

3–4C Consider two identical fans, one at sea level and the other on top of a high mountain, running at identical speeds. How would you compare (a) the volume flow rates and (b) the mass flow rates of these two fans?

3–5C What is the difference between gage pressure and absolute pressure?

3–6C Explain why some people experience nose bleeding and some others experience shortness of breath at high elevations.

3–7 The piston of a vertical piston-cylinder device containing a gas has a mass of 40 kg and a cross-sectional area of 0.012 m^2 (Fig P3–7). The local atmospheric pressure is 95 kPa, and the gravitational acceleration is 9.81 m/s^2 . (a) Determine the pressure inside the cylinder. (b) If some heat is transferred to the gas and its volume is doubled, do you expect the pressure inside the cylinder to change?

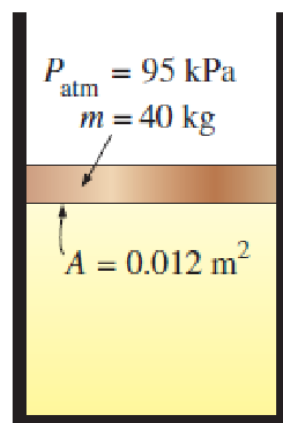


FIGURE P3–7

3–12 The water in a tank is pressurized by air, and the pressure is measured by a multifluid manometer as shown in Fig. P3–12. Determine the gage pressure of air in the tank if $h_1 = 0.4$ m, $h_2 = 0.6$ m, and $h_3 = 0.8$ m. Take the densities of water, oil, and mercury to be 1000 kg/m^3 , 850 kg/m^3 , and $13,600 \text{ kg/m}^3$, respectively.

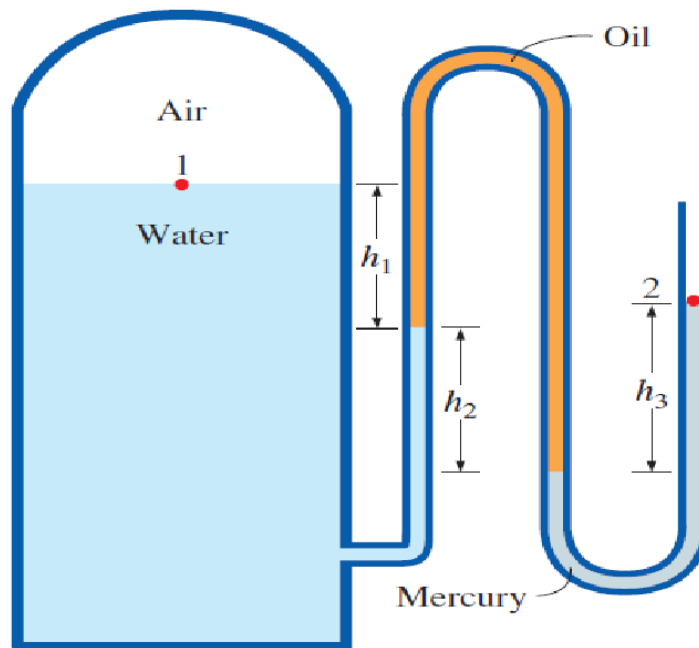


FIGURE P3–12

3–18 Consider a 55-kg woman who has a total foot imprint area of 400 cm^2 . She wishes to walk on the snow, but the snow cannot withstand pressures greater than 0.5 kPa . Determine the minimum size of the snowshoes needed (imprint area per shoe) to enable her to walk on the snow without sinking.

3–30 A gas is contained in a vertical, frictionless piston–cylinder device. The piston has a mass of 4 kg and a cross-sectional area of 35 cm². A compressed spring above the piston exerts a force of 60 N on the piston. If the atmospheric pressure is 95 kPa, determine the pressure inside the cylinder.
Answer: 123.4 kPa

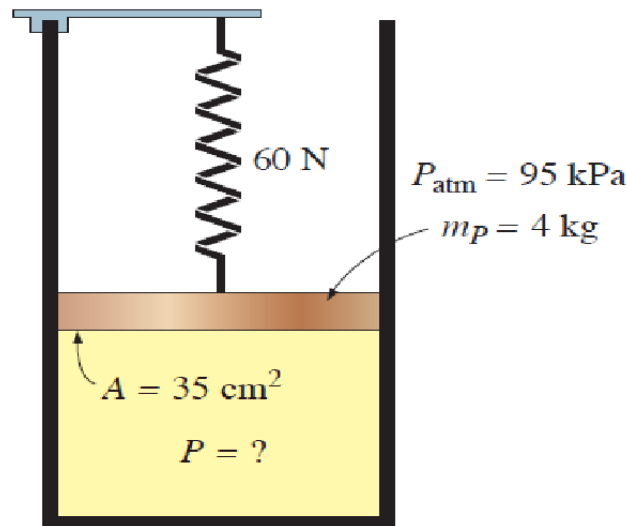
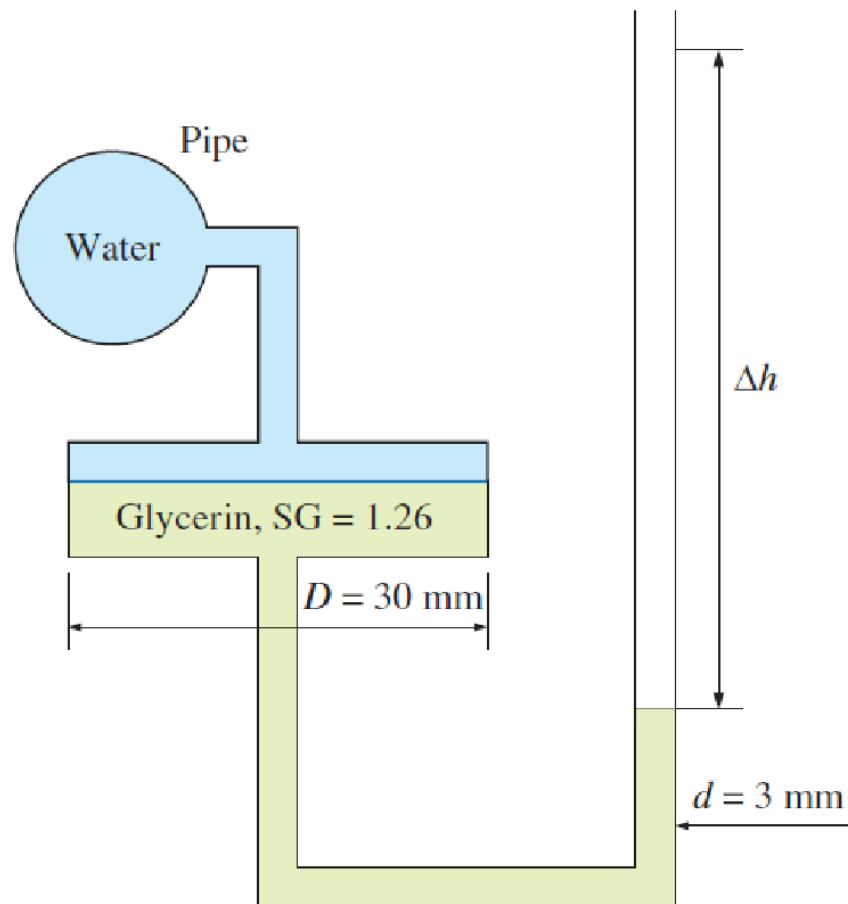


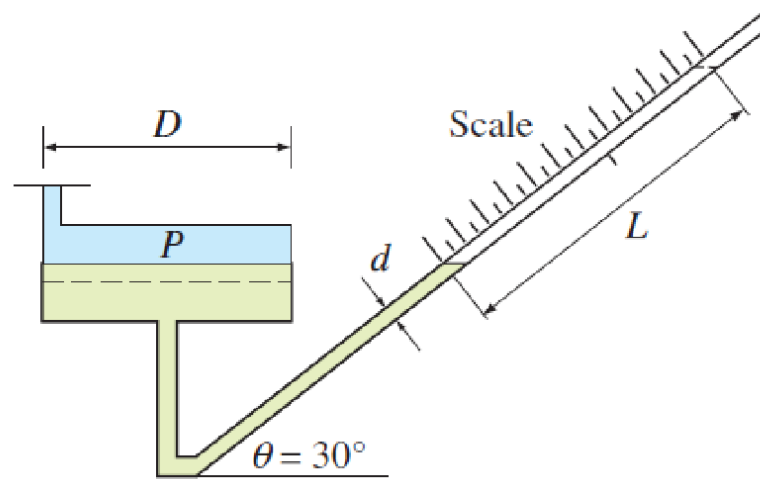
FIGURE P3–30

3–35 The system shown in the figure is used to accurately measure the pressure changes when the pressure is increased

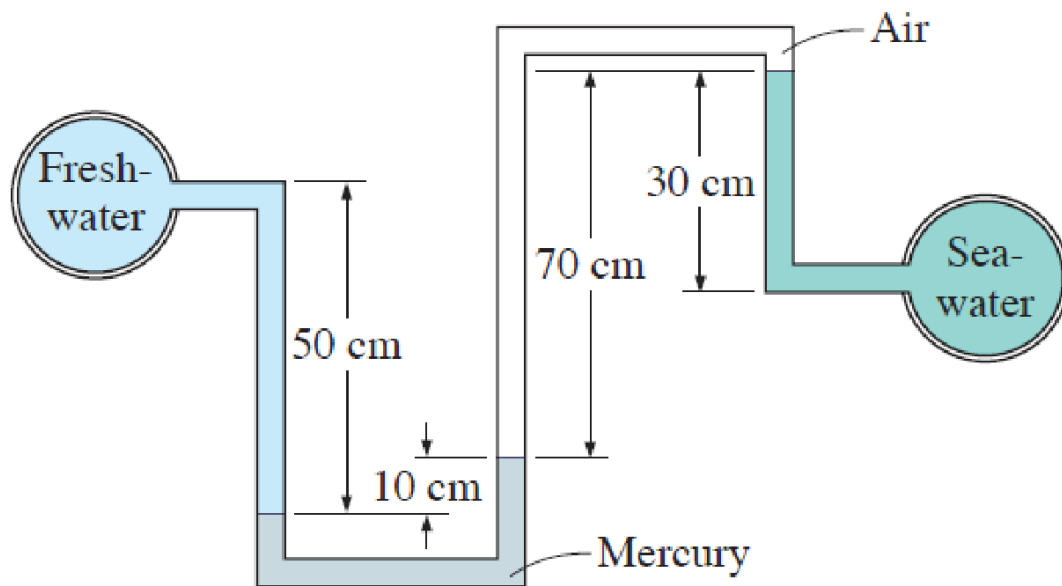


by ΔP in the water pipe. When $\Delta h = 70 \text{ mm}$, what is the change in the pipe pressure?

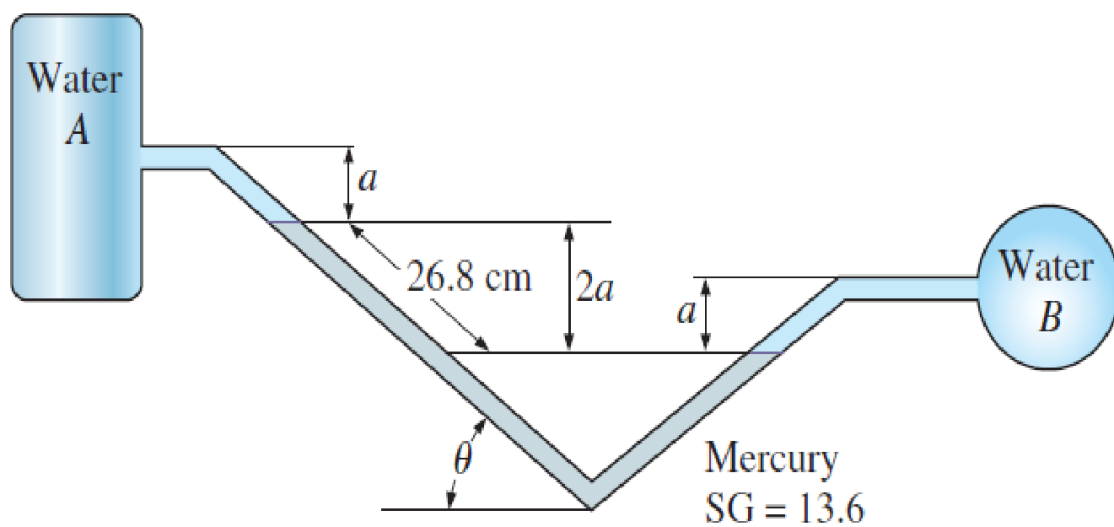
3–36 The manometer shown in the figure is designed to measure pressures of up to a maximum of 100 Pa. If the reading error is estimated to be ± 0.5 mm, what should the ratio of d/D be in order for the error associated with pressure measurement not to exceed 2.5% of the full scale.



3–45 Freshwater and seawater flowing in parallel horizontal pipelines are connected to each other by a double U-tube manometer, as shown in Fig. P3–45. Determine the pressure difference between the two pipelines. Take the density of seawater at that location to be $\rho = 1035 \text{ kg/m}^3$. Can the air column be ignored in the analysis?



3–58 Two water tanks are connected to each other through a mercury manometer with inclined tubes, as shown in Fig. P3–58. If the pressure difference between the two tanks is 20 kPa, calculate a and θ .



3–80 A cylindrical tank is fully filled with water (Fig. P3–80). In order to increase the flow from the tank, an additional pressure is applied to the water surface by a compressor. For $P_0 = 0$, $P_0 = 3$ bar, and $P_0 = 10$ bar, calculate the hydrostatic force on the surface A exerted by water.

