

How to Recognize one Chemical Reaction from another.

Type	Abstracts	Real examples	Thinks to remember
Synthesis	$M + N \rightarrow MN$ $X + Y \rightarrow XY$	$2Na + Cl_2 \rightarrow 2 NaCl$ $N_2 + 3H_2 \rightarrow 2NH_3$	Two or more smaller reactants become a bigger product. AKA Combination Reaction.
Decomposition	$MN \rightarrow M + N$ $XY \rightarrow X + Y$	$CuCO_3 \rightarrow CuO + CO_2$ $2Al_2O_3 \rightarrow 4Al + 3O_2$	Opposite of synthesis. Start with one reactant, which breaks down into smaller products.
Single Replacement (SR)	Cation (metal) replacement $Z + BC_{(AQ)} \rightarrow ZC_{(AQ)} + B$ Anion (nonmetal) replacement $N + CA_{(AQ)} \rightarrow CN_{(AQ)} + A$	$Li + NaCl_{(AQ)} \rightarrow LiCl_{(AQ)} + Na$ $F_2 + 2NaCl_{(AQ)} \rightarrow 2NaF_{(AQ)} + Cl_2$ $Au + HCl_{(AQ)} \rightarrow X$ no reaction A “no reaction” happens when the atoms are “lower” - less reactive than the ion already in solution. Gold is less reactive than hydrogen; the Au “can’t bump” the H out of solution.	Start: atoms are added to a SINGLE aqueous solution. Product is new AQ and diff. atoms. Check Table F, but in every SR a new AQ forms. Find the 2/3 on Table J ♥ Which ever metal (or H) is higher, goes into solution, or stays in solution. Which ever nonmetal is higher goes into solution, or stays in solution. Switch, fix, balance.

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Double Replacement (DR)	$AQ + AQ \rightarrow \text{diff } AQ + \text{SOLID}$ $\underline{AB} + \underline{XY} \rightarrow \underline{AY} + \underline{XB}$ Make sure the first part, the <u>CATION</u> , stays in front. Switch the anions only.	These are “so big” they would not fit in this box. Example below.	Always start with TWO AQ solutions. Switch, fix, balance, F’em. On the odd chance you end up with 2AQ products, that means it was no reaction, just a mixture forms.
Combustion	$HC^* + O_2 \rightarrow CO_2 + H_2O$ No real “abstract”, you always burn a hydrocarbon and oxygen; always get carbon dioxide & water products. *You might start with an oxygenated hydrocarbon. Rarely you have “incomplete combustion” (insufficient oxygen), then $C_{(S)}$ or $CO_{(G)}$ forms <u>with</u> $CO_2 + H_2O$	$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ $2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$ $C_{23}H_{48(S)} + 35O_2 \rightarrow 23CO_2 + 24H_2O$ $2C_2H_5OH + 5O_2 \rightarrow 4CO_2 + 4H_2O$ $2CH_4 + 3O_2 \rightarrow C_{(S)} + CO_2 + 4H_2O$	These are always exothermic, heat is a product. Sometimes the numbers get bigger than “normal”. You will always be given the formula for the HC or oxygenated HC.