

**[tex139] Reversible decompression**

Consider a rigid, insulating box with two compartments of volumes  $V_1$  and  $V_2$  separated by an internal wall. Each compartment contains  $N$  atoms of a monatomic classical ideal gas [ $pV = Nk_B T, C_V = \frac{3}{2}Nk_B$ ] in equilibrium at the same temperature  $T_{ini}$ .

(a) Find the maximum work,  $\Delta W(T_{ini}, V_1, V_2, N)$ , that can be extracted from this system by any means that keep the box rigid and insulating.

(b) Design a reversible process that employs the internal wall, which is movable by an external agent in a controlled manner and which can be switched between heat-conducting and insulating modes.

**Solution:**