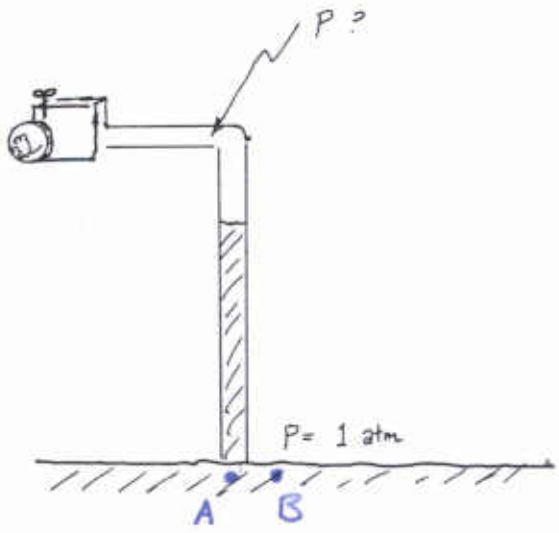
Name_____

Phys 121
Quiz #6



1. A pump works by drawing air out a pipe such that the water rises to a level of 7.2 m about its normal (exposed) level in a sealed tube.

a) Find the pressure of the air which remains in the part of the pipe between the pump and the water. Assume that the pressure of the air outside the pipe is 1.00 atm.

Pressures at points A and B are equal. If the air pressure in the pipe is P_{pipe}, this gives:

$$P_{pipe} + \rho_w g h = P_{atm}$$

where $h = 7.2\ m$ and $P_{atm} = 1\ atm = 1.013 \times 10^5\ Pa$

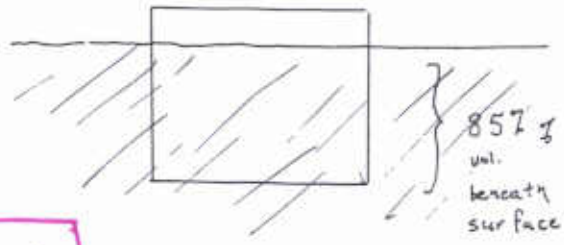
This gives:

$$P_{pipe} = P_{atm} - \rho_w g h = 1.013\times10^5\ Pa - \left(1.000\times10^3\ \frac{kg}{m^3}\right)\left(9.8\ \frac{m}{s^2}\right)(7.2\ m)$$

$$= 1.013\times10^5\ Pa - 7.06\times10^4\ Pa$$

$$= \boxed{3.07\times10^4\ Pa}$$

$V = 1000\ cm^3$
$M = 0.720\ kg$



2. A block of wood has a volume of 1000. cm^3 and a mass of 0.72 kg. It floats in some unknown liquid such that 85% of its volume is beneath the surface.

a) What is the volume of the block in m^3?

$$(1000\ cm^3)\cdot\left(\frac{1\ m}{100\ cm}\right)^3 = \boxed{1.0\times10^{-3}\ m^3}$$

b) What is the volume of the displaced fluid?

It is the part of the block's volume which lies beneath the surface:

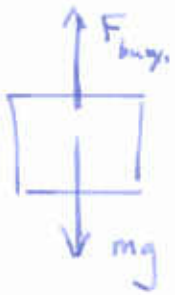
$$V_{disp} = (0.85)(1.0\times10^{-3}\ m^3) = \boxed{8.50\times10^{-4}\ m^3}$$

c) What is the buoyant force which acts on the block?

It must equal the weight of the block:

Thus

$$F_{buoy} = mg = (0.720\ kg)(9.80\ m/s^2) = \boxed{7.06\ N}$$



d) What is the weight of the displaced fluid?

It is the same as the buoyant force:

$$W_{disp} = F_{buoy.} = \boxed{7.06\ N}$$

e) What is the density of the fluid?

The weight of the disp'd fluid is

$$W_{disp} = \underbrace{(\rho_{fluid} V_{disp})}_{\text{mass of displaced fluid.}} g \quad \text{So:}$$

$$\rho_{fluid} = \frac{W_{disp}}{V_{disp}\cdot g} = \frac{7.06\ N}{(8.50\times10^{-4}\ m^3)(9.8\ m/s^2)} = \boxed{847\ kg/m^3}$$

You must show all your work!

$$P = \frac{F}{A} \qquad P_2 - P_1 = \rho g h \qquad 1\ \text{atm} = 1.013\times10^5\ \text{Pa} \qquad 1\ \text{Pa} = 1\ \tfrac{\text{N}}{\text{m}^2}$$

$$g = 9.80\ \tfrac{\text{m}}{\text{s}^2} \qquad \rho = \frac{M}{V} \qquad \rho_{\text{water}} = 1.00\times10^3\ \tfrac{\text{kg}}{\text{m}^3}$$

Buoyant force = Weight of displaced fluid