

In-class problem linked to lecture pages 164-175

Calculate the isothermal compressibility of 47 liters of CO_2 gas at room temperature (300 K) and atmospheric pressure (10^6 dynes/cm²), assuming it obeys the ideal gas law.

1n-class 164-175.

$$pV = NkT$$

$$K = -\frac{1}{V} \frac{dV}{dp}$$

$$V = \frac{1}{p} NkT = p^{-1} NkT$$

$$\frac{dV}{dp} = -p^{-2} NkT$$

$$K = -\frac{1}{V} \left(-\frac{1}{p^2} \right) NkT = \frac{1}{V} \frac{NkT}{p^2}$$

$$\frac{1}{V} = \frac{p}{NkT}$$

$$\frac{p}{NkT} \frac{NkT}{p^2} = \frac{1}{p}$$

$$K = \frac{1}{p} = 10^{-4} \frac{\text{cm}^2}{\text{dyne}}$$

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