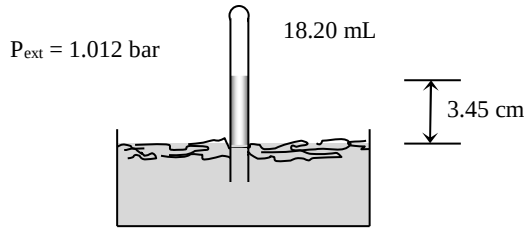
Handin 2: Concentrations and Partial Pressures

1. The O_2 generated from the decomposition of H_2O_2 is collected in an inverted tube filled with water. The volume collected is 18.20 mL at 20.0°C. The height of the water in the tube is 3.45 cm above the surface of the reservoir. Calculate the number of moles of O_2 produced. The ambient pressure is 1.012 bar. [Hint: Use Tables 2.1.1 and 2.2.1. Try Chapter 2 Problems 2 and 3, first.]



2. Calculate the molarity, molality, and solute mole fraction of a 5.000% by weight solution of nickel sulfate, $NiSO_4 \cdot 6\ H_2O$. The molar mass of the hydrated compound is 262.85 g mol^{-1}. The solution density is 1.0539 g mL^{-1}. [Try Chapter 2 Problems 4 and 5, first.]

3. (a). The euphotic zone in a lake extends to 2.65 m. Calculate the effective molar absorption coefficient of the water column assuming the dissolved colored organic matter concentration is 0.300 nM. (b). Assuming the light flux at the surface of the lake is the typical value for Boston, 4.16 kWh m^{-2} day^{-1}, calculate the light energy in J m^{-2} s^{-1} at the bottom of the euphotic zone. [Try Chapter 2 Problems 7, 12, and 13, first.]

4. Two well-stirred compartments are separated by a 2.50x2.50 cm membrane. The membrane is 0.0500 mm thick. The concentration of sucrose in the left compartment is 0.100 M and the concentration on the right is 0.0100 M. The volumes of both compartments are 250.0 mL. The concentration in the dilute compartment increases to 0.0150 M in 254. min. Calculate the diffusion coefficient across the membrane, assuming the flux is constant at the initial value. Assume a linear concentration gradient across the membrane. [Try Chapter 2 Problems 19-22, first.]