CH353 – Physical Chemistry I
Spring 2012, Unique 52135

Quiz 1

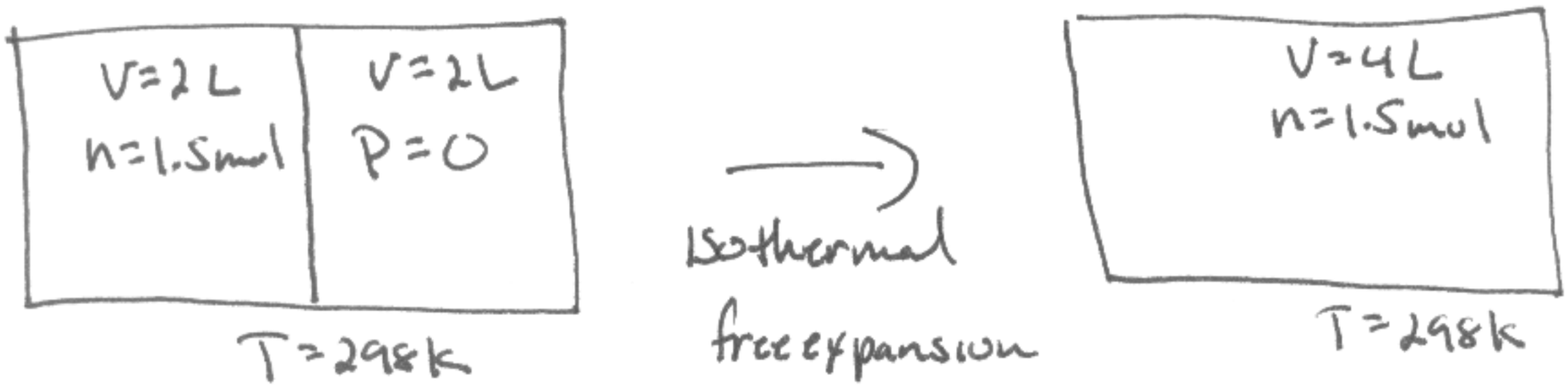
A 4 L container with rigid walls is divided in half into two compartments separated by a rigid wall. One compartment is filled with 1.5 mol of an ideal gas, and the other is evacuated (i.e. pumped down to a vacuum of $P \sim 0$). The wall is removed and the gas expands to fill the entire vessel, while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

a) Draw the initial and final states, and define the path by which the system moves between them.

b) Determine P, V, T, and n of the initial and final states.

c) Extra credit (not much): Was the external heater necessary to maintain the system at this temperature? Why or why not?

a) initial



final

b) $V_i = 2\ L$
$n_i = 1.5 mol$
$T_i = 298\ k$
$P_i = 18 atm$

$V_f = 4\ L$
$n_f = 1.5 mol$
$T_f = 298\ k$
$P_f = 8.9 atm$

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.