NAME: _____SECTION_____

Atmospheric Sciences 101 Winter 2015
Homework #4 (Due Thursday, 12 February, 2015)

1. Diabatic/Adiabatic Processes. ***For the questions below assume the air parcel doesn't exchange heat with the surrounding air*** **and that the parcel remains unsaturated. [3]**

a. Assuming the air parcel doesn't exchange heat with the surrounding air, the process is: [Diabatic or Adiabatic]. (Circle response) [0.5]

b. What happens to the air parcel when it is lifted (expands or shrinks)? [0.5]

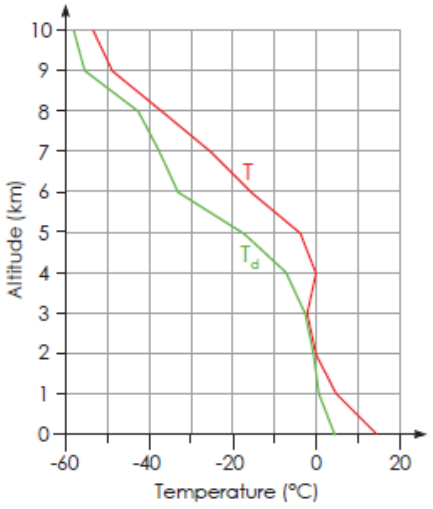
c. During the above process, does the parcel do work on the environment or does the environment do work on the parcel? [0.5]

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

e. When the parcel is being lifted, what happens to its dew point temperature? [0.5]

f. When the parcel is being lifted, what happens to its saturation vapor pressure? [0.5]

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. If the air is saturated, how do the following moisture variables compare (is one greater than, less than, or equal to the other)? [1; ½ pt each]

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

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

4. If instead the air were unsaturated, how do the following moisture variables compare (is one greater than, less than, or equal to the other)? [1; ½ pt each]

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

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

5. 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].

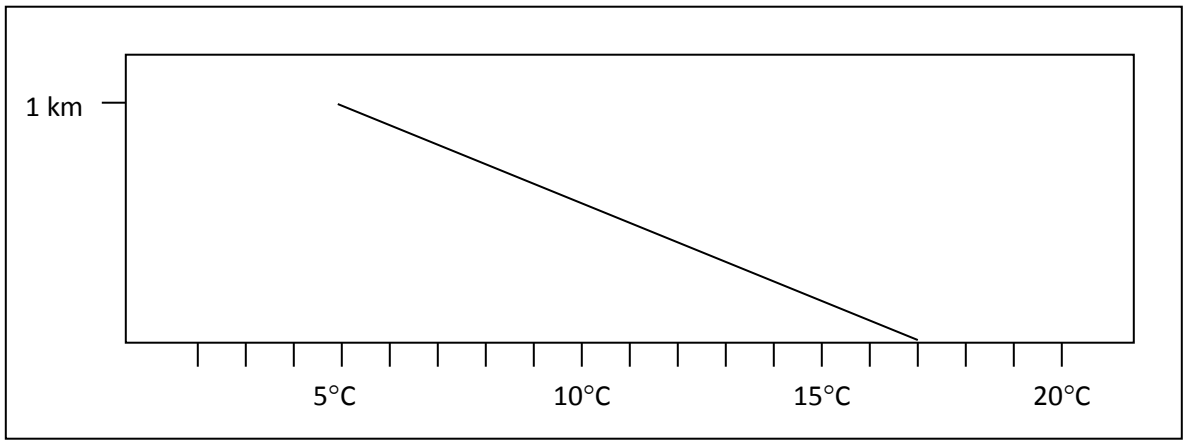
a. What type of clouds are these? Be as specific as you can. [0.5]

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

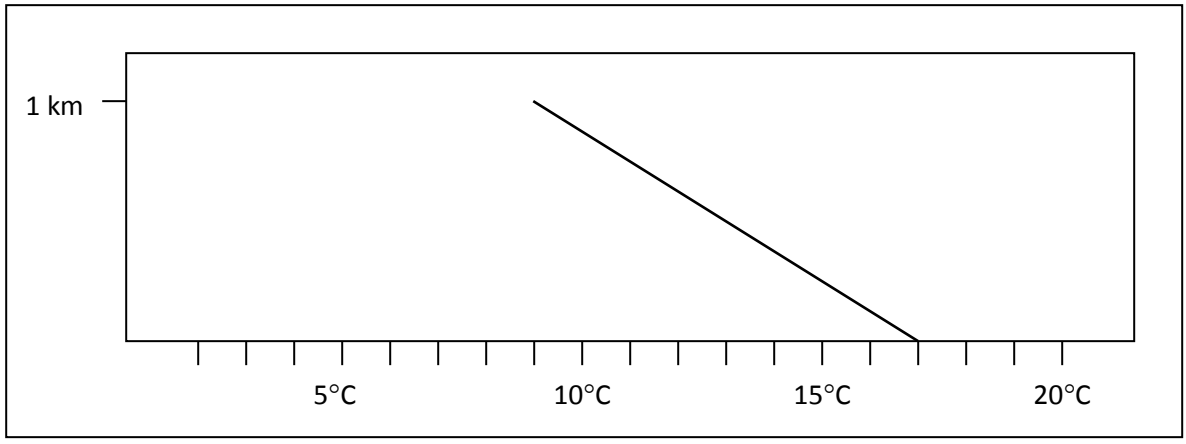
c. What lifting process likely resulted in the formation of these clouds? [0.5]

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]

6. 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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