[tex137] Irreversible heat exchange

Consider an insulating box with two compartments. Each compartment initially contains $N$ atoms of a monatomic classical ideal gas in equilibrium at initial temperatures $T_1 \neq T_2$ and at the same initial pressure $p$. Gas atoms are then allowed to leak through a hole in the dividing wall.

(a) Find the uniform temperature $T$ in the final equilibrium state as a function of $T_1$ and $T_2$.
(b) Show that the pressure remains the same in the final equilibrium state.
(c) Find the increase in total entropy, $\Delta S$, between the initial and final equilibrium states.

Solution: