**Unit Four Note-taking Guide – Periodicity**

**Podcast 4.1 Organization of the Periodic Table**

* Elements with similar properties were placed in vertical **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** (columns) or **\_\_\_\_\_\_\_\_\_\_\_\_\_.**
* Placed by increasing atomic weights in rows called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

Families/Groups

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** Metals
  + Group 1 – Lithium, Sodium, Potassium, Rubidium, Cesium, Francium
  + **\_\_\_\_\_\_\_\_\_\_\_\_**electron in valence (outer) shell
  + Very, VERY reactive – not found free in nature
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** Metals
  + Group 2 – Beryllium, Magnesium, Calcium, Strontium, Barium, Radium
  + **\_\_\_\_\_\_\_\_\_\_\_\_** electron in valence shell
  + Very reactive – not usually found pure in nature
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** Group 18 – Helium, Neon, Argon, Krypton, Xenon, Radon
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** valence electron shell
  + Very stable (not reactive)
  + Under normal conditions do not form compounds with other elements
  + XeF4 (xenon tetrafluoride) is the first reported stable compound of a noble gas - 1962
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** Group 17 – Fluorine, Chlorine, Bromine, Iodine, Astatine
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_** electrons in valence shell
  + Halogen means “salt former”
  + Compounds they form are called salts
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** Metals
  + Groups 3 to 12, periods 4 to 7
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** electrons in valence electron shell
  + Hard and have a high melting point
  + Often used to form alloys (mixtures of metals)

**Podcast 4.2: Early Periodic Tables**

* Mid 1800’s – 60 Different Elements were identified
* 5 were **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** at room temperature (all non-metals)
  + H, O, N, F, Cl
* 2 were **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
  + Hg (metal)
  + Br (non-metal)
* The rest were **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* Scientists searched for a way to organize these elements
  + Elements with similar **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** were placed near one another.
* Dimitri Mendeleev
  + In 1869 he published the first periodic table
  + Mendeleev’s Table arranged by
    - **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** (Molar Mass)
    - Combining Capacity
* Modern Periodic Table arranged by
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
  + Number of valence electrons
  + Put together by Henry Mosely
* Why use Atomic Number rather than Atomic Weight?
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Podcast 4.3: Ions – Charged Particles**

Ions Are Charged Particles

* Atoms will transfer one or more **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** to another to become more stable.
* Each atom is left with a **\_\_\_\_\_\_\_\_\_\_\_\_\_** outer shell.
* Atoms neutral; \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ balance electrons
* Ions carry a charge because electrons (-) are gained or lost from a neutral atom.

Lewis Dot Diagrams: Represent Valence Electrons as Dots

* **Example 1: Sodium + Chlorine**
* **Example 2: Magnesium + Bromine**
* An atom that **gains** one or more electrons will have a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** charge.
* An atom that **loses** one or more electrons will have a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** charge.
* A positive ion is called a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and a negative ion is called an **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

Ionization Equations

* To show how an ion forms, electrons are written as reactants (gained) or as products (lost) in a chemical equation
* Sodium
* Chlorine
* Magnesium
* Oxygen

**Podcast 4.4: Periodic Trends**

Nuclear Charge, Z

* The nucleus is made of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* The charge of the nucleus comes from the protons
* The more protons, the \_\_\_\_\_\_\_\_\_\_\_\_\_ the charge

Electrostatic Force -- Coulomb’s Law

* The force of attraction is described by Coulomb’s Law

*write equation here:*

Electron Affinity = Electronegativity

* How tightly held are the valence electrons?
* More Electronegativity pulls electrons \_\_\_\_\_\_\_\_

Atomic Radius

* Smaller atoms take up less space
* More closely-held electrons take up less space

Ionization Energy: The energy required to REMOVE an electron

* Higher energy means it’s harder to take the electron away
* Cations have \_\_\_\_\_\_\_\_\_\_\_ ionization energies
* Anions have \_\_\_\_\_\_\_\_\_\_\_ ionization energies

Flame Test Results

* Sodium
* Lithium
* Potassium
* Barium

Effects of Electron Shielding

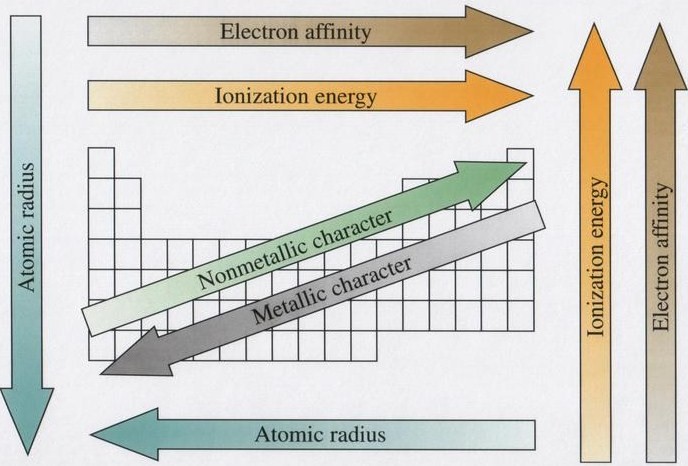
* Back to Coulomb’s Law… distance from the nucleus \_\_\_\_\_\_\_\_\_\_\_ the attraction experienced by valence electrons
* Other electrons get in the way – \_\_\_\_\_\_\_\_\_\_\_ valence electrons from the nuclear charge

Which has more influence… Nuclear Charge or Shielding?

* As the principle energy level increases, effects of shielding \_\_\_\_\_\_\_\_\_\_\_ .

*Answer the question and explain your reasoning:*

Electronegativity (Electron Affinity)

Atomic Radius

Ionization Energy