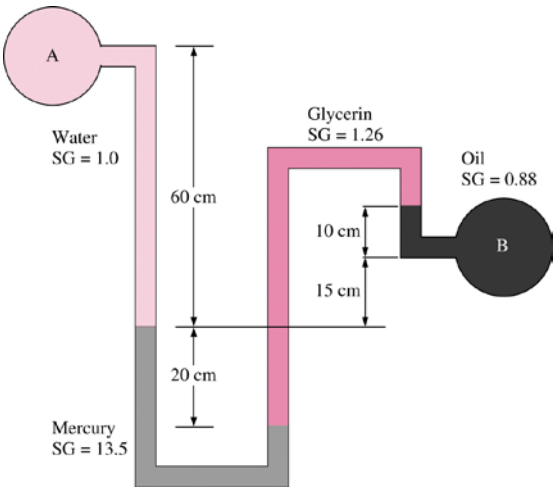
CHEN.3030 Fluid Mechanics (Section 202)

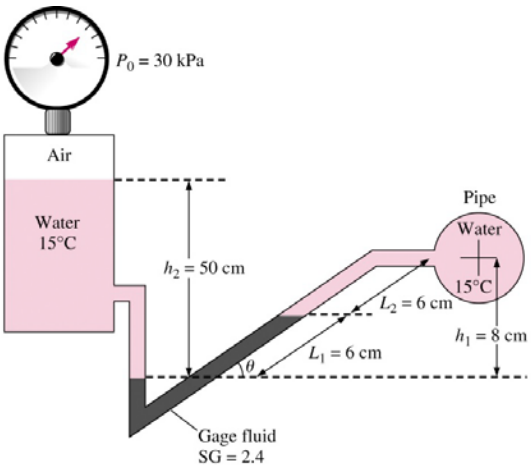
Homework Assignment #3 Spring 2017

Fluid Statics and Buoyancy

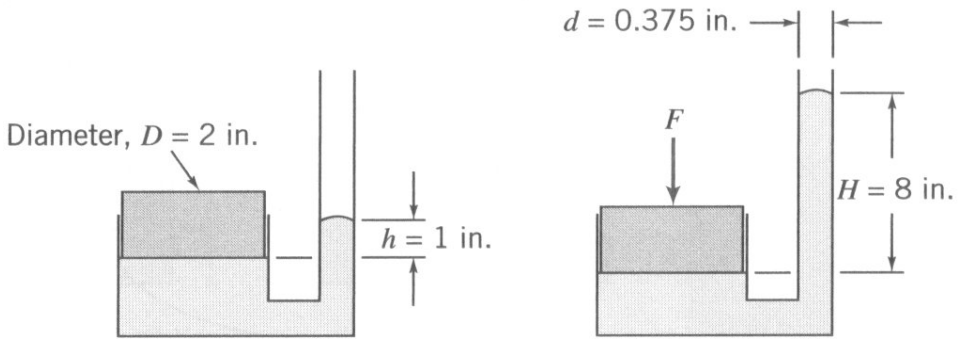
1. The pressure difference between an oil pipe and a water pipe is measured by the manometer shown in the sketch. For the given fluid heights and specific gravities, calculate the pressure difference, $\Delta P = P_B - P_A$.



2. The pressure of water flowing through a pipe is measured by an arrangement that involves both a pressure gage and a manometer, as shown. For the values given in the diagram, determine the pressure in the water pipe.



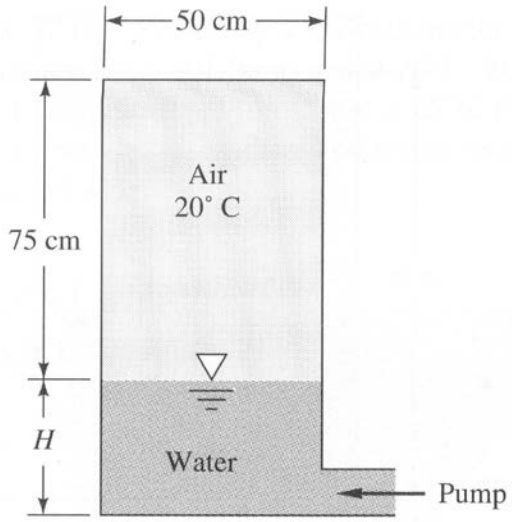
3. The tube shown is filled with mercury at 20 °C. With the information shown in the two sketches, calculate the force, F, applied to the piston. Assume no leakage along the sides of the piston.



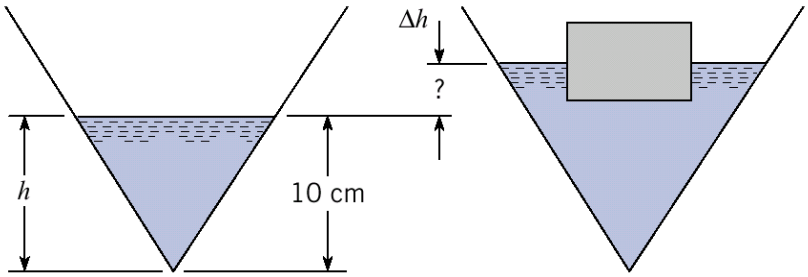
4. A cylindrical tank is being filled slowly with water at 20 C. At the instant shown in the diagram, the air pressure is 110 kPa (abs) and H = 35 cm.

The pump is switched off when its exit pressure (i.e. the pressure at the bottom of the cylinder) reaches 175 kPa (abs).

For isothermal air compression, estimate the value of H once the pump has stopped.



5. A 90^o inverted cone contains water as shown. The volume of water in the cone is given by $V = \pi h^3/3$. The original depth of the water is 10 cm. A block with a volume of 200 cm^3 and a specific gravity of 0.6 is placed in the water. What will be the change (in cm) in the water surface height in the cone?



6. The volume and average density of an irregularly shaped body are to be determined using a spring scale. Using the scale, the body weights 7200 N in air and 4790 N when completely submerged in water. Determine the volume and density of the body.

Explain the logic used in your calculations/analyses.