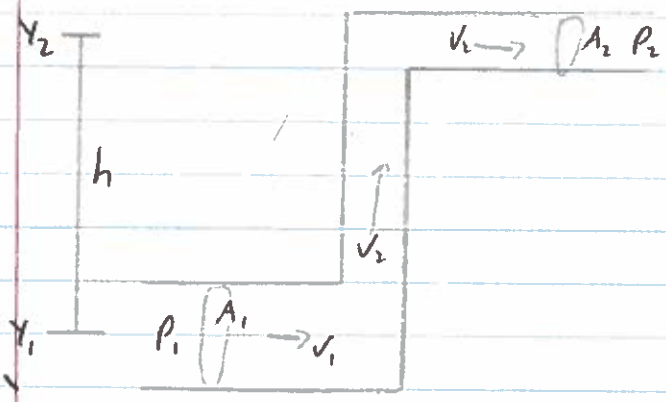
Ex 12.7
p 387



- Use eqn. of continuity to find speed of flow in smaller pipe, v_2.

$$A_1 v_1 = A_2 v_2$$

$$v_2 = \frac{A_1}{A_2} v_1 = \frac{\pi \left(\frac{d_1}{2}\right)^2}{\pi \left(\frac{d_2}{2}\right)^2} v_1 = \left(\frac{d_1}{d_2}\right)^2 v_1$$

$$= \left(\frac{2\,cm}{1\,cm}\right)^2 (1.5\,m\,s^{-1})$$

$$v_2 = 6.0\,m\,s^{-1}$$

- Volume flow rate, $\frac{dV}{dt} = A_2 v_2$

$$= \frac{\pi}{4} d_2^2 v_2 = \frac{\pi (1\times10^{-2}\,m)^2}{4} 6.0\,-$$

$$= 4.7\times10^{-4}\,m^3 s^{-1} = 4.7\times10^{-1}$$

$$\frac{dV}{dt} = 0.47\,L\,s^{-1}$$

Find Pressure, P_2.

Bernoulli's eqn:

$$P_1 + \rho g y_1 + \tfrac{1}{2}\rho v_1^2 = P_2 + \rho g y_2 + \tfrac{1}{2}\rho v_2^2$$

$$P_2 = P_1 + \rho g (y_1 - y_2) + \tfrac{1}{2}\rho (v_1^2 - v_2^2)$$

$$= 4.0 \times 10^5 \text{ Pa}$$

$$+ (1 \times 10^3 \text{ kg m}^{-3})(9.9 \text{ m s}^{-2})(-5.0 \text{ m})$$

$$+ \tfrac{1}{2}(1 \times 10^3 \text{ kg m}^{-3})\left((1.5 \text{ m s}^{-1})^2 - (6.0 \text{ m s}^{-1})^2\right)$$

$$\underline{P_2 = 3.7 \times 10^5 \text{ Pa}}$$

$$P_2 = 3.7 \text{ atm}$$