

## Chemistry Chapter 3 – The Periodic Table and the Makeup of Atoms

1. **Protons** – Subatomic particle with a +1 charge, 1amu mass. **The total number of protons is the atomic number**
2. **Neutron** – Subatomic particle with a +0 charge, 1 amu mass. Discovered by **Cavendish**
3. **Electron** – Subatomic particle with a -1 charge, 1/1837 amu mass. Discovered by **Tomson**
4. **Bohr (Solar-system model)** – electrons have certain allowed energy levels
5. **Atomic mass** = number of protons + neutrons
6. **Isotopes** – Same # of protons, so same atomic #, but different number of neutrons, so different mass number
  - a. Periodic Atomic Weight is the **WEIGHTED AVERAGE** of the weights of the isotopes
7. **Democritus (Atomos)** – philosopher who discovered that matter was discontinuous
8. **Dalton (billiard-ball model)** – experiments w/ gases, concluded that all substances are different combos of atoms
9. **Tomson (Plum-pudding model)** – experiments with gas-discharge tube
  - a. Discovered that atoms have +/- parts (protons and electrons)
  - b. The electron does not change from atom to atom. Different atoms have different **NUMBERS** of electrons
10. **Rutherford (nuclear model)** – most of the mass of the atom is concentrated in the positively charged nucleus
  - a. **Gold Foil Experiment** – sent Alpha particles through a sheet of gold, most went through, others bounced back
  - b. The particles bounced because the positively charged nucleus repelled the positively charged alpha particles
  - c. He concluded that the nucleus is very dense because the alpha particles bounced at **small ref. angles**
11. **Meyer/Mendeleev** – Credited for inventing the Periodic Table by ordering elements by atomic # instead of weight
  - a. They predicted undiscovered elements with striking accuracy (Ga, Ge, Sc)
  - b. Tellurium is placed **BEFORE** iodine even though Te is heavier than I (I has a higher atomic number)
12. **Henri Becquerel/Marie Curie** – studied and discovered radioactivity, named by Curie
  - a. **Alpha particles** – helium nucleus, consists of 2 protons/2 neutrons, carries a +2 charge, least dangerous
  - b. **Beta particles** – a high energy electron with a -1 charge, more dangerous than Alpha particles
  - c. **Gamma particles/rays** – a high energy form of light, the most damaging of the three particles
13. Elements are either **metals, nonmetals, or metalloids**
14. **Metalloids** – these elements that have both metal and nonmetal properties
  - a. Boron (B), Silicon (Si), Germanium (Ge), Arsenic (As), Antimony (Sb), Tellurium (Te), Polonium (Po), and Astatine (At) are all metalloids
15. **Ductility** – the ability to pull a substance into wire
16. **Sectionality** – the ability to cut with a knife
17. **Malleability** – the ability to pound into sheet (the most malleable element is gold)
18. **Conductivity** – ability to carry electrical current
19. **Periods** – horizontal rows on the periodic table (1<sup>st</sup> period, 2<sup>nd</sup> period, etc)
20. **Groups/Families** – vertical columns on the periodic table (Family IA, Family IIA, Etc)
21. **Rare Earth Metals** – the Lanthanide Series
22. **Alkali Metals** - Family IA
23. **Alkali Earth Metals** – Family IIB
24. **Halogens** – Family VIIA
25. **Noble Gases** – Family 0
26. **The Representative Elements** – Anything ending with A (IA, IIA, etc.) and the Halogens
27. **Cathode Ray Tubes** – tubes with 2 electrodes that glow when air is pumped out and voltage is applied
  - a. Neon Lights are Cathode Ray Tubes
  - b. Cathode (the negative electrode) rays are **beams are electrons**, same for all substances
  - c. Canal rays, the positive ions left after ionizing the gases, differ from substance to substance
  - d. The amount of deflection is proportional to it's charge (large charges deflects more than small charges)
  - e. The amount of deflection is inversely proportional to mass of particle (large particles are harder to deflect than small particles)
  - f. The final amount of deflection is the **e/m** (charge – mass) ratio, **Charge of electron  $-1.60 \times 10^{-19}$**