Assignment-11   Date: 7th April 2022
Maximum points: 1   **Instructions:**
  • *Answer all the questions*
  • *Please write your solutions/explanations on a paper with your handwriting*
  • *Scan all pages as a single pdf file and upload in google classroom before 10-04-22*
  • *This will give you **1 point** towards your total evaluation,*
  • *Late submission lead to Zero Marks.*

1. An insulated rigid tank is divided into two equal parts by a partition. Initially, one part contains 5 kmol of an ideal gas at 250 kPa and 40 °C, and the other side is evacuated. The partition is now removed, and the gas fills the entire tank. Determine the total entropy change during this process.

2. A constant-volume tank contains 5 kg of air at 100 kPa and 327 °C. The air is cooled to the surroundings temperature of 27 °C. Assume constant specific heats at 300 K. (*a*) Determine the entropy change of the air in the tank during the process, in kJ/K, *(b)* determine the net entropy change of the universe due to this process, in kJ/K, and (c) sketch the processes for the air in the tank and the surroundings on a single *T-s* diagram. Be sure to label the initial and final states for both processes.

3. The theoretical minimum work required to separate one mole of liquid mixture at 1 atm containing 50 mole % each of n-heptane and n-octane into pure compounds each at 1 atm.

4. Consider the entropy of mixing of more than two components. Let the total number of sites be N, the number of A atoms be NA and the number of B atoms be NB. And NC is the number of empty sites, i.e. NC = N − NA – NB. Obtain the the expression for the number of arrangements of A and B atoms on a lattice where some of the lattice sites can be left empty. Also, Assume the empty sites are occupied by atoms of type C and give an expression for the entropy of mixing (ΔS) in terms of the mole fractions x_A, x_B and x_C. Use the sterling approximation