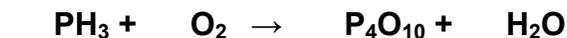


Worksheet 4 - Balancing Reactions, Stoichiometry and Limiting Reagents

- Write out the following reactions, and balance them.
 - Sodium sulfate reacts with carbon to form sodium sulfide and carbon dioxide.
 - Nitrogen dioxide reacts with water to form nitric acid and nitrogen monoxide.
- Balance the following reactions:
 - $__ \text{Cl}_2 (\text{aq}) + __ \text{H}_2\text{O} (\text{l}) \rightarrow __ \text{HCl} (\text{aq}) + __ \text{HOCl} (\text{aq})$
 - $__ \text{PCl}_3 (\text{aq}) + __ \text{H}_2\text{O} (\text{l}) \rightarrow __ \text{H}_3\text{PO}_3 (\text{aq}) + __ \text{HCl} (\text{aq})$
 - $__ \text{P}_2\text{H}_4 (\text{l}) \rightarrow __ \text{PH}_3 (\text{g}) + __ \text{P}_4 (\text{g})$
- Balance the reaction for the combustion of propane, C_3H_8 to answer the following questions.
$$__ \text{C}_3\text{H}_8 (\text{g}) + __ \text{O}_2 (\text{g}) \rightarrow __ \text{CO}_2 (\text{g}) + __ \text{H}_2\text{O} (\text{l})$$
 - How many moles of oxygen (g) are required to react with one mole of propane?
 - How many moles of propane must be burned in order to produce **0.37 g** CO_2 ?
 - How many grams of propane is this?

Limiting Reagent - This is the reactant which controls the extent of the reaction. It will be based on the mass of the reactants present, and on the stoichiometry of the reaction.

4. If **6.80 g** of **PH₃** and **6.80 g** of **O₂** are combined according to the (unbalanced) reaction shown below,



Which is the limiting reagent?

How many grams of the excess reagent will remain unreacted?

How many grams of P₄O₁₀ will be formed?

- a. Balance the equation. Use this to answer the following questions.
- b. Determine the number of moles of each reactant present.
- c. Pick either reactant and, based on the stoichiometry, determine how much of the second reactant would be required to react with it.
- d. Decide which reactant is the limiting reagent.
- e. How many **moles** of the non-limiting reactant will be consumed?
- f. How many **moles** and **grams** of the non-limiting reactant will remain?

- g. How many **grams** of **P₄O₁₀** will be formed?
- h. When the experiment is carried out, only **6.58 g** of **P₄O₁₀** are formed.

What is the **percent yield?** (actual yield / theoretical yield)