

PHYSICS 332-0 STATISTICAL MECHANICS

Ian Low, Spring 2012

Course Webpage:

http://www.hep.anl.gov/ian/teaching/Under_SM_2012/Under_SM_Spring2012.html*ASSIGNMENT #5***Revised May 6**Due at 1 PM, May 9**Reading:** Sections 6.1 - 6.4 and 6.5 - 6.6 of Schroeder.**Problems:** 6.22, 6.26, 6.31, 6.37. 6.52 of Schroeder, and choose either one of the following two additional problems:**Additional Problem 1:** 6.30 of Schroeder.**Additional Problem 2:** A system consists of N weakly interacting particles, each of which can be in either of two states with respective energies ϵ_1 and ϵ_2 , where $\epsilon_1 < \epsilon_2$.

(a) Without explicit calculation, make a qualitative plot of the mean energy \bar{E} of the system as a function of its temperature T . What is \bar{E} in the limit of very low and very high temperatures? Roughly near what temperature does \bar{E} change from its low to its high temperature limiting values?

(b) Using the result of (a), make a qualitative plot of the heat capacity C_V (at constant volume) as a function of temperature T .

(c) Calculate explicitly the mean energy $\bar{E}(T)$ and heat capacity $C_V(T)$ of this system. Verify that your expressions exhibit the qualitative features discussed in (a) and (b).