**Molar Ratios**

The molar ratio will assume a place of central importance in solving stoichiometry problems. The sources for these ratios are the coefficients of a balanced equation. We will look at what a molar ratio is and then a brief word on how to recognize which ratio to use in a problem.

Here is an easy sample equation:

2 H2 + O2 ---> 2 H2O

What is the molar ratio between H2 and O2?

Answer: two to one. So this ratio in fractional form is: http://www.chemteam.info/Stoichiometry/Molar-Ratio-2-1.GIF

What is the molar ratio between O2 and H2O?

Answer: one to two. As a fraction, it is: http://www.chemteam.info/Stoichiometry/Molar-Ratio-1-2.GIF

What is the molar ratio between H2 and H2O?

Answer: two to two or: http://www.chemteam.info/Stoichiometry/Molar-Ratio-2-2.GIF

As you know, this reduces to one to one.

Here's another example equation:

2 O3 ---> 3 O2

The exact molar ratio you would use depends on how the problem is worded.

What is the molar ratio between O3 and O2?

What is the molar ratio between O2 and O3?

The first one, of course, is: http://www.chemteam.info/Stoichiometry/Molar-Ratio-2-3.GIF

And the second simply reverses the numbers: http://www.chemteam.info/Stoichiometry/Molar-Ratio-3-2.GIF

Before looking at the practice problems, an important point: the coefficients of a reaction only give the ratio in which substances react. They do not in any way tell you HOW MUCH is reacting.

**Practice Problems**

Following each equation are two requests for molar ratios from the equation.

1) N2 + 3 H2 ---> 2 NH3

Write the molar ratios for N2 to H2 and NH3 to H2.

2) 2 SO2 + O2 ---> 2 SO3

Write the molar ratios for O2 to SO3 and O2 to SO2.

3) PCl3 + Cl2 ---> PCl5

Write the molar ratios for PCl3 to Cl2 and PCl3 to PCl5.

4) 4 NH3 + 3 O2 ---> 2 N2 + 6 H2O

Write the molar ratios for NH3 to N2 and H2O to O2.

5) Fe2O3 + 3 CO ---> 2 Fe + 3 CO2

Write the molar ratios for CO to CO2 and Fe to CO.

**Answers**

1) N2 + 3 H2 ---> 2 NH3

Molar Ratio

N2 to H2 http://www.chemteam.info/Stoichiometry/Molar-Ratio-1-3.GIF

NH3 to H2 http://www.chemteam.info/Stoichiometry/Molar-Ratio-2-3.GIF

2) 2 SO2 + O2 ---> 2 SO3

Molar Ratio

O2 to SO3 http://www.chemteam.info/Stoichiometry/Molar-Ratio-1-2.GIF

O2 to SO2 http://www.chemteam.info/Stoichiometry/Molar-Ratio-1-2.GIF

3) PCl3 + Cl2 ---> PCl5

Molar Ratio

PCl3 to Cl2 http://www.chemteam.info/Stoichiometry/Molar-Ratio-1-1.GIF

PCl3 to PCl5 http://www.chemteam.info/Stoichiometry/Molar-Ratio-1-1.GIF

4) 4 NH3 + 3 O2 ---> 2 N2 + 6 H2O

Molar Ratio

NH3 to N2 http://www.chemteam.info/Stoichiometry/Molar-Ratio-4-2.GIF

H2O to O2 http://www.chemteam.info/Stoichiometry/Molar-Ratio-6-3.GIF

5) Fe2O3 + 3 CO ---> 2 Fe + 3 CO2

Molar Ratio

CO to CO2 http://www.chemteam.info/Stoichiometry/Molar-Ratio-3-3.GIF

Fe to CO http://www.chemteam.info/Stoichiometry/Molar-Ratio-2-3.GIF