

## **Atmospheric Sciences 101: Weather Review sheet for Midterm 2**

These questions are intended as a guide to concepts to help study for the second midterm on 18 November. These are **not** the exact questions which will appear on the midterm, nor is it necessarily all-inclusive; you are still advised to go over the notes and the homework. This sheet will not be collected for a grade. Partial answers and hints will be posted on Tuesday 16 November. For most questions, you should be able to come up with a **one-sentence answer** using terms and concepts from the class.

1. What is a front?
2. What are the four types of fronts? What symbols are used to represent each of these on a surface weather map?
3. Where in relation to the fronts is precipitation likely to occur?
4. What do the vertical cross sections of each type of front look like?
5. What are the typical weather observations during frontal passage for the two basic kinds of front?
6. What kinds of clouds are produced by each kind of front?
7. What is a common relationship between troughs/ridges aloft and lows/highs at the surface?
8. Why is it generally cloudy in the vicinity of a low pressure area and sunny in the vicinity of high pressure?
9. What are long and short waves on an upper level chart? How do they differ?
10. Consider a large column of air (say 500 km across). What happens to the vorticity (rate of spin) of this air if it is stretched vertically and is pulled inward like a figure skater bringing in her arms?
11. Give the complete definitions for the following variables, their units (if they have any), and what they represent:
  - a. humidity
  - b. water vapor pressure
  - c. saturation vapor pressure
  - d. relative humidity
  - e. dew-point temperature
12. Describe the relationship between saturation vapor pressure and temperature.

13. Why is relative humidity not a very useful variable for specifying the amount of moisture in the air?
14. What is the typical diurnal change in relative humidity, keeping in mind that the amount of water vapor in the air does not change rapidly over a 24-hour period?
15. What are condensation nuclei and ice nuclei?
16. What is fog, and how is it defined?
17. List the four different types of fog, how they form, and an example of each.
18. Why can you see your breath on cold mornings?
19. Clouds grab-bag:
  - a. Name the four basic cloud typesFor each of these cloud types:
  - b. What are their visual characteristics?
  - c. What is their typical composition (i.e. ice crystals or water droplets)?
  - d. What altitude are they typically observed at?
20. What is the moist adiabatic lapse rate (give a definition and a value)?
21. Why is the moist adiabatic lapse rate less than the dry adiabatic lapse rate?
22. What are the three cases of atmospheric stability? Give a typical value of the lapse rate for each. What types of clouds would we expect in each of these?
23. Why are absolutely unstable environmental lapse rates uncommon? Where might we find an absolutely unstable environment?
24. What are the common lifting processes which form clouds?
25. Someone reports seeing a "flying saucer" east of Mt Rainier. What is the most likely explanation for what they saw?
26. What is the size difference between condensation nuclei, cloud droplets, and raindrops?
27. How are 'cold' and 'warm' clouds defined with respect to growth of hydrometeors?
28. Describe briefly how droplets grow in warm clouds.

29. Why will ice particles grow more rapidly than super-cooled droplets in the mixed-phase region of a cold cloud?
30. Name four types of precipitation.
31. What type of cloud and process is needed to make hail?
32. Why do we not expect hail to fall from stratus clouds?
33. Why would a nimbostratus cloud have steadier precipitation than a cumulonimbus cloud?
34. What causes a sea breeze to form? How are sea breezes similar to and different from monsoons?
35. What causes a valley breeze to form? A mountain breeze?
36. Which would be more strongly affected by Coriolis forces: a mid-latitude cyclone or a severe thunderstorm? Why?
37. Which direction does the surface wind typically come from in the Tropics?
38. How do west winds along the equator in the central Pacific help promote El Niño?
39. What effect does El Niño have on the location of thunderstorms in the ITCZ, upwelling off of Peru, and temperatures in the eastern equatorial Pacific?
40. Give one similarity and one difference between coastal and equatorial upwelling.
41. What is the ITCZ? What pattern of surface winds causes it?
42. In what season is the equator-to-pole temperature gradient the greatest? When would the jet stream be the strongest? How are these two related?
43. At which latitudes are upward air motions dominant? Downward?
44. How can we identify where the jet stream is on an upper level chart (e.g. a contour plot of 500 mb surface heights)?
45. At what height above the surface is the jet stream usually found?
46. Why do airplanes try to avoid flying through clouds slightly below 0 deg C?
47. A radar just north of Seattle does not pick up any precipitation southwest of the Olympic mountains. However, observers there are reporting long periods of heavy rain. What is going on?