God first

Department of Chemical engineering

Basic principles and calculation in chemical engineering

HW#1   units and conversion   Dr. N.Rahemi

1. Imagine in a refinery, one of the branches from a separator has a flow rate of **1ft/day**. State this flow rate in units of **m/hr** and **inch/year**.
2. The formula blow is called Darcy law in a porous media:

$$q = k\frac{A}{\mu}\frac{\Delta P}{L}$$

   Where q (volume per time) is flow rate, A is cross sectional area, μ is viscosity (g/cm.s), ΔP is pressure drop, L is length of the rock and K is permeability factor.

   a) Determine the dimension of factor K.
   b) In cgs system, the Darcy law is written as blew:

$$q = \alpha k\frac{A}{\mu}\frac{\Delta p}{L}$$

In cgs we have: (q in cc/sec , A in cm^2, μ in cp , ΔP in atm and L in cm)

Determine the value of α in this system:

q(bbl/sec),A(ft^3),μ(cp),ΔP(psi),L(ft) which (1bbl=5.615ft^3).in both system the unite of k is the same.

3. The relation for Cp is given blew:

$$C_p = 20.869 + 5.293 \times 10^{-2}T$$

Which Cp is in $\frac{BTU}{lbmol\,F}$ and T is in F .

Rewrite the formula in a manner, which Cp is in, $\frac{cal}{gmol\,k}$ and T in K. (1 Btu=252 cal)

4. In a production of a drug having a molecular weight of 192, the exit stream from the reactor containing water and drug flows at the rate of 10.5 L/min. the drug concentration is 41.2% (in water), and the specific gravity of the solution is 1.024. Calculate the concentration of the drug (in kilograms per liter) in the exit stream and the flow rate of the druge in $kgmole/min.$

"Science is a saving account, what you put in; you get out, with interest"

Due date: 7th of Esfand !!