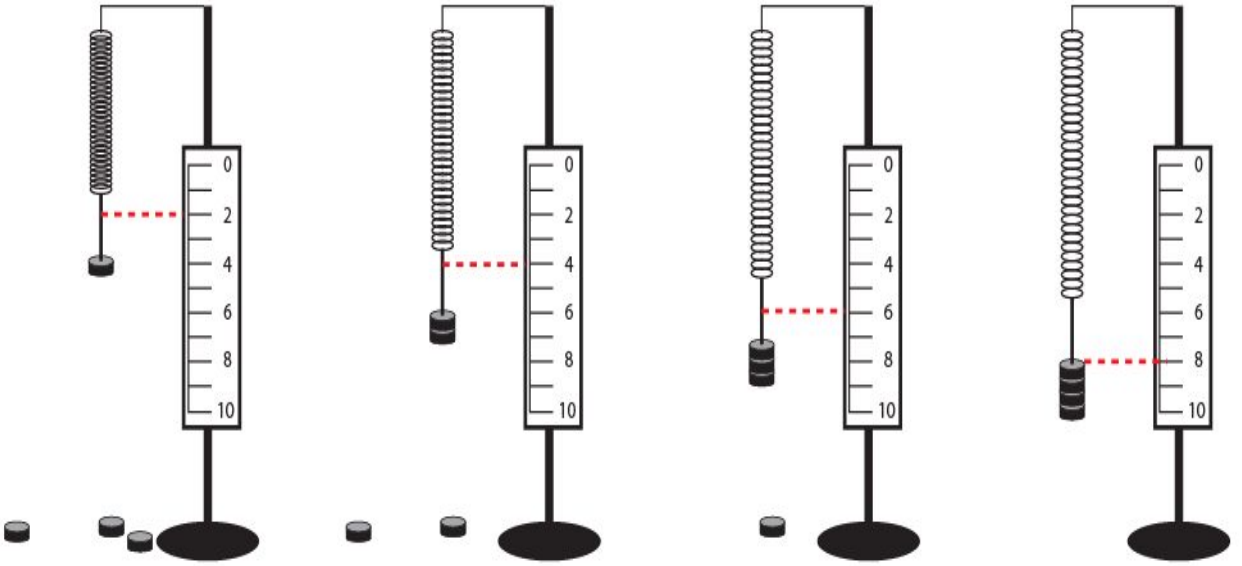
Stoichiometry

Picture Vocabulary

C3DE Stoichiometry

Mass



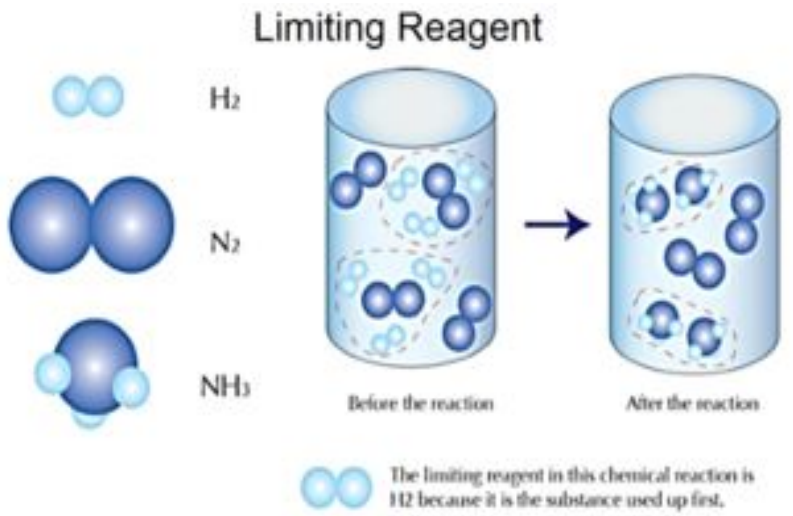
A measure of how much matter is present in a substance

Mole

$$M = \frac{\text{moles of solute}}{\text{volume of solution}}$$

The SI unit is used to describe an amount of a substance. The mole is equal to 6.02×10^{23} atoms or molecules of a substance. One mole is the amount of any substance that contains the same number of units as the number of atoms in exactly 12 grams of carbon-12.

Limiting reactant



Any reactant that is the first to be completely consumed in a chemical reaction, limiting the amount of product that can be produced

Theoretical yield

$$\text{Theoretical Yield} = 0.00153 \text{ mol Sal. Acid} \times \frac{1 \text{ mol ASA}}{1 \text{ mole Sal. Acid}} \times \frac{180.2 \text{g ASA}}{1 \text{ mol ASA}}$$

$$= 0.276 \text{g ASA}$$

A quantity that is always calculated and shows the theoretical amount of product that could be produced in an ideal chemical reaction in which there is a complete conversion of reactant(s) to product(s)

Actual yield

The mass of silver chloride in this reactor has an actual yield of 35.6 g. What is the theoretical yield and percent yield?

$$AgNO_3 + HCL \longrightarrow AgCL + HNO_3$$
50 g 50g 35.6g

$$\frac{50\text{g } AgNO_3}{} \left| \frac{1 \text{ mol } AgNO_3}{169.88\text{g } AgNO_3} \right| \frac{1 \text{ mol AgCl}}{1 \text{ mol } AgNO_3} = 0.29 \text{ mol AgCl}$$

$$\frac{50\text{g HCl}}{} \left| \frac{1 \text{ mol HCl}}{36.46\text{g HCl}} \right| \frac{1 \text{ mol AgCl}}{1 \text{ mol HCl}} = 1.37 \text{ mol AgCl}$$

$$\frac{0.29 \text{ mol AgCl}}{} \left| \frac{143.32\text{g}}{1 \text{ mol AgCl}} \right. = 41.6\text{g AgCl}$$

$$\frac{35.6\text{ g}}{41.6\text{ g}} \times 100 = 85.6\%$$

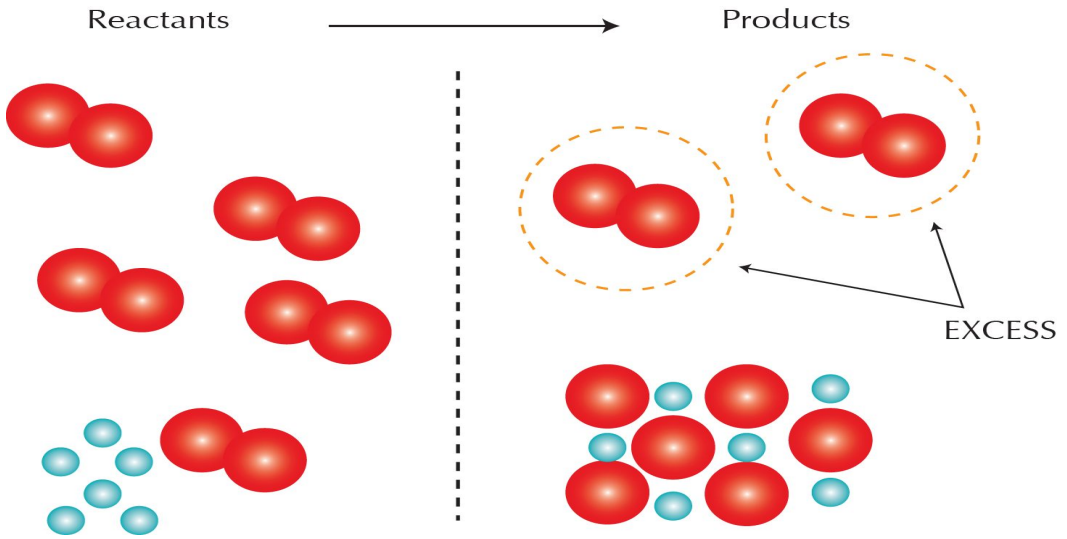
A measured quantity of the actual amount of product produced during a chemical reaction

Percent yield

$$\text{Percent Yield} = \frac{\text{Actual Yield}}{\text{Theoretical Yield}} \times 100$$

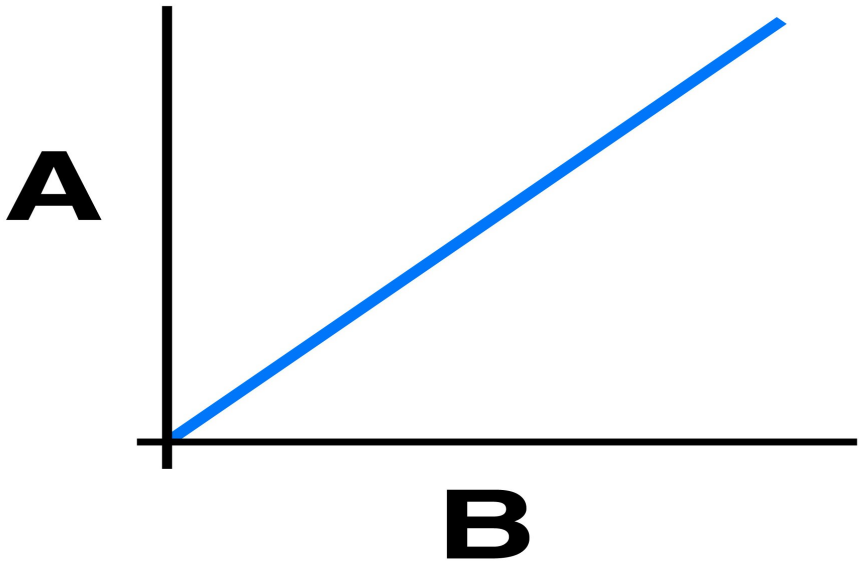
The ratio of the actual yield to the theoretical yield for a chemical reaction expressed as a percentage, shown as actual yield/theoretical yield x 100

Excess reagent



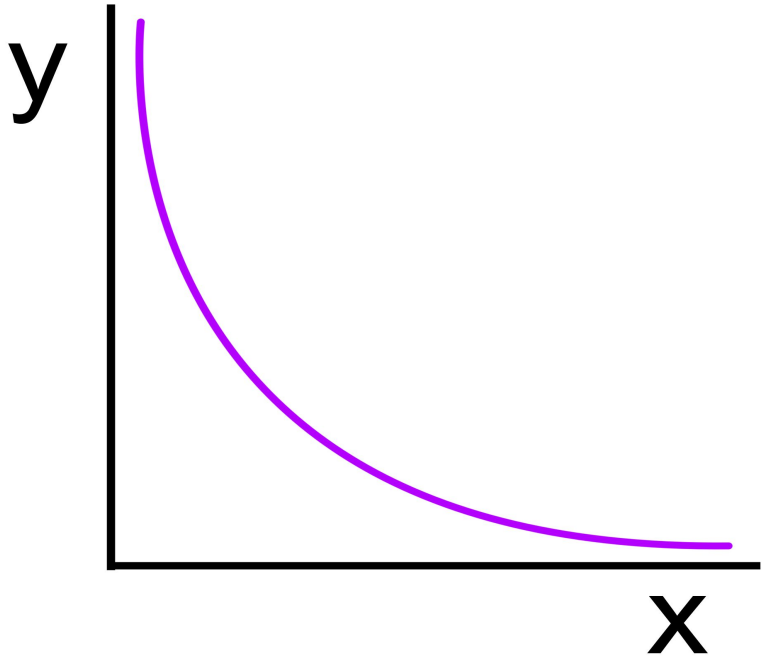
Any reactant that remains after the reactants in a chemical reaction have completely reacted

Directly proportional



A relationship between variables in which the value of one variable can always be determined by multiplying the value of the other variable by a constant

Inversely proportional



One variable decreases while the other variable increases, provided their product remains constant