

**NATS 101, Section 13, Fall 2010
Midterm Examination #1
Study Outline**

Chapter 1: Earth and Its Atmosphere

Composition of the Atmosphere: what are the most abundant gases, which gases are greenhouse gases, concern of changing concentration of greenhouse gases

Vertical profiles of temperature and pressure

Layers of the atmosphere: How are the various layers (“spheres”) of the atmosphere determined? What are the physical mechanisms that govern how temperature changes in these layers?

Mass, weight, density, pressure: how are these defined and what are their SI units of measure. The atmospheric pressure is the weight of a column of air above. What is typical sea level pressure? How does air pressure change as a function of altitude?

Station model notation: How to translate weather information given in a station model, both surface and upper air.

Weather and climate: how is each defined and what is the difference between them?

Chapter 2: Energy: Warming the Earth and the Atmosphere

Energy and temperature: Temperature is a measure of average kinetic energy. Know how to convert between all three temperature scales.

Three mechanisms of heat transfer: conduction, convection, radiation. Be able to define each of them. How do they work in the boiling pot example?

Latent heat: energy of phase change. What are the names for the various phase changes? Is energy consumed or released during phase changes?

The electromagnetic spectrum: How do the various types of waves related to energy? Which parts represent the type of radiation emitted by the sun and earth? How do we sense these?

Laws governing radiation emission: Stefan-Boltzmann Law, Wein's displacement law. What do these laws tell us about radiation? Be able to use these laws if provided the constants within them.

Radiative equilibrium: What is so important about selective absorption by the Earth's atmosphere? What is the greenhouse effect?

Chapter 3: Seasonal and Daily Temperatures

Seasons: dates and orientation of earth on the solstices and equinoxes. What are the factors affecting the solar energy that reaches the ground?

Local controls of temperature: What processes govern the evolution of surface temperature from day to night? What are the effects of clouds, wind, and phase changes of water?

Regional and global controls of temperature: Effects of latitude, proximity to oceans, ocean currents, and altitude.

Chapter 4: Atmospheric Moisture

Humidity: What is the definition of saturation, relative humidity, and dewpoint? Understand the physical concepts behind all of these measures. What is the effect of temperature on the capacity of air to hold water vapor?