

14.28 This problem asks us to compute the permeability coefficient for carbon dioxide through high density polyethylene at 325 K given a steady-state permeability situation. It is necessary for us to Equation 14.9 in order to solve this problem. Rearranging this expression and solving for the permeability coefficient gives

$$P_M = \frac{J \Delta x}{\Delta P} = \frac{J \Delta x}{P_2 - P_1}$$

Taking $P_1 = 2500$ kPa (2,500,000 Pa) and $P_2 = 4000$ kPa (4,000,000 Pa), the permeability coefficient of CO_2 through HDPE is equal to

$$P_M = \frac{\left[2.2 \times 10^{-8} \frac{(\text{cm}^3 \text{ STP})}{\text{cm}^2 \cdot \text{s}} \right] (5 \text{ cm})}{(4,000,000 \text{ Pa} - 2,500,000 \text{ Pa})}$$

$$= 0.73 \times 10^{-13} \frac{(\text{cm}^3 \text{ STP})(\text{cm})}{\text{cm}^2 \cdot \text{s} \cdot \text{Pa}}$$