Recitation 2

In this recitation, we will look at:

- Review:
  - Classical Thermodynamics: Averaging over large numbers
  - Intensive vs Extensive Variables
  - Temperature
  - What are state functions?
  - Work is equivalent to Heat
- Questions regarding homework
- Sample Problems:

Problem 1

Calculate the amount of work which is done when 1 mol of water is vaporized at 100 C and 1 atm pressure. Assume that water vapor behaves as an ideal gas. Clearly state any assumptions necessary to solve the problem. Define the system and its constrains.

Problem 2

7.5 kJ of heat are added to a *closed* system while its internal energy decreases by 12kJ. How much energy is transferred as work? For a process causing the same change of state but for which the work is zero, how much heat is transferred?

Problem 3

This problem has the purpose of illustrating the equivalence between heat and work: A perfectly insulating and sealed container is filled with 100 kg of water at 20C. A stirrer is installed inside the water container, and is made to turn by gravity, using a weight of mass of 100 kg (outside the container). The weight falls *very very* slowly through a distance of 1 m in driving the stirrer. Since the mechanism was designed by some bright MIT kids, the efficiency of the stirring mechanism is such that all the work done by the weight is transferred to the water. Assume also that the acceleration of gravity is $10ms^{-2}$.

- State all assumptions concerning the system, with constrains included
- Calculate
  1. The amount of work done on the water
  2. The internal-energy change of the water
  3. The final temperature of the water (Cp of water: $4.186kJkg^{-1}C^{-1}$)
  4. Amount of heat that must be removed to return the water to its initial temperature
  5. The total energy change of the universe because of the processes of lowering the weight and of cooling the water