Name:

Per:

* This material will NOT be on the Quiz Tomorrow.

Naming and Formula Writing of Simple Binary Ionic Compounds

Model:

Examine the table below and answer the following questions.

Cations	Anions	Chemical Formula	Compound Name
Na^{+1}	Cl^{-1}	NaCl	Sodium chloride
Ca^{+2}	O^{-2}	CaO	Calcium oxide
Zn^{+2}	Cl^{-1}	$ZnCl_2$	Zinc chloride
Li^{+1}	S^{-2}	Li_2S	Lithium sulfide
K^{+1}	N^{-3}	K_3N	Potassium sulfide

Reviewing the Model:

1. Are ALL cations positive ions or negative ions?

2. Are ALL anions positive ions or negative ions?

3. What is the name of the compound formed by the Li^{+1} and S^{-2}?

Exploring the Model

4. When the name of an ionic compound is given, which ion is stated first?

5. Compare the first part of the compound name to the name of the element from the periodic table. How does the name of the cation correspond to the name of the element?

6. Compare the second part of the compound name to the name of the element from the periodic table. How does the name of the anion correspond to the name of the element?

7. In what way does the name provide clues about the classification of each element as an anion or cation?

8. Consider the clues you identified, and write a general rule for how you change the name of the elements to cations when you are naming ionic compounds.

9. Consider the clues you identified, and write a general rule for how you change the name of the elements to anions when you are naming ionic compounds.

10. Given the chemical formulas of an ionic compound, list at least three necessary steps to give the correct name of that compound.

11. Name the following simple binary ionic compounds: $MgBr_2$, NaF, Al_2O_3.

Naming and Formula Writing of Simple Ionic Compounds Cont'd

Consider the following examples of formulas for ionic compounds:

- One Na^+ (sodium ion) and one Cl^- (chloride ion) bond to make NaCl, "sodium chloride."
- One Mg^{2+} (magnesium ion) and two F^- (fluoride ion) bond to make MgF_2. "magnesium fluoride."
- Three Ca^{2+} (calcium ion) and two N^{3-} (nitride ion) bond to make Ca_3N_2, "calcium nitride."
- One Al^{3+} (aluminum ion) and one N^{3-} (nitride ion) bond to make AlN. "aluminum nitride."

The small numbers at the bottom right of each symbol in a formula are called "subscripts". Subscripts tell us how many of each type of atom are present. For example in the formula Mg_3N_2 there are three magnesium ions and two nitride ions.

Critical Thinking Questions

1. Consider the formula NaCl in the above example. It tells us that one Na^+ ion is bonded to one Cl^- ion. What is the overall charge for NaCl? Is it positive, negative, or neutral?

2. Consider MgF_2
   a) What is the charge on a magnesium ion?
   b) What is the charge on a fluoride ion?
   c) What is the overall charge on MgF_2? Note: The formula "MgF_2" tells us that one Mg^{2+} ion bonds with two F^- ions.

3. Given your answer to question 1 and 2c ✓ what do you think is the overall charge on any ionic compound?

4. Calcium nitride is written like this: Ca_3N_2.
   a) What is the charge on one calcium ion?
   b) What is the charge on one nitride ion?
   c) In the formula, Ca_3N_2, there are 3 calcium ions. What is the total charge on 3 calcium ions? (Hint: multiply 3 times your answer to part a.)
   d) In the formula, Ca_3N_2, there are 2 nitride ions. What is the total charge on 2 nitride ions? (Hint: multiply 2 times your answer to part b.)
   e) Why do you think it MUST be written like Ca_3N_2 and not something like CaN_2 or Ca_2N_3? In other words why do exactly three calcium ions bond with exactly two nitride ions? (Hint: think about what your answers to part c and d equal when added together.)

Information: Writing Formulas

Let's say you needed to write the formula for the compound formed by magnesium and chlorine. Follow the two steps below to write the formulas:

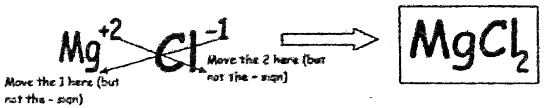
Step 1: Write the charges for each of the ions. The positive ions should be written first.

Mg^{+2} and Cl^{-1}

Step 2: Write the positive one first and make sure the charges equal zero. We will need TWO chloride ions to cancel out one magnesium ion.

$MgCl_2$

Note: many times you can use the "crisscross" method. Write the ions next to each other and like in step one above and then crisscross the charges like below:



Final Step: Reduce the subscripts to the lowest whole number ratio

5. What is wrong with the following formulas?

a) Al_2S b) PNa_3 c) MgS_2

6. Write the formula and name for the compound that forms when the following atoms form ionic compounds. The first is done for you.

a) lithium and chlorine b) barium and sulfur c) magnesium and iodine

LiCl
lithium chloride

d) oxygen and aluminum e) calcium and phosphorus f) sodium and sulfur

Summarize the Notes for Naming and Writing Formulas for Simple Ionic Compounds Below:

Naming

Formula Writing