**ES476/576 Hydrology**
**Review Problems: Physical Properties of Water**

Show all of your math work and unit algebra below. Draw a sketch where required.

1. Determine the following pressure equivalents:
    a. Average atmospheric pressure at the Earth's surface is 1013 millibars (mb) (weight of a column of air pressing down on you; determine the pressure equivalent in:

        psi_____

        bar_____

        Pa_____

        kPa_____

    b. At the deepest depths of the ocean along the Mariana trench, hydrostatic pressure is approximately 1086 bars; determine the pressure equivalent in
        psi _____

        mb_____

        Pa_____

        kPa_____

    c. The base of the Earth's continental crust is at a depth of approximatly 10 km, with a lithostatic pressure equivalent of 10 Kb (kilobars); determing the pressure equivalent in
        psi _____

        mb_____

        Pa_____

        kPa_____

2. The following is a listing of the average densities of the atmosphere, hydrosphere and lithosphere:    $D_{air}$ = 0.001225 g/cm$^3$       $D_{water}$ = 1 g/ cm$^3$        $D_{rock}$ = 2.7 g/ cm$^3$

    Calculate the following density equivalents:

        $D_{air}$= _____ kg/ m$^3$

        $D_{water}$ = _____ kg/ m$^3$

        $D_{rock}$ = _____kg/ m$^3$

    Calculate the following weight density equivalents (aka specific weight):

        $D_{air}$= _____ N/ m$^3$

        $D_{water}$ = _____ N/ m$^3$

        $D_{rock}$ = _____N/ m$^3$

3. Average ocean salinity is approximately a 3.5% solution of dissolved salts and ions (Cl, Na, Mg, Ca). Given that the density of water is 1 g/cm$^3$, and that 1 cm$^3$ = 1 ml in volume equivalents, determine the density of water in Kg/L.

$$D_{water} = \text{_____} \text{ kg/ L}$$

   a. What is the percent concentration of a salt solution in which 1 kg of salt is dissolved in 1 L of water (%concentration = mass of solute / mass of solvent x 100%).

   b. Determine the following concentrations of a saline solution in which 5 g of salt is dissolve in 1 liter of water:

      ppt _____

      ppm _____

      ppb _____

4. A storage tank holds 500,000 gallons of water with an input of 50 cfs and output of 73 cfs. Determine the following:
      i. Inflow _____ gpm
      ii. Outflow _____ cms
      iii. Change in storage flux per unit time _____ cfs
      iv. How much water is gained or lost from the storage tank after 1.3 hours?
            _____ gallons
            _____ cubic feet
            _____ kg