Before you can predict products for a reaction, you must first IDENTIFY the type of reaction*!*

Synthesis (Combination): A + B → AB		
Step	***Directions***	***Ex:* Al + Br_2 →**
1	Place <u>one</u> of each element into the product compound.	Al + Br_2 → AlBr
2	Write the product as ions, the rewrite and criss-cross charges*!*	Al + Br_2 → Al^{3+} Br^{1-} Al + Br_2 → $AlBr_3$
3	Balance	**2** Al + **3** Br_2 → **2** $AlBr_3$

Decomposition: AB → A + B		
Step	***Directions***	***Ex:* SF_6 →**
1	Write <u>one</u> of each element as the product	SF_6 → S + F
2	Are either of the elements in **HOFBrINCl**? If yes, write the subscript 2.	SF_6 → S + F_2
3	Balance carefully – *NEVER* change subscripts when you are balancing*!*	SF_6 → S + **3** F_2

Single Replacement: A + BC → AC + B [A is a cation]		***A + BC → BA + C [A is an anion]***
Step	***Directions***	***Ex:* Ca + H_2O→** / ***Ex:* F_2 + LiBr →**
1	Change any H_2O reactant to H(OH), bracket all polyatomics.	Ca + H(OH)→ /
2	Underline the single element reactant.	<u>Ca</u> + H(OH)→ / <u>F_2</u> + LiBr →
3	Is the underlined element a metal (cation) or nonmetal (anion)?	**Ca is a metal, forms Ca^{2+}** / **F is a nonmetal, forms F^{1-}**
4	A metal switches with another metal, a nonmetal switches with another nonmetal. Underline what it will switch with.	<u>Ca</u> + <u>H</u>(OH)→ / <u>F_2</u> + Li<u>Br</u> →
5	Check the Metal Activity Series or the Periodic Table. Is the single element higher than the element in the compound? a. If no, then: no reaction occurs, stop here. b. If yes, then: proceed to predicting products (next step)	**This reaction will occur because:** Ca is more reactive than H. / **This reaction will occur because:** F is more reactive than Br.
6	Switch elements – writing ONLY ONE of each cation and anion in the compound product.	<u>Ca</u> + <u>H</u>(OH)→ <u>H</u> + <u>Ca</u> (OH) / <u>F_2</u> + Li<u>Br</u> → Br + LiF
7	Check to see if the element by itself is part of **HOFBrINCl.** If yes, write a subscript 2.	Ca + H(OH)→ H_2 + Ca (OH) / F_2 + LiBr → Br_2 + LiF
8	Criss-cross charges in the compound to make a neutral compound. Hint: *<u>un</u>criss-cross* the reactant compounds if you need to find the charges for the cations and anions.	Ca + H(OH)→ H_2 + Ca $(OH)_2$ [Ca^{+2}, $(OH)^{-1}$] / F_2 + LiBr → Br_2 + LiF [Li^{+1}, F^{-1}]
9	Balance	Ca + **2** H(OH)→ H_2 + Ca $(OH)_2$ / F_2 + **2** Li<u>Br</u> → Br_2 + **2** LiF

Double Replacement: AB + CD → AD + CB		
Step	***Directions***	***Ex:* $Al_2(SO_4)_3$ + H_2O →**
1	Change H_2O reactant to H(OH), bracket all polyatomics.	$Al_2(SO_4)_3$ + H(OH) →
2	Underline cations (only the first element except NH_4).	<u>Al_2</u>$(SO_4)_3$ + <u>H</u>(OH) →
3	Switch elements – writing ONLY ONE of each cation and anion in the two product compounds*!*	<u>Al_2</u>$(SO_4)_3$ + <u>H</u>(OH) → <u>H</u>(SO_4) + <u>Al</u>(OH)
4	Criss-cross charges to make neutral compounds. Hint: *<u>un</u>criss-cross* the reactant compounds if you need to find the charges for the cations and anions.	$Al_2(SO_4)_3$ + H(OH) → $H_2(SO_4)$ + $Al(OH)_3$
5	Balance	$Al_2(SO_4)_3$ + **6** H(OH) → **3** H $_2(SO_4)$ + **2** $Al(OH)_3$

Combustion: C_xH_y + O_2 → CO_2 + H_2O		
Step	***Directions***	***Example:* C_4H_{10} Combusts**
1	Add oxygen (O_2) to the reactant side of the equation.	C_4H_{10} + O_2 →
2	Write in the products (products are *always* CO_2 and H_2O).	C_4H_{10} + O_2 → CO_2 + H_2O
3	Balance carefully – *NEVER* change subscripts when balancing*!* a. Write a 2 as the coefficient in front of the hydrocarbon. b. Balance the equation in this order: C – H – O c. If possible, divide each coefficient by 2	**2** C_4H_{10} + **13** O_2 → **8** CO_2 + **10** H_2O