Introduction to Ionic Bonding

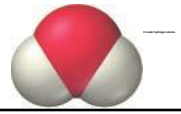
How Many Different Substances Exist?

- Elements combine with each other to form **compounds**.
- The great diversity of substances that we find in nature is a direct result of the ability of elements to form compounds.

Hydrogen, Oxygen, and Water (1 of 2)

- The dramatic difference between the elements hydrogen and oxygen and the compound water is typical of the differences between elements and the compounds that they form.
- When two or more elements combine to form a compound, an entirely new substance results.

Hydrogen, Oxygen, and Water (2 of 2)

Selected Properties	Hydrogen 	Oxygen 	Water 
Boiling Point	–253 °C	–183 °C	100 °C
State at Room Temperature	Gas	Gas	Liquid
Flammability	Explosive	Necessary for combustion	Used to extinguish flame

Mixtures and Compounds

- In a mixture, elements can mix in any proportions Whatsoever (hydrogen, H_2, and oxygen, O_2).
- In a compound, elements combine in fixed, definite proportions (water, H_2O).

Definite Proportion (1 of 2)

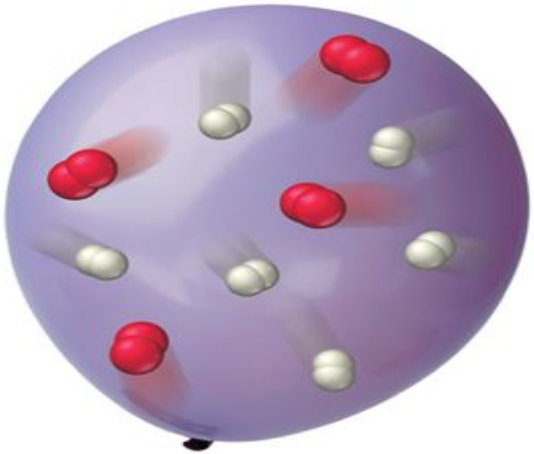
- A hydrogen–oxygen mixture can have any proportions of hydrogen and oxygen gas.
- Water, by contrast, is composed of water molecules that always contain two hydrogen atoms to every one oxygen atom.
- Water has a definite proportion of hydrogen to oxygen.

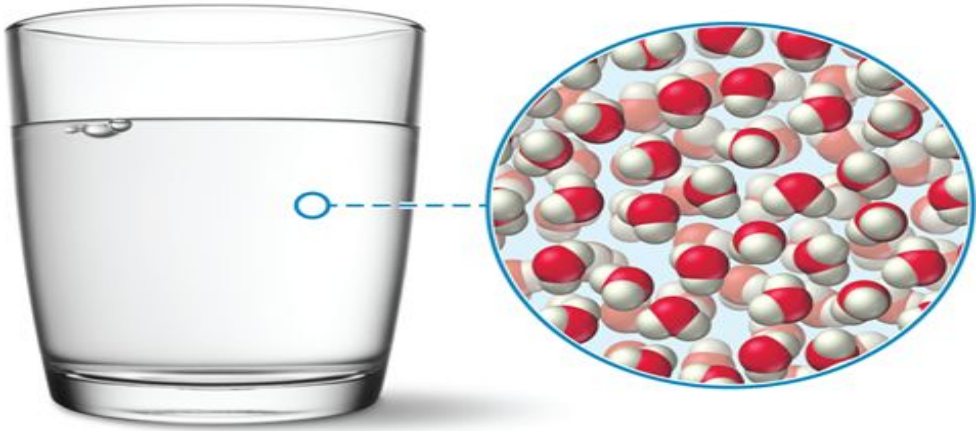
Definite Proportion (2 of 2)

Mixtures and Compounds

Hydrogen and Oxygen Mixture:
This mixture can have any ratio of hydrogen to oxygen.

Water (a compound):
Water molecules have a fixed ratio of atoms—2 hydrogens to 1 oxygen.





Chemical Bonds

- Compounds are composed of atoms held together by **chemical bonds**.
- Chemical bonds result from the attractions between the charged particles (the electrons and protons) that compose atoms.
- Chemical bonds are broadly classified into two types:
  - ionic and

Ionic Bonds

- **Ionic bonds**, which occur between metals and nonmetals, involve the **transfer** of electrons from the metal atom to the nonmetal atom.
- The metal atom then becomes a **cation** while the nonmetal atom becomes an **anion**.
- These oppositely charged ions attract one

Ionic Compounds in Solid Phase

- In the solid phase, the ionic compound is composed of a lattice—a regular three-dimensional array—of alternating cations and anions.