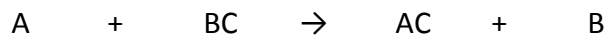


Success 24/7 Chemistry: Single and Double Replacement Reaction Notes

Single Replacement Reactions



An element replaces an element in another compound.

The reaction will ONLY take place if the element that is by itself is higher on the activity series than the one it is trying to replace.

Activity Series of Metals	
Decreasing Activity ↓	Lithium
	Potassium
	Barium
	Calcium
	Sodium
	Magnesium
	Aluminum
	Zinc
	Iron
	Cadmium
	Nickel
	Tin
	Lead
	Hydrogen (a nonmetal)
	Copper
	Mercury
Silver	
Gold	
Platinum	

Metals from Li to Na will replace H from water and acids; metals from Mg to Pb will replace H from acids only.

Activity Series of Nonmetals	
Decreasing Activity ↓	Fluorine
	Chlorine
	Bromine
	Iodine

How to determine what will happen (if anything):

- Write the charges of all elements of the reactants. Look out for polyatomics and keep them together!
- Check to see if the “single” ion is higher on the activity series than the one it is trying to replace.

If no:

- Write N.R. (no reaction) on the product’s side.

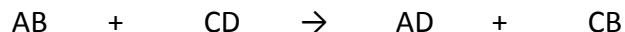
If yes:

- Write the ion that is being replaced as a single element (and check to see if it is a diatomic).
- Make the new compound by criss-crossing the remaining ions. Remember: the positive ion (metal) always goes in front.
- Don’t forget to balance!

Practice:



Double Replacement Reactions



Two compounds switch positive ions.

NOTE: A solid, liquid, or gas must be produced in order for this to be a true reaction.

How to determine what will be produced:

- Write all ions involved in the reaction out. (Remember, there will only be one cation and anion in each compound).
- Switch the positive ions.
- Always keep the metal in front!

Practice:



How do you know if a solid (precipitate), liquid, or gas is produced?

Negative Ion	Plus	Positive Ion	Form a Compound Which is:
Any negative ion	+	Alkali metal ions (Li ⁺ , Na ⁺ , K ⁺ , Rb ⁺ , Cs ⁺)	Soluble
Any negative ion	+	Ammonium ion	Soluble
Nitrate	+	Any positive ion	Soluble
Acetate	+	Any positive ion Ag ⁺	Soluble Not soluble
Chloride, Bromide, or Iodide	+	Ag ⁺ , Pb ²⁺ , Hg ₂ ²⁺ , Cu ⁺ Any other positive ion	Not soluble Soluble
Sulfate	+	Ca ²⁺ , Sr ²⁺ , Ba ²⁺ , Ra ²⁺ , Ag ⁺ , Pb ²⁺ Any other positive ion	Not soluble Soluble
Sulfide	+	Alkali ions or Ammonium, Be, Mg, Ca, Sr, Ba, Ra, Any other positive ion	Soluble Soluble Not soluble
Hydroxide	+	Alkali ions or Ammonium Any other positive ion	Soluble Not soluble
Phosphate, Carbonate, or Sulfite	+	Alkali ions or Ammonium Any other positive ion	Soluble Not soluble

Label each of the following as solid (precipitate) or aqueous:

NH_4NO_3 _____

AgCl _____

CaCO_3 _____

NaOH _____

If water (H_2O) is produced, that would be labeled as a liquid and would mean it is a true reaction as well.

LiOH + HBr →

More Practice:

NaBr + AgNO_3 →

Na_2CO_3 + $\text{Ca}(\text{OH})_2$ →

$\text{Pb}(\text{NO}_3)_2$ + K_3PO_4 →