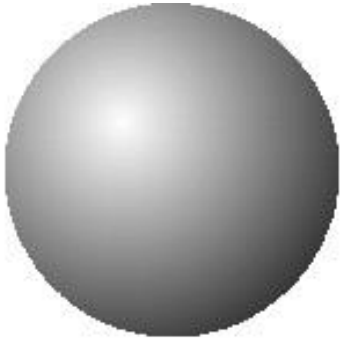
Development of the Atomic Model

Democritus (450 B.C.)

- Believed that all matter was made up of tiny indivisible particles called “atoms”
  - No one believed him
  - Aristotle had a different idea that conflicted with democritus

Democritus’s model



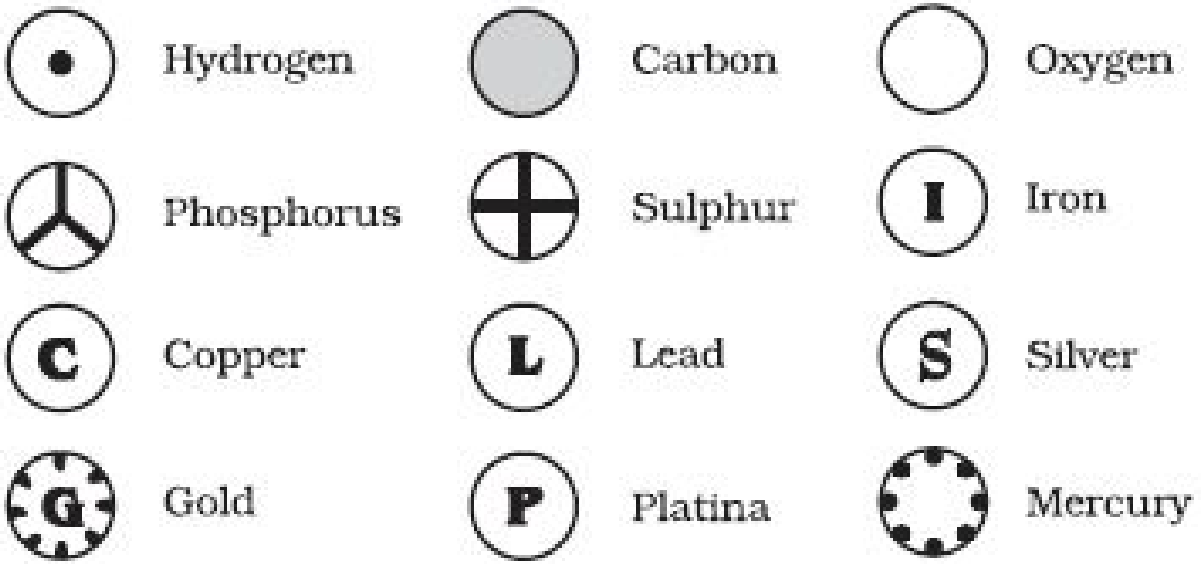
Democritus
(400 B.C.)

Dalton's Atomic theory (early 1800’s)

Four main points

- All matter is made of small, indivisible particles called atoms.
- All the atoms of an element are identical in properties such as size and mass.
- Atoms of different elements have different properties.
- Atoms of different elements can combine in specific fixed ratios to form new substances.

Dalton’s Model (Billard Ball Model)



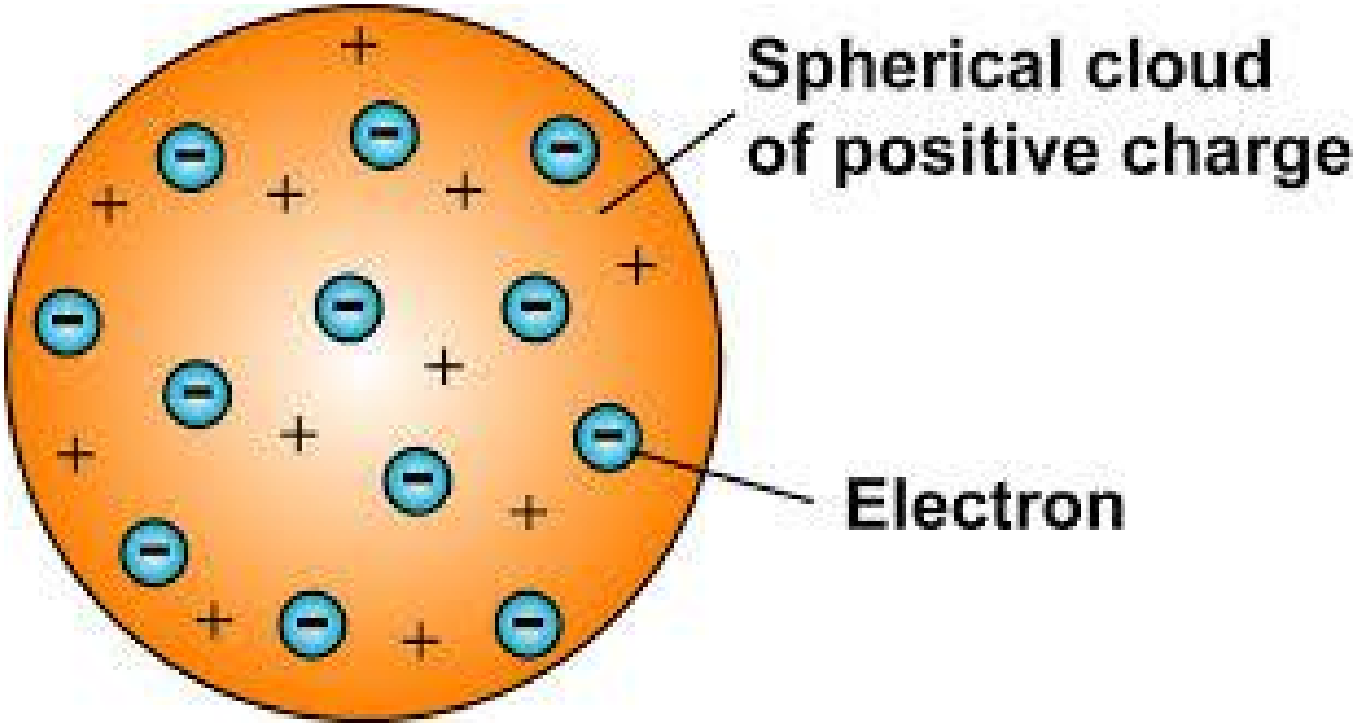
Discovery of Electrons (1897)

- J. J. Thomson discovered the first subatomic particle in 1897 using cathode rays
- Electron are negatively charged subatomic particles
- They are 1000x smaller than the atom and have almost no mass

Thomson’s Atomic Model (1904)

- The atom was a positively charged sphere with negatively charged particles (electrons) embedded in it.
- Also called the raisin bun model or the plum pudding model

Thomson’s Atomic Model



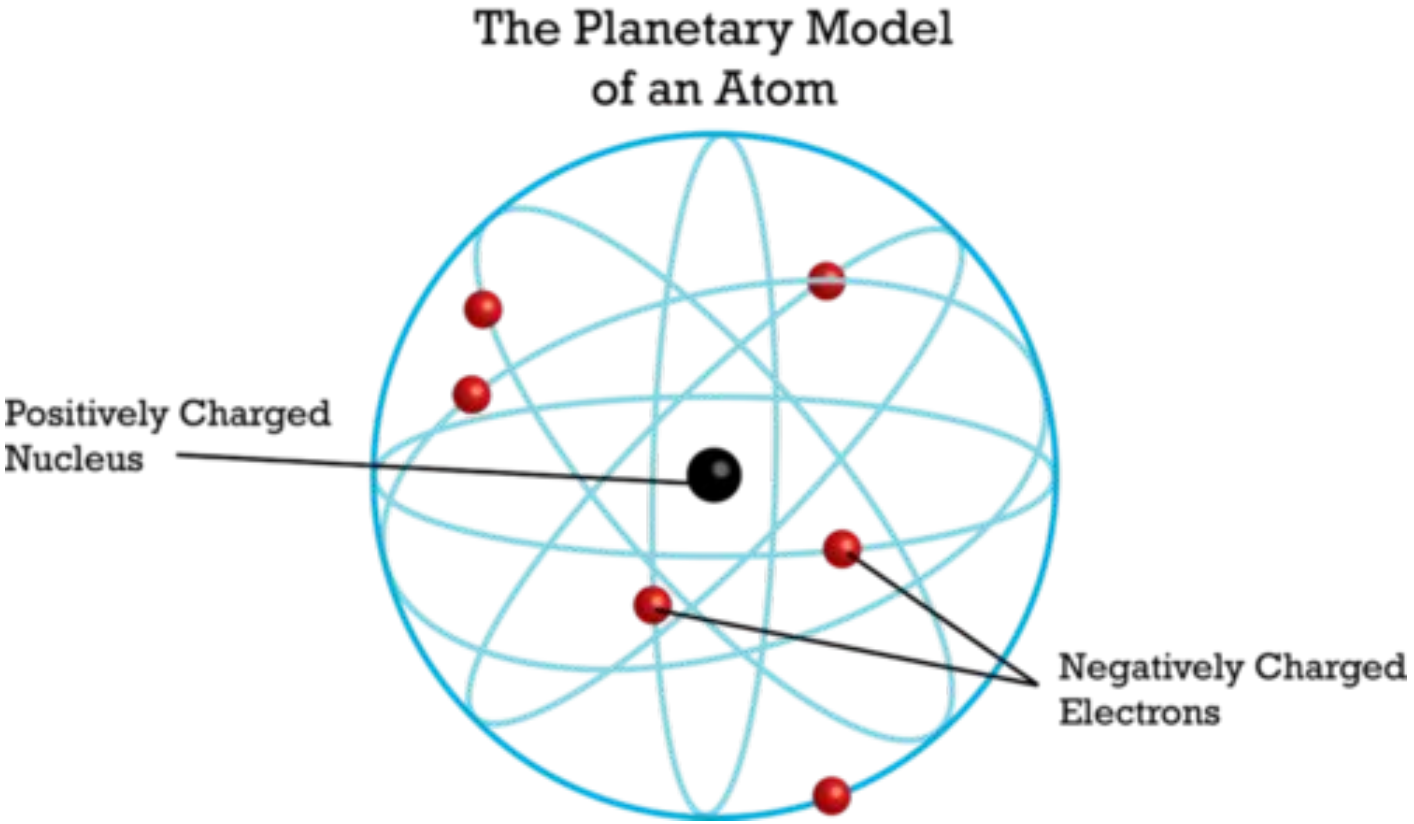
Rutherford’s Experiment (1909)

- Used gold foil and alpha particles
- Lead to the discovery of the nucleus
    - Small , dense and positively charged area at the center of the atom

Rutherford’s Atomic Model (1911)

- Had the nucleus in the center
  - Contained the protons
- Electron orbit the nucleus like planets
- Mostly made of empty space
- Also called the solar system model

Rutherford's Atomic Model



Neutrons

- The discovery of neutrons helped explain the varying masses of the same elements
- Isotopes : The same elements that have different numbers of protons

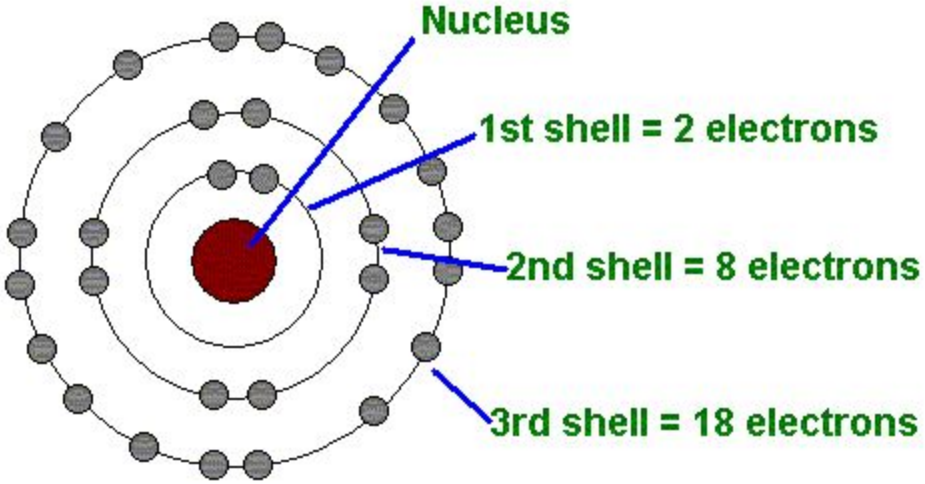
Evidence for Energy Levels

- The cathode rays all emitted light
- Different colours were observed depending on the elements used
- Lead scientists to believe that electrons were arranged in different energy levels

Bohr’s Atomic Model (1913)

- Had the nucleus in the center
  - Contained the protons
- Electron orbit the nucleus in varying energy levels or shells
  - First energy shell contains 2 electrons
  - All other shells hold 8 electrons

Bohr’s Atomic Model



Drawing Bohr diagram

- Make a Bohr diagram for Sodium, Carbon and Chlorine

Current theories

- Energy levels are thought to be more complex with many different sub levels
- Electron grouping is also thought to be in pairs in these energy levels