Review

What is Element, Molecule or Compound?

Questions

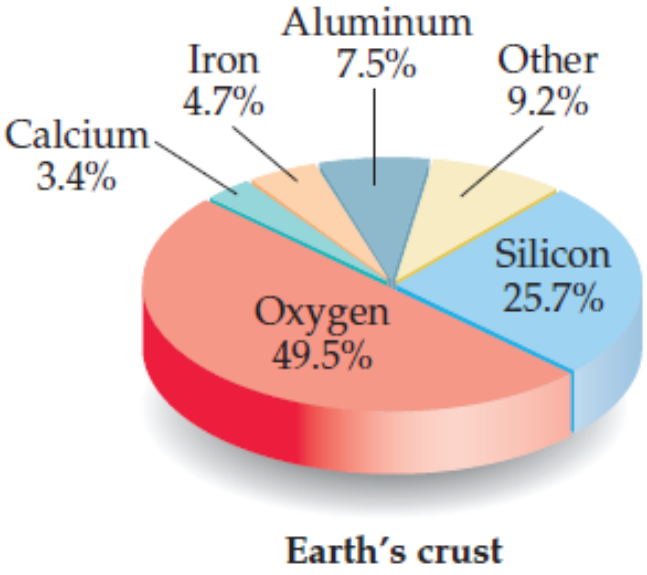
1. Write down any **5** chemical **element**s.
2. Write down **5 molecule**s.
3. Write down **5** different **compound**s.

He H_2O Si NaCl

What is **Atom**? Any distinction from **Element**?

Elements

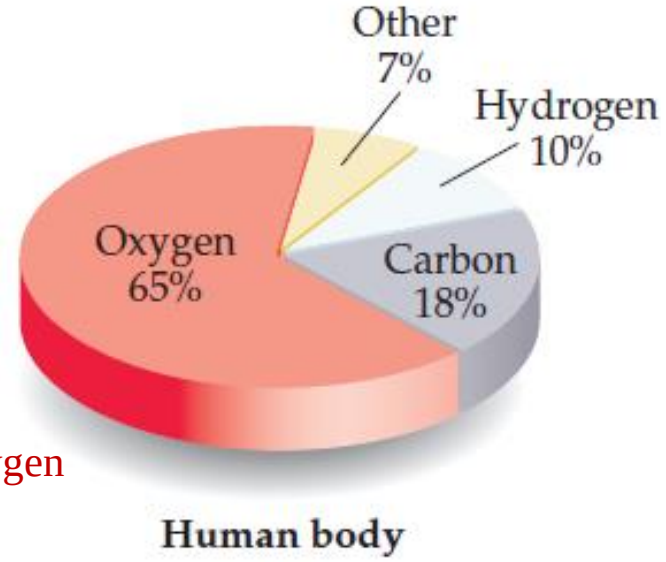
Currently, 118 elements are known, though they vary widely in abundance. Hydrogen constitutes about 74% of the mass in the Milky Way galaxy, and helium constitutes 24%. Closer to home, only five elements—oxygen, silicon, aluminum, iron, and calcium—account for over 90% of Earth's crust (including oceans and atmosphere), and only three—oxygen, carbon, and hydrogen—account for over 90% of the mass of the human body (**Figure 1.6**).



Earth's crust

~50% of the earth's crust mass is from O^{2-} (oxide ion)

Note the importance of oxygen



Human body

C, H, and O constitute 90% of the human body's mass

What is Atom? Any distinction from Element?

Element" is used for atoms with a given number of protons. There are 92

Different atoms of the same element can form by having with different number of neutrons.

(Isotopes---Ch. 2 and Ch. 21)

Representing Elements

- Chemists usually represent elements as **symbols**.
- **Symbols** are one or two letters; the first is always capitalized.
- Some elements are based on Latin, Greek, or other foreign language names.

TABLE 1.1 Some Common Elements and Their Symbols

Carbon	C	Aluminum	Al	Copper	Cu (from *cuprum*)
Fluorine	F	Bromine	Br	Iron	Fe (from *ferrum*)
Hydrogen	H	Calcium	Ca	Lead	Pb (from *plumbum*)
Iodine	I	Chlorine	Cl	Mercury	Hg (from *hydrargyrum*)
Nitrogen	N	Helium	He	Potassium	K (from *kalium*)
Oxygen	O	Lithium	Li	Silver	Ag (from *argentum*)
Phosphorus	P	Magnesium	Mg	Sodium	Na (from *natrium*)
Sulfur	S	Silicon	Si	Tin	Sn (from *stannum*)

Compounds are combinations of elements

Most elements can interact with other elements to form compounds. For example, when hydrogen gas burns in oxygen gas, the elements hydrogen and oxygen combine to form the compound water. Conversely, water can be decomposed into its elements by passing an electrical current through it (**Figure 1.7**).

TABLE 1.2 Comparison of Water, Hydrogen, and Oxygen

	Water	Hydrogen	Oxygen
State[a]	Liquid	Gas	Gas
Normal boiling point	100 °C	−253 °C	−183 °C
Density[a]	1000 kg/m^3	0.084 kg/m^3	1.33 kg/m^3
Flammable	No	Yes	No

[a] At room temperature and atmospheric pressure.

Density

0.99987 g/mL at 0 °C
1.00000 g/mL at 4 °C
0.99707 g/mL at 25 °C
0.95838 g/mL at 100 °C

1.1 | The Study of Chemistry

Chemistry is the study of the properties and behavior of matter. **Matter** is the physical material of the universe; it is anything that has mass and occupies space. A **property** is any characteristic that allows us to recognize a particular type of matter and to distinguish it from other types. This book, your body, the air you are breathing, and the clothes you are wearing are all samples of matter. We observe a tremendous variety of matter in our world, but countless experiments have shown that all matter is comprised of combinations of only about 100 substances called ***elements***. One of our major goals will be to relate the properties of matter to its composition, that is, to the particular elements it contains.

Chemistry also provides a background for understanding the properties of matter in terms of **atoms**, the almost infinitesimally small building blocks of matter. Each element is composed of a unique kind of atom. We will see that the properties of matter relate to both the kinds of atoms the matter contains (*composition*) and the arrangements of these atoms (*structure*).

Appendix B: Properties of Water

Ion-product constant, K_w: 1.14×10^{-15} at 0 °C
1.01×10^{-14} at 25 °C
5.47×10^{-14} at 50 °C

T (°C)	K_w ($mol^2\ dm^{-6}$)	pH
0	0.114×10^{-14}	7.47
25	1.008×10^{-14}	7.00
50	5.476×10^{-14}	6.63
100	51.3×10^{-14}	6.14