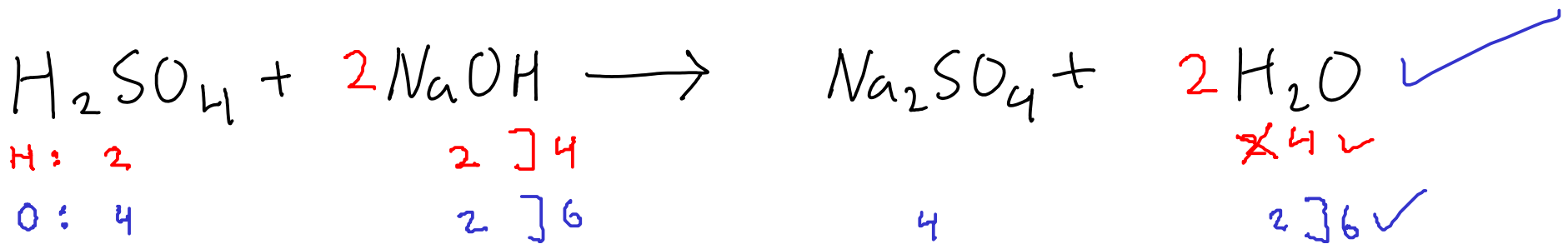
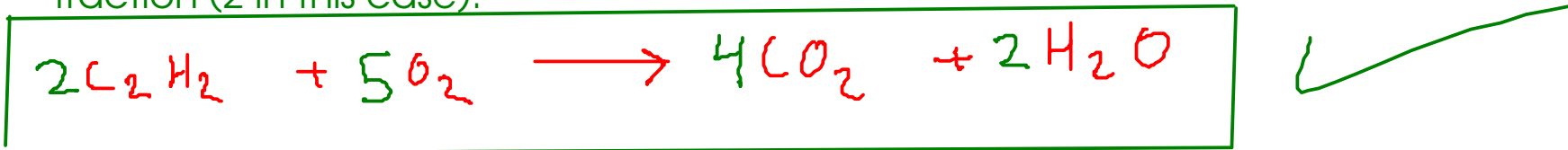


- To get a single oxygen atom from molecular oxygen, we need HALF of a molecule. So, to get 5 oxygen atoms, we need 5/2 oxygen molecules.

- To get rid of the fraction, multiply EVERY coefficient by the denominator of the fraction (2 in this case).



## IDENTIFYING REACTIONS

You may see one or more of these signs when a chemical reaction occurs

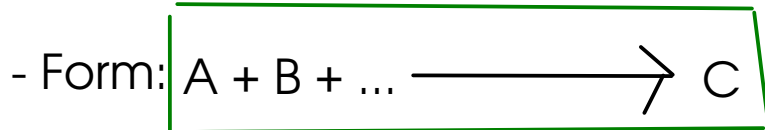
- ① - A change in temperature that can't be explained in another way.
- ② - Emission of light that can't be explained in another way
- ③ - The formation of a solid - or PRECIPITATION - in a previously liquid solution. (Not a simple phase change!) *or gas formation. ✓*
- ④ - Color change (not simply lightening of color caused by diluting a solution!)

# CLASSIFYING REACTIONS

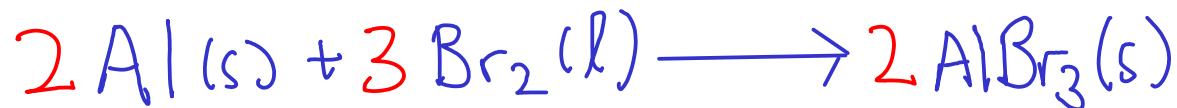
- It's simpler to talk about different reactions if we can classify them into a small number of classes.
- Most of these reaction classes are reactions that involve TRANSFER OF ELECTRONS from one atom to another. The LAST class of reactions we will discuss does NOT involve electron transfer!

## ① COMBINATION REACTIONS

- Reactions that involve two or more simple substances COMBINING to form a SINGLE product
- Often involve large energy changes. Sometimes violent!



Example:



# CLASSIFYING REACTIONS

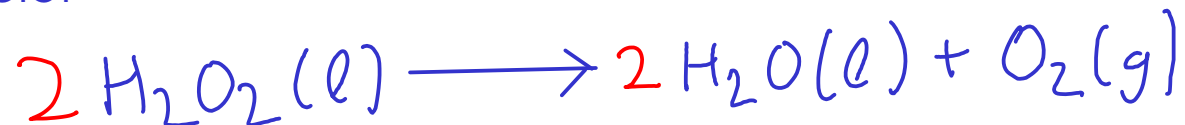
## ② DECOMPOSITION REACTIONS

- Reactions where a SINGLE REACTANT breaks apart into several products

- Form:



Example:



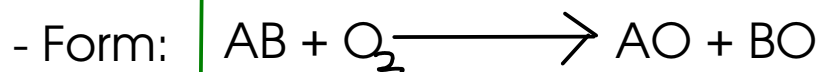
\* This reaction is NOT a combustion reaction, even though  $\text{O}_2$  is involved!

\* Combustion reactions CONSUME  $\text{O}_2$ , while this reaction PRODUCES  $\text{O}_2$

## CLASSIFYING REACTIONS

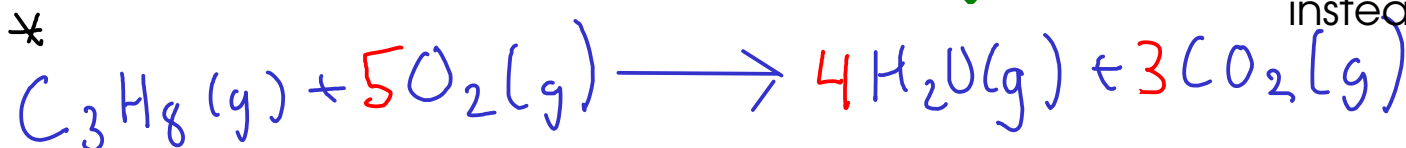
### 3 COMBUSTION REACTIONS

- Reactions of substances with MOLECULAR OXYGEN ( $O_2$ ) to form OXIDES.
- Combustion forms an OXIDE of EACH ELEMENT in the burned substance!



Oxide: a compound containing OXYGEN and one other element!

Examples:



\* Combustion of hydrocarbons makes carbon dioxide and water, if enough oxygen is present. In low-oxygen environments, carbon monoxide is made instead!

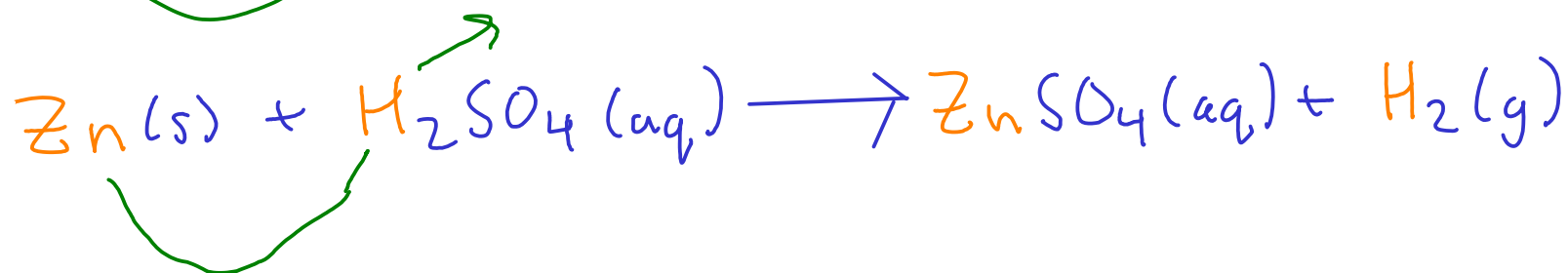
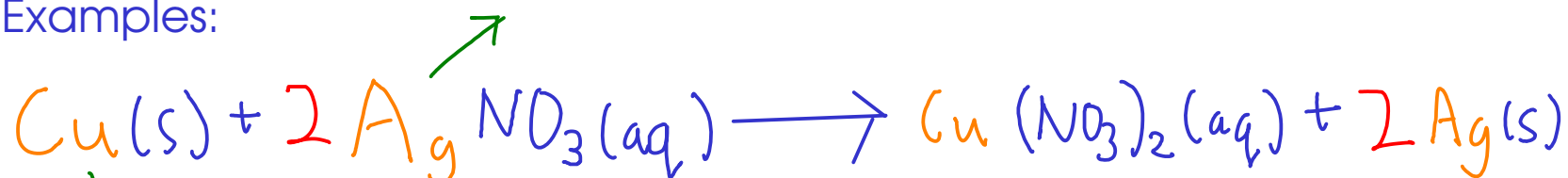
This reaction can also be called a combination!  
Two reactants form a single product.

# CLASSIFYING REACTIONS

## ④ SINGLE REPLACEMENT REACTIONS

- Reactions where one element REPLACES another element in a compound.
- Can be predicted via an ACTIVITY SERIES (more on that later!)
- Form:  $A + BC \longrightarrow AC + B$  "A" and "B" are elements., often metals.
- Easy to spot, since there is an element "by itself" on each side of the equation.

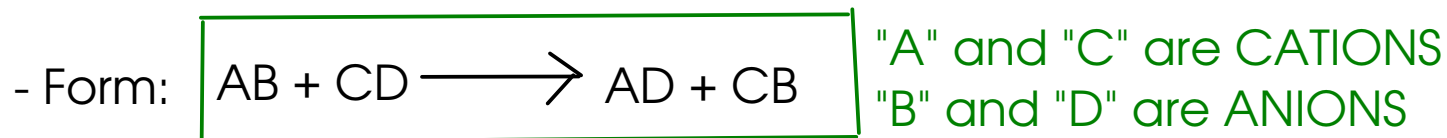
Examples:



# CLASSIFYING REACTIONS

## 5 DOUBLE REPLACEMENT REACTIONS

- Also called "exchange" reactions
- The ions in two ionic compounds (one compound may also be an acid) EXCHANGE PARTNERS, forming two new compounds.



- Can be predicted based on the characteristics of the potential products (More on that later!)
- Occur in AQUEOUS SOLUTION
- Do not involve electron transfer.

Examples:

