**Activity 11: Binary Covalent Compounds**

***Learning Objectives***

*Distinguish ionic and covalent compounds*

*Name covalent compounds given the formula*

*Write the formula for a covalent compound given the name*

**Estimated Completion Time** 15–30 Minutes

**Instructor Information**

It is important to point out that ammonium (NH4+) compounds are exceptions to the rule that ionic compounds contain a metal and a nonmetal. This will come up in question 2. Also, it is important to distinguish the molecule NH3 from ammonium compounds.

**ANSWERS TO QUESTIONS**

*Distinguishing Ionic and Covalent Compounds*

1. a. Metals and nonmetals

b. Nonmetals only

*Covalent Compounds*

1. Ionic compounds are named with the metal first and then the nonmetal with –ide as the ending on the nonmetal. If the metal is a transition element, a Roman numeral is used to indicate the charge on the transition metal. Covalent compounds are named in the order of the elements in the formula. A Greek prefix is used to indicate the number of each nonmetal present.

2. Complete the following table:

|  |  |  |
| --- | --- | --- |
| **Name** | **Ionic or Covalent?** | **Formula** |
| **Copper (I) hydroxide** | **Ionic** | CuOH |
| Nitrogen triiodide | **Covalent** | **NI3** |
| **Sulfur hexafluoride** | **Covalent** | SF6 |
| **Potassium hydrogen phosphate** | **Ionic** | K2HPO4 |
| Dinitrogen pentoxide | **Covalent** | **N2O5** |
| Ammonium nitrate | **Ionic** | **NH4NO3** |
| Phosphorous pentachloride | **Covalent** | **PCl5** |
| **Ammonia** | **Covalent** | NH3 |
| Copper (II) oxide | **Ionic** | **CuO** |

3. The formula for dihydrogen monoxide is H2O. Yes, it can do all the things noted, but it is also vital for life.

**Activity 11: Skill Development**

1. In an ionic bond, electrons give and take to gain a stable number of electrons in their valence shell. They form charges that combine into neutral compounds. Covalent bonds are formed by the sharing of electrons to gain a stable number of electrons in the valence shell.

2. a. Selenium dioxideb.Silicon tetrafluoride

c. Tetraphosphorus trisulfide d. Oxygen difluoride

3. a. Sulfur dioxide b. Carbon tetrachloride

c. Dinitrogen tetraoxide d. Sulfur dichloride

4. a. Covalent, carbon tetrachloride b. Covalent, silicon dioxide

c. Ionic, magnesium bromide d. Covalent, nitrogen trichloride

e. Ionic, chromium(III) chloride

5. a. Ionic, copper(I) oxide b. Covalent, silicon tetrachloride

c. Covalent, water d. Ionic, barium sulfide

e. Covalent, carbon disulfide