - c) HBr _____
 - d) Br_2 _____

- 3) Write the formulas for the following covalent compounds:
 - a) diboron hexahydride _____
 - b) nitrogen tribromide _____
 - c) sulfur hexachloride _____
 - d) diphosphorus pentoxide _____

- 4) Write the empirical formulas for the following compounds:
 - a) $\text{C}_2\text{H}_4\text{O}_2$ _____
 - b) boron trichloride _____
 - c) methane _____
 - d) $\text{C}_6\text{H}_{12}\text{O}_6$ _____

- 5) List three differences between ionic and covalent compounds:

- 6) Explain why ionic compounds are formed when a metal bonds with a nonmetal but covalent compounds are formed when two nonmetals bond.
- 7) What are the shapes of the following molecules?
- a) carbon disulfide _____
 - b) boron trifluoride _____
 - c) carbon tetrafluoride _____
- 8) What does electronegativity have to do with bond polarity?
- 9) Explain how hydrogen bonding takes place.
- 10) Why is the bond length of nitrogen much shorter than the bond length of chlorine?
- 11) What is an organic compound?

Covalent Compounds Worksheet - Key

- 1) Based on the properties of the following materials, determine whether they are made of primarily ionic compounds or covalent compounds:
 - a) telephone receiver: **covalent compounds**
 - b) concrete: **ionic compounds**
 - c) gasoline: **covalent compounds**
 - d) candy corn: **covalent compounds**

- 2) Name the following covalent compounds:
 - a) SiF_4 **silicon tetrafluoride**
 - b) N_2S_3 **dinitrogen trisulfide**
 - c) HBr **hydrogen bromide (or hydrobromic acid)**
 - d) Br_2 **bromine**

- 3) Write the formulas for the following covalent compounds:
 - a) diboron hexahydride **B_2H_6**
 - b) nitrogen tribromide **NBr_3**
 - c) sulfur hexachloride **SF_6**
 - d) diphosphorus pentoxide **P_2O_5**

- 4) Write the empirical formulas for the following compounds:
 - a) $\text{C}_2\text{O}_4\text{O}_2$ **CH_2O**
 - b) boron trichloride **BCl_3**
 - c) methane **CH_4**
 - d) $\text{C}_6\text{H}_{12}\text{O}_6$ **CH_2O**

- 5) List three differences between ionic and covalent compounds:
ionic compounds are hard, covalent compounds are not. Ionic compounds are brittle, covalent compounds are not. Ionic compounds have a high melting and boiling point, covalent compounds have a low melting and boiling point. Ionic compounds involve the transfer of electrons, while covalent compounds share electrons. Ionic compounds conduct electricity when dissolved in water, covalent compounds don't.

- 6) Explain why ionic compounds are formed when a metal bonds with a nonmetal but covalent compounds are formed when two nonmetals bond. **When a metal bonds with a nonmetal, electrons are transferred from the metal to the nonmetal because metals have very low electronegativities and nonmetals have high electronegativities. Because nonmetals tend to have similarly high electronegativities, neither atom can take electrons from the other, forcing them to share electrons.**
- 7) What are the shapes of the following molecules?
- a) carbon disulfide **CS₂**
 - b) boron trifluoride **BF₃**
 - c) carbon tetrafluoride **CF₄**
- 8) What does electronegativity have to do with bond polarity? **The greater the difference in electronegativity between two covalently bonded atoms, the more polar the bond.**
- 9) Explain how hydrogen bonding takes place. **Because hydrogen has a low electronegativity, it forms polar bonds with electronegative atoms and has a partial positive charge. When atoms with lone pairs of electrons are nearby, they tend to donate electron density from the lone pair toward the hydrogen to help stabilize it. This causes the molecules to stick to one another because of the attraction of partially positive and negative charges.**
- 10) Why is the bond length of nitrogen much shorter than the bond length of chlorine? **Nitrogen, N₂, has a triple bond, while chlorine, Cl₂, is singly bonded. Generally, multiple bonds are shorter than single bonds because the atoms are held more tightly together.**
- 11) What is an organic compound? **Organic compounds contain carbon. Most contain hydrogen, and many contain oxygen, nitrogen, and sulfur.**