

8.3: Isothermal Expansion of an Ideal Gas

An ideal gas obeys the equation of state $PV = RT$ (V = molar volume), so that, if a fixed mass of gas kept at constant temperature is compressed or allowed to expand, its pressure and volume will vary according to $PV = \text{constant}$. That is, Boyle's Law. We can calculate the *work done* by a mole of an ideal gas in a reversible isothermal expansion from volume V_1 to volume V_2 as follows.

$$W = \int_{V_1}^{V_2} P dV = RT \int_{V_1}^{V_2} \frac{dV}{V} = RT \ln(V_2/V_1) \quad (8.3.1)$$

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