

**Homework Question Set #4**  
**NATS 101, Section 13**  
**Fall 2010**

**The following questions cover Lectures 15-20. Provide thorough, complete answers for maximum credit. Three of the following questions will be randomly graded, with equal credit given to each question.**

**Due Wednesday, October 20 by 5pm. Submit completed assignment to D2L as .doc or .pdf file. Scanned copies of handwritten answers are fine, provided the document is neat and clearly legible. Note that diagrams or pictures can—and should—be used to answer many of the questions. Please scan in any drawings or diagrams in your answers, if possible. For the problems involving calculations, clearly label and provide appropriate accompanying textual description for equations used.**

1. It is a commonly held belief that the direction a sink drains or a toilet flushes depends on which hemisphere you are in. Do you believe this is true? Explain why or why not.
2. Explain why in the mid-latitudes that upper-level winds are typically observed to blow parallel to lines of constant height on a pressure level surface, like at 300-mb. Would the same be true in the tropics? Explain why or why not.
3. For upper-level winds in the mid-latitudes, assuming the pressure gradient is constant, describe how and why airflow around ridges of high pressure and troughs of low pressure will affect the wind speed. What implications does this have for vertical motion in the atmosphere and weather?
4. In the both movies *Alien* and *Aliens*, in the ending scenes the main character Ripley opens the hatch of her spaceship and sucks the alien into outer space. What force(s) cause the alien to be sucked out of the ship so quickly, violently, and effectively? Would the same solution to get rid of the alien off the ship work if Ripley's spaceship were on the surface of a planet like Earth? Explain.
5. Do Question #2, Problems and Exercises, Chapter 8 in Ahrens text.
6. Explain the difference between thermal turbulence and mechanical turbulence. Give at least one example of where each occurs in the atmosphere.
7. Why would it be very dangerous to fly in either of these situations: a) in the region where lenticular clouds are found downwind of a mountain range, and b) near a thunderstorm that has a strong downdraft.

8. You are flying to Brazil from the United States. Why should you expect a fair amount of turbulence on your flight, at least somewhere along the route? (Hint: think about how Air France flight 447 crashed, as described Matt Clarkson's lecture. Incorporate the relevant details in your answer.)
9. From Ken Drozd's National Weather Service lecture, describe at least four severe weather hazards in Arizona during the summer monsoon and how they physically occur.
10. Describe how the following katabatic winds form and where they geographically occur in the western United States: a) Bora, b) Santa Ana, and c) Chinook.
11. How are mountain valley winds related to the development of monsoon thunderstorms in Tucson during the afternoon?
12. How does a sea breeze circulation develop during the day in a place like Florida? Why does the sea breeze typically reverse at night to become a land breeze?
13. What is the main function of the general circulation of the atmosphere? How is this function accomplished in the tropics and mid-latitudes, respectively?
14. What are most desert regions of the world (including the Sonoran Desert in Arizona) generally found about 30 degrees latitude poleward of the equator? Why are most rainforests found at or near the equator?
15. What is the El Niño Southern Oscillation (ENSO)? How is winter rainfall and temperature affected in the United States by this phenomenon?