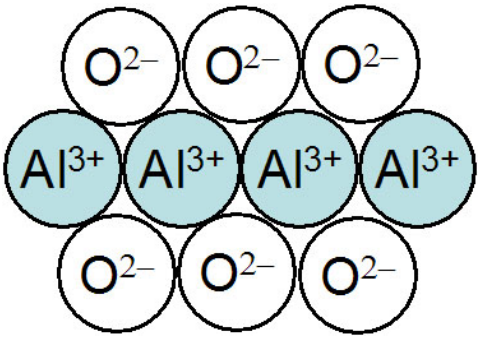
Chemical Formulas and Names of Ionic Compounds

A POGIL workshop activity by Stephen Prilliman

WHY?

Going back to pre-historic times, humans have experimented with chemical processes that helped them to make better tools, pottery and weapons. In the middle-ages, alchemists combined various compounds in the search for the philosopher's stone and the elixir of life. However, as chemistry became a real science, chemists realized that all mater was made of atoms and that chemical processes were simply a rearrangement of these atoms. Chemists needed som

Aluminum oxide



Chemical formula:

Al_2O_3

Key Questions

1. What are the names of the elements found in the compounds above?

2. How does the name of the compound different from that of the elements that form it?

3. How many sodium ions are there in the sodium chloride sample shown above? How many chloride ions? What is the ratio between the two?

4. How many calcium ions are there in the calcium chloride sample shown above? How many chloride ions? What is the ratio between the two?

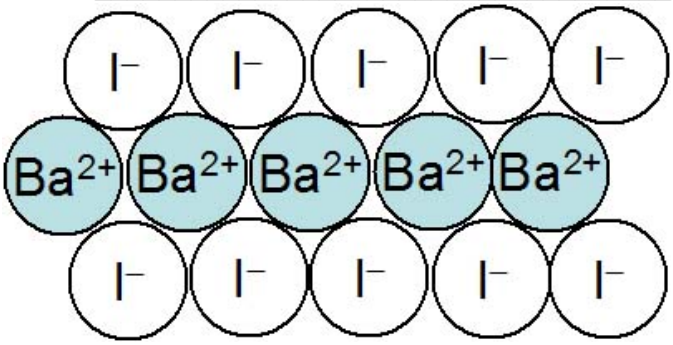
5. How many aluminum ions are there in the aluminum oxide sample shown above? How many chloride ions? What is the ratio between the two?

6. What is the relationship between the chemical formula for the compounds above and the ratio of the atoms in them?

Exercises

1. Write the name and the chemical formula for the compound depicted below.

Name: _____



Chemical formula:

Key Questions

7. What is the charge of sodium ion, what is the charge of a chloride ion, and what is the total (net) charge of all of the ions in the sodium chloride pictured above?

8. What is the charge of an aluminum ion, what is the charge of an oxide ion, and what is the total (net) charge of all the ions in the aluminum oxide sample pictured above?

9. All samples of sodium chloride have a ratio of one sodium per one chloride. What must be true of the total (net) charge for any sample of sodium chloride?

10. All samples of aluminum oxide have an atomic ratio of two aluminums per three oxides. What must be true of the total (net) charge for any sample of aluminum oxide?

11. From the pattern seen in the last two questions, what is the rule for the total charge for any compound?

Model 2: Ionic Charges

Certain ions tend to have the same charge, independent of the compound in which they are found. These are listed in the table below.

Group	1	2	3	15	16	17
Charge	**+1**	**+2**	**+3**	**–3**	**–2**	**–1**
	Lithium Li^{+}	Magnesium Mg^{2+}	Aluminum Al^{3+}	Nitride N^{3-}	Oxide O^{2-}	Fluoride F^{-}
	Sodium Na^{+}	Calcium Ca^{2+}		Phosphide P^{3-}	Sulfide S^{2-}	Chloride Cl^{-}
	Potassium K^{+}	Strontium Sr^{2+}			Selenide Se^{2-}	Bromide Br^{-}
	Rubidium Rb^{+}	Barium Ba^{2+}				Iodide I^{-}

Key Questions

12. What patterns do you notice of the charges of the ions with respect to their positions in the periodic table (or their Group number in the periodic table).

Exercises

Following the rule you established in the last key question, write correct chemical formulas for each of the following compounds

(a) Lithium chloride

(b) Magnesium iodide

(c) Strontium selenide

(d) Rubidium fluoride

(e) Lithium oxide

(f) Sodium sulfide

(g) Potassium chloride

(h) Calcium phosphide

(i) Barium oxide

(j) Aluminum sulfide