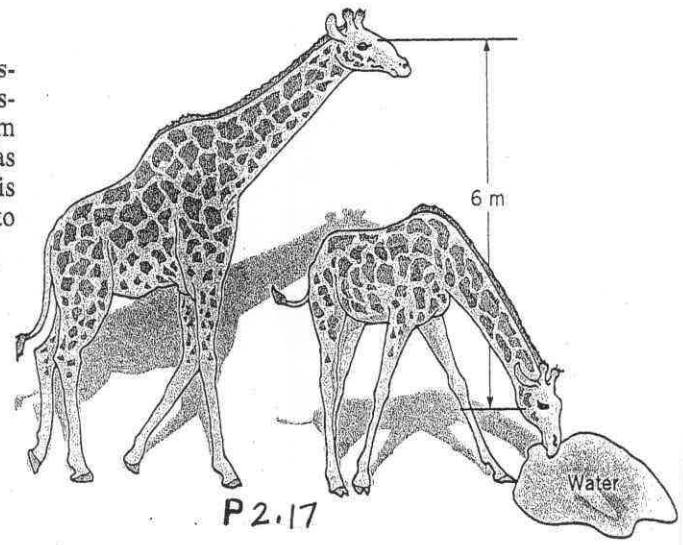
2.17

2.17 (See Fluids in the News article titled "Giraffe's blood pressure," Section 2.3.1.) **(a)** Determine the change in hydrostatic pressure in a giraffe's head as it lowers its head from eating leaves 6 m above the ground to getting a drink of water at ground level as shown in Fig. P2.17. Assume the specific gravity of blood is $SG = 1$. **(b)** Compare the pressure change calculated in part **(a)** to the normal 120 mm of mercury pressure in a human's heart.



P 2.17

(a) For hydrostatic pressure change,

$$\Delta p = \gamma h = \left(9.80 \frac{kN}{m^2}\right)(6\,m) = 58.8 \frac{kN}{m^2} = \underline{58.8\,kPa}$$

(b) To compare with pressure in human heart convert pressure in part (a) to mm Hg:

$$58.8 \frac{kN}{m^2} = \gamma_{Hg} h_{Hg} = \left(133 \frac{kN}{m^3}\right) h_{Hg}$$

$$h_{Hg} = (0.442\,m)\left(10^3 \frac{mm}{m}\right) = 442\,mm\,Hg$$

Thus, the pressure change in the giraffes' head is $\underline{442\,mm\,Hg}$ compared with $\underline{120\,mm\,Hg}$ in the human heart.