Name:_____ **TA/Section:**_____

ATMOSPHERIC SCIENCES 101

Homework 4 (Due at the beginning of lecture, Thursday May 2nd)

1. Cloud Types.

Refer to the cloud pictures on the web page below to answer this question. Indicate a photo that contains the following cloud types (note that some of the photos illustrate more than one type). [0.5 point each]

http://www.atmos.washington.edu/academics/classes/2013Q2/101/HW-2013/cloud_question.html

A. Stratus . . . . . Photo Number _____

B. Cirrostratus . . . . . Photo Number _____

C. Altostratus . . . . . Photo Number _____

D. Cirrocumulus . . . . . Photo Number _____

E. Cumulus congestus. . . . . Photo Number _____

2. Cloud formation

A. Aside from “cooling the air parcel”, what are the other two requirements for cloud formation? [0.5 point each]

B. In the “Cloud in the Bottle” demonstration, identify the processes associated with the formation of the “clouds in a bottle”. [0.5 point each]

Assume the “chamber” has been pressurized (air has been pumped in), the cloud forms when we remove the stopper.

i) When we remove the stopper, does the air parcel inside the chamber expand or shrink to equalize with the environmental pressure.

ii) During this process, does the air parcel does work on the environment or does the environment do work on the air parcel?

iii) Does the kinetic energy (and temperature) of the air parcel decrease or increase?

iv) Does the saturation vapor pressure within the bottle increase or decrease?

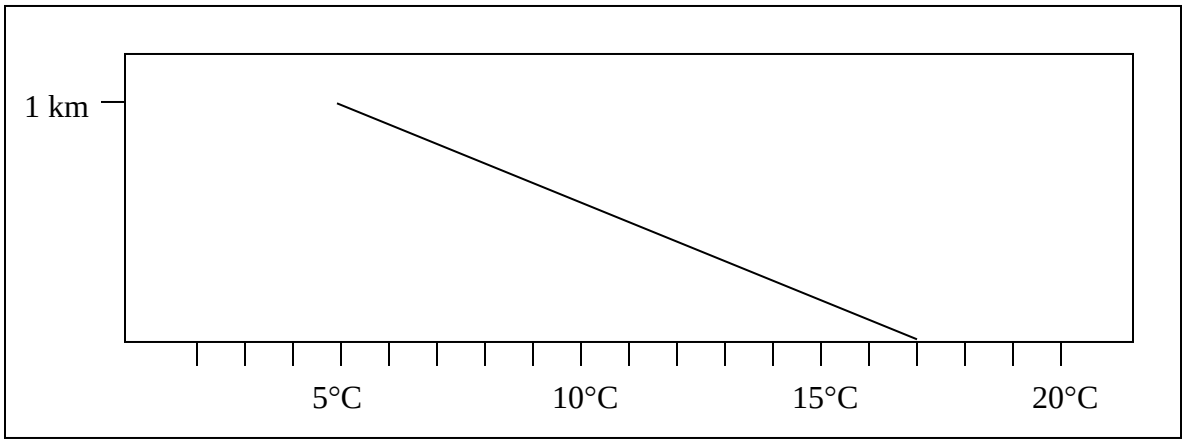
v) Does the relative humidity increase or decrease?

3. Atmospheric Stability

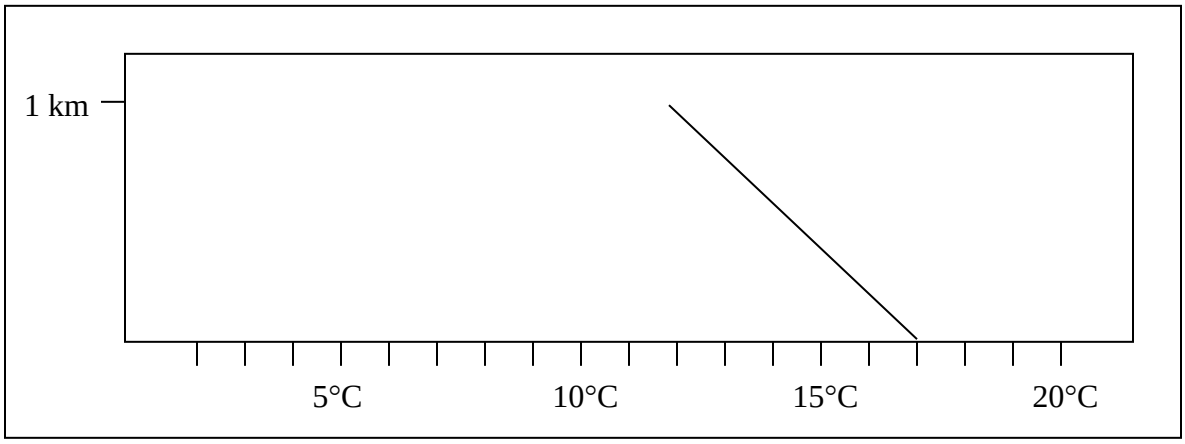
i) What is the value of the **DRY ADIABATIC LAPSE RATE (with units)**? [0.5]

ii) What is the value of the **MOIST ADIABATIC LAPSE RATE (with units)**? [0.5]

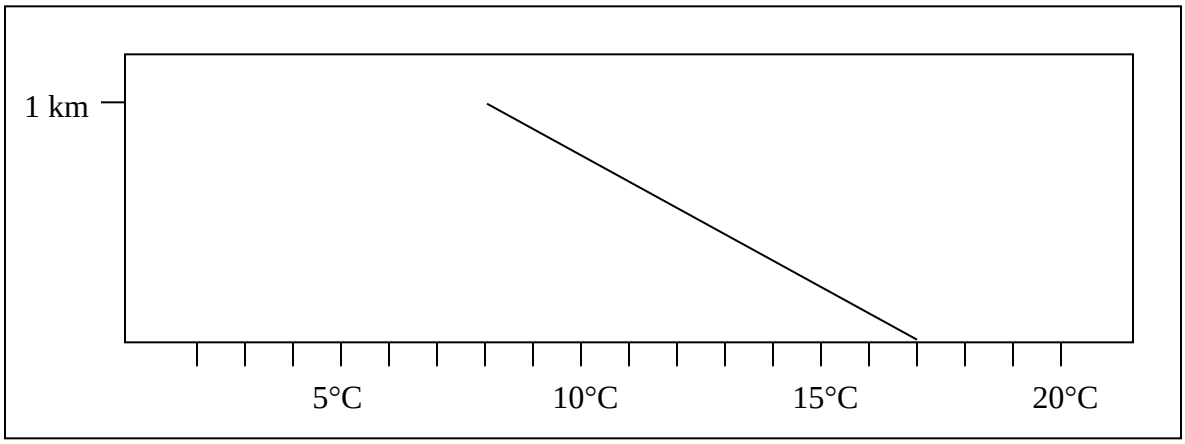
iii) The lapse rate indicated on the following diagrams represents the ENVIRONMENTAL LAPSE RATE. On the three diagrams below, using a ruler, accurately draw in lines representing the DRY ADIABATIC LAPSE RATE and the MOIST ADIABATIC LAPSE RATE starting at the same surface temperature (17ºC) (Hint: each line should be the same in all three diagrams). Based on the information presented, indicate the stability of the three environments below [0.5 point each].



STABILITY:_____



STABILITY: _____



STABILITY: _____

Is the stability of a layer in the atmosphere is determined by the lapse rate of the atmosphere (i.e. environmental lapse rate), the dry adiabatic lapse rate, or the moist adiabatic lapse rate)? [0.5]