

# Elements



- **Element:** A substance that cannot be chemically converted into simpler substances; a substance in which all of the atoms have the same number of protons and therefore the same chemical characteristics.
- For a list of names and symbols for some common elements, see Table 2.1 in the chemistry-first version or Table 3.1 of the atoms-first version of ***An Introduction to Chemistry*** by Mark Bishop.

# Compounds

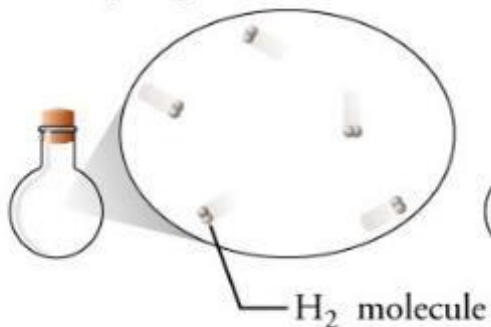


- **Compound:** A substance that contains two or more elements, the atoms of these elements always combining in the same whole-number ratio.
  - Examples are water,  $\text{H}_2\text{O}$ , sodium chloride (table salt),  $\text{NaCl}$ , and sulfuric acid,  $\text{H}_2\text{SO}_4$ .
- Compounds are described with chemical formulas that contain two or more symbols for different elements and subscripts that describe the relative number of atoms of each element.
  - If there is no subscript, we assume it's 1.

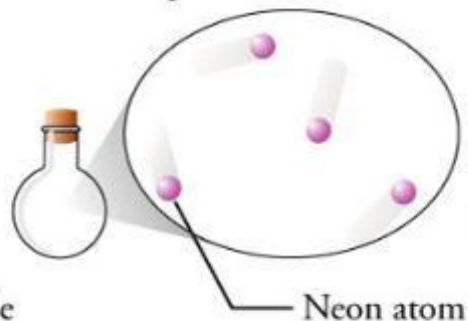
# Elements and Compounds

## ELEMENTS

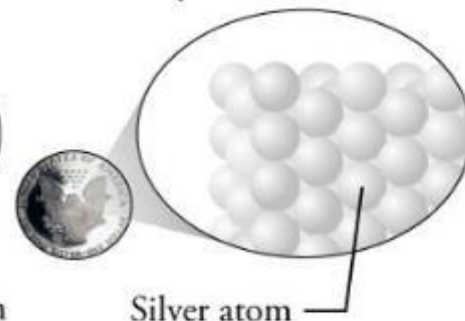
Hydrogen is composed of molecules with 2 hydrogen atoms.



Neon is composed of independent atoms.

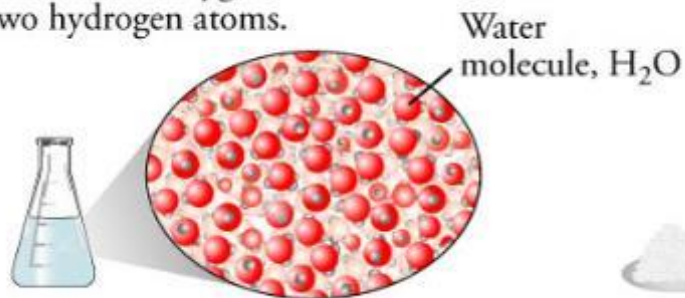


Silver exists as an assembly of silver atoms.

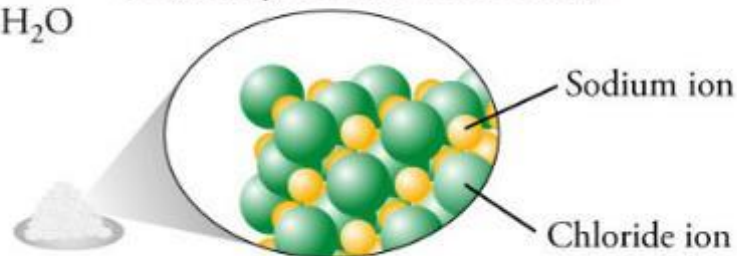


## COMPOUNDS

Water is composed of molecules that contain one oxygen atom and two hydrogen atoms.



Sodium chloride exists as an assembly of sodium and chloride ions, always in a one-to-one ratio.



# Pure substances and Mixtures



- **Pure substances** have a constant composition that can be described with a chemical formula
  - Elements, such as copper, Cu, and compounds, such as glucose,  $C_6H_{12}O_6$ , are pure substances.
- **Mixtures** are combinations of two or more pure substances (elements and compounds) that have variable composition.
  - Examples are sugar dissolved in water and beach sand.

# Homogeneous and Heterogeneous Mixtures

- **Heterogeneous Mixtures** have different parts with different compositions.
  - Beach sand has visibly different parts.
- **Homogeneous Mixtures** have their components mixed down to the molecular level.
  - Sugar water is an example. Because the particles of sugar and water are completely mixed, each volume in the mixture has the the same percentage of sugar and water as any other like volume.

# Classification of Matter

