Stoichiometry and Limiting Reagent:

A reaction equation represent or depict a process in which the reactants or starting materials are converted into products.

Reactant 1 + Reactant 2 → Product

→ Symbolizes “yields”

Stoichiometry:

Consider the reaction

$$X + Y \rightarrow Z$$

This tells the reader that
1 unit of X reacts with 1 unit of Y and yields
1 unit of Z.

Likewise,

1 mole of X + 1 mole Y yields 1 moles Z

Ex: How much Z is produced if 15.0 mol of X is used with excess Y?

$$X + Y \rightarrow Z$$

From reaction equation

1 mole X = 1 mole Z

$$15.0 \text{ mol X} \times \frac{1 \text{ mol Z}}{1 \text{ mol X}} = 15.0 \text{ mol Z}$$

Ex:2 How much Z is produced if 15.0 mol of A is used with excess B an an alternate synthesis?

$$2A + 3B \rightarrow Z$$

From reaction equation

2 mole A = 1 mole Z

$$15.0 \text{ mol A} \times \frac{1 \text{ mol Z}}{2 \text{ mol A}} = 7.50 \text{ mol Z}$$

Yield:

Actual Yield: The amount of product actually obtained in a synthesis. "Real world result."

Theoretical Yield: The amount of product that should be obtained based on the amount of reactants used in the reaction. "Expected"

$$\text{percent yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100\,\%$$

Limiting Reagent:

Limiting reagent is the reagent used in the synthesis that is consumed completly and limits how much product is obtained.

Consider the reaction

$$X + Y \rightarrow Z$$

If 12.5 mol of X is reacted with 11.0 mol of Y.

Consider the reaction

$$X + Y \rightarrow Z$$

Initial:	**12.5 mol X**	**11.0 mol Y**	**0 mol Z**
Change:	**-11.0 mol X**	**-11.0 mol Y**	**+11.0 mol Z**
Final:	**1.5 mol X**	**0.0 mol Y**	**11.0 mol Z**

Limiting reagent: Y

Theoretical Yield: 11.0 mol Z

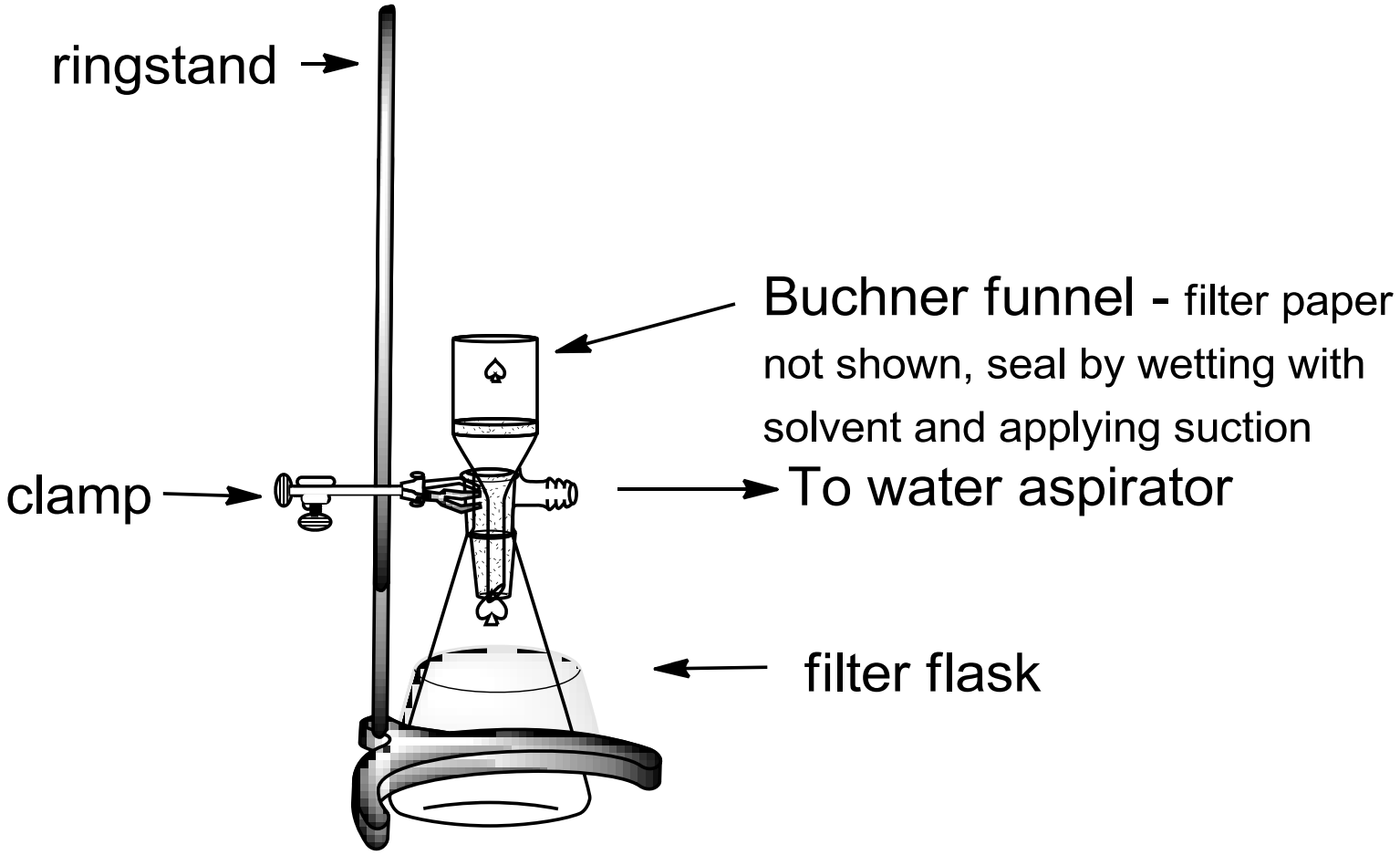
Experiment Reaction:

$$CaCl_2 \cdot 2H_2O(aq) + K_2C_2O_4 \cdot H_2O(aq) \rightarrow CaC_2O_4 \cdot H_2O(s) + 2KCl(aq) + 2H_2O(l)$$

Will prepare a mixture of the two reactants $CaCl_2 \cdot 2H_2O(s)$ and $K_2C_2O_4 \cdot H_2O(s)$ and dissolve in water.

Then predict the limiting reagent and the theoretical yield.

Vacuum Filtration:



Remove rubber tubing connection from aspirator before turning off water