

Problem Set 5

1. Do problem 19-22 in McQuarrie and Simon.
2. Do problem 19-27 in McQuarrie and Simon.
3. Do problem 19-50 in McQuarrie and Simon.
4. The entropy of money: Suppose that someone tells you that he has a total of 10 cents in his pocket. There are a few different combinations of coins which could add up to 10 cents. If we think of these different possibilities as microstates, we can calculate an entropy.
 - a) What is the entropy of 10 cents? Give your answer in terms of k_B .
 - b) Explain what the entropy calculated in question part a actually measures.
 - c) If you were told that one of the coins was a nickel, would the entropy increase or decrease? Why?
5. Do problem 20-2 in McQuarrie and Simon.
6. Water and Ice
 - a) Calculate the entropy change when one mole of ice is heated from 250 K to 300K. Take the heat capacities (C_p) of water and ice to be constant at 75.3 and 37.7 J K⁻¹ mol⁻¹, respectively and the latent enthalpy of fusion ($\Delta_{fus}H^\circ$) as 6.02 kJ mol⁻¹.
 - b) One mole of supercooled water at -10°C and 1 atm pressure turns into ice spontaneously. Calculate the entropy change in the system and in the surroundings.
 - c) One mole of ice at -10°C is placed in a room at a temperature of 10°C. Using the data from part a), calculate the entropy change in the system and in the surroundings.
7. 10 points extra credit: Do problem 19-52 in McQuarrie and Simon.