

1 Problem 9 — Joshua Lin

We are given that the coefficient of volume expansion is defined as

$$\beta = \frac{1}{V} \frac{\partial V}{\partial T}$$

Knowing that the Ideal Gas Law can be rewritten as

$$V = \frac{nRT}{p}$$

we can take a partial derivative with respect to T to arrive at

$$\begin{aligned} \frac{\partial}{\partial T} V &= \frac{\partial}{\partial T} \frac{nRT}{p} \\ \frac{\partial V}{\partial T} &= \frac{nR}{p} \end{aligned}$$

Therefore,

$$\beta = \frac{nR}{pV}$$

which, by the Ideal Gas Law, is equivalent to

$$\beta = \frac{1}{T}$$

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