Name: _____ Per: _____

# Unit 3 Outline/ Study Guide - Electron Configuration and Periodic Trends

## Essential Skills/ State Standards:

1. Students know how to relate the position of an element in the periodic table to its quantum electron configuration and to its reactivity with other elements in the table.
2. Students know how to use the periodic table to identify **metals**, **semimetals**, **nonmetals**, **halogens**, **noble gases**, **alkali metals**, **alkaline earth metals**, and **transition metals**.
3. Students know how to use the periodic table to identify the following trends:
   **ionization energy**, **electronegativity**, and the **relative sizes of ions** and **atoms**
   (this includes knowing the following terms: ionization energy, electronegativity, cation, and anion.)

## Vocabulary:

- Electromagnetic radiation
- Electromagnetic spectrum
- Excited state
- Ground state
- Spectral lines
- Energy levels
- Wavelength
- Periodic table
- Group
- Period
- Metals
- Alkali metals
- Alkaline earth metals
- Transition metals
- Lanthanide
- Actinide
- Semi-conductors
- Non-metals
- Halogens
- Noble gases
- Ionization energy
- Electronegativity
- Atomic radii
- Ion (anions/ cations)
- Ionic size
- Electron configuration
- S, p, d, & f orbitals
- Valence electrons
- Octet rule

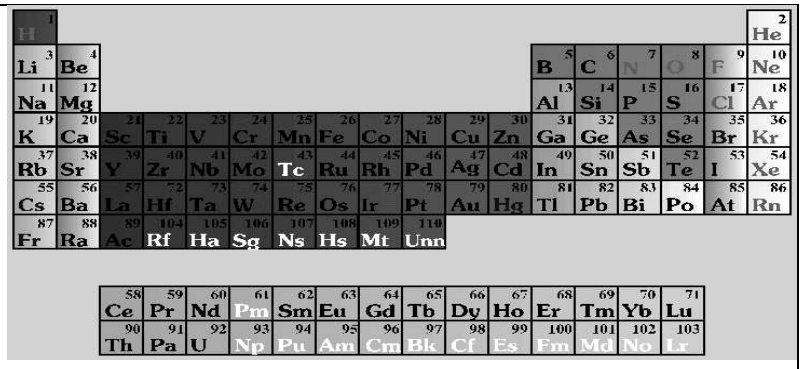
**Extra Credit Homework Problems:**

| *Topic* | *Read:* | *Problems* |
|---|---|---|
| 1. Electromagnetic waves | p. 91 - 97 | **Section Review 4-1 p. 97 #1-5** |
| 2. The Periodic Table | p. 20 – 24<br>p. 123 - 127 | **Section Reviews 1-3 & 5-1**<br>**p. 24 #3-4 p. 127 #2-4** |
| 3. Electron configurations | p. 105 - 116 | **Chp 4 Review p. 119–120 #27-30 & 37** |
| 4. E. Config. & the Periodic Table | p. 128-139 | **Chp 5 Review p.155-156 #4, 8,9, 11-14** |
| 5. Periodic Trends | p. 140 - 154 | **Chp 5 Review p. 156 #17-19a & b, 22-24, 26** |

## Study Guide -(use your notes and worksheets for a more complete review)

1. Identify/ label the following things on the periodic table:

**a. metals** **b. alkali metals**
**c. metalloids (semi-metals)** **d. alkaline earth metals**
**e. transition metals** **f. halogens**
**g. nonmetals** **h. noble gases**
**i. Periods** **j. Groups/ families**
**k. Identify groups/columns that have the following # of valence electrons: 1,2,3,4,5,6,7,8**



2. Why do the elements in the groups (columns) behave so similar to each other even if they have great differences in their number of protons?

3. What is the connection between the following terms: **octet rule**, **valence electrons**, and **ions**?

4. a) List the elements that are exceptions to the **octet rule** b) Why don't these atoms achieve the octet rule?

5. Identify as **Isotope** or **Ion:**

a. atoms that have a different number of neutrons

b. atoms have gained or lost electrons

c. shown by putting a +/- sign next to an element (ex: $Ca^{+2}$)

d. shown by putting the mass in hyphen notation (ex: C- 14)

6. a. Which electron orbital has more energy, electrons in 3p or 5p?
   b. What atomic sublevel has the next highest energy after 2p and will fill next?
   c. Based on your lab experience, how does an electron become excited?
   d. When do you see the unique light pattern for each element?

| 7. | **$O^{-2}$** | **$Mg^{+2}$** |
|---|---|---|
| a. **Cation** or **anion**? How do you know? | | |
| b. Did they **gain** or **lose** electrons? How do you know? | | |
| c. Which atom is **larger** or **smaller** in size? How do you know? | | |

| 8. **Noble Gas Config.** | **# valence electrons** | **period** | **block** | **Group number** | **Ion it will form** | **Element name** |
|---|---|---|---|---|---|---|
| **$[Ne]3s^2 3p^5$** | | | | | **$Cl^{-1}$** | |
| **$[Xe]6s^2 4f^{14} 5d^{10} 6p^3$** | | | | | | |
| | | | | | | **Br** |
| | | | | | | **K** |
| | | | | | | **Po** |

9. How many valence electrons does each of the following elements have? **How do you know?**

   a. noble gases= b. alkali metals= c. halogens= d. alkali earth metals=

Periodic Trends:

10. a. **Ionization energy** (explain term):
    b. Identify the elements that have the highest & lowest ionization energy:

**Na, Cl, Mg, P** — **highest:** **lowest:**

**K, Na, Rb, Li** — **highest:** **lowest:**

11. a. **Electronegativity** (explain term):
    b. Identify the most & least electronegative elements:

**Na, Ne, O, Al** — **most:** **least:**

**Ca, Cu, F, Ar** — **most:** **least:**

12. a. **Atomic radius** (explain term):
    b. Identify the largest to smallest atoms based on atomic radius:

**Ti, P, Cs, Ne** — **largest:** **smallest:**

**Li, O, Cu, K** — **largest:** **smallest:**

Naming/ Formulas:

13. a. what is the rule for naming/ formula writing for a metal + non-metal? b. give an example:

14. a. what is the rule for naming/ formula writing for 2 non-metals? b. give an example: