# Midterm II Review Questions

HUMIDITY

- Give definitions for the following variables, their units (if they have any), and what they represent?
    - humidity
    - vapour pressure
    - saturation vapour pressure
    - relative humidity
    - wet bulb temperature (from psychrometer demonstration)
    - dew-point temperature
- Describe the relationship between saturation vapour pressure ($e_s$) and temperature, dew point temperature, and the amount of water vapor?
- What does saturation mean in terms of relative humidity?
- What phase transition will happen when the air is saturated and how is energy transferred?
- How can air become saturated?
- What is fog?
- List the different types of fog and describe their formation?

ADIABATIC PROCESSES FOR A PARCEL OF AIR

- Why does rising air expand and cool?
- Why does sinking air compress and warm?
- What do the dry adiabatic lapse rate and the moist adiabatic lapse rate represent?
- What is the magnitude of dry adiabatic lapse rate?
- What is the magnitude of moist adiabatic lapse rate? Why is it less than the dry adiabatic lapse rate?
- Describe how and understand why air parcel volume, temperature, saturation vapor pressure, & relative humidity change during the process of lifting the parcel.
- Describe how and understand why air parcel volume, temperature, and saturation vapor pressure change during the parcel's moving process along the windward and leeward side of the mountain.
- On which side of the mountain is rain more likely to fall?
- Which side of the mountain would more likely have a rain shadow? Why?

STABILITY

- What determines the atmospheric stability?
- Describe the temperature profile of an atmosphere that is absolutely stable, absolutely unstable, and conditionally unstable?
- Understand the relationship between the environmental lapse rate and the lapse rate of a lifted parcel.

CLOUDS

- What are the different types of clouds?
- How are clouds classified?
- What visual characteristics distinguish clouds?
- Of what are different clouds composed?
- Is there a connection between general cloud type and atmospheric stability?
- What are the three basic requirements for cloud formation?
- Name three methods of cooling (i.e., lifting) an air parcel.

CLOUD DEVELOPMENT and PRECIPITATION FORMATION

Warm clouds

- How are cold and warm clouds distinguished?
- What is the difference in size between CCN, cloud droplets, and raindrops?
- Describe the dominant growth mechanism for droplets in warm clouds?
- Which growth mechanism is more efficient?
- How can effectively grow the water droplet?
- What is a particle's terminal velocity?
- What factor affects the terminal velocity?
- What factors enhance the growth of precipitation particles in clouds?

Cold clouds

- Describe the ice-crystal growth/nucleation processes?
- Why will ice particles grow more readily than super-cooled drops in the mixed-phase region of a cold cloud?

Precipitation types

- Describe the different forms of precipitation?
- How are these different types of precipitation related to the vertical profile of temperature?

DYNAMICS

- What is pressure gradient force?
- How are the direction and magnitude of pressure gradient force are determined?
- How can well tell the direction and relative magnitude of pressure gradient force from 500mb height map and sea level pressure map.
- Which air pressure decreases faster with increasing altitude, the cold air or the warm air and why?
- What is the Coriolis force?
- How is Coriolis force related to the wind speed and latitude?
- In which direction does the Coriolis force deflect the wind in the Northern/Southern Hemisphere?
- What is the frictional force? What is the effect of friction?
- How is the centripetal/centrifugal force directed?
- Why is it necessary to employ the centrifugal force to balance flow?
- What is geostrophic flow? What determines the magnitude of the geostrophic flow?
- What is geostrophic balance?
- Describe cyclonic and anticyclonic flow.
- What forces are important at various levels in the atmosphere?
- Describe surface convergence and divergence and describe their association with surface highs and lows.
- Describe thermal circulations, sea/land breezes, mountain/valley breezes, Chinook winds, and Santa Ana winds.
- How is pressure defined?
- What is a surface pressure chart?
- What is constant pressure surface?
- Why are higher heights of pressure surfaces associated with higher temperatures?
- What do ridges and troughs represent on a 500mb chart?
- What is a common relationship between troughs/ridges aloft with surface lows/highs?
- Why is it generally cloudy in the vicinity of a low pressure area and sunny in the vicinity of high pressure?
- In what layer of the atmosphere is friction important in affecting the wind?
- How is wind direction defined?