

Hydrogen comes from the Greek word for “water-former.” Mercury was named after a Roman god, but its symbol, Hg, comes from the Latin word *hydrargyrum* for “liquid silver.” Sodium was named for sodanum, a headache remedy, and its symbol, Na, came from the Latin word *natrium*. Notice that a single-letter symbol is always capitalized, and that the first letter of a two-letter symbol is capitalized while the second letter is not.

Chemical Formulas

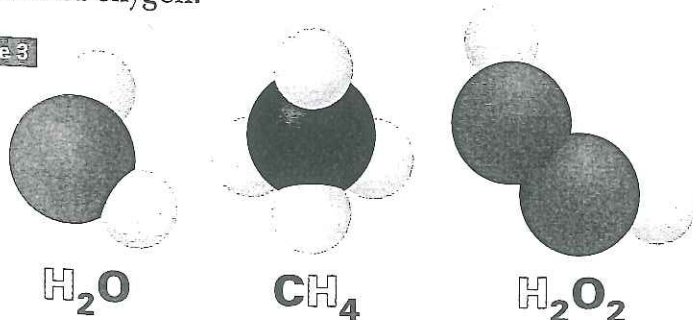
Just as single symbols are used to represent elements, combinations of these symbols are used to represent compounds. A **chemical formula** is the combination of symbols that represents a particular compound (Table 2). The chemical formula indicates which elements are present in the compound and in what proportion, as shown in Figure 3.

Table 2 Some Examples of Chemical Formulas

Name of substance	Formula
sodium bicarbonate (baking soda)	NaHCO ₃
calcium carbonate (chalk)	CaCO ₃
sodium nitrate (fertilizer)	NaNO ₃
calcium phosphate (fertilizer)	Ca ₃ (PO ₄) ₂
sodium chloride (salt)	NaCl
acetylsalicylic acid (ASA or aspirin)	C ₉ H ₈ O ₄
acetic acid (vinegar)	C ₂ H ₄ O ₂

Each chemical symbol in a formula represents an element. If only one atom of an element is present in a compound, no number is included. If there is more than one atom of that element in the compound, the symbol is followed by a number written below the line. This number (called a *subscript*) tells how many atoms of that element are present in one molecule. For example, the formula for water—H₂O—tells you that the elements are present in the ratio of two atoms of hydrogen to one atom of oxygen. The formula for sodium bicarbonate—NaHCO₃—tells you that the elements are present in a ratio of one atom of sodium to one atom of hydrogen to one atom of carbon to three atoms of oxygen.

Figure 3



Understanding Concepts #1-5 only

- Why are symbols useful in describing chemicals?
- What are the symbols for the following elements?
(a) calcium (b) iron
(c) chlorine (d) phosphorus
(e) copper
- Write a chemical formula for the following:
(a) a molecule of hydrogen gas that is made up of two atoms of hydrogen
(b) a molecule of propane gas that is made up of three atoms of carbon and eight atoms of hydrogen
- For each of the compounds in Table 2, state the number of different elements present and the number of atoms of each element. What is the total number of atoms in each molecule?
- Molecules of nitrous oxide, used by dentists as an anaesthetic, contain two atoms of nitrogen and one atom of oxygen. Write the chemical formula for nitrous oxide.

Make a table

3 different items needed

Making Connections

- Research a common use for each of the following pure substances:
(a) helium gas (b) sucrose
(c) acetone (d) tartaric acid
(e) propane
- Prepare a chart describing each substance above, where it is used, chemical formula, and the number of atoms in each type of element in the compound.

Challenge

What chemical symbols and formulas will you need in the challenge you have chosen?