MET 200: Atmospheric Processes and Phenomena
Review questions and study guide for Quiz #4
Also review quiz 4 available at
http://www.soest.hawaii.edu/MET/Faculty/businger/courses/notes101/05QZ4.pdf

The lectures that will be covered in Quiz 4 include:

Scale Interaction	Lecture notes
Weather Forecasting in Hawaii	Chapter 13
Hawaiian Weather Hazards /Air Mass Thunderstorms	Chapter 14
Hawaiian Floods	Lecture notes
Severe thunderstorms, Water spouts, and tornadoes	Chapter 14
Air pollution/ozone hole/acid rain	Chapter 18
Past climate/ice ages/climate change	Chapter 16
Evidence for Global warming: the current situation	Chapter 17
Global warming: looking ahead	Chapter 17

The following questions will be covered in the quiz.

- What is the significance of Rossby Waves (aka planetary waves)?
- What is a Rex block?
- What are the three interacting time scales in high-impact winter storms events.
- What is the mission of the National Weather Service?
- What are the steps in numerical weather prediction?
- What are the challenges in modeling weather in Hawaii?
- What are the weather hazards in Hawaii and what are the four large-scale weather patterns that produce hazardous weather here?
- During what month are kona lows and flash floods most common in Hawaii?
- Why do air mass thunderstorms tend to dissipate in the evening over land?
- Sketch the three stages of an airmass thunderstorm, including airflow, freezing level, and precipitation.
- Thunderstorms help regenerate the charge differential between the ionosphere, which is positive and the ground, which is negatively charged. How do thunderstorms do this?
- What are the three ingredients for heavy rain in Hawaii?
- What are two ways that terrain can enhance rainfall in Hawaii?
- Why is the response time between the onset of heavy rain and flash floods short in Hawaii?
- What tools do forecasters use to forecast flash flooding?
- What are the criteria for a thunderstorm to qualify as severe?
- Which of these criteria require the greatest combined shear and buoyancy?
- What are the ingredients that allow very large hail for occur?
- What are the classic large-scale weather conditions that lead to a “big tornado day?”
- When (time of day and year) and where (state) would you go to have the best chance of seeing a large destructive tornado?
- What air pollutants does the EPA regulate?
- What is the role of temperature inversions in pollution episodes?

- What is the role of high surface-pressure areas in pollution episodes?
- What is pH a measure of? What is the pH of distilled water? of clean rainwater?
- List the two most important pollutants that cause acid rain.
- Where in the Earth's atmosphere is the protective layer of ozone located?
- What is a primary pollutant responsible for the destruction of the Earth's ozone layer?
- What are the hazards associated with a loss of the Earth's protective ozone layer?
- Is ozone in the boundary layer good or bad for your health? Explain.
- What is the primary pollutant in vog?
- List three primary hazards from vog.
- What does a vog dispersion model need for input?
- What determines the long-term climate of the Earth in the simplest terms?
- What is the difference between internal and external forcing of climate change?
- How would you characterize the Earth's climate over the past billion years? over the past million years?
- What is thought to be the cause of the cyclic changes in climate from ice ages to interglacial warm periods during the past million years?
- What evidence supports the claim that the Earth's atmosphere and oceans have warmed since the start of the industrial revolution in the late 1800s?
- Where is most of the warming going?
- Water is by far the most abundant greenhouse gas in the atmosphere, so why is all the focus is on CO_2 and methane?
- Ice in a glass of water keeps the temperature of the water near freezing until all the ice melts. What happens to the temperature of the water after all the ice melts? What conclusion do you draw from this for the temperature of the water in the Arctic Ocean should all the sea ice melt during a given summer?
- Explain why both floods and droughts become more frequent in a warmer climate.
- How do we know that the burning of fossil fuels is the cause of the rise in CO_2 in the atmosphere?
- What aspect of climate do climate models have a great deal of difficulty modeling? (think basic observed weather variables)
- What are some choices society can make to incrementally reduce the emission of CO_2?
- What was proposed in class as a rational approach for quickly reducing global consumption of fossil fuels?