

## Chemistry Notes 9/13/13

### Warm Up

Bleach is made by the following synthesis:  $2\text{NaOH}_{(aq)} + \text{Cl}_{2(aq)} \rightarrow \text{NaOCl}_{(aq)} + \text{NaCl}_{(aq)} + \text{H}_2\text{O}_{(l)}$ ; how many grams of NaOH are needed to react with 25.0g of  $\text{Cl}_2$ ?

$2\text{NaOH}$ : 80g/mol

$\text{Cl}_2$ : 71g/mol

$71/25 = 2.84$

$80/2.84 = 28.2\text{g}$  of NaOH

**Limiting Reactant (Limiting Reagent):** A reactant that "runs out" and limits how much product can be made.

- If you have two moles of  $\text{N}_2$  and three moles of  $\text{H}_2$ , which reactant will limit of how  $\text{NH}_3$  can be made?
  - o  $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$
  - o  $\text{H}_2$  will limit the amount of ammonia that can be made
- How many moles of  $\text{N}_2$  are left over?
  - o One mole of  $\text{N}_2$ 
    - It is said in this case that the Nitrogen is *in excess*
- If you begin with 3.44 moles of  $\text{N}_2$  and 1.39 moles of  $\text{H}_2$ , how many moles of  $\text{NH}_3$  can be made?
  - o  $1.39/3 = .463$
  - o  $2 \times .463 = .926$  mol  $\text{NH}_3$
- How many grams of ammonia could be made?
  - o 1 mol  $\text{NH}_3 = 17\text{g}$
  - o  $17 \times .926 = 15.7\text{g}$   $\text{NH}_3$

**Theoretical Yield:** The amount of product that could be made according to calculations



- If 14.3g of Zn are mixed with 7.44g of S, how much ZnS can form in grams
  - o  $14.3/65.37 = .219$  mol Zn
    - ^ Limiting Reagent
  - o  $7.44/32.00 = .232$  mol S
  - o .219 mol of ZnS can be made
  - o  $.219 \times (32.00 + 65.37) = 21.3\text{g}$  of ZnS



- If you begin with 100.0g of  $\text{CaC}_2$  and 100.0g of  $\text{H}_2\text{O}$  which is the limiting reagent?
  - $100.0\text{g}/64.10\text{g} = 1.560\text{ mol}$
  - $100.0\text{g}/32.04\text{g} = 3.121\text{ mol}$
  - **The limiting reagent is  $\text{CaC}_2$**
- What is the theoretical yield of  $\text{Ca(OH)}_2$ ?
  - $1.56\text{mol} * 74.10\text{g} = \mathbf{116\text{g Ca(OH)}_2}$
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