Writing Ionic Compounds Refresher

Some ions that are a little trickier to get from the periodic table

positive ions: Zinc = Zn^{+2}

Negative ions: **Phosphate** = PO_4^{-3}, **Sulfate** = SO_4^{-2}, **Hydroxide =** OH^{-1}, **Nitrate** = NO_3^{-1}

Acids: **Sulfuric Acid** = H_2SO_4, **Phosphoric Acid** = H_3PO_4, **Hydrochloric Acid** = HCl **Chlorate =** ClO_3^{-1}

A few quick reminders:

- Roman numerals show the positive charge that a metal has (Not the amount of metal atoms)
- There are seven diatomic molecules meaning they are so unstable that they do not exist alone they will bond to themselves if there is nothing else to bond to. The seven diatomic molecules are:
- $Cl_2, H_2, F_2, Br_2, I_2, N_2, O_2$
- Ionic compounds need to have a neutral charge. This is the only time you will assign subscripts (numbers that go below.) Once you have given the right amounts of each atom to make the compound neutral do not change the subscripts after that. For example Magnesium Chloride consists of Magnesium with a +2 charge and Chloride with a -1 charge. So Mg^{+2}, and Cl^{-1}. In order to make this compound neutral we would need two chlorides since each one has a -1 charge to make a total of a -2 charge since Magnesium has a +2 charge. So the compound would be written as $MgCl_2$ the subscript is there to show that there needs to be two chloride atoms to make the compound have an overall neutral charge. Now that I have determined the subscript of that molecule I cannot change it.

On the worksheet you were assigned this will help you with a few of the problems on the side of the worksheet that has eight questions.

1. Zinc and lead (II) nitrate react to form Zinc Nitrate and Lead.
   First write the elements and their charges
   Zinc is not bonded to anything so it is not charged so it is just Zn, Lead (II) Nitrate. The roman numeral II tells me that Lead (Pb) has a +2 charge. Nitrate (NO_3) has a -1 charge. So we have:

   $Zn + Pb^{+2}NO_3^{-1}$

   Lead Nitrate needs to be a neutral compound so we will need two Nitrates to have an overall -2 charge. So $Pb(NO_3)_2$ remember we use parenthesis to keep Nitrate as a whole unit.

   So for the reactants we have: $Zn + Pb(NO_3)_2$

   For the products we have Zinc Nitrate, so Zn^{+2} and NO_3^{-1}, so overall we need to Nitrates to have a total -2 charge to balance the +2 charge from Zinc. So we would have $Zn(NO_3)_2$. Then we would have Lead which is by itself, so since it is not bonded to anything it has a neutral charge so it is just Pb.

   So for the products we have: $Zn(NO_3)_2 + Pb$

   So let's put it all together

   Reactants **Products**

   $Zn + Pb(NO_3)_2 \longrightarrow Zn(NO_3)_2 + Pb$

   It just so happens that this skeleton equations is already balanced. This would be a single replacement reaction as well.

Here is number 2 with not as much explanation.

2. Aluminum Bromide and Chlorine gas react to form Aluminum Chloride and Bromine gas.

Reactants

$Al^{+3}Br^{-1}$ So we will need 3 Bromides to balance the +3 charge of Aluminum.

So $AlBr_3$ and Cl_2 (remember Chlorine is diatomic).

Products

$Al^{+3}Cl^{-1}$ So we will need 3 chlorides to balance the +3 charge of Aluminum.

So $AlCl_3$ and Br_2 (Bromine is also diatomic).

So now all put together

Reactants **Products**

$AlBr_3 + Cl_2 \longrightarrow AlCl_3$ and Br_2

This is just the skeleton equation, you will still need to balance it. This would be a single replacement reaction.

Let's do one more.

6. Calcium Hydroxide and Phosphoric acid(H_3PO_4) react to form Calcium Phosphate and Water.

Reactants

$Ca^{+2}OH^{-1}$, so we will need two Hydroxides to balance the +2 charge of Calcium.

So $Ca(OH)_2 + H_3PO_4$

Products

$Ca^{+2}PO_4^{+3}$ so a number that 3 and 2 have in common is six so we will need 3 Calciums to have a total +6 charge and 2 Phosphates to have a total -6 charge thus making the compound neutral.

So $Ca_3(PO_4)_2 + H_2O$

So now put all of it together

Reactants **Products**

$Ca(OH)_2 + H_3PO_4 \longrightarrow Ca_3(PO_4)_2 + H_2O$

Once again this is just the skeleton equation so you will still need to balance it. This would be a double replacement reaction.