Chapter 16: Properties of Atoms and the Periodic Table
Section 3: The Periodic Table

The term *periodic* means to repeat in a pattern.

Dmitri Mendeleev

- Late 1800s, he presented a way to organize all the known elements
- He found the elements repeated a pattern according to the element's atomic mass
- He did rows for increasing atomic mass and columns of elements that shared similar physical and chemical properties
    - This arrangement is defined as the **periodic table**

Henry Moseley

- He later finalized the periodic table to arrange by increasing atomic number
- This is the modern-day periodic table

Periodic table: the elements are arranged by increasing atomic number, not atomic mass, and by periodic changes in physical and chemical properties

Periods: the horizontal rows of elements

- 7 periods

Groups: the vertical columns of elements

- 18 groups

- Also called families

Energy levels – electrons have different amounts of energy as you go out from the nucleus

- Think of it as rungs on a ladder
  - 1st rung has low GPE but the 4th rung has high GPE
- Periods: similar energy levels
- Groups: increases in energy levels
- Electron configuration diagrams
  - Level 1 = holds 2 electrons
  - Level 2 = holds 8 electrons
  - Level 3 = holds 18 electrons
  - Level 4 = holds 32 electrons
    - Start with finding the number of protons & electrons
    - Put the symbol in the middle
    - Following the levels above, fill in with dots around the symbol
    - Fill until you are out of electrons
    - Examples:

Hydrogen

Helium

Carbon

Fluorine

Valence electrons (ve^-): electrons in the outermost energy level

- Max number of valence electrons equals 8
- These are the electrons used in bonding between atoms
- Looks at the electrons in Groups 1-2 and 13-18 as these elements are in the outermost energy level
    - Group 1 = 1 ve^-
    - Group 2 = 2 ve^-
    - Group 13 = 3 ve^-
    - Group 14 = 4 ve^-
    - Group 15 = 5 ve^-
    - Group 16 = 6 ve^-
    - Group 17 = 7 ve^-
    - Group 18 = 8 ve^-
- **Electron dot notation:** uses the chemical symbol of an element surrounded by dots to represent the number of electrons in the outermost energy level
    - Similar to electron configuration diagrams but this time you only have 4 sides that contain 2 electrons (dots) each
    - Start with a single dot on the top
    - Fill each of the 4-sides with single dots then double up
    - Hydrogen

    - Helium

    - Carbon

    - Fluorine

Regions of the periodic table

- Metals
  - solid at room temperature
  - Shiny
  - Drawn into wires
  - Pounded into sheets
  - Good conductors of heat and electricity
- Nonmetals
  - Gases at room temperature or brittle solids
  - Poor conductors of heat and electricity
- Metalloids
  - Exhibit properties of metals and nonmetals
  - Boron, Silicon, Germanium, Arsenic, Antimony, Tellurium, Polonium, and Astatine