Problem Solving Session 1

Problem:
Consider a system with two accessible energy levels that differ in energy by ϵ.

$$\underline{\quad} \quad \underline{\quad} \qquad \epsilon$$
$$\underline{\quad} \qquad 0$$

(a) Find the partition function, $Z(T)$, of the system coupled to a heat bath at temperature T.

(b) Calculate the probability of finding the system in each of the two energy levels as a function of temperature. Calculate and discuss the two limits as the temperature approaches zero and infinity (explain the meaning of your results).

(c) Calculate the average energy, $\langle E \rangle$, of the system as a function of temperature and discuss the two limits as the temperature approaches zero and infinity (explain the meaning of your results).

(d) Calculate the heat capacity, C_V, as a function of temperature and find two limits as the temperature approaches zero and infinity (explain the meaning of your results).