

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 (NH_4^+) 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 NH_3 from ammonium compounds.

ANSWERS TO QUESTIONS

Distinguishing Ionic and Covalent Compounds

- a. Metals and nonmetals
b. Nonmetals only

Covalent Compounds

- 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	SF ₆
Potassium hydrogen phosphate	Ionic	K ₂ HPO ₄
Dinitrogen pentoxide	Covalent	N₂O₅
Ammonium nitrate	Ionic	NH₄NO₃
Phosphorous pentachloride	Covalent	PCl₅
Ammonia	Covalent	NH ₃
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

- 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.
- Selenium dioxide
 - Silicon tetrafluoride
 - Tetraphosphorus trisulfide
 - Oxygen difluoride
- Sulfur dioxide
 - Carbon tetrachloride
 - Dinitrogen tetraoxide
 - 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