NAME: _____ PER: _____

13B Chemical Formulas

Why do atoms combine in certain ratios?

Chemists have long noticed that groups of elements behave similarly. The periodic table is an arrangement of the elements grouped according to similar behavior. In this investigation, you will discover how the arrangement of electrons in atoms is related to groups on the periodic table. You will also learn why atoms form chemical bonds with other atoms in certain ratios.

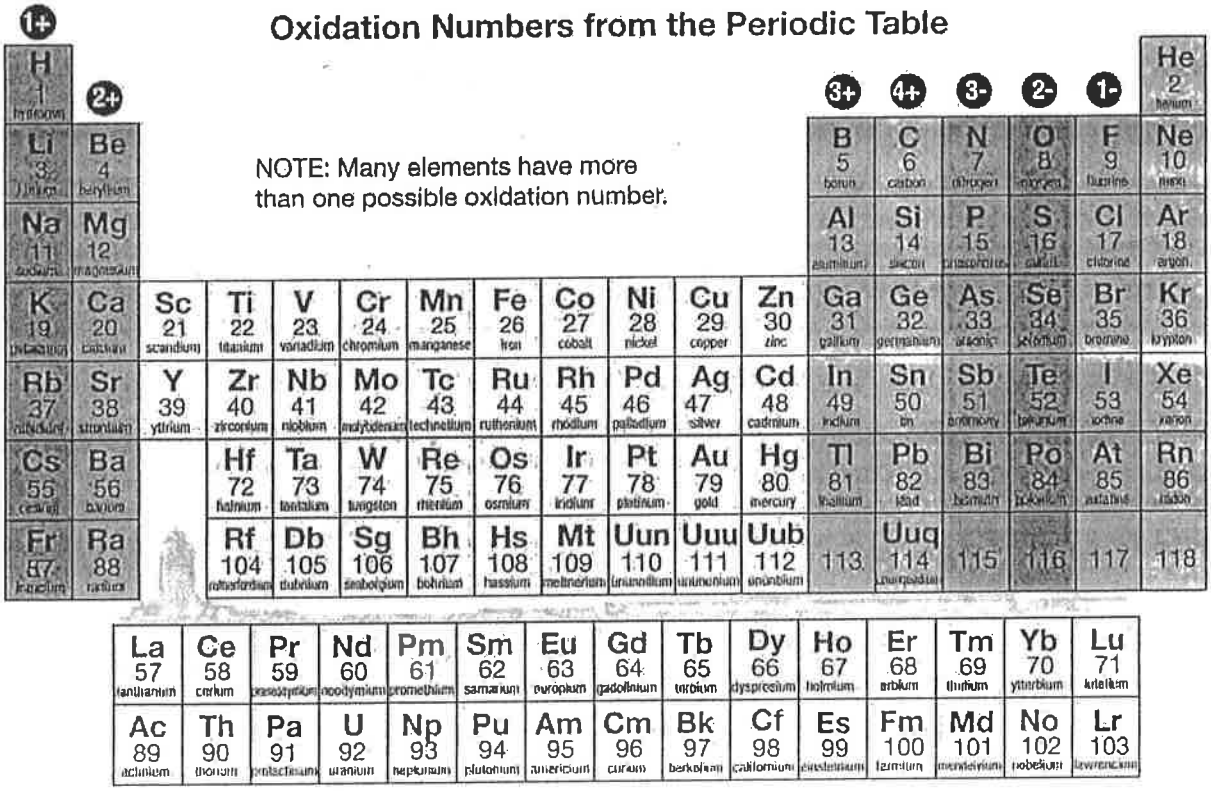
Materials

- Periodic Table Tiles
- Periodic table with oxidation numbers
- Special Bonds card

1 Oxidation numbers and ions

An element's *oxidation number* indicates how many electrons are lost or gained when chemical bonding occurs. The oxidation number is equal to the charge an atom has when it *ionizes*, that is, gains or loses electrons to become an *ion*. The partial periodic table below shows the most common oxidation numbers of the elements. The oxidation numbers are written above the group number above each column on the table. The most common oxidation numbers for the main group elements are shown.

Oxidation Numbers from the Periodic Table



2 Stop and think

a. Describe the groups on the periodic table according to their valence electrons.

b. Why do elements in group 2 have an oxidation number of 2+?

c. Why do elements in group 17 have an oxidation number of 1–?

d. Why do the oxidation numbers in the first two groups tend to be positive?

3 Predicting chemical formulas

A *binary compound* is composed of two different elements. Predict the chemical formulas for the binary compounds that are made up of the pairs of elements in the table below. Use the following steps:

1. Using the periodic table on the previous page, determine the ion formed by each element.
2. Figure out how many periodic table tiles of each element will be needed to make the compound electrically neutral.

3. Form the compound with your tiles and write the chemical formula for each compound based on the number of tiles of each element.

Table 1: Writing chemical formulas for binary compounds

Element 1	Element 2	Oxidation number 1	Oxidation number 2	Number of tiles of element 1	Number of tiles of element 2	Chemical formula
hydrogen	fluorine					
magnesium	sulfur					
calcium	bromine					
aluminum	oxygen					
potassium	chlorine					
lithium	argon					
rubidium	sulfur					

4 Naming compounds

Naming binary ionic compounds is very simple if you follow these rules:

1. Write the name of the element with a positive oxidation number first.
2. Write the root name of the element with a negative oxidation number second. For example, *chlor-* is the root name of chlorine. Subtract the *-ine* ending.
3. Add the ending *-ide* to the root name. *Chlor-* becomes chloride.

Using these rules, write the name of each of the compounds in Table 1.