**WHAT IS A LIMITING REAGENT?**

What is a limiting reagent? Simply put, it is the chemical that will run out first when you are creating a compound.

For example, if I have a cake mix that needs 3 eggs and a cup of milk to complete and I have 2 cake mixes, 3 cups of milk, and a dozen eggs how many cakes can I make?

1 cake = 3 eggs. 1 milk, 1 mix 3 cakes = 9 eggs, 3 milk, 3 mix

2 cakes = 6 eggs, 2 milk, 2 mix 4 cakes = 12 eggs, 4 milk, 4 mix

Although I have milk enough for three cakes; and enough eggs for four cakes; I only have two cake mixes, so the mix is my **limiting reagent**, *the element I will* ***run out of first*** *and that will determine how many cakes I can make*. Substitute a chemical formula for a cake recipe and you get the picture!

**HOW TO FIGURE LIMITING REAGENTS**

1. Write and balance the equation, which is the “recipe” for this compound: Mg + 2 Cl 🡪 MgCl2
2. Look at the ratio between the two elements/ions: 1 Mg + 2Cl = 1:2 ratio Mg:Cl
3. Use dimensional analysis to figure out which one is the limiting reagent:

An easy mnemonic to remember the steps of the dimensional analysis is **“Gosh My Mother’s Glad”**

Grams (of the first) to Moles (of the first) to Moles of Other (the ratio between the two, found from the written balanced equation) to Grams (of the second).

Example: You have 10.0 grams of magnesium and 20.0 grams of chloride. How many grams of magnesium chloride can you make?

10 g Mg x (1mol Mg/24.31 g Mg) x (2 mols Cl/1 mol Mg) x (35.45 g Cl/1 mol Cl) = 29.16 grams Cl

This is how many grams of chloride are needed to react all 10.0 grams of magnesium. Since you only have 20.0 grams of chloride, this is the limiting reagent.

**BUT WAIT! YOU ARE NOT DONE YET!!!!!!!!!!!!!!**

You still need to figure how many grams of MgCl2 you can make if you have 10.0 grams of magnesium and 20.0 grams of chloride!

1. Use dimensional analysis to solve:

20.0 grams x ( 1 mol Cl/35.45 g Cl) x (1 mol MgCl2/2 mol Cl) x (95.21 g MgCl2/ 1 mol MgCl2) =

**26.82 g MgCl2­**