Unit #4 Review: Chemical Nomenclature

1. Be able to recognize the following types of compounds from their chemical formulas: ionic compounds, covalent compounds, binary compounds, acids, peroxides, and hydrates. Know the naming rules for each type of compound.

2. Which of the following are binary ***ionic*** compounds?

   Binary ionic compounds must:
   - contain two ***types*** of elements
   - have a metal as their first element

   NH_3 CO_2 MgS $Ca(OH)_2$ $NaBr$ Zn_2C Br_2 $Ba(CN)_2$ $A\ell F_3$

3. Which of the following are acids?

   Any substance which has hydrogen as its first element can be named as an acid.

   CH_4 NH_3 $HC\ell$ HNO_3 AgH H_2O HCH_3COO H_2Se HIO $Ca(HS)_2$

4. Which of the following are peroxides?

   - a peroxide is an oxide that contains one more oxygen atom than the "usual" oxide
   - use the criss-cross rule to find the chemical formula of the usual oxide. Compare the formula of the given compound to the usual oxide. If the formula you have been given has one more oxygen atom than the usual formula, then the given formula is a peroxide
   - for example, magnesium oxide is MgO, therefore MgO_2 is magnesium peroxide
   - similarly, aluminum oxide is Al_2O_3, therefore Al_2O_4 is aluminum peroxide

   Na_2O_2 Ag_2O H_2O_2 MgO_2 ZnO $A\ell_2O_4$ K_2O_2 CaO BaO_2

5. Which of the following are binary ***covalent*** compounds?

   Binary covalent compounds must:
   - contain two ***types*** of elements
   - have a non-metal, including hydrogen, as their ***first*** element

   H_3P CH_4 NH_3 $HC\ell$ SI_6 AlH_3 H_2O CH_2O XeF_6 C_6H_6 I_2

6. Write the chemical formulas for the following compounds:

cadmium hydroxide	$Cd(OH)_2$	arsenic (V) acetate	$As(CH_3COO)_5$
sulfuric acid	H_2SO_4	hydrobromic acid	HBr
barium hydride	BaH_2	silver chromate	Ag_2CrO_4
phosphorus (V) chloride	$PC\ell_5$	sodium hypoiodite	NaIO
carbon tetrafluoride	CF_4	hypochlorous acid	$HC\ell O$
mercury (I) hypobromite	HgBrO	gold (I) phosphide	Au_3P
hydrophosphoric acid	H_3P	xenon hexafluoride	XeF_6
arsenic (III) oxide	As_2O_3	chromium (II) iodite	$Cr(IO_2)_2$
phosphorous acid	H_3PO_3	nitrogen gas	N_2
nickel (III) perchlorate	$Ni(C\ell O_4)_3$	strontium hydroxide	$Sr(OH)_2$
sodium cyanide	NaCN	cesium peroxide	Cs_2O_2
mercury (II) thiosulfate	HgS_2O_3	lithium perchlorate	$LiC\ell O_4$
iodine heptachloride	$IC\ell_7$	oxalic acid	$H_2C_2O_4$
hydrogen peroxide	H_2O_2	dinitrogen pentoxide	N_2O_5
oxygen gas	O_2	iron (III) hydrogen sulfide	$Fe(HS)_3$
nitrogen trihydride	NH_3	silicon tetrabromide	$SiBr_4$
hydrofluoric acid	HF	periodic acid	HIO_4
tin (IV) borate	$Sn_3(BO_3)_4$	lead (IV) thiocyanate	$Pb(SCN)_4$
titanium hydrogen sulfite	$Ti(HSO_3)_3$	boric acid	H_3BO_3
bismuth (III) dihydrogen phosphate	$Bi(H_2PO_4)_3$		
copper (II) hydroxide pentahydrate	$Cu(OH)_2 \cdot 5H_2O$		
gold (III) nitrite tetrahydrate	$Au(NO_2)_3 \cdot 4H_2O$		
sodium acetate trihydrate	$NaCH_3COO \cdot 3H_2O$		

7. Provide IUPAC names for the following. If the first element is hydrogen, name the compound as an acid (unless it is a peroxide). If the first element is a non-metal, name the compound using the prefix system.

$Ni_2(Cr_2O_7)_3$	nickel (III) dichromate	$Mn(OH)_4$	manganese (IV) hydroxide
P_2O_3	diphosphorus trioxide	CS_2	carbon disulfide
NH_4BrO	ammonium hypobromite	Li_2O_2	lithium peroxide
$As(BrO_3)_5$	arsenic (V) bromate	SnC_2O_4	tin (II) oxalate
$Bi(IO_2)_3$	bismuth (III) iodite	As_2O_3	arsenic (III) oxide
HIO_4	periodic acid	H_3PO_3	phosphor**ous** acid
$CuHCO_3$	copper (I) hydrogen carbonate	Cs_2O_2	cesium peroxide
$Co(BrO_2)_3$	cobalt (III) bromite	Au_3BO_3	gold (I) borate
F_2	fl**uo**rine gas	$Cd(HS)_2$	cadmium hydrogen sulfide
$Ba(CH_3COO)_2$	barium acetate	$HBrO_2$	bromous acid
$HC\ell O$	hypochlorous acid	$KHSO_4$	potassium hydrogen sulfate
$Pb(C_2O_4)_2$	lead (IV) oxalate	$MgHPO_3$	magnesium hydrogen phosphite
Na_2O_2	sodium peroxide	SO_2	sulfur dioxide
LiH	lithium hydride	CBr_4	carbon tetrabromide
$Ti(HS)_3$	titanium hydrogen sulfide	$C\ell_2$	chlorine gas
$HMnO_4$	permanganic acid	Ag_2O_2	silver peroxide
SnF_4	tin (IV) fluoride	HI	hydroiodic acid
$(NH_4)_3P$	ammonium phosphide	$Bi(SCN)_3$	bismuth (III) thiocyanate
H_2SO_4	sulfuric acid	H_2O_2	hydrogen peroxide
H_3P	hydrophosphoric acid	N_2O_4	dinitrogen tetroxide
HIO	hypoiodous acid	HCH_3COO	acetic acid
$Cd_3(BO_3)_2 \cdot 5\ H_2O$	cadmium borate pentahydrate		
$Bi(C\ell O_2)_3 \cdot 3\ H_2O$	bismuth (III) chlorite trihydrate		
$As_2(HPO_3)_3 \cdot 7\ H_2O$	arsenic (III) hydrogen phosphite heptahydrate		
$NH_4OCN \cdot 4\ H_2O$	ammonium cyanate tetrahydrate		

8. What are two correct names for the following compounds?

H_2S hydrosulfuric acid, dihydrogen monosulfide, hydrogen sulfide
H_2O dihydrogen monoxide, hydrogen oxide, or water
$PC\ell_3$ phosphorus trichloride, phosphorus (III) chloride
P_2O_5 diphosphorus pentoxide, phosphorus (V) oxide
H_3P hydrophosphoric acid, trihydrogen monophosphide, hydrogen phosphide

9. Follow the naming rules to determine names for the following (they are not on your ion chart):

$Hg(MnO_2)_2$ mercury (II) manganite
$Li_2S_2O_2$ lithium thiosulfite
$Fe(HCrO_4)_3$ iron (III) hydrogen chromate
$Pb(SO_2)_2$ lead (IV) hyposulfite
Cs_3BO_2 cesium borite