Chemistry: Hood River Valley High School Unit 4 Note Pack and Goals	Name:_____ Period:_____

Unit 4 – Metals, Non-Metals, Metalloids, Ions, and Ionic compounds.

Unit Goals- As you work through this unit, you should be able to:

1. Identify the position of groups, periods, and different chemical families on the periodic table and understand how the periodic table is organized using periodic law. (6.1)
2. explain why elements in the same family have similar properties and relate this to electron configuration. (6.2)
3. describe the trends on the periodic table of atomic size, and electronegativity and how they relate to atomic structure. (6.3)
4. Use the periodic table to infer the number of valence electrons in an atom and draw its electron dot formula.(7.1)
5. Describe the formation of cations/anions from metals/nonmetals using electron dot formula and electron configuration.(7.2)
6. Relate cations and anions to metals and nonmetals.(7.2)
7. Distinguish between chemical formulas and formula units.(7.2, 9.1, 9.2)
8. Describe the formation of an ionic bond and the characteristics of an ionic bond.(7.2, 9.1, 9.2)
9. Relate the model for metallic bonding to properties of metals.(7.3)
10. Use electronegativity values to classify a bond as ionic.(9.1, 9.2)
11. Know the charges of the formulas for monatomic ions using the periodic table.(9.1)
12. Be familiar with the charges and the formulas for polyatomic ions.(9.1, 9.2)
13. Apply the rules for naming and writing formulas for binary and ternary ionic compounds.(9.1, 9.2)
14. Apply the rules for naming and writing formulas for binary molecular compounds.(9.1, 9.2)

READ:

Chapter 6, 7, 9.1 & 9.2

Assignments:

	Description	5	4	0
A5	Period Table: Organizing the Elements (ch 6.1 & 6.1)			
A6	Periodic Table and Trends (Ch. 6.2 & 6.3)			
A3	Ionic Bonding (7.1 & 7.2)			
A4	Chemical Names and Formulas (7.2, 9.1)			
A5	Naming Ions and Ionic Compounds (9.1, 9.2)			

Activities, Labs & Test

Computer Bonding
Unit 4 Test

Late Lab Stamp

(this stamp means you are not qualified to do lab and test corrections)

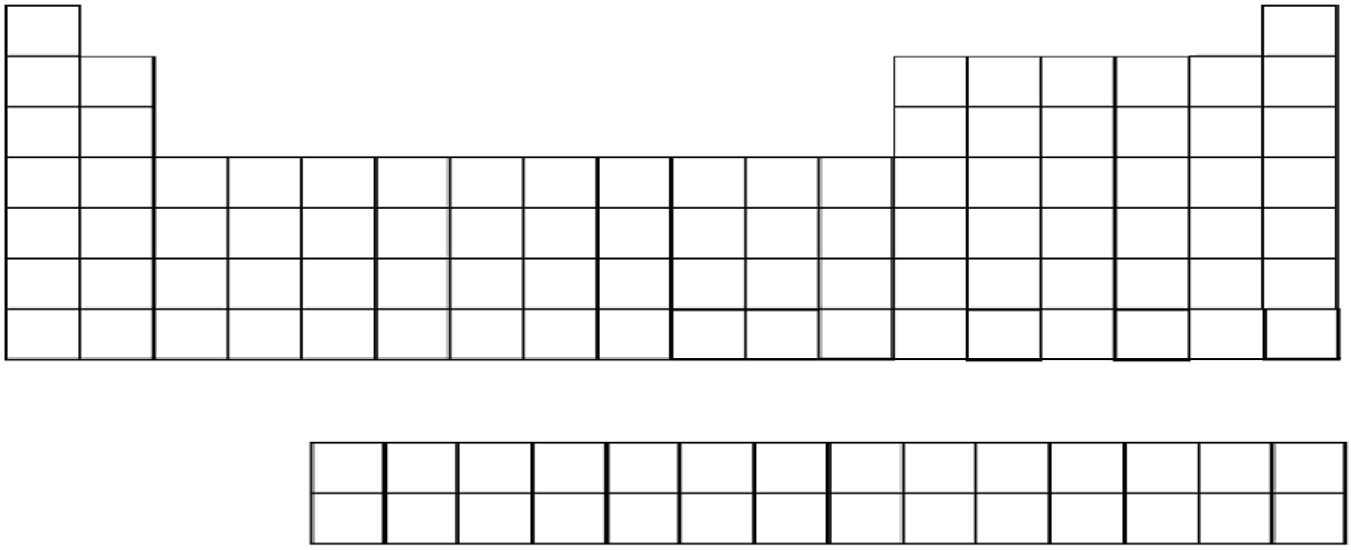
Key Terms: periodic table, periodic law, representative elements, period, group, metals, non-metals, alkali metals, alkaline earth metals, transition metals, halogens, noble gases, metalloids, atomic size, electronegativity,,molecule, molecular compounds ions, cation, anion, ionic compound, chemical formula, formula unit, molecular formula, monatomic ions, polyatomic ions, binary compounds, ternary compounds, valence electron, ion, electron dot structure, octet rule, ionic bond, stability, metallic bonds, ionic compound, single covalent bond,

Demo's: Metal vs. Non-metal vs. Metalloids, Electrolytes with light bulbs, Boiling/Melting salt, sugar, coconut oil, ethanol, Intermolecular attractive forces with posters, Fe + O_2, Na in water, Pennies in HNO_3, Zinc/Copper/Mg/Lead,

Unit 4: Chemical bonding, names and formulas **NAME_____**
Ch. 7, 8 & 9

Period:_____

6.1 Organizing Elements



A. Metals, Non-Metals, & Metalloids

a. _____: _____ of the ladder(exception is_____)

i. Conduct_____: means they can pass_____

ii. _____: Means they can be pounded_____

iii. _____: Means they can be draw into thin _____

iv. _____at room temp except_____

b. _____:_____of the ladder

i. Do not _____ _____(exception_____ vs. _____)

ii. _____: _____when hit with hammer

iii. Many are _____ at room temp

iv. ____, _____,_____,_____,_____ are solids at room temp

v. ____, is a liquid at room temp

c. _____:_____two sides of the ladder

i. These have _____ properties of _____ and _____

d. The _____groups are called _____. This is b/c the group number tells you _____ for that group of elements. Each group has the exact same _____or _____

i. Group 1A metals are called _____.
-Their valence electrons follow what pattern?

ii. Group 2A metals are called _____
-Their valence electrons follow what pattern?

iii. Group 7A are called _____
-Their valence electrons follow what pattern?

iv. Group 8A are called _____
-Their valence electrons follow what pattern?

e. The _____groups are called _____ because metals with _____ energy sublevels in their _____ shell can _____ their valence electrons. There are of course three exceptions(_____, _____, _____)

v. _____ metals have valence electrons that occupy an _____energy sublevel and the nearest _____energy sublevel

vi. _____ transition metals have valence electrons that occupy an _____ energy sublevel and the nearest _____energy sublevel. These are found _____ the periodic table.

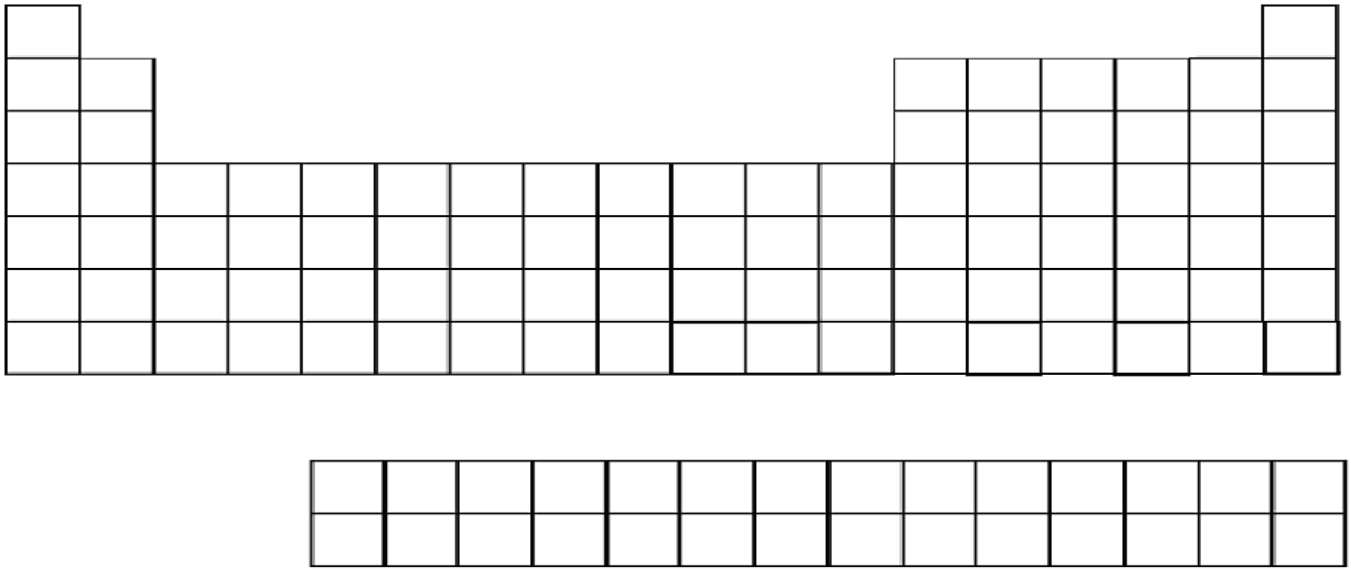
6.2 Periodic Trends

A. Atomic Size is measured as the atomic _____ of an atom by taking _____ the distance between two atoms of the same _____. See diagram below of Florine and Iodine

a. Trends in Group Size: As you go _____ a group, size _____ because _____ levels are increasing, cause valence electrons to fly _____ away from the _____.

b. Trends in Period Size: As you go across a period, to the _____, the valence electrons occupy the _____level, but the additional _____ in the nucleus cause greater _____, resulting in _____ atomic radius.

Atomic Size (Radius)



B. Electronegativity: The ability of an atom to attract electrons when the atom is in a compound.

a. Electronegativity _____as you go down a group because the _____nucleus becomes _____from the valence electrons, thus _____it's influence.

b. Electronegativity _____as you move _____across the periodic table because the proton influence _____along the same principal energy level.

Electronegativity Tends

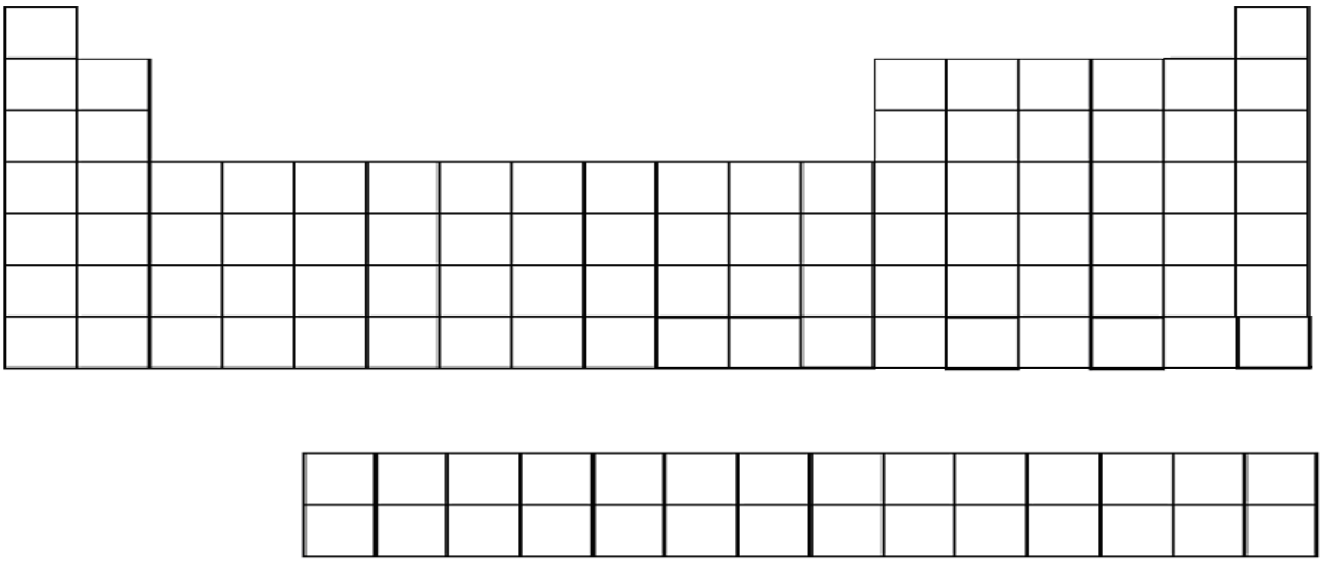


Diagram how electronegativity affects ion formation below between fluorine and cesium. Include relative sizes of atoms to help illustrate why they are so different.

Chapter 7: Ions

a. Define <u>Ion</u> –

b. How & Why do ions form? They form by _____ or _____ electrons. This is done because all atoms really want full _____ electrons.

i. _____ only have a few valence electrons, so they _____ them to expose their full inner shell. _____ of the ladder _____.

ii. _____ are already almost _____, so they _____ them.

iii. Both want to be like the _____ in group _____. Called the _____ rule.

c. Predicting Ion Charges: Look at the **_____** e's. Decide how many electrons they want to **_____**or **_____**in order to have a **_____**valence shell.

d. Electron Dot Structures: These simple models only show **_____**as dots.

e. Octet Rule: when forming compounds, atoms tend to seek electrons like _____ _____ which is typically _____

Copy Figure 7.1 here

Draw sodium and chlorine forming ions, and an ionic bond.

Q: What type of bond have we formed in the above compound?_____
Called a _____ _____

i. How do we name positive ions?

ii. How do we name negative ions?

7.2 Ionic Bonds and Ionic Compounds

A. Modeling Ionic Compounds

1. Show the formation of an ionic bond between magnesium and fluorine

2. Show the formation of an ionic bond between sodium and nitrogen

3. Show the formation of an ionic bond between aluminum and sulfur

B. Formula Units

i. An ionic compound is represented by a _____ _____. This is the smallest _____ number ratio of _____ to _____ in the compound. This is not a single physical unit, but a repeating grid _____. Overall the formula must be neutral. A Trick is called crossing charges to find the Formula Unit.

Try Magnesium and Chlorine

Try Aluminum and Bromine

C. Properties of ionic Compounds:

i. _____Structure with a repeating pattern of _____&_____

ii. Solids at _____.

iii. Conduct _____ when dissolved in water

7.3 Metallic Bonds

A. Metals bond because there are forces of _____ between the _____ _____ electrons and the _____ charged metal _____. Metals are described as having a _____ of electrons.

1. This explains whey they conduct electricity. Electrons added to metals are able to _____ among the _____.

2. This also explain why _____ are so easy to make, since all metals have similar _____. Alloys are made of _____. _____ and _____ are great examples.

Chapter 9: Chemical Names and Formulas

9.1 Naming Ions

A. _____ions: Ions made of single _____.

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

Metals

Non - Metals

B. _____ metals: We cannot determine how many electrons are lost for the _____ metals b/c their in their valence electrons can _____. Remember, Transition metals are any metal with _____ orbitals. They include all of the _____ groups, and the metals under the _____. _____is the exception because it does not have d orbitals. Aluminum is also considered a metal even though it _____the ladder.

1. How can we tell someone how many electrons lost for the transition metals?

Formula:

Name:

Examples: Name the following transition metal ions: For help, refer to page 144, table 6.3

a. Lead (lost 2 electrons)

b. Lead (lost 4 electrons)

c. Vanadium (lost 3 electrons)

d. Vanadium (lost 2 electrons)

C. There are 3 exceptions to this rule:

1. Silver is always a _____
2. Zinc and Cadmium are always a _____
   *Place their charges in their boxes on your periodic table so you don't forget this rule.
3. **DO NOT** USE A ROMAN NUMERAL WHEN NAMING SILVER, ZINC AND CADMIUM IONS.
4. **ALWAYS** USE A ROMAN NUMERAL WHEN NAMING ANY OTHER TRANSITION METAL ION.

Write the symbol and charge of the following elements.		**Name the ion**	**Cation or Anion?**
a. Oxygen	O^{-2}		
b. Chromium (II)			
c. Barium			
d. Neon			
e. Chlorine			
f. copper (II)			
g. Nitrogen			
h. Zinc			
i. Potassium			

D. _____ **Ions:** Ions made of _____.

1. What endings to polyatomic ions receive when naming them?
2. There are 3 important exceptions, they are:
3. Use chart 6.4 (or back of your periodic table) to write formulas of the following polyatomic ions:
   a. ammonium ion
   b. sulfate ion
   c. sulfite ion
   d. carbonate ion
   e. nitrate ion
   f. permanganate ion
   g. hypochlorite ion
   h. phosphate ion
   i. cyanide ion
   j. hydroxide ion

9.2 Naming and Writing Formulas for Ionic Compounds

A. _____ Ionic Compounds

1. What are Binary Ionic Compounds?

2. What are the "rules" for writing Binary Ionic Compounds?

- **a.** Write the _____ (positive) ion first
- **b.** Write the _____ (negative) 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.

*Trick: Crossing charges. Cross the numbers of the charges down as subscripts removing the +/-. Reduce if possible.

Ionic Compound Practice:
Write the name &formula for the compound formed b/w magnesium and chlorine.

Write the name &formula for the compound formed b/w sodium and oxygen.

Write the name &formula for the compound formed b/w aluminum and sulfur.

Write the name &formula for the compound formed b/w iron (III) and oxygen.

Write the name &formula for the compound formed b/w calcium and sulfur.

PRACTICE PROBLEMS:

1. Write the formulas for the compounds formed between these pairs of ions. NAME THEM.

a. Be^{+2}, O^{-2}

b. Na^{+1}, N^{-3}

c. Mg^{+2}, P^{-3}

d. Zr^{+2}, Cl^{-1}

2. Write formulas for these compounds.

a. silver chloride

b. Gallium (III) phosphide

c. potassium nitride

d. lead (IV) sulfide

e. barium oxide

f. magnesium carbide

3. Write names for these binary ionic compounds

a. ZnS

b. KCl

c. BaO

d. $CuBr_2$

e. CuO (careful!)

f. Ag_2S

g. Al_2Se_3

B. Writing formulas for Compounds with _____ _____Compounds

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

B. Write the formula for Sodium Cyanide, a ternary compound:

C. 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.

1. Write the formula for Sodium sulfate:

2. Write the formula for calcium acetate:

3. Write the formula for ammonium phosphite:

4. Write the formula for aluminum dichromate:

Practice Problems:

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

a. NH_4^{+1}, CO_3^{2-}

b. Lithium ion, phosphite ion

c. Al^{3+}, SO_4^{-2}

d. Strontium ion, silicate ion

2. Write formulas for these compounds

a. Berylium dihydrogen phosphate

b. chromium (IV) nitrate

c. mercury (IV) oxide

d. ammonium oxalate

3. Name these compounds:

a. $Al(OH)_3$

b. LiCN

c. $InClO_3$

d. $Hg(SO_4)_2$

e. $Mg(CN)_2$

f. $(NH_4)_2CO_3$

g. $Fe(ClO_4)_2$

h. $Ni(H_2PO4)_3$