

For each of the following reactions, write the formula equation and balance.

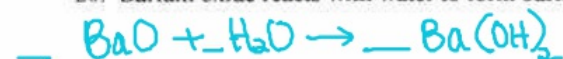
18. Ammonia reacts with hydrogen chloride to form ammonium chloride.



19. When heated, calcium carbonate decomposes to form calcium oxide and carbon dioxide.



20. Barium oxide reacts with water to form barium hydroxide.



21. Acetaldehyde (CH_3CHO) decomposes to form methane (CH_4) and carbon monoxide.



22. Zinc reacts with copper (II) nitrate to form zinc nitrate and copper.



23. When heated, calcium sulfite decomposes to form calcium oxide and sulfur dioxide.



24. Iron reacts with sulfuric acid to form iron (II) sulfate and hydrogen gas.



25. Carbon monoxide reacts with chlorine gas to form phosgene (COCl_2)



26. Aluminum sulfate reacts with ammonium bromide to produce aluminum bromide and ammonium sulfate.



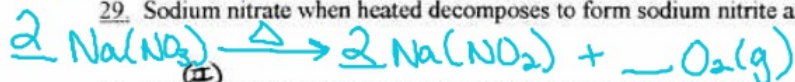
27. Potassium fluoride and barium bromide react to yield barium fluoride and potassium bromide.



Copper (II) 28. Cupric nitrate and ammonium hydroxide react to form cupric hydroxide and ammonium



29. Sodium nitrate when heated decomposes to form sodium nitrite and oxygen gas.



30. Lead hydroxide when heated decomposes to produce lead monoxide and water.



Practice

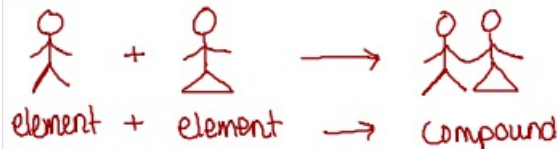
- | | | | | | | |
|---------------|---------------|---|---------------|---------------|-----------------|---------------|
| 1. <u>DEC</u> | 6. <u>DEC</u> | } | <u>DC</u> 1. | <u>DEC</u> 6. | <u>DR</u> 11. | <u>DR</u> 16. |
| 2. <u>DR</u> | 7. <u>SR</u> | | <u>DC</u> 2. | <u>SR</u> 7. | <u>DR</u> 12. | <u>DC</u> 17. |
| 3. <u>DC</u> | 8. <u>SR</u> | | <u>DC</u> 3. | <u>SR</u> 8. | <u>DC</u> 13. | <u>SR</u> 18. |
| 4. <u>DR</u> | 9. <u>DEC</u> | | <u>DEC</u> 4. | <u>SR</u> 9. | <u>DR</u> 14. | <u>SR</u> 19. |
| 5. <u>SR</u> | 10. <u>DC</u> | | <u>DEC</u> 5. | <u>DR</u> 10. | <u>skip</u> 15. | <u>DR</u> 20. |

2/16/16
Types of Rxns

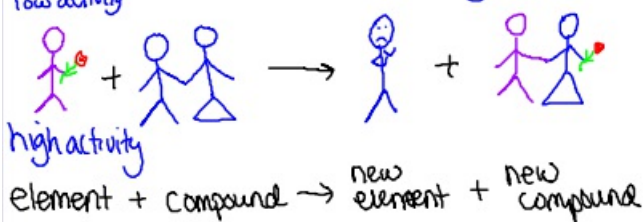
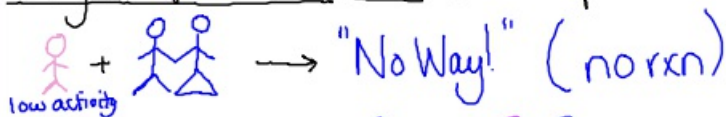


Compounds come together based on ionic charges

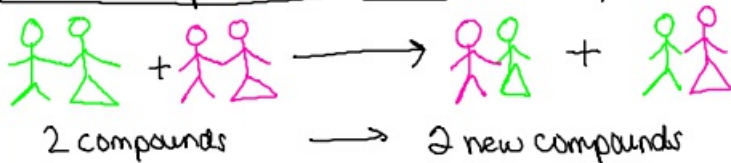
Direct Combination [DC] (Synthesis) ~~multiple reactants~~ → one product



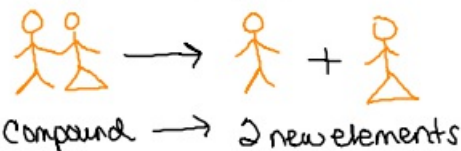
Single Replacement [SR] ~~like replaces like~~ (if strong enough)



Double Replacement [DR] ~~metals (positives) switch places~~

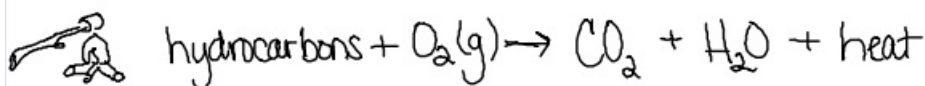
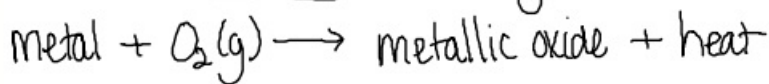


Decomposition [DEC] ~~a compound breaking apart~~



ternary + → follow rules for family breakdown

Combustion [Comb] metal or hydrocarbon + O₂^(g) → ___ + ___ + heat



Types of Chemical Reactions

Chemical reactions can be classified on the basis of what processes occur during the reaction. You will be required to be able to identify what type of reaction has occurred and to predict the products of the reaction. There are four basic types of reactions as listed below.

- 1) **Direct Combination** (synthesis) $A + B \rightarrow AB$
 - a) Two elements \rightarrow a binary compound
 - b) Two compounds (with a common ion) \rightarrow one compoundExample: $2H_2(g) + O_2(g) \rightarrow 2H_2O$

- 2) **Single Replacement** $A + BX \rightarrow AX + B$
 - a) Element + compound \rightarrow different element + different compound
 - b) Strong metals (Groups I & IIA) + Water \rightarrow metallic hydroxide + hydrogenExample: $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$

- 3) **Double Replacement** $AX + BY \rightarrow AY + BX$
 - a) Two compounds \rightarrow two different compoundsExample: $NaCl + AgNO_3 \rightarrow NaNO_3 + AgCl$
 - b) Special : combustion of hydrocarbons $C_xH_y + O_2 \rightarrow CO_2 + H_2O$

- 4) **Decomposition** $AB \xrightarrow{\Delta} A + B$
 - a) One compound $\xrightarrow{\Delta}$ two or more products
 - b) Rules for Decomposition Rxns.
 - i) Binary compounds (with heat or electricity) \rightarrow free elements
Example: $H_2O \xrightarrow{\Delta} H_2 + O_2$
 - ii) Some oxides (when heated) \rightarrow free elements
Example: $2HgO \xrightarrow{\Delta} 2Hg + O_2$
 - iii) Metallic carbonates (when heated) \rightarrow metallic oxides + CO_2
Example: $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$
 - iv) Metallic chlorates (when heated) \rightarrow metallic chlorides + O_2
Example: $2KClO_3 \xrightarrow{\Delta} 2KCl + 3O_2$
 - v) Metallic hydroxides (when heated) \rightarrow metallic oxides + H_2O
Example: $Ca(OH)_2 \xrightarrow{\Delta} CaO + H_2O$
 - vi) Oxyacids (when heated) \rightarrow nonmetallic oxides + H_2O
Example: $H_2SO_4(aq) \xrightarrow{\Delta} H_2O + SO_3$
 - c) MEMORIZE: $NH_4OH \xrightarrow{\Delta} NH_3 + H_2O$

* Reminders: The physical state of the substance is often indicated by a letter following the formula. (s) = solid, (l) = liquid, (g) = gas, (aq) = aqueous, and (ppt) = precipitate. A precipitate is the solid formed when two liquid compounds combine and one of the resulting compounds is insoluble in the newly formed liquid.

** EXCEPTIONS: Generally combustion reactions are direct combination reactions, but this is not always true. Also, a metal will only replace another metal if it has a higher activity than the existing metal.

Practice: Identify the type of reaction.

Steps:

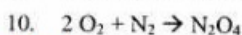
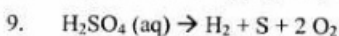
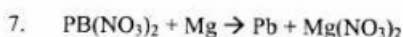
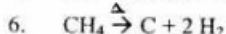
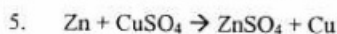
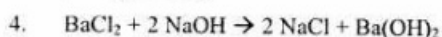
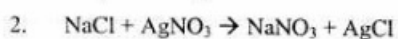
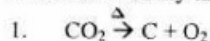
① Determine Type

② Complete * word problem

③ write chem rxn

④ balance chem rxn

* Predict the products



1. DEC

2. DR

3. DC

4. DR

5. SR

6. DEC

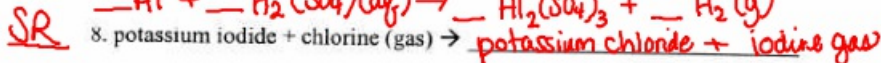
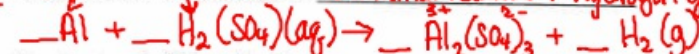
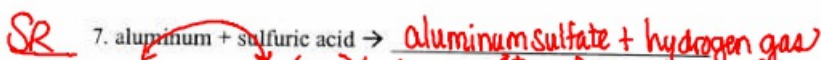
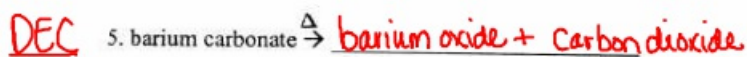
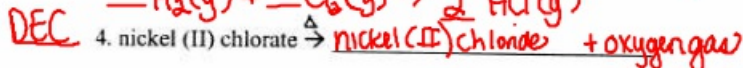
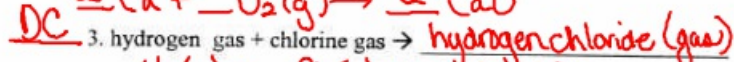
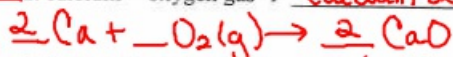
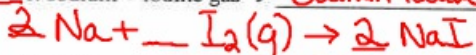
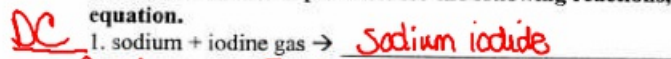
7. SR

8. SR

9. DEC

10. DC

Practice: Predict the products for the following reactions, and write a balanced equation.

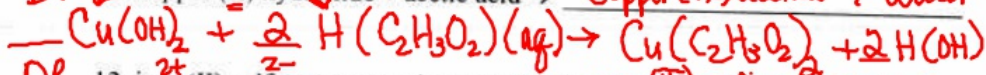


* homework: section #1 1-10 all, section #2 2-20 EVEN only

SR 9. iron + copper (II) nitrate → _____

DR 10. silver nitrate + zinc chloride → silver chloride + zinc nitrate

DR 11. copper (II) hydroxide + acetic acid → Copper(II) acetate + water



DR 12. iron (II) sulfate + ammonium sulfide → iron(II) sulfide + ammonium sulfate



DC 13. cobalt + oxygen gas → _____

DR 14. potassium chloride + silver nitrate → _____

Skip 15. calcium oxide + water → _____

DR 16. sodium hydroxide + hydrochloric acid → _____

DC 17. hydrogen gas + nitrogen gas → _____

SR 18. silver nitrate + nickel → _____

SR 19. magnesium bromide + chlorine gas → _____

DR 20. sodium chloride + sulfuric acid → _____