

**PHYS 324 – Thermodynamics**  
Spring 2008

**Homework 2:** (due Jan 28<sup>th</sup>)

1. Each day a certain amount of water evaporates from the oceans, lakes, and earth surface and forms water vapor and clouds in the atmosphere. Each day a certain amount of rain falls back to the earth. Make the reasonable assumption that, on the average, the energy consumed by evaporating and lifting the water is equal to the energy produced by condensation and rain falling back to earth.

To evaporate one mole of water, approximately 41090 joules of heat are required and an equivalent amount is expelled when a mole of water condenses.

- a. Estimate the amount of work required each day to produce the rain. That is, the work to evaporate and lift the water. You may need to find data to help make this estimate (such as the average height of a rain cloud). State what those data are and where you found them.
- b. Discuss what is supplying this daily energy.
- c. Compare this daily energy consumption with the energy produced each year in Richmond.

2. Two springs, A and B, are attached to each other and to opposite rigid walls separated by a distance  $L$  as shown below. The point of attachment,  $x_i$ , is such that the system of springs is out of equilibrium. The two springs have different spring constants,  $k_A$  and  $k_B$ . Assume that the two springs make an adiabatic system. Calculate the change in internal energy and force on each spring once the system reaches equilibrium.

