REACTION CATEGORY	**DOUBLE REPLACEMENT**
REACTION DESCRIPTION	During double replacement, the cations and anions of two different compounds switch places.
REACTION FORMAT	**AB + CD -----> AD + CB**
REACTION GUIDELINES	1. It is important that the formulas of the products be written correctly. If they are correct, balancing the equation is a simple task; if not, the equation will probably never balance. 2. In these reactions, there is never a change in oxidation state. 3. Sometimes you must determine if a reaction actually takes place? For example : Does a mixture of NaCl and H_2SO_4 react to give Na_2SO_4 and HCl, or rather, does a mixture of Na_2SO_4 and HCl react to give NaCl and H_2SO_4. Obviously we cannot test every reaction before we write the equation, but fortunately, there are certain conditions under which a reaction goes to completion (i.e goes in one direction only). These are summarized below. A reaction takes place or tends to go to completion if: a. One of the products is a gas and is allowed to escape. b. An unionized substance such as H_2O or NH_3 is formed. c. An insoluble substance is formed. The first two of these are obvious if we are able to recognize which substances are gases. The most common inorganic gases are H_2, Cl_2, O_2, N_2, H_2S, HF, HCl, HBr, HI, CO, CO_2, SO_2, SO_3, NH_3, NO, N_2O, NO_2 and HCN. The most difficult aspect of reactions of this type is the ability to recognize insoluble substances. Here are some solubility guidelines: 1. All nitrates and acetates are soluble. 2. All chlorides, bromides, and iodides are soluble except those of Pb^{2+}, Ag^{+}, and Hg^{2+}. 3. All sulfates are soluble except those of Ba^{2+}, Sr^{2+}, and Pb^{2+}. $CaSO_4$, Ag_2SO_4, and Hg_2SO_4 are slightly soluble. 4. All hydroxides are insoluble except those of group I in the periodic table, NH_4^{+}, and Ba^{2+}. $Ca(OH)_2$ and $Sr(OH)_2$ are slightly soluble. 5. All carbonates and phosphates are insoluble except those of group I and NH_4^{+}. Many hydrogen phosphates are soluble. 6. All sulfides are insoluble except those of Group I and Group II in the periodic table and NH_4^{+}. In addition, keep in mind the following when H_2CO_3, H_2SO_3, and NH_4OH are formed as products: 7. H_2CO_3 decomposes into CO_2 + H_2O 8. H_2SO_3 decomposes into SO_2 + H_2O 9. NH_4OH decomposes into NH_3 + H_2O
REACTION GUIDELINE EXAMPLES	$AgNO_3$ + NaCl ---> AgCl + $NaNO_3$ $CaCO_3$ + HCl ---> $CaCl_2$ + CO_2 + H_2O (#7) $Pb(NO_3)_2$ + $CuSO_4$ ---> $PbSO_4$ + $Cu(NO_3)_2$

CHEMISTRY **DOUBLE REPLACEMENT REACTION WORKSHEET**

PRACTICE REACTIONS

1) $Ca(OH)_2 + H_3PO_4$ --->

2) $K_2CO_3 + BaCl_2$ --->

3) $Cd_3(PO_4)_2 + (NH_4)_2S$ --->

4) $Co(OH)_3 + HNO_3$ --->

5) $AgNO_3 + KCl$ --->

6) $Na_2CO_3 + H_2SO_4$ --->

7) $Al(OH)_3 + HC_2H_3O_2$ --->

8) $Al_2(SO_4)_3 + Ca_3(PO_4)_2$ --->

9) $Cr_2(SO_3)_3 + H_2SO_4$ --->

10) $AgC_2H_3O_2 + K_2CrO_4$ --->

11) $FeBr_2 + K2CO_3$ --->

12) $Ag_2S + CuCl_2$ --->

13) $Pb(NO_3)_2 + HI$ --->

14) $Ba(ClO_3)_2 + H_2SO_4$ --->

15) $CuS + KCl$ --->

16) $Na_3PO_4 + MgSO_4$ --->

17) $Pb(NO_3)_2 + H_2SO_4$ --->

18) $FeCl_2 + H_2S$ --->

19) $KCl + H_2SO_4$ --->

20) $HCl + NaOH$ --->

21) $FeBr_3 + Ba(OH)_2$ --->

22) $FeCl_3 + Na_3PO_4$ --->

23) $Hg_2Cl_2 + HCl$ --->

24) $CaS + HCl$ --->

25) $H_2O + K_2SO4$ --->

26) $NH_4Cl + KOH$ --->

27) $NaNO_3 + KC_2H_3O_2$ --->

28) $Pb(C_2H_3O_2)_2 + KI$ --->

29) $NH_4OH + BaCl_2$ --->

30) $Ca(NO_3)_2 + Na_2SO_4$ --->