Naming Compounds Notes

What are ions, how and why do they form, what can they do together?

1. All atoms are neutral because they have equal numbers of _____ and _____.

   Helium has 2 protons and 2 electrons, sodium has ____ protons and _____electrons, mercury has 80 protons and 80 electrons.

2. All atoms have a unique number of protons, and all have the exact same number of _____.

3. All atoms are always neutral. The _____ = _____,

4. All atoms are neutral, this is okay, but in order to bond together, atoms must first become _____.

5. An ion is an atom that is no longer _____.
6. A metal atom will lose an electron, which makes it have a net charge of _____.

7. It's still a metal, it's still the same metal, but now it is the _____, it has a charge of +1, and it can bond.
8. For example….Lithium atoms have _____ and _____ (it's neutral)
9. If lithium "loses" an electron, it has 2 protons and now only 2 electrons, which sums to net _____

10. _____ + _____ = +1 net charge

11. Group 1 atoms	ATOM Electron configurations	ION Electron configuration and Ion Symbol	Ion becomes Isoelectric to
lithium	2-1		
sodium	2-8-1		
potassium	2-8-8-1		
rubidium	2-8-18-8-1		

12. _____ to a noble gas means that the atom has an electron configuration that matches a _____.

13. Count the pumpkins, make fun of the superstitious! Ha!

14. Metals _____ noble gases, they form into metal ions, that happen to have the same electron configuration as a noble gas.

15. We use the noble gases to guide us, metals lose _____ to a noble gas.

16	Fill in this chart to see how group 2 metals become ions.			
	Atom	Atomic Electron config. From Periodic Table	Ionic Electron Configuration	Ion symbol with charge
A	beryllium	2-2		
B	magnesium	2-8-2		
C	calcium	2-8-8-2		
D	strontium	2-8-18-8-2		
E	barium	2-8-18-18-8-2		
F	radium	2-8-18-32-18-8-2		

17. All group 2 metals _____ to become isoelectric to noble gases.

18. They do not _____, nor do they turn into gases, they are ions with a +2 charge because they have "lost" 2 electrons to get that perfect electron orbital system, like the noble gases.

Fill in the chart

Be^{+2}	is isoelectric to →	He helium
Mg^{+2}	is isoelectric to →	
Ca^{+2}	is isoelectric to →	
Sr^{+2}	is isoelectric to →	
Ba^{+2}	is isoelectric to →	

20	Last metal of the day… (fill in this table)			
	Atom	Atomic Electron configuration from Periodic Table	Ionic Electron Configuration	Ion symbol with charge
Al	Aluminum	2-8-3	→	

21. _____ when they form ions.

22. Metals lose 1, 2, 3 electrons to form _____ ions.

23. A _____ has lost electrons.

24. Another name for a positive ion is a _____.

25. Nonmetals _____.

26. Nonmetals must _____to become ISOELECTRIC to a noble gas.

27. They will end up with a -1, -2, or -3 _____, depending if they gain 1, 2 or 3 electrons.

28. Metals _____when they "lose" electrons.

Nonmetals _____when they "gain" electrons.

29. In truth, no electrons are ever lost or gained. Electrons _____ from metals to nonmetals.

30. The positive and negative ions form _____, at the same time,

_____,with no leftover electrons, or IOU electrons that I promise I'll give them to you later.

31. Ions do not have to form, but _____ they first need to become ions.

32. There needs to be a _____of electrons.

33. Both the metal and nonmetal will be _____ to noble gases.

34. Metals only _____ to become positive ions.

Nonmetals only _____ to become negative ions

36. Fill in this table now.

Atom symbol	Atomic electron configuration	Ionic electron configuration	Ion symbol *(isoelectric to)*
Fluorine F	2-7		
Chlorine Cl	2-8-7		
Bromine Br	2-8-18-7		
Iodine I	2-8-18-18-7		

35. The bond metal ion & nonmetal ions is called an _____.

37. _____to become isoelectric to a noble gas, all become -1 ions.

38. Nonmetals gain electrons and form into _____

39. The rest of the Periodic Table Anions: Group 16 (top three) Group 15 (last three)			
Atom symbol	Atomic electron configuration	Ionic electron config	Ion symbol *(isoelectric to)*
O – oxygen	2-6		
S – sulfur	2-8-6		
Se - selenium	2-8-18-6		
N - nitrogen	2-5		
P - phosphorous	2-8-5		
As - arsenic	2-8-18-5		

End of class one (wow)

Naming Simple Monoatomic Ionic Compounds

40. Ionic compounds form when positive metal cations bond with negative _____

41. They are wildly attracted to each other due to their _____

42. Cations form when metals _____to nonmetals, which simultaneously form anions.

43. Opposites attract, it's like <u>love!!!</u>

44. There is ALWAYS a _____of electrons, and if it's not a perfect transfer, nothing happens.

45	There are 2 rules for naming simple monoatomic ionic compounds. (think: NaCl)
1st name rule	
2nd name rule	

The metals in groups 1, 2 and Al, are easy enough to say, we already practiced them. Here come nonmetals.

46. Say, and write the anion names in the proper boxes.	N	O	F
	P	S	Cl
	As	Se	Br
These are the ONLY anions that form in high school.			I

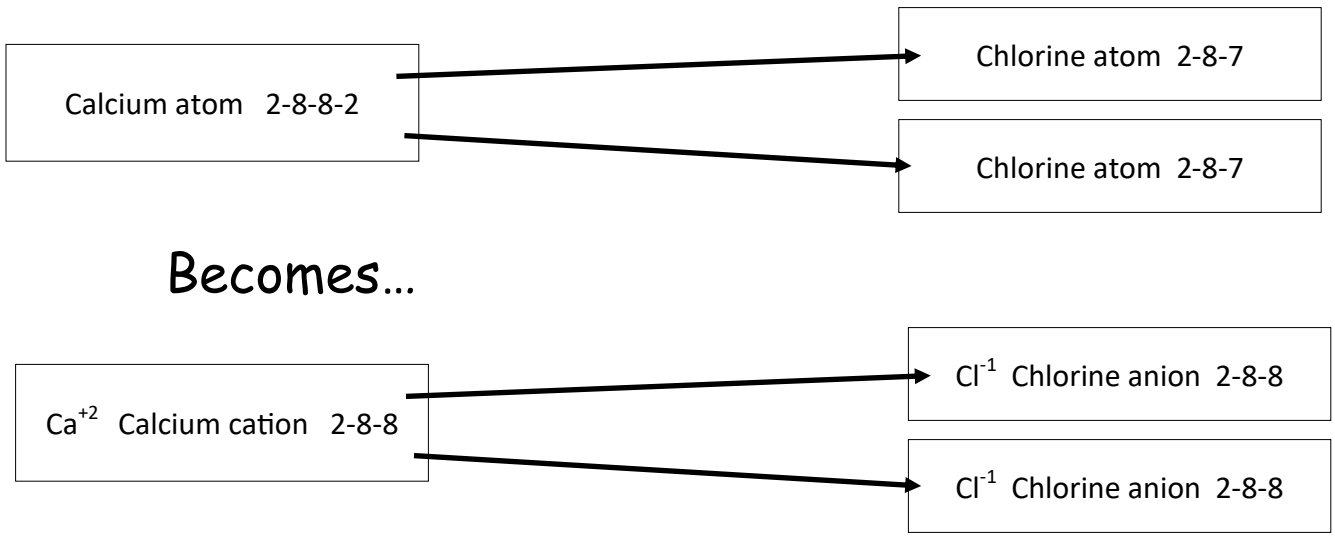
47. Fill in this table with the proper compound names	
Formulas	simple monoatomic ionic compound names
LiBr	
CaO	
BeS	
MgO	
CsF	
SrS	
AlP	

48. Na^{+1} and Cl^{-1} combine in a _____, because (+1) + (-1) = 0

49. What happens if we try to combine something like calcium and chlorine?

_____ _____ will form into _____

50.



51. Fill in the cations and anions, then write formulas and names

Cation	Anion	Formula of compound	Name of compound
Na^{+1}	P^{-3}	Na_3P	Sodium phosphide
Ca^{+2}	S^{-2}		
Al^{+3}	P^{-3}		
Mg^{+2}	Br^{-1}		
Li^{+1}	O^{-2}		

John Dalton said atoms can combine together to form compounds in SIMPLE WHOLE NUMBER RATIOS.

52. An easy way to determine formulas… Let's bond some magnesium and bromine together.

Mg^{+2} Br^{-1} → _____

use the criss cross method!

53. Fill in the cations & anions, then criss cross to get the formulas, and then write the names

Cation	Anion	Formula of compound	Name of compound
Be^{+2}	F^{-1}		
Sr^{+2}	Cl^{-1}		
Ba^{+2}	N^{-3}		
K^{+1}	I^{-1}		
Al^{+3}	O^{-2}		

54. Name these monoatomic ionic compounds with proper names, two at a time because you are so good at this already (☺)

NaF	
Sr_3N_2	
Al_2S_3	
BeO	
Ba_3N_2	
Rb_2Se	
K_3P	
CsI	

55. The compounds formed when ions bond together are called _____

56. The bonds that form are called _____

57. They are so strong, ionic compounds always have HIGH _____

and very high _____.

Naming Class #3 Objective: Transitional Metals become ions too. The rules for ionic bonding and naming ionic compounds from the middle of the periodic table.

58. Group 1 all make _____, because all LOSE 1 electron in the outer orbital.
examples: Li^{+1}, Na^{+1}, K^{+1}, etc.

59. Group 2 all make +2 cations, because they all _____from their outer orbital
examples: Be^{+2}, Mg^{+2}, Ca^{+2}, etc.

60. Al makes _____ it forms the cation Al^{+3}

61. Group _____, because they all need to gain 1 electron to become isoelectric to the noble gases.

62. Group _____, they all need to gain 2 electrons to fill their outer orbital

63. _____ -3 anions (you know why)

All of these, Group 1 and 2 metals, and aluminum, and group 17, 16, and 15 all follow the

simple _____
when becoming ions. They are truly simple and there are no exceptions here.

64. The TRANSITIONAL METALS, in _____, and

_____ have sub-orbitals that can make funky electron configurations.

65. Scandium makes a _____. See that +3 in the corner? That's what it means.

66. Yttrium is next, it also makes a _____

Peek at zinc, it only makes a _____ also.

67. The transitional metals make the cations that are indicated, they _____ follow the simple "isoelectric rule" like the metals we've seen in groups 1 and 2, and Al.

68. Sc^{+3} + Cl^{-1} → _____ called _____

69	Atoms	Ions	Formula	name
ex	Na Cl	Na^{+1} Cl^{-1}	NaCl	Sodium chloride
	Zr P			
	In F			
	Ag Cl			

70. Titanium can make _____.

71. Look in box 22, Titanium can make _____.

72. Let's look at each of these atoms and determine what cations that they make:	
V (#23)	
Cr (#24)	
Fe (#26)	
Cu (#29)	
Ga (#31)	
Cd (#48)	
Nb (#41)	
Hg (#80)	

73. Let's see what happens when we combine chlorine to both gold cations… (criss cross)

Metal Atom	Nonmetal Atom	Cation	Anion	Compound Formula	Compound Name
Au	Cl	Au^{+1}	Cl^{-1}		
Au	Cl	Au^{+3}	Cl^{-1}		

74. The Roman Numerals you need in chemistry are 1-7

_____

75. Combine every type of manganese cation with bromine. Write the CATION CHARGES first, then the criss crossed formulas, and finally the stock names (roman numeral names) for each one.

Cation	Anion	Formula of compound	Stock Name of compound
Mn^{+}	Br^{-1}		
Mn^{+}	Br^{-1}		
Mn^{+}	Br^{-1}		
Mn^{+}	Br^{-1}		

76. Do the same for both copper cations bonding to oxygen			
Cation	Anion	Formula of compound	Stock Name of compound
	O^{-2}		
	O^{-2}		

77. Last one (this is tricky). Combine tantalum (element 73) with sulfur.			
Cation	Anion	Formula of compound	Stock Name of compound
	S^{-2}		

Naming Class #4 Objective: Table E, the polyatomic ions, making more ionic compounds!

78. Table E shows us the _____.
Poly means more than one, here, atomic means atoms that are stuck together.

79. POLYATOMIC IONS can be _____ or _____.
They have fun names that we never change.

80. Most of their names end in _____. Some don't. Why? Just because.
These Table E polyatomic ions follow their own "rules".

81. We will start talking about AMMONIUM. Formula is _____

Ammonium is _____ atom of _____ bonded to _____ atoms of _____, with a ____ charge.

82. _____ + _____ → _____

83. Polyatomic ions NAMING RULES…

Cations _____, always.

Anions always _____. Never change their names.

84. Criss cross the ions to determine formulas, then write their proper names.

Cation	Anion	Formula of compound	Stock Name of compound
Na^{+1}	$C_2H_3O_2^{-1}$		
K^{+1}	CN^{-1}		
Mg^{+2}	CO_3^{-2}		

85. Magnesium cation + hydroxide ion → magnesium hydroxide (write ions, then formula)

_____ + _____ → _____

86. _____ is correct. What's wrong with these mistakes?

$MgOH_2$ _____

MgO_2H_2 _____

87	cation	anions	formula	name
ex	Na^{+1}	Cl^{-1}	NaCl	Sodium chloride
a	Li^{+1}	CrO_4^{-2}		
b	Al^{+3}	ClO^{-1}		
c	Mg^{+2}	SCN^{-1}		
d	Ca^{+2}	MnO_4^{-1}		

88	cation	anions	formula	name
a				beryllium phosphate
b				sodium hydrogen carbonate
c				ammonium nitrate
d				ammonium dichromate

89	cation	anions	formula	name
e				Bismuth (V) thiosulfate
f				Cobalt (III) chlorate

Objective: Naming molecular compounds, writing molecular formulas, and determining how for form molecular compounds using the selected oxidation states.

90. Ionic compounds form when positive cations and negative anions combine in the proper ratios with each other, and form neutral compounds with each other because of opposite charge.

_____

91. Molecular compounds contain _____.

Molecular compounds form when 2 or more nonmetals bond together, in the proper ratios.

In Molecular Compounds _____

92. When two or more nonmetal atoms bond together, they form a _____.

93. A molecule is the smallest part of a _____

94. Fill in the compound names (there are NO METALS in molecular compounds)	
CO_2	
CO	
HCl	
NH_3	(nitrogen trihydride)
CH_4	(carbon tetrahydride)
H_2O	(dihydrogen monoxide)
C_8H_{18}	(gasoline)

95. The bonds that hold these atoms together in molecules is called the

_____.

96. Co – means to _____

– valent refers to _____

97. When 2 or more ions bond, they make ionic bonds, and they form into _____.

We can abbreviate that as _____

98. Ionic compounds do not form into _____, they form _____'s!

NAMING RULES FOR MOLECULAR COMPOUNDS
If you can remember what CO, CO_2, and H_2O are, then the naming rules are easy
carbon monoxide, carbon dioxide + dihydrogen monoxide (write these on your periodic table now)

99. NAMING RULES FOR MOLECULAR COMPOUNDS		**FILL IN BELOW**
	A single atom?	→
1st name rule		
	Multiple atoms?	→
2nd name rule	one or more atoms...	→

100. List of the TEN Latin Prefixes to memorize for molecular compounds 1 to 10				
1	2	3	4	5
6	7	8	9	10

101	Compound Name		Compound Name
HF		SF_6	
CS_2		N_7Cl_3	
SO_3		Cl_2O_8	
CCl_4		I_4O_9	
PF_5		N_2F_{10}	

102. Write formulas for each compound	
Phosphorous tribromide	
Diphosphorous trioxide	
Oxygen difluoride	
Dihydrogen monoxide	
Nitrogen monoxide	
Carbon tetrafluoride	

102. Name these compounds	
NO_2	
CI_4	
N_2O	
SO_3	
N_2O_5	
HCl	

103. On the periodic table there are _____

Draw the "T" chart below. List the 2 oxidation state for hydrogen and the one for oxygen with signs.

106. Do this again, another “T” chart for carbon and oxygen, try to figure out ALL of the possible carbon-oxygen compounds.

107. Another: Nitrogen and oxygen. Formulas and names (there are five!)

108. Last one, it’s short. All the fluorine and bromine compounds, formulas and names.