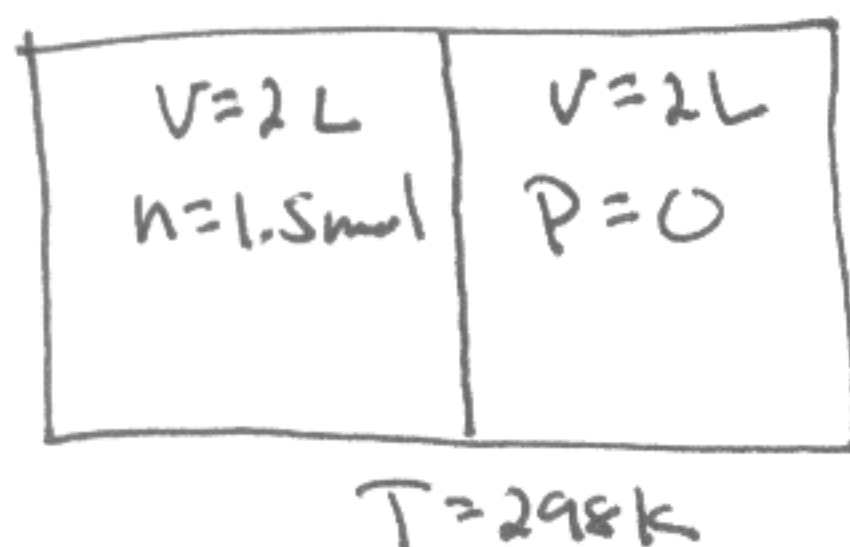


Quiz 1

A 4 L container with rigid walls is divided in half into two compartments separated by a rigid wall. One compartment is filled with 1.5 mol of an ideal gas, and the other is evacuated (i.e. pumped down to a vacuum of $P \sim 0$). The wall is removed and the gas expands to fill the entire vessel, while an external heater keeps the system at 25°C.

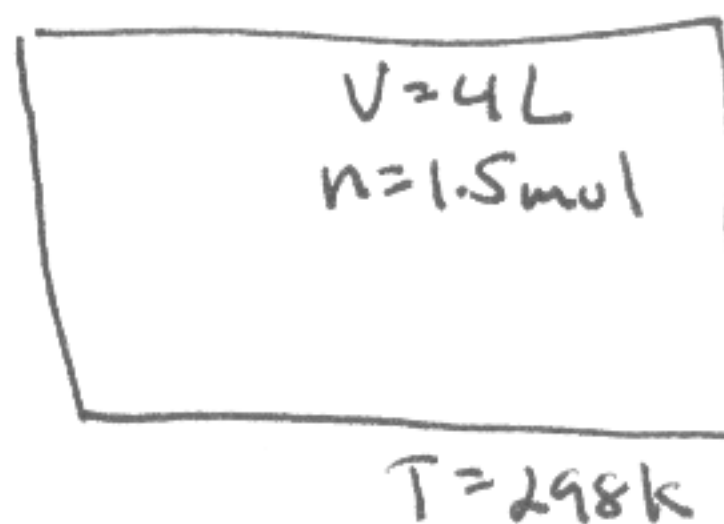
- Draw the initial and final states, and define the path by which the system moves between them.
- Determine P , V , T , and n of the initial and final states.
- Extra credit (not much): Was the external heater necessary to maintain the system at this temperature? Why or why not?

a) initial



final

→
isothermal
free expansion



b)

$$V_i = 2\text{ L}$$
$$n_i = 1.5\text{ mol}$$
$$T_i = 298\text{ K}$$
$$P_i = 18\text{ atm}$$

$$V_f = 4\text{ L}$$
$$n_f = 1.5\text{ mol}$$
$$T_f = 298\text{ K}$$
$$P_f = 8.9\text{ atm}$$

c) The heater was not necessary because this is free expansion. Because the gas is pushing against a vacuum, no work was done and no heat was lost.