Chapter 2: Atoms

Overview

Chapter 2 begins with the Greek concept of matter and moves chronologically forward through the development of the atomistic model of matter.

Lecture Outline

2.1 Atoms: Ideas from the Ancient Greeks

The Greek philosophers had two main ideas regarding matter:

(a) The atomistic view (Leucippus and Democritus)

(b) The continuous view (Aristotle)

2.2 Scientific Laws: Conservation of Mass and Definite Proportions

Lavoisier was the first great experimentalist. More than anything, he introduced experimental chemistry to Western civilization. Through his experiments, he formulated the Law of Conservation of Mass, which states that matter is neither created nor destroyed during a chemical reaction.

2.3 John Dalton and the Atomic Theory of Matter

John Dalton summarized the work of Lavoisier and Proust to form the famous Atomic theory.

2.4 Mendeleev and the Periodic Table

John Dalton established relative atomic masses using hydrogen as a base. Mendeleev arranged a table of elements according to increasing atomic weights placing elements with similar properties in the same column. This was the beginning of the modern periodic table.

2.5 Atoms and Molecules: Real and Relevant

Demonstrations

1. Electrolysis of water.

2. Fill three flasks with zinc (gray powder), sulfur (yellow powder), and zinc sulfide (white powder), and show to the class to illustrate how the properties of a compound differ from those of the component elements. (Or use mercury [silver liquid], oxygen [colorless gas], and mercuric oxide [red powder].)

3. Use samples of metals and nonmetals to demonstrate the difference in their properties. (Aluminum foil, copper wire, nickel coin, zinc strip; capped bottle of liquid bromine, balloon filled with hydrogen, bottles of carbon, sulfur, etc.)

4. Using the largest nuts and bolts you can find, start with unequal numbers of nuts and bolts (e.g., 5 and 7). Connect the pairs of nuts and bolts, with some remaining unpaired, to illustrate the Law of Definite Proportions.

5. Heat a sample of HgO in a large test tube with a burner. Mercury droplets form on the inside of the tube. Test for oxygen with a glowing splint, which bursts into flame when inserted into the test tube.