TOPIC: GENERAL ARRANGEMENT OF THE PERIODIC TABLE

Part I: Vocab - Match the vocabulary term on the left with the definition on the right.

A. Periodic Law	1. **C** These elements are poor conductors and are not malleable, shiny nor ductile. These elements have a wide range of physical properties such as color, melting point and hardness.
B. Atomic Radius	2. **D** The energy required to remove the outermost electron from a neutral atom
C. Nonmetals	3. **G** A horizontal row on the periodic table. The row number is the same as the number of occupied energy levels.
D. Ionization Energy	4. **I** These elements are good conductors of heat and electricity. These elements are malleable, ductile, shiny and almost always solids at room temperature.
E. Groups	5. **H** This indicates an atom's ability to attract electrons in a chemical bond.
F. Valence Electrons	6. **B** This is the distance from the center of an atom's nucleus to the outermost electrons
G. Periods	7. **E** Elements with similar properties are arranged in vertical columns. These elements have the same number of valence electrons.
H. Electronegativity	8. **A** When elements are arranged in order of increasing atomic number, their physical and chemical properties show a periodic trend.
I. Metals	9. **F** This is responsible for an atom's chemical properties and are located in the high occupied energy level.

II. Practice

10. Identify if each of the following is a metal, nonmetal or metalloid.
    a. Sodium **metal**
    b. Carbon **nonmetal**
    c. Boron **metalloid**
    d. Gold **metal**
    e. Aluminum **metal**
    f. Fluorine **nonmetal**

III. Analysis and Application

Base your answer to Questions 11 and 12 on the information below.

Densities of Group 14 Elements

Element	Density at STP (g/cm^3)
C	3.51
Si	2.33
Ge	
Sn	7.31
Pb	11.35

11. Predict a value for the density of Ge. **Any value greater than 2.33 and less than 7.31**

12. Identify one element of each type from group 14.

Metal **Sn or Pb**

Nonmetal **C**

Metalloid **Si or Ge**

13. Describe how an elements electron configuration is related to its location on the periodic table.
The number of occupied energy levels is associated with the period the element is located and the number of valence electrons indicates the group within the period.

TOPIC: GROUP CHEMISTRY

Part I: Properties of Families

Match the Group of elements with the appropriate family. Some of the groups may have multiple properties linked to them and some of the properties may be linked to multiple groups.

A. Alkali Metals
B. Alkaline Earth Metals
C. Halogen
D. Nobel Gases
E. Transition Metals

1. Never exist in the free or uncombined state in nature
2. Soft metals
3. Produced colored compounds and solutions
4. Stable valence electron shell
5. Inert (do not react)
6. Highly reactive with water and air
7. All diatomic elements
8. Only group containing elements in all three states of matter
9. All elements in the group are gases
10. Reactive metals
11. Reactive nonmetals
12. Metals with low reactivity

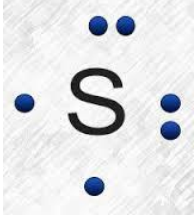
Part II: Throwback – Answer each of the following questions using your knowledge of chemistry.

1. Which of the following represents an excited state electron configuration?
   a. 2-8-1 b. 2-8-8-1 **c. 2-7-2** d. 2-8-8-2

2. Which of the following best describes what happens when an electron transitions from the third energy level to the second energy level?
   a. The electron absorbs energy in the form of heat.
   b. The nucleus absorbs energy in the form of heat.
   c. The nucleus releases energy in the form of light.
   d. The electron releases energy in the form of light.

3. The gold foil experiment led to the conclusion that most of the atom was empty space because most of the alpha particles
   a. Passed through the foil
   b. Remained trapped in the foil
   c. Were deflected by the nuclei in the foil
   d. Were deflected by the electrons in the foil.

4. Construct a Lewis Dot diagram for an atom of S-32.



TOPIC: PERIODIC TRENDS

1. Rank the following elements in order of increasing atomic radius:
carbon, aluminum, oxygen, potassium.

O < C < Al < K

2. Rank the following elements in order of increasing electronegativity:
sulfur, oxygen, neon, aluminum

Ne < Al < S < O

3. Why does iodine have a lower first ionization energy than fluorine?
Iodine has a lower first ionization energy than fluorine because both iodine and fluorine are in the same group and Iodine has a greater number of occupied energy levels. These additional levels create a shielding effect between the nucleus and the valence electrons therefore the valence electron is more loosely bound to the nucleus and can be removed using less energy.

4. Why do elements in the same family generally have similar properties?
Elements within the same group or family have similar properties because the have the same number of valence electrons.

5. What causes the trend in atomic radius down a group?
As atomic number increases down a group atomic radius increases because there are a greater number of occupied energy levels as you move from one period to the next throughout the group.

6. What causes the trend in ionization energy across a period?
As atomic number increases across a period the first ionization energy increases. This increase in the energy needed to remove an electron is due to the fact that as atomic number increases acorss a period the nuclear charge increases while the shielding effect remains constant. This creates a stronger pull by the nucleus on the valence electrons therefore requiring additional energy to remove an electron.

7. Circle the atom in each pair with the larger atomic radius.
a. Al or B b. Na or Al c. O or F d. Mg or Ca

8. Circle the atom in each pair with the higher ionization energy.
a. Li or Be b. Cl or Si c. Na or K d. P or Ar

9. Circle the atom in each pair that has the lower electronegativity.
a. Ca or Ga b. Li or O c. Ba or Sr d. O or S

10. Circle the atom or ion in the pair that has the larger radius.
a. Na or Na^+ b. S or S^{2-} c. Cl or Cl^- d. Al or Al^{3+}

***Note Cations (positive) are always smaller than the neutral atom. Anions (negative) are always larger than the neutral atom.*