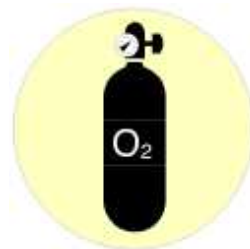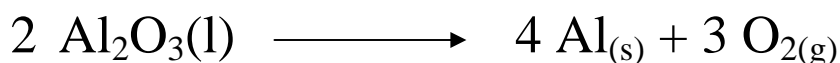## 7:3 A Stoichiometry

Stoichiometry is the branch of chemistry that deals with the mass relationships between reactants and the products in chemical reactions. It is nice to know how much of a product will be produced given the amount of reactants and how to make sure that the correct amounts are mixed as not to waste any materials.

1. First and foremost, there must be a correctly balanced equation with the correct formulas.

2. Mole-to-Mole ratio – Moles of substance A yields moles of substance B. This can be read directly from the balanced equation. As an example:

$$2 \ Al_2O_3(l) \longrightarrow 4 \ Al_{(s)} + 3 \ O_{2(g)}$$

In this reaction 2 moles of the reactant yield 4 moles of the aluminum product. The ratio is always 2:4 or 1:2. Suppose a student starts with 4 moles of the product. She will get 8 moles of the reactant. It will always follow a 1:2 ratio.

7:3 B Stoichiometry

3. Mass to mole calculations: If a student starts with 10 grams of reactant, how many moles of product will be produced? Convert grams to moles by (grams of reactant/molar mass of reactant)=moles of reactant. As and example:

(10 g of Al_2O_3 / 113 g/mole (m.w. of Al_2O_3))=. 088 moles Because of the 1 to 2 ratio, then there are .18 moles of the Al product.

4. Mole to mass calculation: How many grams of product are there? Simply convert moles of Al (.18 moles) to grams of Al.

0.18 moles of Al x 27 g/moles = 4.8 g of Al

NOTE: A common mistake is to multiply the 0.18 x 4. Do not do this. The four was already used in the ratio. It is a straight mole to grams calculation.