Chemical Reaction Types

1) SYNTHESIS REACTIONS

a) Metal element + Non-metal element ----> Binary Ionic Compound

i) $Ca(s) + N_2(g) \rightarrow$

ii) $Li(s) + P_4(s) \rightarrow$

iii) $Al(s) + S(s) \rightarrow$

iv) $Fe(s) + Cl_2(g) \rightarrow$ (Two possible products)

v) $Hg(l) + O_2(g) \rightarrow$ (Two possible products)

b) Non-metal element + Non-metal element ----> Binary Covalent Compound

i) $C(s) + O_2(g) \rightarrow$

ii) $P_4(s) + F_2(g) \rightarrow$

iii) $H_2(g) + Cl_2(g) \rightarrow$

iv) $N_2(g) + H_2(g) \rightarrow$

v) $S(s) + Cl_2(g) \rightarrow$

c) Metal Oxide + Water ----> Metal Hydroxide (Base)

i) $Al_2O_3(s) + H_2O(l) \rightarrow$

ii) $K_2O(s) + H_2O(l) \rightarrow$

iii) $CuO(s) + H_2O(l) \rightarrow$

iv) $PbO_2(s) + H_2O(l) \rightarrow$

v) $Fe_2O_3(s) + H_2O(l) \rightarrow$

d) Non-Metal Oxide + Water -----> Oxyacid

i) $CO_2(g) + H_2O(l) \rightarrow$

ii) $SO_3(g) + H_2O(l) \rightarrow$

iii) $P_2O_5(g) + H_2O(l) \rightarrow$

iv) $SO_2(g) + H_2O(l) \rightarrow$

v) $P_2O_3(g) + H_2O(l) \rightarrow$

e) Metal Oxide + Carbon Dioxide ----> Metal Carbonate

i) $HgO(s) + CO_2(g) \rightarrow$

ii) $Li_2O(s) + CO_2(g) \rightarrow$

iii) $Al_2O_3(s) + CO_2(g) \rightarrow$

iv) $CaO(s) + CO_2(g) \rightarrow$

v) $SnO_2(s) + CO_2(g) \rightarrow$

2) DECOMPOSITION REACTIONS

a) Binary Ionic Compound -----> Metal element + Non-metal element
b) Binary Covalent Compound ------> Non-metal element + Non-metal element

i) $H_2O(l) \rightarrow$

ii) $MgO(s) \rightarrow$

iii) $HI(g) \rightarrow$

iv) $FeCl_2(s) \rightarrow$

v) $AlBr_3(s) \rightarrow$

vi) $Cu_2S(s) \rightarrow$

vii) $NI_3(s) \rightarrow$

c) Metal Hydroxide ----> Metal Oxide + Water

i) $NaOH(s) \rightarrow$

ii) $Ba(OH)_2\ (s) \rightarrow$

iii) $AgOH\ (s) \rightarrow$

iv) $Fe(OH)_3(s) \rightarrow$

d) Metal Carbonate ----> Metal Oxide + Carbon Dioxide

i) $ZnCO_3(s) \rightarrow$

ii) $Na_2CO_3(s) \rightarrow$

iii) $Ga_2(CO_3)_3(s) \rightarrow$

iv) $Pb(CO_3)_2(s) \rightarrow$

3) SINGLE DISPLACEMENT REACTIONS

Complete and balance the following chemical reactions, if no reaction would occur, complete the equation by writing "NO RXN":

Metal Element + Ionic Compound → New Metal Element + New Ionic Compound

i) $Cu(s) + AgNO_3(aq) \rightarrow$

ii) $Ag(s) + Fe(NO_3)_2(aq) \rightarrow$

iii) $Pb(s) + CuCl_2(aq) \rightarrow$

iv) $Mg(s) + NaBr(aq) \rightarrow$

v) $Ca(s) + ZnCl_2(aq) \rightarrow$

vi) $Al(s) + Cu(NO_3)_2(aq) \rightarrow$

vii) $Ni(s) + MgCO_3(aq) \rightarrow$

viii) $Zn(s) + SnSO_4(aq) \rightarrow$

Metal Element + Acid → Hydrogen gas + Ionic Compound
Alkali (or Alkaline Earth) Metal + H_2O —> Hydrogen gas + Metal hydroxide

i) $Mg(s) + HCl(aq) \rightarrow$

ii) $Pb(s) + H_3PO_4(aq) \rightarrow$

iii) $Zn(s) + CH_3COOH(aq) \rightarrow$

iv) $Ca(s) + H_2O(l) \rightarrow$

v) $Al(s) + H_2SO_4(aq) \rightarrow$

vi) $Ag(s) + HCl(aq) \rightarrow$

vii) $Al(s) + H_2O(l) \rightarrow$

viii) $K(s) + H_2O(l) \rightarrow$

Halogen + Ionic Compound → New Halogen + New Ionic Compound

i) $F_2(g) + NaCl(aq) \rightarrow$

ii) $Br_2(g) + CaF_2(aq) \rightarrow$

iii) $Cl_2(g) + MgI_2(aq) \rightarrow$

iv) $F_2(g) + AlBr_3(aq) \rightarrow$

3) DOUBLE DISPLACEMENT REACTIONS

Use the solubility rules (pg 92) to help you determine if a reaction occurs in the following cases. Complete and balance the equations.

i) $NaOH(aq) + CaBr_2(aq) \rightarrow$

ii) $Pb(NO_3)_2(aq) + KCl(aq) \rightarrow$

iii) $Na_2CO_3(aq) + KF(aq) \rightarrow$

iv) $AgNO_3(aq) + CuSO_4(aq) \rightarrow$

metal carbonate + acid → a salt + water + carbon dioxide gas

i) $Na_2CO_3(aq) + H_2SO_4(aq) \rightarrow$

ii) $MgCO_3(aq) + HCl(aq) \rightarrow$

iii) $K_2CO_3(aq) + H_3PO_4(aq) \rightarrow$

acid + base → a salt + water

i) $HCl(aq) + NaOH(aq) \rightarrow$

ii) $HNO_3(aq) + CaO(s) \rightarrow$

iii) $H_2SO_4(aq) + KOH(aq) \rightarrow$

iv) $H_3PO_4(aq) + MgO(s) \rightarrow$

MIXED REACTION TYPES PROBLEMS

Identify the reaction type, then complete and balance the equations.

A) $Ca(s) + N_2(g) \longrightarrow$

B) $H_2\ SO_4(aq) + Al_2O_3(s) \longrightarrow$

C) $CaCl_2(aq) + AgNO_3(aq) \longrightarrow$

D) $Cs_2O(s) + CO_2(g) \longrightarrow$

E) $Fe(NO_3)_3(aq) + Zn(s) \longrightarrow$

F) $Cu(s) + H_2O(l) \longrightarrow$

G) $Mg(HCO_3)_2(s) \longrightarrow$

H) $LiCl(aq) + ZnSO_4(aq) \longrightarrow$

I) $KOH(aq) + SO_2(g) \longrightarrow$