

## Foundations of Physics Study Guide for Chapter 4:

- Section 4.1 “The Development of Atomic Theory”
  - Models of the Atoms
    - Greeks: Their ideas
    - Democritus: Contribution
    - Alchemists: Contribution
    - Boyle: Contribution
    - Dalton: 5 parts of his atomic theory & which part was incorrect
    - Thomson: Experiment & findings
    - Rutherford: Experiment & findings
- Section 4.2 “The Structure of Atoms”
  - Subatomic Parts of the Atom
    - Proton: Charge, Relative Mass, Location, Size
    - Neutron: Charge, Relative Mass, Location, Size
    - Electron: Charge, Relative Mass, Location, Size
  - Atoms have a unique number of protons (Identifies the element)
  - Atoms are neutral (Protons = electrons)
  - Electric force holds the atoms together (Protons attract the electrons)
  - Atomic Math:
    - Writing the Symbol:  $\overset{\text{Mass Number}}{\text{Atomic Number}} \text{Element Symbol}^{\text{Charge}}$
    - Atomic Number: Definition and identification
    - Mass Number: Definition and calculation
      - It is never found on the PT
    - # of Protons: Identification
    - # of Neutrons: Calculation
    - # of Electrons: Calculation
  - Isotopes: Definition
    - Draw the nucleus for the Bohr Model
  - Mole: Definition
    - Avogadro’s Number:  $6.02 \times 10^{23}$
    - Elements: Finding the atomic Mass on the PT
      - Ex: C: 12.011
    - Compounds: Molar Mass is determined by adding the each atoms atomic mass together.
      - Ex: H<sub>2</sub>O:  $2(1.0079) + 1(15.9994) = 18.0153$
- Section 4.3 “Modern Atomic Theory”
  - Electromagnetic Radiation
    - Types
    - Higher Energy
  - Electrons location is limited to energy levels.
  - Electrons act like waves
    - Einstein: Contribution
    - DeBroglie: Contribution

- The exact location of an electron cannot be determined.
  - Bohr Model
  - Size: Definition
  - Shape: Definition and identification
  - Orientation: Definition and identification
  - Spin: Definition
  - Orbitals
- Electron Energy Levels
  - Using the Aufbau Chart (It should be added to your PT):
    - 1s
    - 2s 2p
    - 3s 3p 3d
    - 4s 4p 4d 4f
    - 5s 5p 5d 5f
    - 6s 6p 6d 6f
    - 7s 7p 7d 7f
  - Types of orbitals
  - Number of electrons that can exist in a subshell orientation (orbital)
  - Number of different orientations (orbitals) for each subshell
  - Total number of electrons in each subshell
  - Writing the electron configuration for an atom using the AUFBAU chart
  - Drawing the atom's electron arrangement using *s* – dots; *p* – stars; *d* – boxes; *f* – smiley face.
  - Know the *Atoms Chart*
  - † Know the atom's electron arrangement and use the knowledge from *Atoms Chart* to predict the number of valence (outermost/outer shell) electrons of other elements in a group
- Electron transitions
  - Photons: Define
  - Ground state: Define
  - Excited state: Define
  - Electrons absorb or emit light at certain wavelengths
    - Describe how atoms emit energy
    - Amount of energy released produces a specific wavelength
    - Example: The atom's in a red shirt only absorb and release certain wavelengths and therefore is always red. If this did not happen, it would change colors in front of our eyes.