Physics 214A
Problem Set 2
Fall 1997

Problem 4.

An ideal gas consists of a mixture of particles; N_i of mass $M_i, i = 1 \ldots c$.

a. What is the entropy as a function of E, V, N_i?

b. Find the equation of state and C_v.

Problem 5.

Suppose a partitioned volume contains two different ideal gases (masses m_1, m_2) in each subvolume, both at the same temperature and pressure.

a. What is the initial entropy? Now remove the partition and let the gases mix.

b. What is the final entropy?

c. How will the change in entropy manifest itself?

d. Repeat b in the case the gases are identical.

e. What would be the result had the factor $1/N!$ not been included in the sum over classical states?

Problem 6. Pathria 1.11

Problem 7.

Consider a set of N distinguishable harmonic oscillators, each with energy levels $E_n = n\omega$. The total energy is $E = P\omega$. What is the entropy of this system? $[N, P$ are large.$]$ What is E as a function of temperature?