Chemical Equations: Notes

In this lesson…

- Chemical Equations
- Balancing Chemical Equations

Chemical Equations:

- Chemical equations are the **symbolic equations of a chemical reaction**
- **Reactant(s) → Product(s)**
- Can have element(s) or compound(s) in the reactant or product

Balancing Chemical Equations:

- **Chemical equations need to be balanced because each side needs to have the same amount of atoms in each element.**

Equation: $NaBr + Cl_2 \rightarrow NaCl + Br_2$

Step 1: Rewrite the equation, then write the amount of atoms of each of the elements in a chart below.

$NaBr + Cl_2 \rightarrow NaCl + Br_2$

Na= 1 →1
Cl= 2 → 1
Br= 1 →2

- The amount of atoms is shown through the subscript (exponent at the bottom) next to the element abbreviations.
- If there is no subscript for an element, its atom value is 1.
- If two abbreviations are next to each other with no plus or space, they are a compound of two elements each with a subscript of 1.

- Writing down the number of atoms in each element helps you to recognize the amount of atoms needed to a certain element in order to properly balance them.

Step 2: Find which element(s) need(s) to be modified. You need to balance the equation, so both sides need to have elements that have the same amount of atoms.

$NaBr + Cl_2 \rightarrow NaCl + Br_2$

Na= 1 →1 - Sodium doesn't need to be changed, because it has 1 atom on each side of the equation.
Cl= 2 → 1 - Chlorine needs to be modified on the right side because both sides need 2 atoms of chlorine
Br= 1 →2 - Bromine needs to be modified on the left side because both sides need 2 atoms of bromine

- NOTE: YOU CANNOT CHANGE THE ATOM COUNT FOR ONE ELEMENT PART OF A COMPOUND!!!
- In this example, that means, if you want to multiply the NaBr by 2 to make it equal to the Bromine on the other side, you have to multiply the Sodium too, because they are part of the same compound.

Step 3: Balance the equation! You need to multiply certain parts of the equation so both sides are equal.

$NaBr + Cl_2 \rightarrow NaCl + Br_2$

Na= 1 →1
Cl= 2 → 1
Br= 1 →2

$2NaBr + Cl_2 \rightarrow 2NaCl + Br_2$

Na= 1x2 →1x2
Cl= 2→ 1x2
Br= 1x2 →2

- NOTE: When balancing equations, make sure to put the amount you are multiplying the element or compound by in front of the said element or compound, NOT in the subscript.

- You needed to multiply Chlorine on the right side by 2 and Bromine on the left side by 2.
- Since they are part of a compound with Sodium, you also need to multiply the Sodium on each side by 2 as well.

Step 4: Check the equation! Make sure the atoms in each element on both sides of the equation are the same.

$2NaBr + Cl_2 \rightarrow 2NaCl + Br_2$

Na= 2 →2
Cl= 2→ 2
Br= 2 →2

- Each element has 2 atoms, so the equation $2NaBr + Cl_2 \rightarrow 2NaCl + Br_2$ is balanced!

NOTE: Chemical equations can have larger numbers in them than the ones in this example, but they aren't more difficult. Just use your algebraic skills and you can solve all of them! You can apply knowledge of solving basic chemical equations to solving any chemical equation.