

SECTION 2

OBJECTIVES

- Define *molecule* and *molecular formula*.
- Explain the relationships among potential energy, distance between approaching atoms, bond length, and bond energy.
- State the octet rule.
- List the six basic steps used in writing Lewis structures.
- Explain how to determine Lewis structures for molecules containing single bonds, multiple bonds, or both.
- Explain why scientists use resonance structures to represent some molecules.

Covalent Bonding and Molecular Compounds

Many chemical compounds, including most of the chemicals that are in living things and are produced by living things, are composed of molecules. A **molecule** is a neutral group of atoms that are held together by covalent bonds. A single molecule of a chemical compound is an individual unit capable of existing on its own. It may consist of two or more atoms of the same element, as in oxygen, or of two or more different atoms, as in water or sugar (see **Figure 4** below). A *chemical compound* whose simplest units are molecules is called a **molecular compound**.

The composition of a compound is given by its chemical formula. A **chemical formula** indicates the relative numbers of atoms of each kind in a chemical compound by using atomic symbols and numerical subscripts. The chemical formula of a molecular compound is referred to as a molecular formula. A **molecular formula** shows the types and numbers of atoms combined in a single molecule of a molecular compound. The molecular formula for water, for example, is H_2O , which reflects the fact that a single water molecule consists of one oxygen atom joined by separate covalent bonds to two hydrogen atoms. A molecule of oxygen, O_2 , is an example of a diatomic molecule. A *diatomic molecule* is a molecule containing only two atoms.

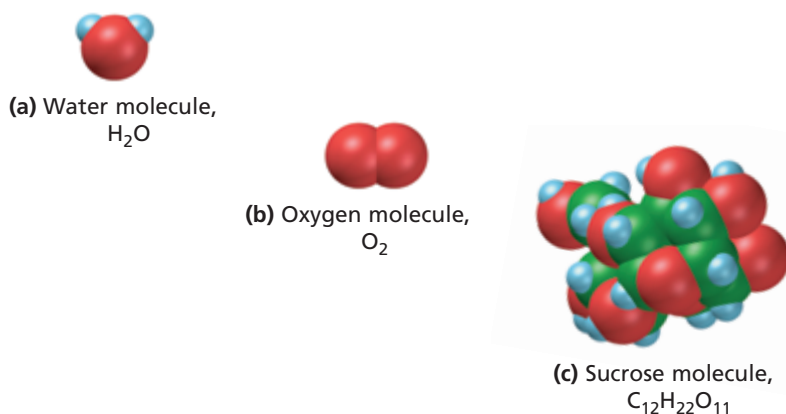


FIGURE 4 The models for (a) water, (b) oxygen, and (c) sucrose, or table sugar, represent a few examples of the many molecular compounds in and around us. Atoms within molecules may form one or more covalent bonds.