NAME: _____SECTION_____

Atmospheric Sciences 101 Fall 2014
Homework #5 (Due Thursday, 6 November 2014)

1. ***For the questions below assume the air parcel doesn't exchange heat with the surrounding air*** **[3]**

a. Assuming the air parcel doesn't exchange heat with the surrounding air, what word do we use to describe this process? [0.5]

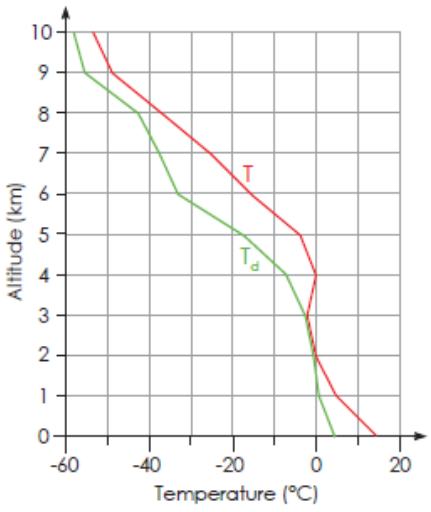
b. What happens to the volume of the air parcel when it is lifted? [0.5]

c. During the above process, does the parcel do work to the environment or the environment does work to the parcel? [0.5]

d. While the parcel is being lifted, what happens to its temperature? [0.5]

e. While the parcel is being lifted, what happens to its saturation vapour pressure and relative humidity? [1]

2. Using this temperature profile, where the temperature (T) is plotted in red, and the dew point temperature (T_d) in green, what would you expect to see around 2-3 kilometers height? Explain briefly. [1]



3. In order for clouds to form the air must be saturated. In questions a – c, if the air is saturated, how do the following moisture variables compare (is one greater than, less than, or equal to the other)? [2; ½ pt each]

a. Vapor pressure (e) and saturation vapor pressure (e_s).

b. Temperature (T) and dew point temperature (T_d).

c. Dry bulb temperature (T_{db}) and wet bulb temperature (T_{wb}).

d. If the air is **unsaturated**, what two conditions could be changed to make the air saturated?

4. You are taking a walk through a barren field in Central Washington in the early afternoon. It has been a very warm, sunny day with little wind. The sky is predominantly blue with a few small, puffy clouds that seem close to the ground; all the cloud bases seem to be at the same height [2].

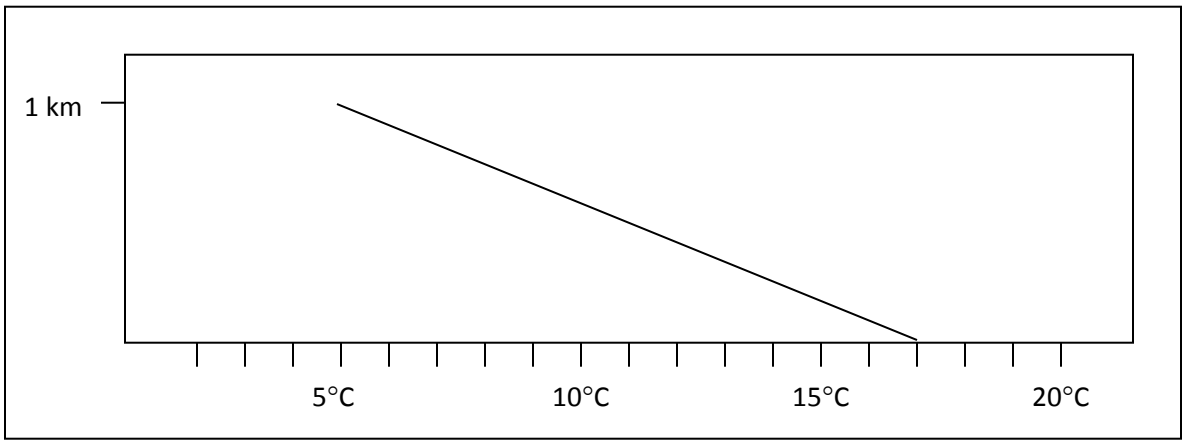
a. What type of clouds are these? Be as specific as you can. [0.5]

b. How would the surface temperature likely compare with the air temperature a few metres above? [0.5]

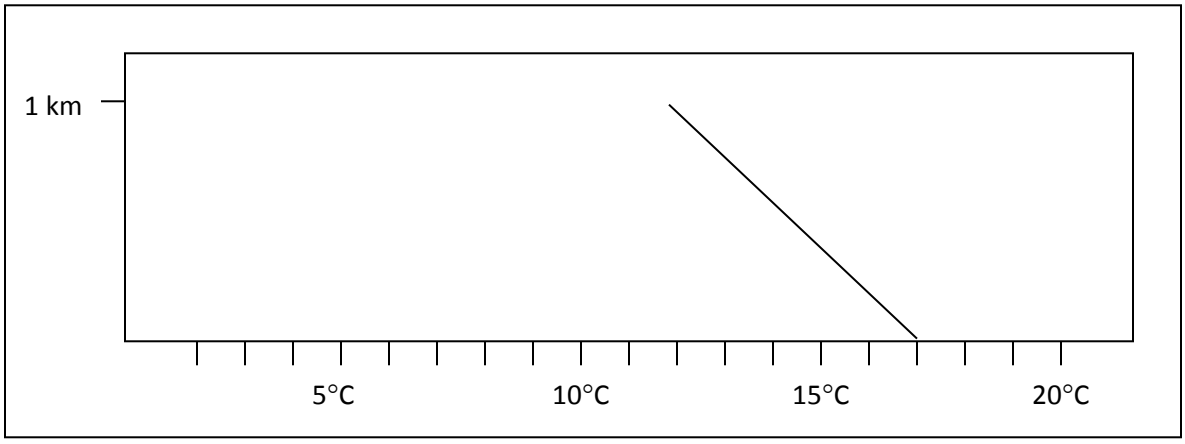
c. What lifting process likely resulted in the formation of these clouds? [0.5]

d. In a deep layer of conditionally unstable air, how could you tell if the air parcel (cloud) had been lifted above the level of free convection? [0.5]

5. The lapse rate indicated on the following diagrams represents the **ENVIRONMENTAL LAPSE RATE**. On the diagrams below, using a straight-edge, draw in lines representing the **DRY ADIABATIC LAPSE RATE** and the **MOIST ADIABATIC LAPSE RATE** starting at the same surface temperature (17ºC). Based on the plots, indicate the stability of the two environments below. [2]



Stability of layer: _____



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