GEO-105 STUDY GUIDE - SECOND EXAM November 2009

This exam will be concerned entirely with earthquakes (lectures 9 - 15). There will be five major questions (20 points each), each one containing sub-sections. You will find it easier if you bring a ruler and a calculator to this exam.

Historical Perspective

1. Be familiar with the contributions of people like Mallet, Milne, Mercalli, Reid, Richter to the study of earthquakes and seismology.
2. What is the fundamental difference between the Mercali and Richter intensity scales for earthquakes?
3. Understand the ideas behind the elastic rebound theory.
4. Where do earthquakes mostly occur, and how are they related to plate tectonics?
5. How does a seismograph work?
6. How did the Lisbon earthquake affect thinking of that time?

Faults - there is **always** a major question on faulting (20 points)

1. Understand the basic terminology (strike, dip, hanging wall, foot wall, horst, graben).
2. Be able to recognize the different types of faults from diagrams (normal, reverse, transform, thrust etc,)
3. What are the stresses (tension, compression, shear) related to each of these types of faults?
4. Could you draw an example of a specific type of fault?

Seismic Waves

1. Understand the difference between Body and Surface waves.
2. Familiarize yourself with the motions of the different seismic waves
3. What are their relative speeds through the earth's crust?
4. Which ones cause the most damage?
5. Be able to interpret a seismic record, including P and S waves, their times of arrival and their amplitudes.

Distance to Earthquake Epicenters and Earthquake Magnitudes - there is **always** a major question (20 points) on one or both of these topics. Warning, if you cannot determine distance you cannot determine magnitude! Also, this is the kind of question where you are **totally right** or **totally wrong**.

1. Be certain that you can calculate the distance to an earthquake epicenter using **both** the "back of the envelope" approach as well as the graphical approach.
2. In the "real world" you will have to deal with hours, minutes and seconds, not just seconds!
3. Familiarize yourself with producing answers in both miles and kilometers.
4. Know how to measure amplitude from a seismic record.
5. Practice using the Richter nomogram. If there is an earthquake magnitude question, the nomogram will be provided on the exam sheet.

6. Be sure to understand how the Richter scale works. Remember it is logarithmic!

Tsunamis

1. How are tsunamis produced?
2. What are tsunamis?
3. Wave speed is proportional to the depth of the ocean.
4. What is being done about tsunamis?

Earthquake Case Histories - we have looked at several "classic" earthquakes (San Francisco, 1906; Alaska, 1964; Loma Prieta, 1989; New England). Questions on these **always** come up.

1. How big were they?.
2. What caused them?
3 Be familiar with what specifically happened during those earthquakes, especially the nature of the damage. Conversely, be familiar with the major causes of earthquake damage (faulting, ground shaking, slumping, liquefaction, landslides, fire, tsunamis) and where they occurred.

Monitoring and Predicting Earthquakes

1. What are fore-shocks and after-shocks?
2. Understand the seismic gap theory and how it is applied to earthquake forecasting.
3. What are the physical measurements (geodetic, tilt, creep, conductivity , radon) that are used in earthquake monitoring, and why?

Hints:

Unlike multiple choice or true/false questions, questions on faults or distance to epicenters and earthquake magnitude are "all or nothing questions". They are worth 20 points each. Consequently, you either get them right (and do very well) or you get them wrong (and screw up big time!). My advice (for what it is worth) is make absolutely sure you can "ace" those questions.