Pressure in gases. Atmospheric pressure

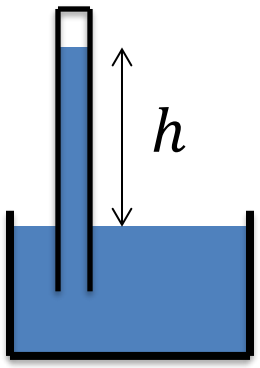
A gas is characterized by its temperature T

$$T \sim KE_{avg}$$

volume V and pressure p. These three quantities are related:

$$p = p(V, T)$$

Toricelli's experiment:



Atmospheric pressure:

$$p_{atm} = \rho_{merc} \cdot g \cdot h$$

$$p_{atm} = 100\ kPa$$

Homework 22

Problem 1.
If we replace mercury in the Torricelli's experiment with water, how high would the column of water in the tube be (assuming the tube is long enough that the vacuum forms at the top end)? The density of water is $1000\ \frac{kg}{m^3}$.

Problem 2.
Calculate the force with which the atmosphere pushes down on the top surface of a desk of a rectangular shape, 1 meter by 2 meters. How does this force compare to the weight of an elephant? The mass of the elephant is $5000\ kg$.

Problem 3.
You are designing a submarine and want it to have a round window for observations. The radius of the window is $10\ cm^2$. You can make the window withstand a force up to $50\ 000\ N$. What is the maximal depth you can take the submarine to? The density of ocean water is $1030\ \frac{kg}{m^3}$.