**The Simplified Atomic Model** (a simple model of what the atom looks like)

- Each proton has a positive charge.
- Each electron has a negative charge.
- Each neutron has no charge (i.e. it is neutral).
- The amount of negative charge in one electron = the amount of positive charge in one proton. Therefore, one electron will cancel out the charge of one proton.
- If an atom has 6 protons and 6 electrons then the atom is electrically neutral since +6 will cancel out -6 (+6-6=0).
- A neutral atom has the same number of protons and electrons.
- The mass of one proton ≈ the mass of one neutron (each is $1.67 \times 10^{-27}$ kg).
- The mass of one proton is approximately 1840 x larger than the mass of one electron.
- The mass of one neutron is approximately 1840 x larger than the mass of one electron.
- The mass of one electron (which is about $9.11 \times 10^{-31}$ kg) may be considered to be negligible compared to the mass of a proton or a neutron. (negligible means ≈ 0).
- Protons and neutrons are found in the nucleus of an atom.
- Electrons travel in *orbits*, or *energy levels* around the nucleus.
- Up to two electrons can be in the innermost orbit (the first orbit).
- Each additional orbit can hold up to a maximum of eight electrons.
- The diameter of an atom is extremely small (around $5 \times 10^{-8}$ cm, or 0.000 000 05 cm). Note that up to 36 billion atoms, $3.6 \times 10^{10}$, can stand on the head of a pin (this is 6 times the number of people on Earth).
- The nucleus occupies a **very** small area of the atom. The diameter of the nucleus is 50 000 times smaller than the diameter of the atom... an analogy would be that if you could imagine an atom the size of the Olympic Stadium, the nucleus would be a fly in the center. Or, imagine a sphere with a diameter of 2 km. Now imagine a marble in the middle. The ratio of the sphere to the marble is comparable to the ratio of the atom to the nucleus!
- The nucleus contains almost all (99.97%) of the atom's mass (since it contains the protons and neutrons).
- So, the nucleus has a tiny volume, but a huge mass. Density = $\frac{\text{mass}}{\text{volume}}$

  The nucleus is extremely dense. A nucleus the size of a pea would have a mass of 250 million tons, or 250 billion kilograms.
- The number of neutrons in an atom of a particular element is not a set amount.
- The number of protons in an atom of a particular element is = the atomic #
- The number of electrons = the number of protons, assuming a neutral atom.
- Electrons stay in an atom due to attraction to the positively charged nucleus.
- The nucleus stays together due to nuclear forces between neutrons & protons.
- The atomic mass number for an element = # protons + # neutrons.
- Isotopes are atoms of the same element that have different numbers of neutrons, and therefore different masses.