NAME: _____ SECTION _____

Atmospheric Sciences 101 Spring 2013
Homework #5 (Due Thursday, 9 May 2013)

1. Precipitation Growth Methods.

a. Name and briefly describe the predominant precipitation growth method in warm clouds. [0.5]

b. Name and briefly describe one precipitation growth method in cold clouds involving super-cooled water droplets and ice particles. [0.5]

c. Name and describe a precipitation growth method in cold clouds involving only ice crystals. [0.5]

2. There are two basic forms of clouds: stratiform (stratus) and cumuliform (cumulus or convective).

a. Which basic cloud form would be associated with a stable environmental lapse rate? Briefly explain considering how a lifted parcel will respond. [1]

b. Which basic cloud form would be associated with a conditionally unstable environmental lapse rate? Briefly explain considering how a lifted parcel will respond. [1]

c. From which cloud-type would you expect the largest precipitation particle size? Briefly explain what properties of the cloud contribute to rapid growth of particles. [1]

3. What force is responsible for flow between areas of varying pressure? [0.5] Describe the direction of this force? [1]

4. For the following table, fill in the missing values. The figure illustrating the relationship between saturation vapour pressure and temperature is found on page 88 of the textbook (AHRENS, 6th edition). The dry adiabatic lapse rate is 10°C/km and you can assume that the moist adiabatic lapse rate is constant and 6°C/km. In the last column of the table, describe the stability of the parcel as stable (S), unstable (U), or neutral (N). [0.5 points each]

HEIGHT	T (environment)	T (parcel)	*e* (parcel)	e_s (parcel)	R.H.	Stability
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? [0.5]

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? [0.5]