Dot Notation and Ion Formation Organizer

Important vocabulary:

Valence electron – An electron in the _____ energy level. An electron available for _____.

Octet – A group of _____ valence electrons

Noble gas configuration – Valence electrons equal to that of a _____ gas. For most elements, a Noble gas configuration is an _____. For a few small elements (H, Li, Be), it is two electrons, the configuration of _____ ($1s^2$)

Cation – a _____-charged ion formed when a metal _____ electrons

Anion – a _____-charged ion formed when a nonmetal _____ electrons

Metals _____ electrons, forming _____

Nonmetals _____ electrons, forming _____

	Group 1	**Group 2**	**Group 13**	**Group 14**	**Group 15**	**Group 16**	**Group 17**	**Group 18**
Element	Sodium Na	Magnesium Mg	Aluminum Al	Silicon Si	Phosphorus P	Sulfur S	Chlorine Cl	Argon Ar
Valence electrons								
Element dot notation								
Electrons lost or gained	Lose __ e^-	Lose ___ e^-	Lose ___ e^-	_____ to form _____ bonds	Gain ___ e^-	Gain ___ e^-	Gain ___ e^-	Don't gain, lose or share electrons
Ion formed								

Type I Binary Ionic Compounds

Name _____
Per _____ Date _____

1. Add the proper charge for the simple ions listed to the element symbol. Example, S becomes S^{2-}.
2. Write the chemical formula for the combined pairs in the intersecting box. Example Li_2S

Anion → Cation ↓	F	Cl	O	Br	N	S^{2-}	I	P
Li^+	1		2		3	Li_2S		
Na		4				5		6
Be			7		8		9	
K	10		11					12
Al				13	14	15		
Mg						16	17	18
B		19	20		21			
Ca				22		23		24

1. Write the chemical formula from the other side of this page into the correctly numbered space provided.
2. Next to each formula write its chemical name.

Chemical Formula	Chemical Name
1.	
2. Li_2O	lithium oxide
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
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21.	
22.	
23.	
24.	

Type II Binary Ionic Compounds

Name _____
Per _____ Date _____

1. Add the proper charge for the ions in the first row.
2. Fill in the missing ion names and ionic symbols for transition metal ions.
3. Write the chemical formula for the combined pairs in the intersecting box. Example $PbCl_2$.

Metal Ion Name	Metal Ion Symbol	F	Cl^-	O	Br	N	S	P
Tin(II)					1		2	3
	Pb^{2+}	4	$PbCl_2$	5		6		
Copper(I)			7			8	9	
	Fe^{3+}			10	11			12
Lead(IV)		13				14	15	
	Sn^{4+}		16			17	18	
Iron(II)				19	20			21
	Co^{3+}	22		23				24

1. Write the chemical formula from the other side of this page into the correctly numbered space provided.
2. Next to each formula write its chemical name.

Chemical Formula	Chemical Name
1. $SnBr_2$	tin(II) bromide
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
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11.	
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24.	

1. Add the proper charge for the simple ions and polyatomic ions listed. Example, NH_4 becomes NH_4^+.
2. Add any ion symbols missing using the ion names provided.
3. Write the chemical formula for the combined pairs in the intersecting box. Example $(NH_4)_2SO_4$

Anion → Cation ↓	OH	CO_3	PO_4	NO_3	SO_4^{2-}	Cr_2O_7
NH_4^+	1		2		$(NH_4)_2SO_4$	3
Iron(II)		4		5		
Tin(IV)			6		7	
Al		8		9	10	
K	11		12	13		14
Mg		15			16	17
Tin (II)	18	19		20		21
Iron (III)	22		23		24	

1. Write the chemical formula for the compounds on the other side of this page in the chemical formula column.
2. Next to each formula write its chemical name.

	Chemical Formula	Chemical Name
1.	NH_4OH	ammonium hydroxide
2.		
3.		
4.		
5.		
6.		
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24.		

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Name _____

Type III Binary Compounds

General Chemistry

Per ____ Date _____

Element	Symbol	Qty	Element	Symbol	Qty	Formula	Name
Carbon		1	Oxygen		1		
	C	1		O	2		
						PCl_5	
							Diboron tetrafluoride
						SiO_2	
							Sulfur difluoride
Phosphorus		2	Hydrogen		4		
	As	1		Cl	5		
						NI_3	
						SF_6	

Drawing Lewis Structures

Step #1: Look at the formula for the compound and determine the number of atoms of each element in the molecule.

Step #2: Determine the number of valence electrons that each atom contributes.

Step #3: Determine the total number of valence electrons contributed by all of the atoms.

Step #4: Arrange the atoms to form a skeleton structure for the molecule. The atom that wants the most bonds (HONC rule) is at the center. If there is more than one carbon, the carbon atoms *usually* bond to each other. Hydrogens and halogens can only form one bond, so they are never at the center (unless the molecule is diatomic!)

Step #5 Join the atoms with bonding pairs so that you fulfill the HONC rule.

Step #6 Add unshared pairs of electrons so that each nonmetal (except hydrogen) is surrounded by eight electrons (4 pairs).

Step #7 Count the electrons in the structure to be sure that the number of valence electrons used equals the number available.

Step #8 Replace bonding pairs of electrons with lines representing bonds:

- ≡ is three shared pairs, a triple covalent bond
- = is two shared pairs, a double covalent bond
- – is one shared pair, a single covalent bond

DO NOT replace unshared pairs with lines!

Please Draw 2D and Build 3D models for the following molecules. They are “fair game" on the tests, as are their structural analogs.

Structural analog = same basic structure with different elements.
Example: CF_4 has the same basic structure as CBr_4 and SiF_4.
Example: H_2S has the same basic structure as H_2O

HI	OF_2	C_2I_4	O_2	H_2S
CH_2O	CO	CF_4	HCN	C_2H_2
CH_4	NH_3	CO_2	CS_2	H_2O
C_2H_4	CH_2I_2	PF_3	$C_2H_4F_2$	C_2H_6
NI_3	HF			

Here are some “challenges” for those of you who need a bit more. They may show up for the tests:

Benzene, C_6H_6	Formic acid, HCO_2H	Glycine, $NH_2CH_2CO_2H$
Carbonate Ion	Nitrate Ion	

Try to build two ***different*** structures that have two carbons, six hydrogens, and one oxygen!