87.202 - PRINCIPLES OF EARTH & ENVIRONMENTAL SYSTEMS II
STUDY QUESTIONS AND PROBLEMS II

1. If you could make a leak-proof balloon of weightless and perfectly elastic material, the pressure inside it would be the same as the pressure of the surroundings, but the density inside it might be different. What could cause the difference? What would happen if the balloon were lifted to a position in the atmosphere where the pressure is lower and allowed to come to thermal equilibrium there?

2. When air is pumped into a tire, the tire gets hot. Why? How is this related to the change in temperature of an air parcel when it descends from a higher to a lower level?

3. Consider the variation of temperature with height at various times during a clear day. Discuss the kind of stability that is present in the layer of air immediately above the ground at each time.

   a. In the early morning after the air has been cooled by contact with the ground throughout the night.

b. In the mid-morning when the ground is being heated rapidly by the sun.

c. At the time of maximum temperature, when it is presumed that there is no longer any heating of the air by the ground.

4. Distinguish between a process curve and a sounding curve. What is potential temperature?

5. Suppose the maximum temperature on a summer afternoon is 30°C. Assuming a dry adiabatic lapse rate what is the temperature at 1 km? (ans: 20°C)

6. What is an inversion and why is it significant with respect to air pollution?

7. The air pressure at the base of Mount Washington is 1001.25 mb and the temperature at the base is 15°C. The summit of Mount Washington is 1400 m above the base. Given an environmental lapse rate of 6°C km^{-1}, calculate the pressure at the top of Mount Washington. (ans: 846 mb)