

TABLE 1 Elements That Normally Exist as Diatomic Molecules

Element	Symbol	Molecular formula	Physical state at room temperature
Hydrogen	H	H ₂	gas
Nitrogen	N	N ₂	gas
Oxygen	O	O ₂	gas
Fluorine	F	F ₂	gas
Chlorine	Cl	Cl ₂	gas
Bromine	Br	Br ₂	liquid
Iodine	I	I ₂	solid

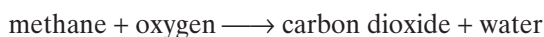
form definite molecular structures. Two exceptions to this rule are sulfur, which is usually written S₈, and phosphorus, which is usually written P₄. In these cases, the formulas reflect each element's unique atomic arrangement in its natural state.

3. *The law of conservation of mass must be satisfied.* Atoms are neither created nor destroyed in ordinary chemical reactions. Therefore, the same number of atoms of each element must appear on each side of a correct chemical equation. To balance numbers of atoms, add coefficients where necessary. A **coefficient** is a small whole number that appears in front of a formula in a chemical equation. Placing a coefficient in front of a formula specifies the relative number of moles of the substance; if no coefficient is written, the coefficient is assumed to be 1. For example, the coefficient 4 in the equation on page 261 indicates that 4 mol of water are produced for each mole of nitrogen and chromium(III) oxide that is produced.

Word and Formula Equations

The first step in writing a chemical equation is to identify the facts to be represented. It is often helpful to write a **word equation**, an equation in which the reactants and products in a chemical reaction are represented by words. A word equation has only qualitative (descriptive) meaning. It does not give the whole story because it does not give the quantities of reactants used or products formed.

Consider the reaction of methane, the principal component of natural gas, with oxygen. When methane burns in air, it combines with oxygen to produce carbon dioxide and water vapor. In the reaction, methane and oxygen are the reactants, and carbon dioxide and water are the products. The word equation for the reaction of methane and oxygen is written as follows.



The arrow, \longrightarrow , is read as *react to yield* or *yield* (also *produce* or *form*). So the equation above is read, “methane and oxygen react to yield

extension

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Keyword: HC6RXNX