THERMAL AND STATISTICAL PHYSICS H.W №3

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PROBLEM (1)

Two identical blocks of iron, one at 100^oC and the other at 0^oC, are brought into thermal contact. What happens? What is the total entropy change? Assume the process occures under constant volume .

PROBLEM (2)

n moles of an ideal gas at temperature T_0 are originally confined to half of an insulated container by a partition. The partition is removed without doing any work. What is the change in entropy?

PROBLEM (3)

2 litres of ideal gas was heated in isobaric conditions from $27°C$ to $100°C$. Calculate the entropy change.

PROBLEM (4)

If the entropy for a system is given by its energy in the following relation (assume constant volume) :

$$S = k_B \frac{4\pi E^2}{L^2}$$

For k_B is Boltzmann constant and L is a constant.
Find its temperature and specific heat.

PROBLEM (5)

1. What is the increase in entropy of one gram of ice at O^oC is melted and heated to 50^oC?

2. Find the change in entropy if 500 g of water at 80^oC is added to 300 g of water at 20^oC

PROBLEM (6)

Consider a system coposed of 2 coins, both thrown at once.

1. What are the micro states and macrostates ?

2. What is the statistical wieght ?

3. Find the probability of finding the system at each macrostate.

PROBLEM (7)

A system of N particles with spin $1/2$, that can point in the $+z$ or $-z$ directions. The system is put in a magnetic field given by $\vec{B} = \cos\theta B_0 \hat{x} + \sin\theta B_0 \hat{z}$.

1. What is Ω ?

2. Find the energy of the system

3. For a fixed angle θ_0. Find the energy of the most probable macrostate.