

CHE 205 MASS AND ENERGY BALANCES

Instructors: Assoc. Prof. Ayşe Karakeçili

Assist. Prof. Berna Topuz

CHEMICAL COMPOSITION

ATOMIC WEIGHT; is defined as the mass of an atom on ^{12}C scale.

MOLECULAR WEIGHT; is the sum of the atomic weights of all the atoms that constitute the molecule.

The molecular weight can be used to establish the relation between mass flow rate and molar flow rate.

MASS FRACTION:

$$X_A = \frac{\text{mass of } A}{\text{total mass}} \left(\frac{\text{kg } A}{\text{kg total}} \right)$$

MOLE FRACTION:

$$Y_A = \frac{\text{moles of } A}{\text{total moles}} \left(\frac{\text{kmol } A}{\text{kmol}} \right)$$

AVERAGE MOLECULAR WEIGHT:

$$\bar{M} = y_1 M_1 + y_2 M_2 + \dots = \sum_{\text{all components}} y_i M_i$$

CONCENTRATION:

Mass concentration of a component of a mixture is defined as the mass of this component to the volume of the mixture.

Molar concentration is the number of moles of component per unit volume of the mixture.

Molarity of a solution is defined as the value of molar concentration expressed in gram-moles of solute per liter solution.

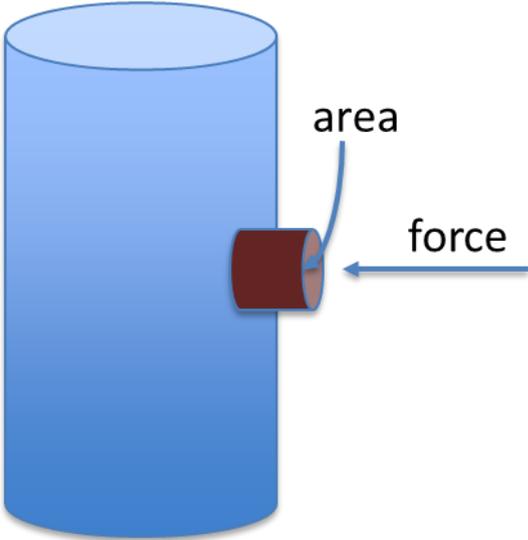
Parts per million (ppm) and parts per billion (ppb) are used to define the concentration of trace elements in mixtures of gases or liquids.

YOUR TURN:

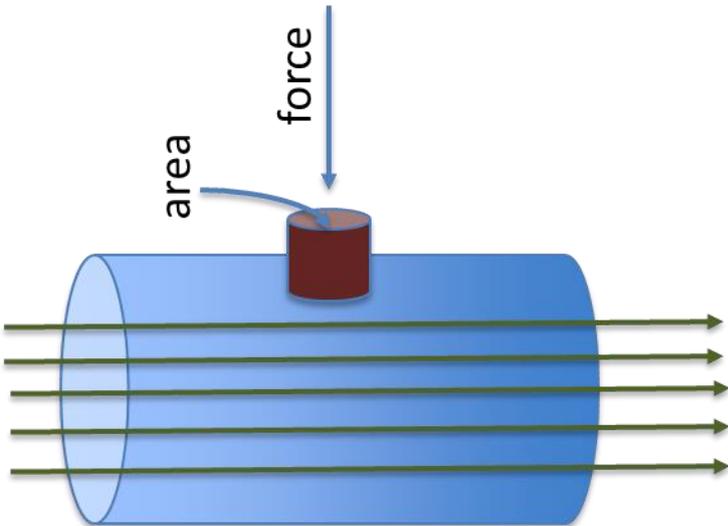
- 1. A solution contains n_1 mol of solute A with a molecular weight of M_1 (kg A/ mol). If the volume of this solution is V_1 (L), calculate the molar concentration and mass concentration of A.**
- 2. How many lb-moles and lb_m of C are contained in 1 lb-mole of CO_2 ?**

PRESSURE; is the ratio of a force (F) acting on a specified area (A)
(N/m^2 , dynes/cm^2).

The fluid pressure can be defined as the ratio of minimum force against the water surface area by means of a plug to prevent the water from emerging.



Fluid pressure in a tank.



Fluid pressure in a pipe.