



"I have just returned from a short vacation for which the only books I took were a half-dozen detective stories and your

'Chemical Bond.' I found yours the most exciting of the lot."

—Gilbert N. Lewis (1875–1946), in a letter to Linus Pauling in 1939

✓ Learning Outcomes

- 4.1 Hydrogen, Oxygen, and Water
- 4.2 Types of Chemical Bonds
- 4.3 Representing Compounds: Chemical Formulas and Molecular Models
- 4.4 The Lewis Model: Representing Valence Electrons with Dots
- 4.5 Ionic Bonding: The Lewis Model and Lattice Energies
- 4.6 Ionic Compounds: Formulas and Names
- 4.7 Covalent Bonding: Simple Lewis Structures
- 4.8 Molecular Compounds: Formulas and Names
- 4.9 Formula Mass and the Mole Concept for Compounds
- 4.10 Composition of Compounds
- 4.11 Determining a Chemical Formula from Experimental Data
- 4.12 Organic Compounds

Key Learning Outcomes

HOW MANY DIFFERENT SUBSTANCES exist? Our world contains about 91 different naturally existing elements, so there are at least 91 different substances. However, the world would be dull—not to mention lifeless—with only 91 different substances. Fortunately, elements combine with each other to form *compounds*. Just as combinations of only 26 letters in our English alphabet allow for an almost limitless number of words, each with its own specific meaning, so combinations of the 91 naturally occurring elements allow for an almost limitless number of compounds, each with its own specific properties. The great diversity of substances that we find in nature is a direct result of the ability of elements to form compounds. Life, for example, could not exist with just 91 different elements. It takes compounds, in all of their diversity, to make life possible.