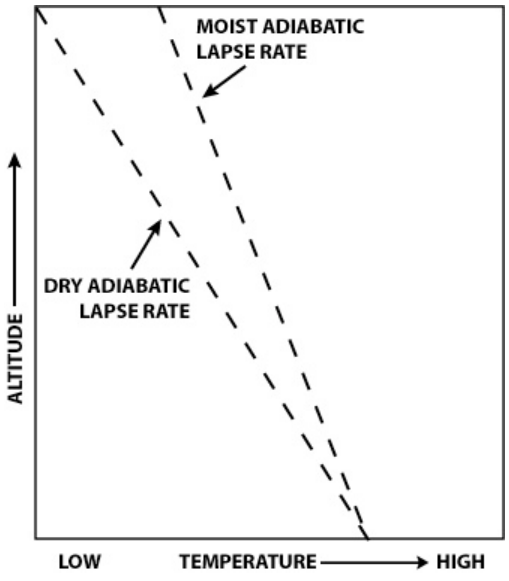
MET 200: Atmospheric Processes and Phenomena
Review questions and study guide for Quiz #2
Also review quiz 2 available at
http://www.soest.hawaii.edu/MET/Faculty/businger/courses/notes101/05QZ2.pdf

The lectures that will be covered in the quiz include:

Stability, convection, latent heat release	Chapter 6
Precipitation processes and types	Chapter 7
Laws of motion and wind	Chapter 8
Hawaii local winds	Chapter 9
Global circulation	Chapter 10
El Niño – impact on Hawaiian weather	Chapter 10/Lecture notes

1. An air parcel that is saturated (100% relative humidity) is lifted from sea level to the top of a mountain pass at 2 km elevation. If its temperature was 15° C at sea level, its new temperature at the pass will be _____ ? (Show your work)
2. If the air parcel in part a) descended the far side of the pass back to a sea level elevation, its final temperature will be _____? Use your answer to 7) as the starting point, and assume the descending parcel is dry because the excess cloud water has rained out. (Show your work).
3. Given the dry and moist adiabatic lapse rates in the figure on the right, draw and label lines that represent a conditionally unstable lapse rate, an absolutely stable lapse rate, and an absolutely unstable lapse rate.
4. Under what conditions in the atmosphere is the wind in geostrophic balance with the PGF = Co?
5. Write an equation for the geostrophic wind (V_g).
6. From a carefully drawn hand analysis the magnitude of the gradient in geopotential height (Z) at 500 mb over Seattle, Washington is estimated to be 10 m per 100 km, with lower heights to the south. Calculate the wind speed

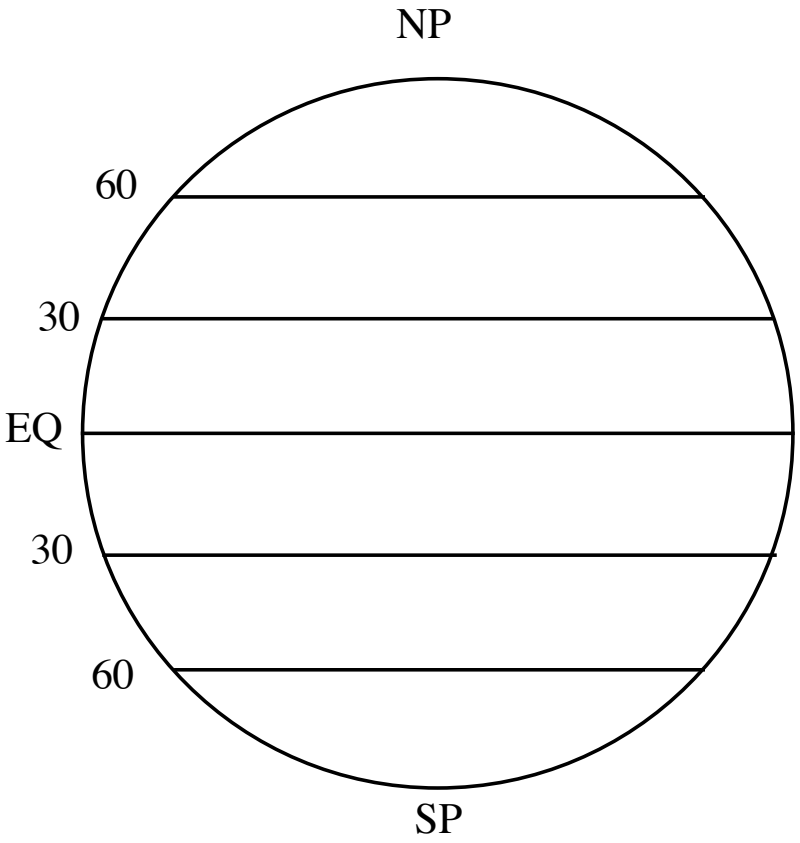


in knots consistent with this gradient, and give the direction that the wind is blowing from. (Assume $f \sim 10^{-4}$ s^{-1}, $g \sim 10$ m s^{-2}, 2 kt ~ 1 m s^{-1}).

7. Give some examples of atmospheric phenomena the produce winds for which the Coriolis force is not important.
8. What causes the sea breeze and why is the sea breeze circulation strongest on the Island of Hawaii?
9. What is the relationship between the orientation and spacing of isobars on a weather map and the direction and strength of the winds?
10. For the following question, place an **X** in the box under the appropriate forces that are in balance in each case.

	Pressure	Coriolis	Gravity	Centrifugal	Friction
a. Geostrophic Balance					
b. Hydrostatic Balance					
c. Cyclostrophic Balance					
d. Gradient Balance					
e. Straight-line Surface Winds					

11. El Niño conditions include anomalously *warm* sea surface temperatures over the eastern equatorial Pacific and anomalous *westerly* winds near the international dateline. Textbooks often misplace the enhanced rainfall near the coast of Central America, whereas it is really nearer the dateline. Why is that?
12. Using the diagram below draw and *label* the major features of the general circulation of the Earth's atmosphere. Include arrows for winds, locate highs (H) and lows (L), Hadley cell, trade winds, westerlies, easterlies, ITCZ, and polar front.


NP
60
30
EQ
30
60
SP