

Chemical Reactions Study Guide

Notes #5

I. Balancing Chemical Equations

The first step to balancing chemical reaction equations is to be able to accurately count the number of each type of element on both the reactants and products side of the arrow. This is done by multiplying the coefficient (big number in front of an element symbol) with the subscript (little number found after the element symbol). **Remember:** if no coefficient or subscript is written, then there is an implied, imaginary "1".

Examples: 3Br_2 $\leftarrow$ there are 6 bromine atoms ($3 \times 2 = 6$)

CaO $\leftarrow$ there is 1 calcium and 1 oxygen (in each case $1 \times 1 = 1$). The "1"s are implied.

$\text{CH}_4 + \text{O}_2 \rightarrow \text{H}_2\text{O} + \text{CO}_2$ $\leftarrow$ There are 3 total oxygens on the product (right) side ($1 \times 1 + 1 \times 2 = 3$)

Practice: How many of each type of atom is represented.

3Cl_2 _____ Fe _____ 2Sn _____ MgF_2 _____

I_2 _____ 4Ni _____ $2 \text{Li}_2\text{O}$ _____ H_2O_2 _____

H_2SO_4 _____ $2 \text{Pb}(\text{NO}_3)_2$ _____

$\text{C}_2\text{H}_4 + \text{O}_2 \rightarrow \text{H}_2\text{O} + \text{CO}_2$ Reactants _____

Products _____

Notes #6

Now that we've learned to count, it's time to put our skills into action by altering the numbers of certain elements to suit our desires. In any case, our desires are to have the same number of each type of element on both the products and reactants side of the equation. We do this by **changing the coefficients**.

Example: $\text{Li} + \text{O}_2 \rightarrow \text{Li}_2\text{O}$ A lovely synthesis reaction. What do we do first?

1. Count the number of each element on both sides.

Reactants: 1 Li and 2 O's

Products: 2 Li's and 1 O

2. Add/change coefficients to balance.

1) First, I check the first element, Li (lithium). There's one on the reactants side and 2 on the products, so I'll add a coefficient of 2 to the reactants to balance: $2 \text{Li} + \text{O}_2 \rightarrow \text{Li}_2\text{O}$

2) Now for O (oxygen). 2 on reactants, 1 on product so I'll put a 2 in front of Li_2O to balance:



3) Whoops, that affects lithium. I now have four on the products side, so I'll go back and change the "2" to a "4" on the reactants side: $4 \text{Li} + \text{O}_2 \rightarrow 2 \text{Li}_2\text{O}$ **BALANCED!!!! @**

Practice: Balance each of the following chemical reaction equations. Check your answer by counting each element on each side when you think you're done.



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JS Bruner



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