

**Homework Question Set #2**  
**NATS 101, Section 13**  
**Fall 2010**

**The following questions cover Lectures 7-10. Provide thorough, complete answers for maximum credit. Three of the following questions will be randomly graded, with equal credit given to each question.**

**Due Friday, September 17 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. For the problems involving calculations, clearly label and provide appropriate accompanying textual description for equations used.**

1. What are the principal factors that explain the occurrence of seasons?
2. Barrow, Alaska, located north of the Arctic Circle, receives twenty four hours of daylight on the date of the summer solstice. So why does it have a much lower average maximum temperature on this date than Tucson, Arizona, a location that experiences an approximate ten hour period of night?
3. It is commonly observed that the northward facing side of a mountain in the western U.S. has dense areas of vegetation, like evergreen trees, while the south facing side has relatively sparse vegetation. Explain this observation. Do you think exactly the same observation would hold true for mountains in other parts of the world, such as the Alps in Europe or Andes in South America? Why or why not?
4. Suppose you are landscaping your backyard in Arizona. The back of your house faces due west. Relative to the rear of the house, which of the following directions would be best to plant a large tree to maximize the amount of shade to the house in the summer: west, northwest, or southwest? Explain.
5. As discussed in class lecture, a cotton region shelter is used to house a thermometer that records official surface temperature measurements. Why is the shelter box elevated and painted white with vents on the sides? What is the most ideal location to place such a shelter and why?
6. Why does the maximum temperature typically occur in mid to late afternoon, rather than at noon when the sun is directly overhead?
7. If clouds arrive at 2 a.m. in the middle of a calm, clear night, it is common to see temperatures rise. How does this happen?
8. In Pennsylvania and New York, grapes are typically planted on hillslopes rather than valleys. Why is this a common practice in these states?

9. In Fargo, North Dakota, during winter the temperature frequently falls below 0°F and the city can experience heavy snowstorms. By contrast, Seattle, Washington, experiences relatively mild and rainy winters with temperatures that rarely fall much below freezing. Why are the climates of the two cities so different, even though they are at approximately the same latitude?

10. What is the dew point temperature? How is the difference between dew point and air temperature related to the relative humidity?

11. When outside air is brought indoors on a cold winter day, the relative humidity of the heated air drops below 25%. Explain why this situation occurs.

12. In Arizona, in many older houses it is common to use evaporative cooling, or a swamp cooler, in lieu of any air conditioning even though it is one of the hottest places in the country. Why do swamp coolers work well in a dry, hot climate like Arizona's, but not in a moist, humid climate like the Southeast U.S.?

13. Three cities have the following temperature (T) and dew point (T<sub>d</sub>) during a July afternoon:

Atlanta: T = 90°F; T<sub>d</sub> = 75°F

Baltimore: T = 80°F; T<sub>d</sub> = 70°F

Oklahoma City: T = 70°F; T<sub>d</sub> = 65°F

- (a) Which city has the highest relative humidity?
- (b) Which city has the lowest relative humidity?
- (c) Which city has the least water vapor in the air? The most?
- (d) Calculate the relative humidity for each city. Show your work. See p. 102, Chapter 4 of 9<sup>th</sup> edition or p. 98 in 8<sup>th</sup> edition to help you.

14. Why are atmospheric aerosols necessary for the formation of clouds?

15. Thick fog is very common during winter in the Sacramento in San Joaquin Valleys of central California. What type of fog is this and how does it occur?