AP Chem Formulas and Reactions Packet! Name: Sarah Seat #____

1. Formula Writing Practice: Write the missing name or formula:

(Rule of thumb: formulas are usually only two words long.)
(Make sure you are naming it according to the correct system: ionic, covalent, acid.)

KI potassium iodide

P_2O_5 diphosphorus pentoxide

$ZnCr_2O_7$ zinc dichromate

chromic hydroxide $Cr(OH)_3$

$CuBr_2$ copper(II) bromide (cupric bromide)

xenon tetrafluoride XeF_4

SBr_2 sulfur dibromide

ammonium carbonate $(NH_4)_2CO_3$

SO_3^{-2} sulfite ion

$Sn(CO_3)_2$ tin (IV) carbonate (stannic carbonate)

SO_3 sulfur trioxide

$PbSO_4$ lead (II) sulfate or plumbous sulfate

hydroiodic acid HI

ferric bisulfate * $Fe(HSO_4)_3$

* hint: "bisulfate" is the name of an ion! it's on your ion sheet.

carbonic acid H_2CO_3

helium He oxygen O_2

arsenic acid H_3AsO_4

ferrous phosphate $Fe_3(PO_4)_2$

aluminum bicarbonate* $Al(HCO_3)_3$

* hint: "bicarbonate" is the name of an ion! it's on your ion sheet.

$HClO_2$ chlorous acid

sulfurous acid H_2SO_3

H_2S hydrosulfuric acid

Si_3N_4 trisilicon tetranitride

S_2F_{10} disulfur decafluoride

Pb_3N_4 lead (IV) nitride (plumbic nitride)

chromium (II) silicate $CrSiO_3$

N_2O_4 dinitrogen tetroxide

Cl_2O dichlorine monoxide

Na_2O sodium oxide

barium oxide BaO

barium hydroxide $Ba(OH)_2$

barium peroxide BaO_2

barium hydride BaH_2

3. Fill in the missing name or formula for each element, compound, or ion.

NO nitrogen monoxide

CaO calcium oxide

CaO_2 calcium peroxide

calcium acetate $Ca(C_2H_3O_2)_2$

oxalic acid $H_2C_2O_4$

lithium oxalate $Li_2C_2O_4$

Gallium permanganate $Ga(MnO_4)_3$

sulfur hexafluoride SF_6

HNO_3 nitric acid

HNO_2 nitrous acid

HBr hydrobromic acid

ferric chromate $Fe_2(CrO_4)_3$

NO_2 nitrogen dioxide

*gallium isn't on your ion sheet, but you can figure out the charge based on its position on the periodic table!

↑ group III so Ga^{+3}

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3. *Reactions Practice Part I* Name:_____ Seat #_____

(We'll do a few of these in class. Check answers in problem notebook) (I balanced mine for fun)

Write a chemical equation for each reaction. You need not balance. Show phase subscripts.

If a reaction is "N.R." you still need to write formulas for reactants, with an arrow going to NR.

1. Acetylene gas (C_2H_2) is combusted in air.

$2\,C_2H_{2(g)} + 5\,O_{2(g)} \rightarrow 4\,CO_{2(g)} + 2\,H_2O_{(g)}$

2. Nitrogen and oxygen react at high temperature (Show two possible reactions)

a. $N_{2(g)} + O_{2(g)} \rightarrow 2\,NO_{(g)}$ **b.** $N_{2(g)} + 2\,O_{2(g)} \rightarrow 2\,NO_{2(g)}$

3. Solutions of aluminum nitrate and sodium carbonate are mixed.

$2\,Al(NO_3)_{3(aq)} + 3\,Na_2CO_{3(aq)} \rightarrow Al_2(CO_3)_{3(s)} + 6\,NaNO_{3(aq)}$

4. Chlorine gas is bubbled through a solution of sodium iodide.

$Cl_{2(g)} + 2\,NaI_{(aq)} \rightarrow 2\,NaCl_{(aq)} + I_{2(s)}$

5. A piece of nickel is dropped into a solution of zinc sulfate.

$Ni_{(s)} + ZnSO_{4(aq)} \rightarrow$ N.R.

6. A piece of calcium is placed in a crucible, and is heated until it starts burning.

$2\,Ca_{(s)} + O_{2(g)} \rightarrow 2\,CaO_{(s)}$

7. A heated piece of calcium reacts with the nitrogen in the air.

$3\,Ca_{(s)} + N_{2(g)} \rightarrow Ca_3N_{2(s)}$

8. Solutions of ammonium carbonate and perchloric acid are mixed.

$(NH_4)_2CO_{3(aq)} + 2\,HClO_{4(aq)} \rightarrow 2\,NH_4ClO_{4(aq)} + H_2O_{(l)} + CO_{2(g)}$

9. Potassium is dropped into water.

$2\,K_{(s)} + 2\,H_2O_{(l)} \rightarrow 2\,KOH_{(aq)} + H_{2(g)}$

10. Tin is dropped into water.

$Sn_{(s)} + H_2O_{(l)} \rightarrow$ N.R.

11. A piece of iron is dropped into a solution of hydrochloric acid. A green solution forms.
(Note: $Fe^{+2}_{(aq)}$ ion is usually a pale green. $Fe^{+3}_{(aq)}$ ion is usually orange.)

$Fe_{(s)} + 2\,HCl_{(aq)} \rightarrow FeCl_{2(aq)} + H_{2(g)}$

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12. Solutions of potassium hydroxide and nitrous acid are mixed.

$KOH_{(aq)} + HNO_{2(aq)} \rightarrow H_2O_{(l)} + KNO_{2(aq)}$

13. A piece of zinc is dropped into a solution of ferric nitrate.

$3\,Zn_{(s)} + 2\,Fe(NO_3)_{3(aq)} \rightarrow 3\,Zn(NO_3)_{2(aq)} + 2\,Fe_{(s)}$

4. Reactions Practice Part II.
Write a chemical equation for each reaction. Balance and show phase subscripts. Two are N.R.
If a reaction is "N.R." you still need to write formulas for reactants, with an arrow going to NR.

1. Fluorine gas is bubbled through a solution of lithium bromide.

$F_{2(g)} + 2LiBr_{(aq)} \rightarrow 2LiF_{(aq)} + Br_{2(\ell)}$

2. Solid iodine is stirred into a solution of lithium fluoride.

$I_{2(s)} + LiF_{(aq)} \rightarrow$ N.R.

3. Solid lithium carbonate is added to a solution of bromic acid.

$Li_2CO_{3(s)} + 2HBrO_{3(aq)} \rightarrow 2LiBrO_{3(aq)} + H_2O_{(\ell)} + CO_{2(g)}$

4. Solutions of sodium hydroxide and bromous acid are mixed.

$NaOH_{(aq)} + HBrO_{2(aq)} \rightarrow NaBrO_{2(aq)} + H_2O_{(\ell)}$

5. A piece of magnesium is placed into a solution of chromium (III) sulfate.

$3Mg_{(s)} + Cr_2(SO_4)_{3(aq)} \rightarrow 3MgSO_{4(aq)} + 2Cr_{(s)}$

6. Bromine reacts with iron powder. (Show the two possible balanced equations, depending on the charge of iron that forms).

a. $Br_{2(\ell)} + Fe_{(s)} \rightarrow FeBr_{2(s)}$ b. $3Br_{2(\ell)} + 2Fe_{(s)} \rightarrow 2FeBr_{3(s)}$

7. Coal (carbon) burns in a power plant.

$C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$

8. Sulfur is burned in air. (Show two possible reactions)

a. $S_{(s)} + O_{2(g)} \rightarrow SO_{2(g)}$ b. $2S_{(s)} + 3O_{2(g)} \rightarrow 2SO_{3(g)}$

9. Calcium metal is dropped into water.

$Ca_{(s)} + 2H_2O_{(\ell)} \rightarrow Ca(OH)_2 + H_{2(g)}$

10. Solutions of magnesium chloride and iron(III) sulfate are mixed. (s) or (aq) depending on which chart..

$MgCl_{2(aq)} + Fe_2(SO_4)_{3(aq)} \rightarrow$ NR (since $FeCl_3$ and $MgSO_4$ are both soluble)

11. Solutions of lithium phosphate and barium hydroxide are mixed.

$2Li_3PO_{4(aq)} + 3Ba(OH)_{2(aq)} \rightarrow 6LiOH_{(aq)} + Ba_3(PO_4)_{2(s)}$

12. Liquid cyclohexene (C_6H_{10}) is combusted in air.

$2C_6H_{10(\ell)} + 17O_{2(g)} \rightarrow 12CO_{2(g)} + 10H_2O_{(g)}$

Reactions Practice Part III. Name:_____ Seat #_____

Write a net ionic equation for each reaction, including subscripts. Balance at least reactions 1-10. Note: Not all reactions will have compounds that should be split up! Only aqueous ionic compounds and aqueous strong acids should be split up into ions. (Assume that all acids given in this part are strong acids) None of these are N.R. For the starred (*) reactions, fill in the blanks to indicate the substance oxidized (if any), the substance reduced (if any), and the overall # of electrons transferred (if any).

***1.** Solutions of magnesium sulfate and potassium phosphate are mixed. ox Ø red Ø #e- Ø

$3MgSO_{4(aq)} + 2K_3PO_{4(aq)} \rightarrow Mg_3(PO_4)_{2(s)} + 3K_2SO_{4(aq)}$

$3Mg^{+2}_{(aq)} + 2PO_4^{-3}_{(aq)} \rightarrow Mg_3(PO_4)_{2(s)}$

***2.** Aluminum is added to bromine, and the mixture is heated until reaction occurs. ox Al red Br_2 #e- 6

$2Al_{(s)} + 3Br_{2(l)} \rightarrow 2AlBr_{3(s)}$

***3.** Aluminum foil is added to a solution of copper (II) chloride. ox Al red Cu^{+2} #e- 6

$2Al_{(s)} + 3CuCl_{2(aq)} \rightarrow 2AlCl_{3(aq)} + 3Cu_{(s)}$

$2Al_{(s)} + 3Cu^{+2}_{(aq)} \rightarrow 2Al^{+3}_{(aq)} + 3Cu_{(s)}$

4. A solution of ammonium carbonate is added to a solution of nitric acid.

$(NH_4)_2CO_{3(aq)} + 2HNO_{3(aq)} \rightarrow 2NH_4NO_{3(aq)} + H_2O_{(l)} + CO_{2(g)}$

$CO_3^{-2}{}_{(aq)} + 2H^{+1}_{(aq)} \rightarrow H_2O_{(l)} + CO_{2(g)}$

***5.** Fluorine gas is bubbled through a solution of potassium iodide. ox I^{-1} red F_2 #e- 2

$F_{2(g)} + 2KI_{(aq)} \rightarrow 2KF_{(aq)} + I_{2(s)}$

$F_{2(g)} + 2I^{-1}_{(aq)} \rightarrow 2F^{-1}_{(aq)} + I_{2(s)}$

***6.** A piece of zinc is added to aqueous nitric acid. ox Zn red H^{+1} #e- 2

$Zn_{(s)} + 2HNO_{3(aq)} \rightarrow Zn(NO_3)_{2(aq)} + H_{2(g)}$

$Zn_{(s)} + 2H^{+1}_{(aq)} \rightarrow Zn^{+2}_{(aq)} + H_{2(g)}$

***7.** A freshly cut piece of sodium reacts with the oxygen in the air. ox Na red O_2 #e- 4

$4Na_{(s)} + O_{2(g)} \rightarrow 2Na_2O_{(s)}$

***8.** Magnesium powder is added to water. ox Mg red H #e- 2

$Mg_{(s)} + 2H_2O_{(l)} \rightarrow Mg(OH)_{2(s)} + H_{2(g)}$

9. Octane ($C_8H_{18(l)}$) burns in your car engine.

$2C_8H_{18(l)} + 25O_{2(g)} \rightarrow 16CO_{2(g)} + 18H_2O_{(g)}$

***10.** A piece of nickel is added to a solution of tin (IV) nitrate. ox Ni red Sn^{+4} #e- 4

$2Ni_{(s)} + Sn(NO_3)_{4(aq)} \rightarrow 2Ni(NO_3)_{2(aq)} + Sn_{(s)}$

$2Ni_{(s)} + Sn^{+4}_{(aq)} \rightarrow 2Ni^{+2}_{(aq)} + Sn_{(s)}$

Reactions Practice Part III, Continued. (Same instructions as the previous page) (balancing not necessary)

***11.** Hydrobromic acid and sodium hydroxide solutions are mixed. ox ∅ red ∅ #e- ∅

$HBr_{(aq)} + NaOH_{(aq)} \rightarrow H_2O_{(l)} + NaBr_{(aq)}$

$H^{+1}_{(aq)} + OH^{-1}_{(aq)} \rightarrow H_2O_{(l)}$

except you kind of need to to figure out # e- transferred..

12. Hydrogen burns.

$2\,H_{2(g)} + O_{2(g)} \rightarrow 2\,H_2O_{(g)}$

***13.** A piece of barium is dropped into water. ox Ba red H in H_2O #e- 2

$Ba_{(s)} + 2\,H_2O_{(l)} \rightarrow Ba(OH)_{2(aq)} + H_{2(g)}$

$Ba_{(s)} + 2\,H_2O_{(l)} \rightarrow Ba^{+2}_{(aq)} + 2\,OH^{-1}_{(aq)} + H_{2(g)}$

14. Solutions of hydrochloric acid and sodium carbonate are mixed.

$2\,HCl_{(aq)} + Na_2CO_{3(aq)} \rightarrow H_2O_{(l)} + CO_{2(g)} + 2\,NaCl_{(aq)}$

$2\,H^{+1}_{(aq)} + CO_3^{-2}{}_{(aq)} \rightarrow H_2O_{(l)} + CO_{2(g)}$

***15.** A solution of hydrobromic acid is poured onto calcium carbonate powder. ox ∅ red ∅ #e- ∅

$2\,HBr_{(aq)} + CaCO_{3(s)} \rightarrow H_2O_{(l)} + CO_{2(g)} + CaBr_{2(aq)}$

$2\,H^{+1}_{(aq)} + CaCO_{3(s)} \rightarrow H_2O_{(l)} + CO_{2(g)} + Ca^{+2}_{(aq)}$

***16.** A solution of hydrobromic acid is poured onto magnesium powder. ox Mg red H^{+1} #e- 2

$2\,HBr_{(aq)} + Mg_{(s)} \rightarrow MgBr_{2(aq)} + H_{2(g)}$

$2\,H^{+1}_{(aq)} + Mg_{(s)} \rightarrow Mg^{+2}_{(aq)} + H_{2(g)}$

***17.** Solutions of hydroiodic acid and lead (II) nitrate are mixed. ox ∅ red ∅ #e- ∅

$2\,HI_{(aq)} + Pb(NO_3)_{2(aq)} \rightarrow PbI_{2(s)} + 2\,HNO_{3(aq)}$

$2\,I^{-1}_{(aq)} + Pb^{+2}_{(aq)} \rightarrow PbI_{2(s)}$

18. A mixture of hydrogen and nitrogen gas is heated in the presence of a catalyst.

$3\,H_{2(g)} + N_{2(g)} \rightarrow 2\,NH_{3(g)}$

***19.** Bromine reacts with sodium. ox Na red Br_2 #e- 2

$Br_{2(l)} + 2\,Na_{(s)} \rightarrow 2\,NaBr_{(s)}$

***20.** A piece of zinc is added to a solution of iron (III) sulfate. ox Zn red Fe^{+3} #e- 6

$3\,Zn_{(s)} + Fe_2(SO_4)_{3(aq)} \rightarrow 3\,ZnSO_{4(aq)} + 2\,Fe_{(s)}$

$3\,Zn_{(s)} + 2\,Fe^{+3}_{(aq)} \rightarrow 3\,Zn^{+2}_{(aq)} + 2\,Fe_{(s)}$