Unit 4 Assignment Packet

Name_____
Period:_____

A1: The Periodic Table: Organizing the Elements

A. periodic table	B. metals	C. nonmetals
D. periods	E. alkali metals	F. halogens
G. columns	H. periodic law	I. alkaline earth metals
J. noble gases	K. group	L. outer transition metals
M. metalloids	N. inner transition metals	
O. atomic number	P. representative elements	

- Use this completion exercise to check your understanding of the concepts and terms associated with the organization of the periodic table. Each blank can be completed with a term. Some terms may be used more than once or not at all. Put the **LETTER** of the correct term in the space provided.

The periodic table organizes the elements into vertical _____ and horizontal _____ in order of increasing _____. The table is constructed so that the elements having similar properties are in the same _____. The elements in Groups 1A through 7A are called the _____. The _____ makeup Group 8A. The elements in Groups 2A and 3A are interrupted in periods 4 and 5 by the _____ and in the periods 6 and 7 by the _____. The group 1A elements are called the _____, and the group 2A elements are called the _____. The nonmetals of group 7A are called the _____. Elements with properties that are intermediate between those of metals and nonmetals are called _____.

- ***Classify each statement as true or false.***

_____ 1. In his periodic table, Mendeleev arranged elements in ascending order of atomic number.

_____ 2. The representative elements are the Group A elements.

_____ 3. The transition metals and inner transition metals are the Group B elements.

_____ 4. The element in group 4A, period 3, is gallium

- ***Match each description in Column B to the correct term in Column A***.

Column A

_____ 5. periodic table

_____ 6. periods

_____ 7. group

_____ 8. representative elements

_____ 9. alkali metals

_____ 10. transition metals

_____ 11. halogens

_____ 12. noble gases

Column B

a. A vertical column of elements in the periodic table
b. The Group 8A elements
c. The Group 1A elements
d. A portion of the Group B elements
e. An arrangement of elements according to similarities in their properties
f. Group A elements
g. The horizontal rows of the periodic table
h. The Group 7A element

Answer the following questions in the space provided.

13. List the elements of Group 5A. Tell whether each is a metal, nonmetal, or metalloid.

14. List three properties of metals, nonmetals, and metalloids each.

A2: Periodic Table and Trends

1. What determines the vertical arrangement of the periodic table?

2. What determines the horizontal order of the periodic table?

3. What determines the order of the periodic table?

4. Why did Mendeleev and other scientists of his time arrange elements in the periodic table in order of atomic masses?

5. All halogens are highly reactive. What causes the similarity among the halogens?

6. What properties do Noble gasses share and how does this relate to their electron configuration?

7. For each element tell which period and group the element is in, identify the element, and state whether it is a metal, nonmetal, or metalloid.

Element	Period	Group	Identity	Metal, non, metalloid
#34				
#40				
#14				
#56				
#18				

8. Classify the following as metals, nonmetals or metalloids below each name:
manganese . arsenic carbon niobium radium

9. Iodine is used in many commercial chemicals and dyes. To what family does it belong? What are the other members of this family? How many electrons are in the outermost energy level?

10. Define atomic size and describe its trend on the periodic table.

11. Define electronegativity and describe its trend on the periodic table.

12. Explain why as you go down the periodic table, within a group, the atoms get larger.

13. Explain why as you go across the periodic table to the right, within a period, the atoms get smaller.

14. Explain how electronegativity is related to atomic size using the trends on the periodic table.

A3: Ionic Bonding (Ch 7.1-7.2)

1. What are valence electrons?

2. How do valence electrons largely determine the chemical properties of an element?

3. Is the following sentence true or false? The group number of an element in the periodic table is related to the number of valence electrons it has.

4. What is an electron dot structure?

5. Draw the electron dot structure of each of the following atoms

    a. Argon

    b. Calcium

    c. Iodine

6. What is the octet rule?

7. Metallic atoms tend to lose their valence electrons to produce a(n) _____ or a positively charged ion. Most nonmetallic atoms achieve a complete octet by _____ electrons.

8. Write the electron configuration for theses metals and circle the electrons lost when each metal forms a cation.

    a. Mg

    b. Al

    c. K

9. Atoms of most nonmetallic elements achieve noble-gas electron configurations by gaining electrons to become _____, or negatively charged ions.

10. What property of nonmetallic elements makes them more likely to gain electrons than lose electrons?

11. Is the following sentence true or false? Elements of the halogen family lose one electron to become halide ions.

12. How many electrons will each element gain in forming an ion?

    a. Nitrogen
    b. Oxygen
    c. Sulfur
    d. Bromine

13. Write the symbol and electron configuration for each ion from question 12 and name the noble gas with the same configuration.

    a. Nitride
    b. Oxide
    c. Sulfide
    d. Bromide

14. What is an ionic bond?

15. In an ionic compound, the charges of the _____and _____ must balance to produce an electrically _____ substance.

16. Why do beryllium and fluorine combine in a 1:2 ratio?

Complete the chart for each element.

Element	# Protons	# Electrons	# Valence Electrons	Ion Charge
Sodium				
Chlorine				
Beryllium				
Fluorine				
Lithium				
Oxygen				
Phosphorus				

For the each ionic bond do the following:

17. A. Use electron dot structures to show the transfer of electrons from one element to the other.
    B. Write the electron configuration of each element before and after bonding.

Sodium + Fluorine → Sodium Fluoride

A.

B.

Magnesium + Phosphorus → Magnesium Phosphide

A.

B.

Aluminum + Oxygen → Aluminum Oxide

A.

B.

Lithium + Nitrogen → Lithium Nitride

A.

B.

A4: Chemical Names and Formulas (Ch. 7.1 - 7.2)

1. What does a chemical formula represent?

2. Define Ion –

   a. Cations are _____ because they have _____ electrons. _____ form these positive ions.

   b. Anions are _____ because they have _____ electrons. _____ form these negative ions.

3. How do we name positive ions?

4. How do we name negative ions?

5. Create a list of physical properties that Ionic Compounds share.

6. _____ _____ show the type and number of atoms in an ionic compound.

7. A _____ written after the element symbol indicates the number of atoms/ions of each element in the ionic compound.

8. How many atoms of each element are in $AlBr_3$?

9. How many atoms/ions of each element are in $4Li_2O$?

10. What information can be gathered from the chemical formula CO_2?

11. Ionic compounds are always made of _____ and _____.

12. To represent ionic compounds, chemists use a _____ _____, which is the _____ whole-number ratio of the _____ in the compound.

13. For Fe_3P_2:
    a. What is the cation in the ionic compound?

    b. What is the anion in the ionic compound?

    c. What is the ratio of cations to anions in the ionic compound?

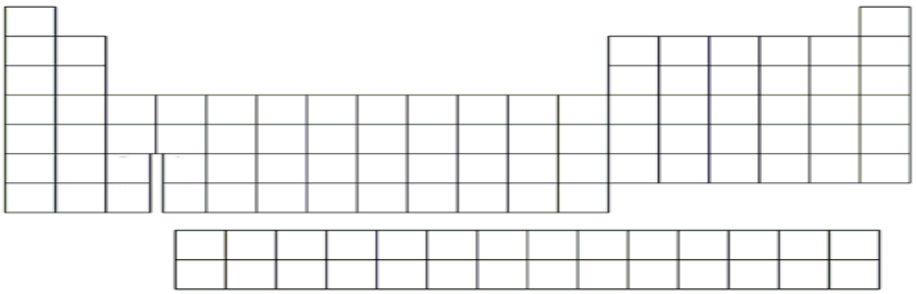
14. How many of each ion are present in $AlCl_3$?

15. _____ions: Ions made of single atoms.

A5: Naming Ions & Ionic Compounds (Ch. 9.1 & 9.2)

1. Representative Elements: There is a pattern in predicting how many electrons are lost and gained for the representative elements, can you guess it?

WRITE ON YOUR PERIODIC TABLES THE CHARGES OF THE REPRESENTATIVE ELEMENTS NOW.



2. The Transition metals have much more complicated patterns of valence electrons. There are two methods of naming such cations. The preferred method is called the stock system. As part of this system, a roman numeral in parentheses indicates the charge value of the cation.

   Examples: Name the following transition metal ions:

   a. tin (lost 2 electrons): *Tin (II)*

   b. tin (lost 4 electrons)

   c. iron (lost 3 electrons)

   d. iron (lost 2 electrons)

   There are 3 exceptions to this rule:
   1. DO NOT USE A ROMAN NUMERAL WHEN NAMING SILVER, ZINC AND CADMIUM IONS.
   2. ALWAYS USE A ROMAN NUMERAL WHEN NAMING ANY OTHER TRANSITION METAL ION.
   3. DO NOT USE A ROMAN NUMBERAL WHEN NAMING A REPRESENTATIVE ELEMENTS ION.

Write the symbol and charge of the following elements.		Name the ion	Cation or Anion?
a. sulfur	S^{2-}	Sulfide	anion
b. lead (4 electrons lost)			
c. strontium			
d. bromine			
e. copper (1 electron lost)			
f. selenium			
g. silver	Ag^{+}		
h. cesium			
i. phosphorus			

3. Polyatomic Ions: Ions made of _____.

4. What endings do most polyatomic ions receive when naming them?

5. There are 3 important exceptions, they are:

6. What are the "rules" for writing Binary Ionic Compounds?
    a. Write the _____ ion first
    b. Write the _____ ion last
    c. The net charge for the compound must add to _____ (positives + negatives = 0)
    d. Use _____ to indicate how many of each ion you need to "balance" the charge.

7. Write the formula for the ionic compound formed between potassium and chlorine.

8. Write the formula for the ionic compound formed between calcium and bromine.

Another approach to writing a balanced formula for a compound is to use the crisscross method. In this method, the numerical charge of each ion is crossed over and used as the subscript for the other ion. The signs of the numbers are dropped.

9. Use the crisscross method to write the formula for the ionic compound formed between iron (III) and oxygen.

10. Use the crisscross method to write the formula for the ionic compound formed between calcium and sulfur.

11. Write the formulas for the compounds formed between these pairs of ions.

a. Ba^{+2}, S^{-2}

b. Li^{+1}, O^{-2}

c. Ca^{+2}, N^{-3}

d. Cu^{+2}, I^{-1}

12. Write formulas for these compounds.
    a. sodium iodide
    b. potassium sulfide
    c. tin (II) chloride (also called stannous chloride)
    d. calcium iodide

13. Define ternary ionic compounds –

    Remember, they are still just two ions, and all rules from before still apply!

14. Write the formula for lithium nitrate, a ternary compound:

15. Sometimes, we need to take more than one polyatomic ion to balance the charge to 0. If this happens, place the polyatomic ion in parenthesis and the subscript outside of the parentheses.

    a. Write the formula for lithium carbonate:

    b. Write the formula for potassium sulfate:

    c. Write the formula for ammonium phosphate:

16. Write the name & formulas for ionic compounds formed from these pairs of ions:

    a. NH_4^{+1}, SO_3^{2-}

    b. Calcium ion, phosphate ion

    c. Al^{3+}, NO_3^{-1}

    d. Potassium ion, chromate ion

17. Write formulas for these compounds

    a. lithium hydrogen sulfate

    b. chromium (III) nitrite

    c. copper (II) bromide

    d. ammonium dichromate

18. Name these compounds:

    a. LiCN

    b. $(NH_4)_2CO_3$

    c. $Fe(ClO_3)_3$

    d. $CaSO_4$

    e. KClO

    f. $KMnO_4$

    g. Li_2SO_3