

AMSE205 Thermodynamics I

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Problem Set #1

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1. 길이 200cm 인 끈으로 형성되는 사각형 중 최대 넓이를 지니는 사각형에 대한 해를 Lagrangian Undetermined Multiplier Method를 이용하여 구하라.
2. Derive the expression for the entropy change when n_A mole of ideal gas A and n_B mole of ideal gas B is mixed.
3. Solve the following problem once again. Here consider the two different contributions to the total entropy change: thermal entropy and configurational entropy.

A rigid container is divided into two compartments of equal volume by a partition. One compartment contains 1 mole of ideal gas A at 1 atm, and the other compartment contains 1 mole of ideal gas B at 1 atm.

- (a) Calculate the entropy increase in the container if the partition between the two compartments is removed.
 - (b) If the first compartment had contained 2 moles of ideal gas A, what would have been the entropy increase due to gas mixing when the partition was removed?
 - (c) Calculate the corresponding entropy changes in each of the above two situations if both compartments had contained ideal gas A.
4. Consider a model in which the available energy levels are linearly spaced along the energy axis

$$\varepsilon_n = \left(n + \frac{1}{2} \right) \varepsilon_0, \quad (n = 0, 1, 2, \dots, 9)$$

The system contains ten particles. Consider two macrostates:

State I	{0, 0, 1, 2, 4, 2, 1, 0, 0, 0}
State II	{0, 1, 1, 2, 2, 2, 1, 1, 0, 0}

- (a) Which macrostate has the higher energy?
- (b) Which macrostate has the higher entropy?
- (c) Which macrostate is more likely to be observed?