Before “Chemistry”

- **Alchemy/Alchemists** - a pseudoscience built around trying to turn cheap metals into GOLD! (400 B.C.-1400 A.D.)
- **Metallurgy** – systematic extraction of metals from ores laid some groundwork for modern chemistry. (1500s)
- The first “chemist” was **Robert Boyle** who worked on pressure and volume of gases and postulated that elements could not be separated into simpler substances. (1660s)

Other Early Chemists

- **Antoine Lavoisier** (late 1700s) – carefully weighed reactants and products of combustion. Developed the “Law of conservation of Mass”.
- **Joseph Proust** (early 1800s) – discovered that a given compound always contained the same proportions of certain elements by mass. “Law of Definite Proportions”
- **John Dalton** (early 1800s) – noted that elements that combined to form more than one kind of compound, did so in proportions of integers by mass. “Law of Multiple Proportions”

John Dalton’s Atomic Theory

1. Each element is made up of tiny particles called **atoms**.
2. Atoms of a given element are identical, atoms of different elements are different.
3. Chemical **compounds** are formed when atoms of 2 or more elements combine with each other. A given compound always has the same relative numbers and types of atoms.
4. Chemical reactions involve reorganization of the atoms, but not atoms are destroyed or created. “Law of conservation of mass”

Practice Problem

Which box displays a

i. a gaseous compound and gaseous element  A and B
ii. a solid element and a gaseous compound  C

J. J. Thomson, Cathode Ray Tube

[Diagram of cathode ray tube with electron paths shown]
Robert Millikan, Charge Oil Droplets

Ernest Rutherford, Gold Foil Experiment

Plum Pudding Model of the Atom

Modern View of Atomic Structure (Page 5)

If a nucleus were the size of a marble, the atom would be the size of Memorial Stadium.

Nuclear Particles (Page 9)

<table>
<thead>
<tr>
<th>Particle</th>
<th>Mass</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrons</td>
<td>$9.10939 \times 10^{-31}$ kg</td>
<td>1-</td>
</tr>
<tr>
<td>Protons</td>
<td>$1.67265 \times 10^{-27}$ kg</td>
<td>1+</td>
</tr>
<tr>
<td>Neutrons</td>
<td>$1.67495 \times 10^{-27}$ kg</td>
<td>None</td>
</tr>
</tbody>
</table>

Mass number, $A$ = total number of protons and neutrons
Atomic number, $Z$ = number of protons