

CHE-201
Term 072 (HW#2)

Q1. The pressure drop (lb_f/ft^2) in a pipe is represented by the following equation:

$$\Delta P = 14 \frac{L v \mu}{D^2}$$

where ΔP = pressure drop, lb_f/ft^2
L = pipe length, ft
v = fluid velocity, ft/s
 μ = fluid viscosity, $\text{lb}_m/\text{ft}\cdot\text{s}$
D = diameter of the pipe, ft

- a) Is the equation dimensionally homogeneous?
- b) Are units consistent? (if not), make it consistent.

Q2. Your handbook shows that microchip etching roughly follows the relation

$$d = 16.2 - 16.2e^{-0.021t}$$

Where d is depth of the etch in microns (micrometers, μm) and t is the time of the etch in seconds.

- a) What are the units associated with the numbers 16.2 in each term and 0.021.
- b) Convert the relation so that d becomes in inches and t can be used in minutes.

Q3. State what you would plot to get a straight line if experimental (x,y) data are to be correlated by the following relations, and what the slopes and intercepts would be in terms of the relation parameters. If you could equally well use two different kinds of plots (e.g. rectangular or semilog), state what you could plot in each case [the solution to part (a) is given as an example]

- a) $y^2 = ae^{-b/x}$ solution: construct a semilog plot of y^2 vs $1/x$ or a plot of $\ln(y^2)$ vs $1/x$ on rectangular coordinates, slope = -b, intercept = $\ln a$.
- b) $y^3 = mx^2 - n$
- c) $1/\ln(y-3) = (1+a\sqrt{x})/b$
- d) $(y+1)^2 = (1/a)(x-3)^{-3}$
- e) $y = \exp(a\sqrt{x} + b)$
- f) $y = \frac{10^{[a(x^2+y^2)+b]}}{x}$

Q4. Ex. 2.45 (a, b & c only)