Developing Models of Matter

Empedocles - about 450 BC
- Earth, Air, Wind, Fire

Democritus - about 400 BC
- matter made of tiny particles
- called them *atoms*

AD 500-1600
- Alchemists-part philosopher, mystic, magicion and chemist

Robert Boyle - about 1650
- " a pure substance that cannot be broken down into simpler substances"

Priestly, Lavoisier and Cavendish - late 1700's
- isolated oxygen and later hydrogen and recognised them as elements

John Dalton - 1808

- All matter is made of tiny particles
- Each element has its own kind
- Compounds are created when elements combine
- atoms cannot be created or destroyed

1831- Michael Faraday

- matter must contain positive and negative charges
- opposite charges attract, like charges repel
- atoms combine to form compounds because of electrical attractions

Ernest Rutherford -1911

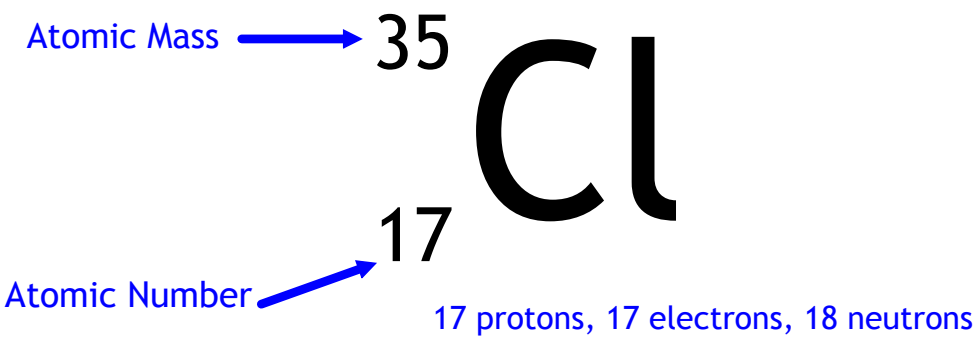
- gold foil experiment
- a tiny dense postive core called the nucleus
- surrounded by mostly empty space containing the rapidly moving negative electrons

Inside the Atom

- atoms consist of sub-atomic particles
  protons-positively charged
  electrons-negatively charged
  neutrons-neutral
- the number of protons is significant since it is this that determines what the element actually is

atomic number = number of protons
number of protons = number of electrons
number of neutrons = mass number - number of protons

Standard Atomic Notation



-Can also be written as Cl-35

Charged Atoms

- normally # of protons = # of electrons
- # of protons NEVER changes
- gaining or losing electrons produces what is called an ion
- this is a charged particle

EXAMPLE:
-sodium, Na, is atomic #11, therefore 11 protons and 11 electrons
-a sodium atom can lose 1 electron and therefore have 11 protons and 10 electrons
-this is one more + charge

-written as Na^{1+}

A Planetary Model of the Atom

Niels Bohr, suggested the following:
-electrons can move around the nucleus in nearly circular orbits
-each electron has a specific amount of energy
-the farther away from the nucleus the greater the amount of energy
-electrons cannot exist 'between' these orbits, but can move up and down from one orbit to another
-the order of filling these orbits is 2, 8, 8 for the the first three orbits
-electrons are more stable at lower energy, closer to the nucleus

Bohr Diagrams

the element symbol is written in the center and the electrons are 'filled' into the orbits around this nucleus

Electron

Example:
Hydrogen has 1 proton, and 1 electron

H

Nitrogen has 7 protons and 7 electrons
(Hint: remember 2,8,8)

N

Try these!
determine the # of protons and electrons
Dont forget the 2, 8, 8

● Electron

P Cl Mg