**Reaction Unit Outline**

You should know all of this already, but, just in case you need a review, I hope this will help.

Balancing Equations:

* We must have the same numbers of atoms of each element on each side of the equation because of the Law of the Conservation of Matter. It says that matter cannot be created or destroyed but it can be changed (like how chlorine might be bonded to magnesium and after a single replacement reaction it is not bonded to sodium)
* Remember, don’t change the subscript (little numbers after the individual elements) once a formula is correctly balanced (criss-crossed).
* Instead, put in coefficients (big numbers before the formula)
* The number of atoms on the left side of the equation must equal the number of atoms on the right side of the equation!!

Different Types of Reactions:

* Remember to look at your reference tables!! **Guidelines for Predicting the Products of Selected Types of Chemical Reactions**
* Synthesis –
  + Recognizing Synthesis
    - The only type we’ve looked at is binary: A + B → AB
    - When you only have two single reactants on the left, then the only thing for them to do is come together.
    - The “single reactants” on the left side of the equation can either be a single element (Na, Mg, S, …), a diatomic gas (O2, Cl2, H2, …), or a polyatomic ion (SO4, OH, NH4, …)
  + Predicting Synthesis Products
    - You must find the charges of the single reactants and criss-cross them in order to balance the formula of the product.
    - Once the product is balanced, then you should count the number of each element on each side of the equation and add coefficients if you need to balance anything.
* Decomposition
  + Recognizing Decomposition
    - We looked at four different types of decomposition reactions (labeled a, b, d, and e on your reference table)
    - Decomposition reactions ALWAYS have **only one** compound on the reaction side (left).
    - It is possible for “heat” to also be on the left side of a decomposition reaction, but there’s only one compound to be broken up.
  + Predicting Decomposition Products
    - Before you predict the products, you must determine which type of decomposition you have.
      * Binary (AB → A + B): You just have to split the compound up into its individual elements. Make sure you remember which non-metals are diatomic!
      * Metallic carbonates (MCO3→ MO + CO2): Remember to find the charge of the metal in the reactant and use that charge to criss-cross it with oxygen for your metal oxide product.
      * Metallic hydroxide (MOH → MO + H2O): If your reactant has hydroxide in it, this you’ll use this form. Again, make sure you remember to criss-cross the metal oxide.
      * Metallic chlorates (MClO3→MCl + O2): If your single reactant has a chlorate in it, then use this form. Make sure to criss-cross the metal chloride.
    - Remember to balance everything with coefficients after you predict the products.
* Single Replacement
  + Recognizing Single Replacement
    - For single replacement reactions, you are going to have one reactant as a single atom and the other will be a compound.
    - Your single reactant can either be a single element (Na, Mg, S, …), a diatomic gas (O2, Cl2, H2, …), or a polyatomic ion (SO4, OH, NH4, …).
    - The compound will have two of these elements bonded together.
  + Predicting Single Replacement Products
    - Look at your single product and determine if it is a metal or a halogen. Then, find the same element within the compound and compare them on your activity series.
    - Whichever element is higher on the series is more reactive, so that element wants to be in the compound more. If that’s the one already bonded, then no reaction will occur. If the more reactive element is by itself as a reactant, then it will replace the other in the compound.
    - If a replacement occurs, you must have the charges and criss-cross in order to write your new formula.
    - If you are doing a Halide-Halide replacement (halogens), make sure you remember the diatomics.
    - Don’t forget to balance the entire equation when you’re done!
* Double Replacement
  + Recognizing Double Replacement
    - For double replacement reactions, you are going to have two sets of compounds on the reactant side.
    - Each compound must have two of the following: a single element (Na, Mg, S, …), a diatomic gas (O2, Cl2, H2, …), or a polyatomic ion (SO4, OH, NH4, …)
  + Predicting Double Replacement Products
    - First, split each of your reactants up and find their charges. When you’re done with this step, you should have four different ions. Remember, the subscripts in the reactants only matter if it is in a polyatomic ion (and these can all be found on your reference tables)
    - Next, give the ions new partners (remember OI with a twist). Always put the positive ion first. Also, make sure you criss-cross.
    - Check your solubility rules for each of the products. If it is soluble then it’s aqueous and you should write (aq) after it. If it is insoluble then it’s a solid and you should write (s) after it.
    - If both of the products are aqueous then no reaction can occur. If one product is a solid then you must finish by balancing the equation with coefficients.
* Combustion
  + Recognizing Combustion
    - Combustion reactions must have a hydrocarbon (compound with Hydrogen, Carbon, and possible Oxygen) and O2 as the reactants.
    - If there is anything other than these three elements as a reactant then it is not combustion.
  + Predicting Combustion Reactions
    - No matter what, the products are also CO2 and H2O. Then only thing that you have to do now is balance the equation.
    - As you balance, do the carbons first. Then Hydrogen and end with Oxygen.
    - Remember, if you have an odd number of Oxygens on the product side and it is not possible to get that number with your reactants, then you just need to put a two in front of the hydrocarbon and start the balancing over.