

Name: _____

NATS 101 Introduction to Weather and Climate, Section 54, Fall 2005
Homework #4: Due at beginning of lecture **Tuesday**, 22 November 2005.

Global Atmosphere-Ocean Interactions [18]

1. Explain why the thermocline in the eastern tropical Pacific levels out during **El Niño**. Describe the air-sea interaction processes involved, including the shift of the surface pressure systems, the resulting winds and the effect on the ocean. [6]

2. During the **positive** phase of the Pacific Decadal Oscillation, describe how the north Pacific surface ocean temperature are different from normal. What effect does this have on the Aleutian Low and the north Pacific storm track? [6]

3. During the **negative** phase of the North Atlantic Oscillation, describe how the Icelandic Low and Bermuda High are different from normal. What effect does this have on the Atlantic storm track? What effect does this have on the trade winds off Africa? Upwelling off the coast of Africa? [6]

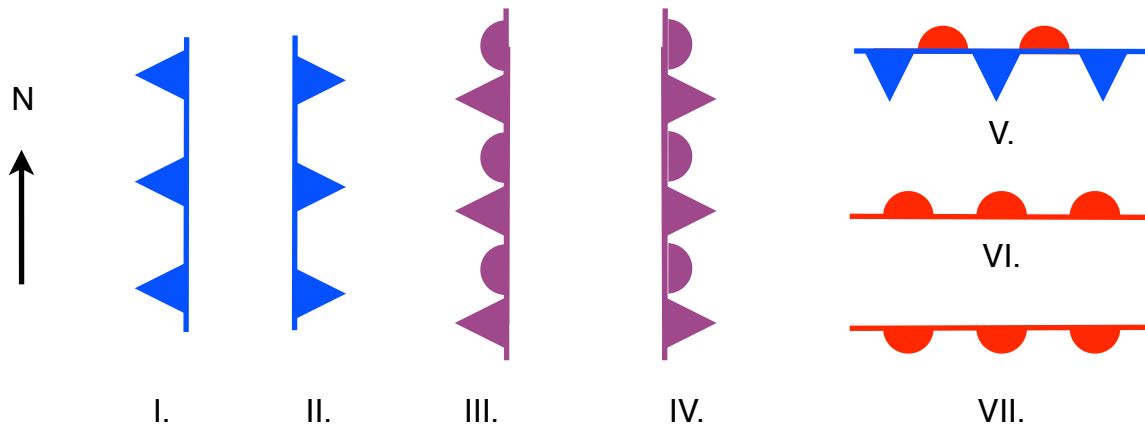
Air Masses [4]

4. Define the four types of air masses discussed in class and give their abbreviations. [4]

Fronts [37]

5. Match the roman numeral to the correct definition. (You will not need all the roman numerals.) [4]

- a. cold front moving east _____
- b. warm front moving north _____
- c. stationary front _____
- d. occluded front moving east _____



6. Name **three** ways of finding (locating) a front on a weather map. [3]

____ 7. A **cold** front moves _____ than a **warm** front and has a _____ leading edge. [5]

- a. faster, more gradual
- b. slower, more gradual
- c. faster, steeper
- d. slower, steeper

____ 8. The air within a **warm** air mass is typically _____, causing _____ upon lifting over a **cold** air mass. [5]

- a. stable, fair weather
- b. absolutely unstable, precipitation and cloud formation
- c. conditionally unstable, fair weather
- d. conditionally unstable, precipitation and cloud formation

____ 9. A **fast** moving cold front will more likely produce _____ clouds, while a **slow** moving cold front will more likely produce _____ clouds. [5]

- a. stratus, cumulonimbus
- b. cumulonimbus, nimbostratus
- c. fog, nimbostratus
- d. cumulonimbus, cumulus

10. Define the term **overrunning** in the context of a warm front. Which cloud types are most likely to form in this situation? [5]

11. Use a diagram to explain **cold occlusion**. [5]

12. Use a diagram to explain **warm occlusion**. [5]

Mid-latitude Cyclogenesis [13]

_____ 13. The polar front could also be considered a _____ front. [5]

- a. cold
- b. warm
- c. stationary
- d. occluded

14. Steps to cyclogenesis:

a. What direction do the winds blow on either side of the polar front? How does this encourage the development of a localized low pressure within the front? [2]

b. Once the localized low develops within the front, how does the front change structure? What new fronts form and what motion develops on either side of the low due to these fronts? [2]

c. What role does cold front and warm front movement play in the developing low pressure region? [2]

d. What final frontal system results from this motion prior to the dissipation of the low and the re-establishment of the original type of front (named in 13.)? [2]

Thunderstorms and Lightning [28]

____ 15. Air _____ and _____ determine air density. [5]

- a. pressure, temperature
- b. speed, pressure
- c. temperature, humidity
- d. humidity, pressure

16. During the growth stage (cumulus stage) of a developing ordinary thunderstorm, what allows the cloud to grow upwards? What process creates downdrafts? [5]

17. During the mature stage of an ordinary thunderstorm, how does the gust front act to encourage the lifetime of the storm? [5]

18. During the growth of a severe thunderstorm, how does vertical wind shear help to encourage the lifetime of the storm? [5]

19. If you see lightning strike and then hear the thunder 20 seconds later, how far away is the thunderstorm? [3]

20. What elements are electrically charged (positive or negative) in a thunderstorm cloud? Why is it a bad idea to sit under a tall tree in an open field during a thunderstorm? [5]