Writing Binary Formulas Name Key- Mr. Sudbury Period____

A binary formula is a formula that contains two types of elements (the prefix bi- means two). A binary formula is typically an ionic compound. To write the formula of an ionic compound, you must know the charge of the ion that will form. Remember that you can determine charge from the location on the periodic table of element. To figure out how many atoms of an element are in a compound you must know the charges, and you must understand that the overall compound will not have any charge. So in forming the compound the positive charge form the cation cancels the negative charge from the anion.

Steps:

1. Write the element symbol with the ionic charge for the cation (+) and the anion (-).
2. Determine the ratio that these must combine to cancel out the charge. (or criss - cross)
3. Write the formula for the binary compound with the metal first and then the nonmetal. Use subscripts after the element if there are more than 1.
4. Reduce subscripts if possible.

Example:

Magnesium & Nitrogen

Mg^{2+} N^{3-}

Mg^{2+} N^{3-}

Mg_3N_2

Write the formulas for the compounds formed from the following elements:

1. Calcium & Phosphorus (Ca^{2+} P^{3-}) Ca_3P_2
2. Lithium & Sulfur (Li^{+} S^{2-}) Li_2S
3. Strontium & Bromine (Sr^{2+} Br^{-}) $SrBr_2$
4. Aluminum & Chlorine (Al^{3+} Cl^{-}) $AlCl_3$
5. Francium & Oxygen (Fr^{+} O^{2-}) Fr_2O
6. Gallium & Sulfur (Ga^{3+} S^{2-}) Ga_2S_3
7. Gallium & Nitrogen (Ga^{3+} N^{3-}) $Ga_3N_3 \xRightarrow{\text{reduce}} GaN$
8. Magnesium & Oxygen (Mg^{2+} O^{2-}) $Mg_2O_2 \xRightarrow{\text{reduce}} MgO$
9. Rubidium & Selenium (Rb^{+} Se^{2-}) Rb_2Se
10. Sodium & Sulfur (Na^{+} S^{2-}) Na_2S
11. Aluminum & Oxygen (Al^{3+} O^{2-}) Al_2O_3
12. Potassium & Oxygen (K^{+} O^{2-}) K_2O
13. Cesium & Phosphorus (Cs^{+} P^{3-}) Cs_3P
14. Cesium & Arsenic (Cs^{+} As^{3-}) Cs_3As
15. Hydrogen & Bromine (H^{+} Br^{-1}) HBr
16. Radium & Fluorine (Ra^{2+} F^{-}) RaF_2
17. Indium & Sulfur (In^{3+} S^{2-}) In_2S_3
18. Beryllium & Oxygen (Be^{2+} O^{2-}) $Be_2O_2 \xRightarrow{\text{reduce}} BeO$
19. Magnesium & Oxygen (Mg^{2+} O^{2-}) $Mg_2O_2 \xRightarrow{\text{reduce}} MgO$
20. Calcium & Chlorine (Ca^{2+} Cl^{-}) $CaCl_2$

Writing Binary Formulas (Part 2)

If the binary formula includes a transition metal, you will be told the charge (oxidation state) of the transition metal because you cannot predict by location on the PT. Remember to reduce when possible.

Write the formulas for the compounds formed from the following ions:

21. Na^{+}, Cl^{-} $NaCl$
22. Ba^{+2}, F^{-} BaF_2
23. K^{+}, S^{-2} K_2S
24. Li^{+}, Br^{-} $LiBr$
25. Al^{+3}, I^{-} AlI_3
26. Zn^{+2}, S^{-2} $Zn_2S_2 \xRightarrow{reduce} ZnS$
27. Ag^{+}, O^{-2} Ag_2O
28. Mg^{+2}, P^{-3} Mg_3P_2
29. Ni^{+2}, O^{-2} $Ni_2O_2 \xRightarrow{reduce} NiO$
30. Ni^{+3}, O^{-2} Ni_2O_3
31. Fe^{+2}, O^{-2} $Fe_2O_2 \xRightarrow{reduce} FeO$
32. Fe^{+3}, O^{-2} Fe_2O_3
33. Cr^{+2}, S^{-2} $Cr_2S_2 \xRightarrow{reduce} CrS$
34. Cr^{+3}, S^{-2} Cr_2S_3
35. Cu^{+}, Cl^{-} $CuCl$
36. Cu^{+2}, Cl^{-} $CuCl_2$
37. Pb^{+2}, O^{-2} $Pb_2O_2 \xRightarrow{reduce} PbO$
38. Pb^{+4}, O^{-2} $Pb_2O_4 \xRightarrow{reduce} PbO_2$
39. Mn^{+2}, Br^{-} $MnBr_2$
40. Mn^{+4}, Br^{-} $MnBr_4$

Working Backwards:

You can look at a formula and determine what ions are involved in the bond by "un-criss-crossing" the subscripts. (Be careful, some of them may have been reduced.)

Write the ions (with charges) that are involved in these bonds.

41. $PbBr_4$ Pb^{4+} & Br^{-1}
42. Rb_2O Rb^{+} & O^{2-}
43. CsF Cs^{+} & F^{-}
44. $NiBr_2$ Ni^{2+} & Br^{-}
45. Ag_2O Ag^{+} & O^{2-}
46. AgO Ag^{2+} & O^{2-}
47. CuS Cu^{2+} & S^{2-}
48. PbO_2 Pb^{4+} & O^{2-}
49. $HgBr$ Hg^{+} & Br^{-1}
50. $HgSe$ Hg^{2+} & Se^{2-}