NAME: _____SECTION_____

Atmospheric Sciences 101 Winter 2015
Homework #5 (Due Thursday, 19 February 2015)

1. There are two basic forms of clouds: stratiform (stratus) and cumuliform (cumulus or convective). [3]

a. Which basic cloud form would be associated with a stable environmental lapse rate? Briefly explain. [1]

b. Which basic cloud form would be associated with a conditionally unstable environmental lapse rate? Briefly explain. [1]

c. From which cloud-type would you expect the largest precipitation particle size? Briefly explain. [1]

2. Precipitation Growth Methods [4].

a. What is the name of the particles upon which water vapor condenses to form cloud droplets? [0.5]

b. Name and describe the predominant precipitation growth method in warm clouds. [1]

c. Name and briefly describe a precipitation growth method in cold clouds involving super-cooled water droplets and ice particles. [1]

d. Name and briefly describe a precipitation growth method in cold clouds involving only ice crystals. [1]

e. A cumulonimbus cloud contains supercooled cloud drops and ice particles in the layer where the temperature is between 0 and −40°C. Why could a hailstone the size of a golf ball develop in this part of the cumulonimbus, but could never form in the 0 to −40°C layer of a nimbostratus? [0.5]

3. This table contains some information about an atmospheric profile. Use it to answer the questions below. [3]

HEIGHT	T (environment)	T (parcel)	e (parcel)	e_s (parcel)	R.H.
0.0 km	20.0°C	20.0°C	6.0 mb	24.0 mb	25%
1.0 km	12.0°C	10.0°C	6.0 mb	12.0mb	50%
2.0 km	4.0°C	0.0°C	6.0 mb	6.0 mb	100%
3.0 km	-4.0°C	-6.0°C	3.0mb	3.0 mb	100%
4.0 km	-12.0°C	-12.0°C	2.5mb	2.5 mb	100%
5.0 km	-20.0°C	-18.0°C	1.5mb	1.5 mb	100%

a. The lifting condensation level (LCL) is the height in the atmosphere where water first condenses. This represents the approximate level of the cloud base. For the above scenario, at what level (in km) is the LCL? [1]

b. The level of free convection (LFC) is the height in the atmosphere above which the parcels no longer require lifting and will continue to rise (positively buoyant). For the above scenario, at what level (in km) is the LFC? [1]

c. Describe the stability of the 0-5 km layer. Note that the environmental lapse rate in this example is constant throughout the entire layer (8°C/km). [1]