

Highlights

$$W = - \int_{V_i}^{V_f} P dV$$

ideal gas law: $PV = Nk_B T$

$$E_{th} = (N) \left(\begin{array}{l} \text{degrees of} \\ \text{freedom} \end{array} \right) \frac{k_B T}{2}$$

1st law

$$\Delta E_{th} + \Delta E_{mech} = W + Q$$

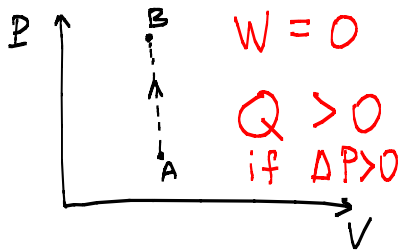
2nd law

Heat flows from hot to cold.

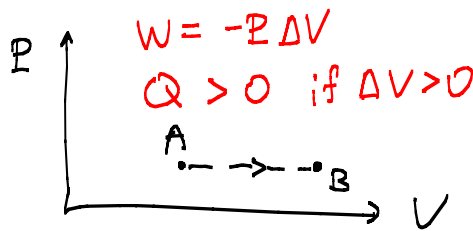
typically neglect for gas

heat

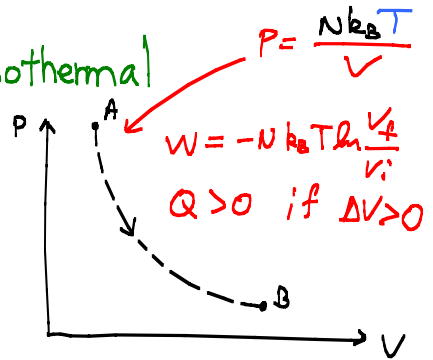
isochoric



isobaric



isothermal



Adiabatic process ($Q=0$): $PV^\gamma = \text{constant}$

where $C_v = \frac{(\text{degrees of freedom})}{2} R$

$$\gamma = \frac{C_p}{C_v} = 1 + \frac{R}{C_v}$$