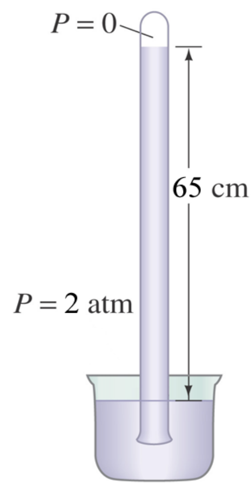
Phyx 135-1, Spring 2016, Quiz 6 **Name** ________________________________

1) (10 points) You have taken a mercury barometer to the planet Zargon. As shown at right, the atmospheric pressure on Zargon is 2 atm = 2.02×10^5 Pa. If the specific density of mercury is 13.56, what is the value of "g" (gravity) on the planet Zargon?

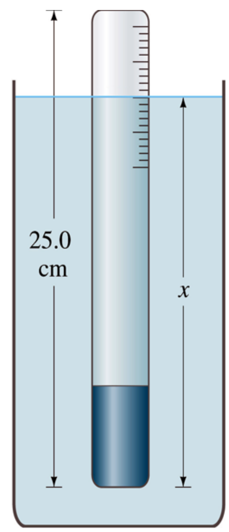


Solution

We know that $P = P_o + \rho gh$. In this case, the pressure above the mercury column is zero, so $P_o = 0$. The pressure at the bottom of the mercury column must equal the Zargonic atmospheric pressure, so we have:

$2.02 \times 10^5 = (13.56 \times 10^3)g(0.65)$, or g = $22.9\ m/s^2$

2) (10 points) A sealed tube that is 25 cm long and has no mass itself, is filled with air and 5.3 cm of an oily gunk which has a specific density of 3.70 g/cm^3. If I float the tube in a cylinder of water, how much of the tube will be underwater? In other words, calculate "x" in the diagram.



Solution

For the tube to float, the weight of the tube must equal the weight of the displaced water. We are not told what the cross-sectional area A of the tube is, but we know that V = Ah, so we will just plug that in and keep moving.

The mass of the tube = $\rho_{oil}V = \rho_{oil}\ A\ h_{oil} = (3.7\ g/cm^3)A(5.3\ cm) = (19.6\ g/cm^2)A$.

The mass of the displaced water = $\rho_{water}\ V = (1\ g/cm^3)Ax$.

Equating the weights gives us $(19.6\ g/cm^2)Ag = (1\ g/cm^3)Axg$, or
$19.6\ g/cm^2 = (1\ g/cm^3)x$, or x = 19.6 cm