Objective 3. Write chemical formulas of ionic and molecular compounds. Determine mole ratio of elements in compounds. Name ionic and molecular compounds.

Quiz Practice problems:

Key ideas: metals form cations, non-metals form anions. Ionic compounds contain a metal ion and non-metal ion. Cation charge = anion charge. Polyatomic ions are molecules with a charge. Molecular compounds contain two or more non-metals. Compounds combine in whole number ratios. The subscripts in a chemical formula tell you the ratio of elements in the compounds. The rules for naming compounds is different for ionic compounds and molecular compounds.

Skills: Write chemical formula of ionic and molecular compounds.
Use Table of common monoatomic and polyatomic ions.
Given a chemical formula, name ionic or molecular compound.
Given chemical name, determine chemical formula of an ionic or molecular compound.
Naming rules:
ionic compounds – name metal first, followed by non-metal. Use –ide suffix on non-metal.
See a Table of Common Monoatomic and Polyatomic Ions. Use charge to determine subscripts in chemical formula.
If you see a chemical formula with more than two elements, think polyatomic ion.
Molecular compounds – name in order of formula. Use –ide suffix on last non-metal. Use mono-, di-, etc. prefixes.

1. Ionic compounds.
a. Sodium fluoride is used in toothpaste.
(i) Write the chemical formula of this compound.
(ii) What is the charge on the fluoride ion?
b. Gypsum is calcium sulfate dihydrate and is used in wallboard and casts.
(i) What is the chemical formula of calcium sulfate?
(ii) What is the mole ratio of calcium to sulfate?
(iii) How many oxygen atoms are in one calcium sulfate? (Answer: 4)
c. Aluminum sulfate is used in water purification.
(i) Write the chemical formula of this compound.
(ii) How many aluminum ions are in one aluminum sulfate?
(iii) What is the conversion factor of moles of aluminum to moles of sulfate?
(iv) How many sulfur atoms are in <u>two</u> aluminum sulfates? (Answer: 6)
d. Rust is iron (III) oxide.
(i) What does the (III) in iron (III) oxide mean?
(ii) Write the chemical formula of this compound.
(iii) How many moles of Fe are in 10 moles of iron (III) oxide?
e. Ammnonium nitrate is used in the manufacture of fertilizer and explosives.
(i) Write the chemical formula of this compound.
(ii) What is the mole ratio of nitrogen to oxygen in ths compound? (Answer: 2:3)
(iii) Ammnonium nitrate does not contain any metals. Why is this compound ionic?
f. TSP (Na_3PO_4) is used as a degreaser (to remove kitchen grease).
(i) What is the chemical name of this compound?
(ii) What is the ratio of sodium to phosphate?
g. $(NH_4)_2S$ is used in the manufacture of textiles.
(i) What is the chemical name of this compound?
(ii) What is the mole ratio of H to S in this compound?
h. $Ca(NO_3)_2$ is used in explosives and matches.
(i) What is the chemical name of this compound?
(ii) What is the conversion factor of N to O?

2. Molecular compounds.
a. Carbon disulfide is used as an anti-ulcer drug. Write the chemical formula of this compound.
b. CO is a side product of a combustion reaction and is toxic. What is the chemical name of this compound?
c. P_2O_5 is used as a drying agent. What is the chemical name of this compound?
d. Dinitrogen monoxide is laughing gas. What is the chemical formula of this compound?
e. Ethanol, C_2H_5OH, is the alcohol us humans can drink in small quantities. How many moles of carbon are in 4.5 moles of ethanol?