

Indirect Pressure Determination from Volume and a Change in Pressure

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A sample of $\text{N}_2(\text{g})$ occupies a volume of 42.0 mL under the existing barometric pressure. Increasing the pressure by 85 mm Hg reduces the volume to 37.7 mL. What is the prevailing barometric pressure, in millimeters of mercury?

$$V_1 = 42.0 \text{ mL}$$

$$P_1 = \text{unknown}$$

$$V_2 = 37.7 \text{ mL}$$

$$P_2 = P_1 + 85 \text{ mmHg}$$

$$P_1(42.0 \text{ mL}) = (P_1 + 85 \text{ mmHg})(37.7 \text{ mL})$$

$$1.114P_1 = P_1 + 85 \text{ mmHg}$$

$$0.114P_1 = 85 \text{ mmHg}$$

$$P_1 = P_{\text{barometric}} = 745 \text{ mmHg}$$