Concentration of Solutions

Percent by Mass:

$$\%\ \text{Mass of solute (W/W)} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100 \times \frac{1}{d}$$

*Mass of solution = mass of solute + mass of solvent

*d = density

Concentration of Solutions

- Calculate the mass of 8.00% w/w NaOH solution that contains 32.0 g of NaOH.

Answer: 400. g solution

Concentration of Solutions

- What mass of NaOH is required to prepare 250.0 g of solution that is 8.00% w/w NaOH?

Answer: 20.0. g NaOH

Concentration of Solutions

- Calculate the mass of NaOH in 300.0 mL of an 8.00% w/w NaOH solution. Density is 1.09 g/mL.

Answer: 26.2 g NaOH

Limiting Reactant Concept

- Kitchen example of limiting reactant concept.

1 packet of muffin mix + 2 eggs + 1 cup of milk

→ 12 muffins

- How many muffins can we make with the following amounts of mix, eggs, and milk?

Limiting Reactant Concept

Mix Packets	Eggs	Milk
1	1 dozen	1 gallon
limiting reactant is the muffin mix		
2	1 dozen	1 gallon
3	1 dozen	1 gallon
4	1 dozen	1 gallon
5	1 dozen	1 gallon
6	1 dozen	1 gallon
7	1 dozen	1 gallon
limiting reactant is the dozen eggs		

Limiting Reactant Concept

- Suppose a box contains 87 bolts, 110 washers, and 99 nuts. How many sets, each consisting of one bolt, two washers, and one nut, can you construct from the contents of one box?

$$87\ \text{bolts}\left(1\ \text{set}/1\ \text{bolt}\right) = 87\ \text{sets}$$

$$110\ \text{washers}\left(1\ \text{set}/2\ \text{washers}\right) = 55\ \text{sets}$$

$$99\ \text{nuts}\left(1\ \text{set}/1\ \text{nut}\right) = 99\ \text{sets}$$

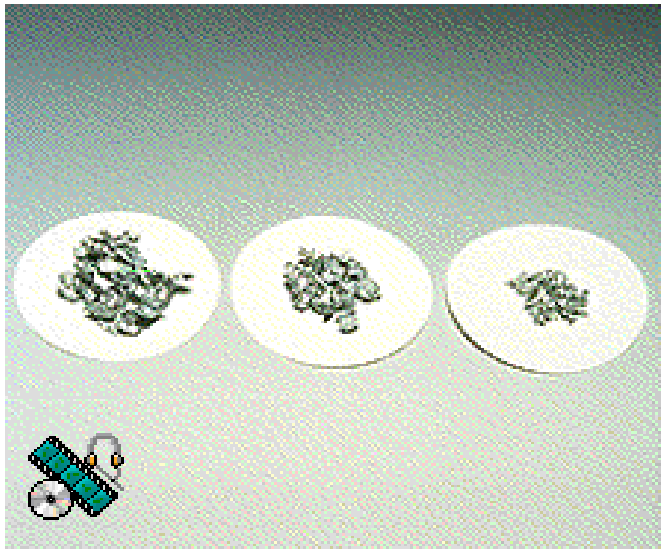
$$\text{the maximum number we can make is } 55\ \text{sets}$$

$$\text{determined by the smallest number}$$

Limiting Reactant Concept

- Look at a chemical limiting reactant situation.

$$Zn + 2\ HCl \rightarrow ZnCl_2 + H_2$$



What mass of CO_2 could be formed by the reaction of 16.0 g of CH_4 with 48.0 g of O_2?

How many grams of NH_3 can be prepared from 89.78 g of N2 and 18.17 g of H_2?

Answer: 102.3 g NH_3