Study Guide, GEOL/ESS 2000, Exam II **Exam II is during class, Oct. 20, 2017**

You need not memorize the equations we have seen in class or in lab. I am interested in whether or not you understand the general concept, not whether you can memorize equations. I'll give you equations or data needed for a calculation. BUT – you do need to be able to understand what the equation means when you see it!

In general, it is obvious that the second exam will cover the material since the first exam that we have covered in lecture up to this time (Ch. 2 through beginning of Ch. 7 or just Ch. 6). Concepts from lab might also appear in the exam.

Chapter 2:
-Perturbation vs. Forcing
-Positive and negative linkages between system components
-Positive and negative feedback loops
-Albedo – what is it?
-How do daisies regulate climate on daisyworld?
-What are the stable and unstable states on daisyworld?
-Are there limits on how far the daisies can be pushed by increasing solar output?

Chapter 3:
-Understand light as electromagnetic wave with wavelength, frequency
-Relationship between light intensity and distance
-What is flux?
-Steady-state; what is steady state?
-Black body radiation
-Energy balance for a planet; how to calculate the temperature of a "black body" planet
-Difference between actual and "black body" temperature: effect of atmosphere
-Modes of heat transfer
-Atmosphere structure: troposphere, stratosphere, mesosphere, etc.
-Molecular vibration and ability to absorb light energy
-Light as electromagnetic wave with wavelength, frequency, speed
-Relationship between light intensity and distance
-What is a light power flux?
-Steady-state; what is steady state? Does steady-state apply to heat energy input and output? How do you calculate residence time? (we did this before – but this is ongoing!)
-Black body radiation; how do we calculate temperature from emission spectrum, how do we calculate the emission temperature of Earth or other planets?
-Energy balance for a planet; how to calculate the temperature of a "black body" planet, emission of infrared (IR) light, absorption of sunlight.
-Difference between actual and "black body" temperature: effect of atmosphere

Chapter 4:
-Modes of heat transfer
-Atmosphere structure: troposphere, stratosphere, mesosphere, etc.
-Molecular vibration and ability to absorb light energy

-Troposphere-stratosphere-mesosphere – temperature gradient with altitude, why important?
-Global energy distribution
-Atmospheric convergence, divergence, subsidence, convection
-Moderating effect of ocean on air temperature, large continental temperature variation
-Hadley cells, polar pressure gradient and polar front zone, jet stream
-Coriolis forces
-Climate bands – combination of convective circulation and Coriolis forces
-Water saturation in air, relative humidity, dewpoint

Chapter 5:
-Ocean gyres; Ekman spirals, convergence, divergence zones for surface water flow
-Thermocline – halocline – pycnocline; importance of water density
-Thermohaline circulation; age of deep ocean water, zones of origin of deep ocean water
-El Nino/Southern Oscillation – what, basically, are the symptoms?

Chapter 6:
-Cryophere; river-lake ice, sea ice, glaciers, snow and ice on land, permafrost; thermal inertia, glacial motion, permafrost properties.

The following will depend on how far we get on Wednesday
-p-waves, s-waves, the structure of the Earth in terms of major layers
-Plate tectonic features – mid-ocean ridges, subduction zones, transform faults, hot spots
-In simple form, role of water in plate tectonics; effect on melting temperatures