

### [tex1] Entropy change caused by expanding ideal gas

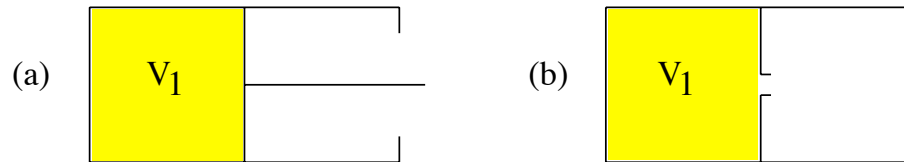
Consider the amount  $n = 1\text{mol}$  of a classical ideal gas in a box of volume  $V_1$  with heat-conducting walls. The gas is described by the equation of state  $pV = nRT$  and the internal energy  $U = C_V T$  with  $C_V = \text{const}$ . Now we let the gas expand to the volume  $V_2 = 2V_1$  via two different processes:

(a) by quasi-static isothermal expansion;

(b) by leakage through a hole in one wall.

Calculate the change in entropy  $\Delta S_G$  of the gas and  $\Delta S_E$  of the environment during each process.

Express the results in SI units.



**Solution:**