Chemistry Review - Unit 1 – Atomic Concept

The Nature of the Atom, Subatomic Particles, Atomic Structure, Energy Levels, Valance Electrons

**1. The modern model of the atom has evolved over a long period of time through the work of many scientists.**

* *Dalton’s Model:* 
  + - Elements are made of atoms
    - Atoms of an element are the same.
    - Compounds are formed from combinations of atoms.
* *Rutherford Experiment*
  + - Bombarded gold foil with alpha particles. Showed atoms were mostly empty space with small, dense positively charged nucleus.
* *Bohr Model*
  + - Small, dense, positively charged nucleus surrounded by electrons in circular orbits.
* *Wave-Mechanical Model (Modern Atomic Theory)*
  + - Small, dense, nucleus positively charged nucleus surrounded by electrons moving in “electron cloud”. “Orbitals” are areas where an electron with a certain amount of energy is *most likely* to be found.

**2. Each atom is made of a positively charged nucleus with one or more orbiting, negatively charged electrons.**

**3. Protons and neutrons are found in the nucleus.**

**4. Protons have a positive charge, neutrons no charge, and electrons a negative charge.**

**5. The number of protons in an atom equals the number of electrons.**

* The positive charges of the protons are cancelled by the negative charges of the electrons, so overall an *atom* has a neutral charge.

**6. The mass of a proton is 1 amu. The mass of a neutron is 1 amu. The mass of an electron is almost 0 amu.**

* The amu is defined as 1/12 the mass of a Carbon atom.
* The atomic mass of an atom is equal to the total number of protons and neutrons.

**7. Each electron in an atom has its own distinct amount of energy.**

* When all electrons are at their lowest possible energy, it is called the “ground state.”
* Electrons fill in energy levels and orbitals starting with the one that requires the least energy (1s) and progressively move to those levels and orbitals that require increasing amounts of energy.

**8. When the electron gains a specific amount of energy, it moves to a higher orbital and is in the “excited state”.**

**9. When an electron returns from a higher energy state to a lower energy state, it emits a specific amount of energy usually in the form of light. This can be used to identify an element (bright line spectrum).**

* The instrument used to see the bright line spectrum is called a spectroscope.

**10. The outermost electrons are called valence electrons. These affect the chemical properties of the element.**

* Atoms with a filled valence level are stable.
* Most elements can have up to 8 electrons in their valence level. The exceptions are H and He, which can have only 2 valence electrons.
* Atoms form bonds in order to fill their valence levels.
* You can use orbital notation or Lewis structures to show the configuration of the valence electrons.

**11. Atoms of the same element all contain the same number of protons.**

* Changing the number of protons changes the atom into a different element.
* The atomic number is the number of protons in an atom of an element.

**12. Isotopes are atoms with equal numbers of protons but different numbers of neutrons.**

* Isotopes of an element have the same atomic number (protons only), but different atomic masses (protons + neutrons).

**13. The average atomic mass of an element is the weighted average of its naturally occurring isotopes.**