

Atmospheric Optics

1. Why is the sky blue?
2. What causes the horizon to turn red or orange at sunset?
3. What types of clouds are responsible for phenomena such as haloes, coronas, sun dogs, etc?

Tropical Cyclones

1. What are the prominent features of tropical cyclones in terms of pressure, wind direction and clouds?
2. Why do tropical cyclones not form on the equator?
3. Where do tropical cyclones usually form?
4. What are the life cycle stages of tropical cyclones
5. What are the prominent features of the eye and eyewall in terms of vertical motion, horizontal wind speed, pressure and temperature?
6. Hurricane damage (i.e. wind, storm surge, flooding)
7. Distinguish between mid-latitude cyclone and hurricanes

Fronts and Air Masses

1. Types of air masses (e.g. continental polar)
2. What is a front? Where do fronts form?
3. What is the boundary between two air masses of different moisture but similar temperature called?
4. What symbols are used to represent the various fronts.
5. What are the typical air masses are found behind and ahead of cold and warm fronts in different regions of North America?
6. Draw the vertical structure across the various fronts and the associated weather.
7. Be aware of the obvious changes in wind, pressure, temperature, humidity and precipitation before, during and after frontal passage.

Mid-latitude Cyclones

1. Favorable location for surface cyclogenesis relative to an upper level low.
2. The vertical structure/configuration of mid-latitude cyclone, i.e. how the upper-level and middle-level configure to sustain/intensify the mid-latitude cyclone.
3. Warm and cold air masses and their locations relative to fronts (this is related to #5 in the Fronts and Air Masses section)
4. Above a typical mid-latitude cyclone, where do warm air advection and cold air advection occur, what conditions lead to warm/cold air advection, and what are the respective vertical air motions?

Thunderstorms and Tornadoes

1. What are the requirements for the formation of a thunderstorm?
2. Different types of thunderstorms. Which one is strongest? Which one lasts the longest? Which one is responsible for producing violent tornadoes?
3. What is a gust front? How do gust fronts form? Why are gust fronts cold?
4. Why are single-cell thunderstorms short-lived?
5. Why can multi-cell thunderstorms last longer than single-cell thunderstorms?
6. How does the wind shear affect the multi-cell storm?
7. What is a mesocyclone? A wall cloud? In which type of thunderstorm can these be found?

Weather Forecasting

1. What are different forecasting methods (e.g. persistence, climatology, numerical weather prediction)?
2. What tools do we use for weather forecasting (e.g. satellite imagery, RADAR echoes, numerical modelling)?

General Tips

1. **Read** the questions carefully before you answer them. Choose the best answer.
2. If given a weather chart, see first **what pressure level that is**. 500mb? 200mb or surface?
3. Can you tell the difference between a trough and a ridge? (Note: It is different when the flow is easterly)
4. Know when to use dry/moist adiabatic lapse rates.
5. Know the changes in temperature, saturation vapor pressure and relative humidity when the air parcel rises or sinks.
6. Know where we use the satellite images and radar images.
7. Know the relationship between air temperature and pressure (At 500mb surface, high heights represent high pressure.)
8. Know the always-true configuration between low-level divergence/convergence and upper-level convergence/divergence, and associated rising/sinking motion.
9. Need to consider “friction” when seeing “surface”; need to consider “centrifugal force” when seeing “curved flow”