

SECTION 3

Enrichment

The Crisscross Method

The process of writing chemical formulas can be made easier by using oxidation numbers.

Remember that the total charge on a compound must be zero. Remember also that oxidation numbers describe the number of electrons an atom or ion gains or loses when forming compounds. Atoms in the same group on the periodic table usually will have the same oxidation number. Use the periodic table to determine the oxidation numbers of atoms. Refer to your textbook for oxidation numbers of polyatomic ions.

Example: Write the formula for barium chloride.

Step 1: Determine the oxidation numbers for the two elements or ions. Because barium is in Group 2, its oxidation number is 2+. Elements in Group 2 tend to lose the two electrons in the outer energy level, leaving the ions with positive charges. Chloride is in Group 17, so its oxidation number is 1-. Elements in Group 17 have seven electrons in the outer energy level and tend to gain one electron. The ions are negative.

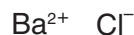
Step 2: Write the chemical symbols in the correct order, with the metal ion first.



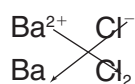
Directions: Use the crisscross method to write the chemical formulas for the compounds described below. Check that the total charge on each compound equals zero.

- Write the correct chemical formula for a compound containing barium and oxygen. What is the name of this compound?
- Write the formula for zinc iodide, a compound that is used as an antiseptic.
- One of the uses of ammonium sulfate is in flameproofing fabrics and paper. Write the formula for ammonium sulfate.

Now, write the oxidation numbers as superscripts. For an ion with an oxidation number of 1+ or 1-, write only the sign and not the number.



Next, crisscross the numbers only—not the signs this time, writing the oxidation number of one element as the subscript for the other. Don't write the number 1 here either.



Step 3: Determine whether the formula is in its simplest form. Reduce the subscripts to their simplest form by dividing by a common denominator. The formula for barium chloride is BaCl_2 , which cannot be further reduced.

Step 4: Check the formula by calculating the total positive and total negative charges and confirming that the total charge on the compound is zero.

	Oxidation Number	×	Subscript	=	
Barium	(+2)	×	(1)	=	+2
Chlorine	(-1)	×	(2)	=	-2