

# **HONR 115-Earth Resources and Environment**

## **Study Guide for Hour Exam #1 (to be held on September 22, 2008)**

There will be **10 definitions** (3 points each), **5 short answer questions** (10 points each), and **1 essay question** (20 points). Definitions deal with important terms that one needs to know in order to better communicate about a topic with others. In other words, no matter how you phrase it the meaning of the term remains unchanged. For definitions I want you to write no more than two sentences and a sketch (if appropriate). Short answer questions involve briefly discussing various aspects of a topic. To answer short answer questions you will need to understand a certain topic (e.g. felsic igneous rocks) and its relations to other relevant topics (e.g. what geologic and/or plate tectonic settings are suitable for formation of felsic igneous rocks). You will have to know how to apply your knowledge about a topic to new situations, i.e. you should be able to analyze various components of a broad topic (e.g. felsic rocks are intrusive but when you find them exposed on the surface of the earth it implies that weathering processes must have removed the overburden). The essay question is designed to see if you can synthesize information from various topics to answer a question. You should be able to analyze, synthesize, and evaluate different aspects of a problem and offer your own judgment in light of the knowledge that you have gained about Science, Earth Resources, and Environment in this course (e.g. if you were an exploration geologist for a company, how would you go about designing a plan to look for a certain kind of mineral resource in an unexplored area). In order to answer an essay question well, you have to have a broad understanding of most or all subject matters covered in the class, and I will not list any specific essay question in this study guide. I will only say that, try to understand the concepts as to how our planet works, i.e. try to understand the big pictures and be able to put things in perspective.

### **Here is a list of terms that you need to know for definitions:**

Science, theory, hypothesis, geology, non-renewable resources, mineral, rock, Rock Cycle, differentiation process, outgassing, lithosphere, asthenosphere, magnetosphere, convection currents, lithospheric plates, plate boundaries, hot spots, subduction zone, magma intrusion, plutonic vs. volcanic igneous rocks, igneous textures, ferromagnesian vs. non-ferromagnesian minerals, felsic vs. mafic igneous rocks, Bowen's Reaction Series, regional vs. contact metamorphism, burial metamorphism, agents of metamorphism, foliated vs. non-foliated metamorphic textures, metamorphic grades, rock-forming minerals, silicate minerals, Black Smokers, hydrothermal veins, pegmatite, hydrothermal gradient, weathering, erosion, depositional environments, lithification, sediments, grain sizes, sorting, roundness, clastic vs. chemical precipitates, evaporates.

### **Short answer questions:**

- What is science? How is science different from other disciplines? What steps are involved in doing science? Know a specific example where you observe a

phenomenon or problem and develop an experiment in light of science methods (steps).

- How do theory and hypothesis vary from each other? Know examples of scientific hypothesis and theories.
- What is geology? Is geology a science? What makes or doesn't make geology a branch of science?
- Why do we need to study Earth Resources and Environment? Know specific examples as to how issues related to Earth Resources and Environment touch your everyday life.
- Where do we stand in terms of earth resources availability, consumption, and environmental degradations that have resulted due to extraction and uses of mineral resources? Know specific examples in terms of changes in population growth, increase in the amount of resources use, and environmental degradation caused by such uses of Earth resources during last century in general and last few decades in particular.
- Describe the origin of Earth, its atmosphere, ocean, internal structure, and various rocks and minerals in light of Nebular hypothesis.
- What is the difference between crust, lithosphere, asthenosphere, and mantle. How do they relate to each other?
- What is the difference between minerals and rocks? What properties are used to identify minerals and rocks out in the field or in the lab? Know specific examples as how you could identify minerals or rocks that "look" alike.
- What is Rock Cycle? Why is it important to understand the Rock Cycle? What forces or causes are behind the Rock Cycle? How do the Rock and Plate Tectonic Cycle relate to each other? How are they different or are they?
- What are some major differences between three types of rocks? In other words, why rocks are divided into three groups? Know examples of each type of rocks.
- When you study igneous rocks what criteria do you look for and what can those criteria tell you about their origin or history of formation? What are some economic mineral resources that owe their origin to igneous processes. How do the igneous rocks originated in or on the continent differ from those in oceans? Know examples of igneous rocks that you are likely to find in different parts of the plate tectonic settings (e.g. along divergent and convergent boundaries).
- Why is the concept of Plate Tectonic so important in terms of Earth resource exploration? What are some evidence you can think of that proves (or disproves) that the theory of Plate Tectonics at (or not) at work Be able to sketch cross sections (i.e. sub-surface view) of various plate boundaries and show various types of rocks (all three types) and economic resources that you possibly can find in different parts of the plate tectonic settings.
- What factors are responsible for formation of metamorphic rocks? Know how various grades of metamorphic rocks relate to plate boundaries. What economic resources are generated by different types of metamorphism. How can you explain the occurrence of different types of coal (anthracite, bituminous coal, lignite) in terms of plate tectonic history of Pennsylvania?

- What are some differences between foliated and non-foliated metamorphic rocks? When you study metamorphic rocks what are some major questions that you try to answer about those rocks?
- What makes sedimentary rocks different from other two kinds? Why are sedimentary rocks important to study? What are different sources for materials (sediments) that make up sedimentary rocks?
- What geologic processes are responsible for formation of sedimentary rocks? What are some major criteria or characteristics in sedimentary rocks you study to understand the history of formation of these rocks? When you study sedimentary rocks what questions you try to answer the most about them?
- What criteria are used to determine depositional environment of a sedimentary rock? What are some economic resources that are associated with sedimentary rocks? Know examples of sedimentary processes and the economic resources that they produce.
- How do sedimentary rocks relate to Plate Tectonics? In other words, does Plate Tectonics play any role in formation of sedimentary rocks? If it does, how?

### **Essay Question ...**

As I said earlier, I am not going to list any essay question here. Understand major concepts, pay attention to the details in answering the question. Here is your chance to show your mastery of the subject matter. You will be graded based on completeness of the answer, logical reasoning (not necessarily being always right), ability to analyze, synthesize, and evaluate a real-world situation, as well as the quality of your writing.