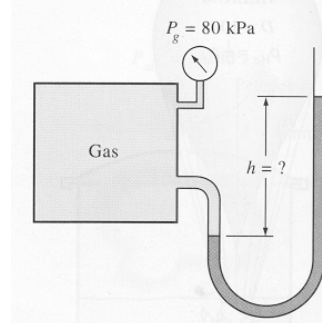
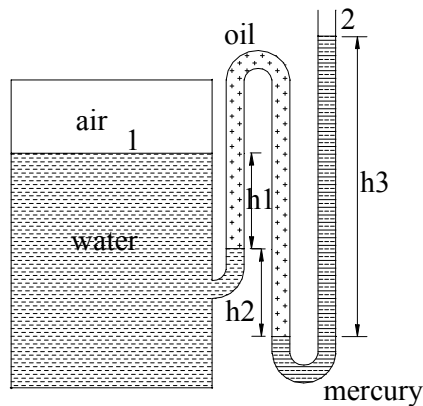


**Introduction to Thermodynamics and Heat Transfer (ECE 309)**  
Suggested Problems for Chapter 1

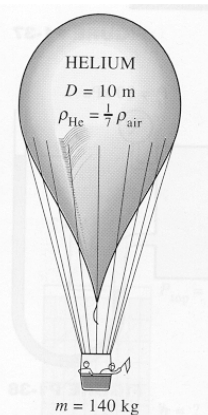
1. Both a gage and a manometer are attached to a gas tank to measure its pressure. If the reading on the pressure gage is 80 kPa, determine the distance between the two fluid levels of the manometer if the fluid is (a) mercury ( $\rho = 13,600 \text{ kg/m}^3$ ) or (b) water ( $\rho = 1000 \text{ kg/m}^3$ ).



3. The pressure in a pressurized water tank is measured by a multi-manometer as shown in the figure. Determine the gage pressure of air in the tank.



2. Balloons are often filled with helium gas because it weighs only about one-seventh of what air weighs under identical conditions. The buoyancy force which can be expressed as  $F_B = \rho_{\text{air}} g V_{\text{balloon}}$  will push the balloon upward. If the balloon has a diameter of 10 m and carries two people, 70 kg each, determine the acceleration of the balloon when it is first released. Assume the density of air is  $\rho = 1.16 \text{ kg/m}^3$ , and neglect the weight of the ropes and the cage. (Answer:  $16.5 \text{ m/s}^2$ )



3. Determine the maximum amount of load, in kg, the balloon described in Prob. 2 can carry. (Answer: 520.6 kg).

4. The lower half of a 10-m-high cylindrical container is filled with water ( $\rho = 1000 \text{ kg/m}^3$ ) and the upper half with oil that has a specific gravity of 0.85. Determine the pressure difference between the top and bottom of the cylinder. (Answer: 90.7 kPa)

