Homework 1   Due date: 17-Jan-2006

1. Thermal conductivity in the American Engineering system of units is:

$$k = \frac{Btu}{(h)(ft^2)\left(\,^oF\!\!\middle/\!\!ft\right)}$$

Change this to:

$$k = \frac{kJ}{(day)(m^2)\left(\,^oC\!\!\middle/\!\!cm\right)}$$

Btu = British thermal unit, and 1 Btu = 252 cal

2. The power required to run a pump is obtained by multiplying the pressure difference between outlet and inlet of the pump with volumetric flow rate

$$P = \Delta p Q$$

P is power, Δp is pressure difference and Q is flow rate. Specify the units of the variables in SI system for the above equation to be dimensionally homogeneous. Calculate P in hp (horse power) if Δp is 50 psi and Q is $35 t^3$/min. Note 746W = 1hp.

3. Complete problem 3 of tutorial 1.

4. Convert the following:
   a) 2 lb of acetic acid to g mol
   b) 100 g of nitrogen to lb mol
   c) 10 kg of water to g mol
   d) 50 lb of air to kmol

5. Convert the following:
   a) 10^oC to ^oR
   b) 500^oR to K
   c) 212^oF to K

6. How many significant figures would the solution of each of the following problems have? What are the solutions? (Read handout 1 on the course webpage)
   a) $(1.76 \times 10^4)(0.12 \times 10^{-6})$
   b) 18.76 - 7