

## **ESCI 102 Midterm Exam Review Questions Spring 2005**

### **Dynamic and Evolving Earth**

What is uniformitarianism?

What are the five subsystems of Earth? Give three examples of how they are inter-related.

What are the sources of Earth's heat?

Give 3 examples of interactions of Earth's subsystems.

When did the origin of the universe occur?

Prior to the Big Bang, what was the universe? What laws did it obey?

What are 2 pieces of evidence for the Big Bang?

What is the solar nebula theory?

What are the features of terrestrial planets? Of Jovian planets?

What are the three layers of Earth?

How thick is continental crust? Oceanic crust?

What are the lithosphere and the asthenosphere?

What are the primary components of Earth's core?

What are average densities for oceanic crust, continental crust, mantle, core rocks?

### **Plate Tectonics**

What's the driving force for plate tectonics?

What are "hot spots?" Why are they useful?

What is plate tectonic theory? When was it first established?

What are the three primary types of plate boundaries?

Provide three examples of how plate tectonics impacts the Earth's subsystems.

At what type of plate boundary is new crust formed?

At what type of plate boundary are mountains formed?

How many plates make up the surface of Earth?

How deep is it to the center of Earth's inner core?

About how large is the inner core of the Earth?

How thick is the lithosphere? Asthenosphere?

What is the difference in their physical properties?

What is continental drift? What was the key problem with the concept?

How old is the oldest oceanic crust?

How quickly do continental plates move?

### **Rocks and Minerals**

What is the difference between contact and regional metamorphism?

What is the difference between felsic, intermediate, and mafic igneous rocks?

What are the three types of rocks? Give an example of each.

What is the relationship between minerals and rocks?

What is the most common class of minerals on Earth? How much of Earth's crust is composed of this group?

What are the textures of metamorphic rocks?

What is foliation? What types of rocks can be foliated?

What is the atomic mass number of an element?

What are isotopes?

Are all isotopes useful for radiometric dating? If not, which ones are?

If I start with 400 atoms of a radioactive parent element and measure the number of parent atoms after 4 half-lives, how many parent atoms will I have?

What can we learn from radiometric dating of sedimentary rocks?

Does radiometric dating work for metamorphic rocks? If so, why?

Define what is meant by a closed-system, in the context of radiometric dating.

What are the 3 main isotopes of carbon? Which are stable and which are unstable?

What does carbon-14 dating measure?

Define matter, element, and atom.

Geologically speaking, what is a mineral?

There are \_\_\_\_\_ minerals, but only about \_\_\_\_\_ are common.

What is the difference between ferromagnesian and non-ferromagnesian silicates?

Draw a picture of the rock cycle. Identify the types of rocks that are produced and how they are produced.

Are magma and lava different? Why or why not?

What information can we get from igneous rock texture (for example, porphyritic or phaneritic rock)?

What criteria are used to classify igneous rocks?

How does lithification occur in sedimentary rocks? What does lithification do?

Give an example of a chemical sedimentary rock and a detrital sedimentary rock.

### **Rocks, Fossils and Time**

In what types of rocks do you find fossils? Why?

In what types of rocks won't you find fossils? Why?

What are the two types of fossils?

What are marine transgressions and regressions? What can cause them?

What types of fossils are useful for dating rocks? Why?

Define fossil. Describe two things we can learn from fossils.

Give an example of a type of body fossil.

What is a trace fossil? Give two examples.

The fossil record is incomplete, yet useful. Define at least 2 processes that make it incomplete.

What is the principle of fossil succession?

Define the two ways of correlating rocks between different areas.

What is indirect dating?

How can igneous rocks be used to date sedimentary rocks?

What do we call missing time in the rock record?

What are two things that can cause missing time in the rock record?

What are the three types of unconformities? Define them.

### **Sedimentary Rocks**

What are the three types of sedimentary rocks? Give an example of each.

In a sedimentary rock, what does the grain size, degree of sorting, and shape of the grain tell you?

Give two examples of poorly sorted sediment deposits.

Give two examples of well sorted sediment deposits.

What is a sediment?

How do sedimentary rocks form?

What are the two environments in which sedimentary rocks form?

What type of sedimentary rocks form in braided streams? In meandering streams?

Describe the types of sedimentary rocks formed in glaciated regions.

What is the difference between well- and poorly-sorted?

Give an example of a high energy environment and the type of sediments they transport.

Give an example of a low energy environment and the type of sediments they transport.

Describe a current ripple mark. What can you learn from it? How is it different from a wave-formed ripple mark?

What is stratigraphy? What type(s) of rocks can be stratified?

What is a bedding plane? What does it separate?

Define sedimentary facies.

### **Geologic Time**

Which carbon isotope is used for radiocarbon dating? What is its half-life?

What is a half-life?

What are the three types of radioactive decay?

What are the two types of geologic dating? How are they different?

Rank the following by length of time: period, era, eon, epoch.

What is relative dating?

What is absolute dating?

How does radiometric dating work?

Name 2 ways to get absolute dates.

Provide 3 estimates for the age of Earth and how they were determined.

What is the age of Earth?

Who was Nicolas Steno? Why was he important to historical geology?

Name and define the six principles of relative dating.

What is the principle of superposition?

Who is the father of modern geology?

What is the concept of Neptunism? Why did it fail?

How was catastrophism incorporated into ideas on Earth history? Why was it abandoned?

What is uniformitarianism? Who developed the concept? Who was the chief advocate?

According to uniformitarianism, why must Earth be very old?

What was Lord Kelvin's role in uniformitarianism? What was his experiment?

Define radioactivity and why its discovery was important for geology (two key reasons).

### **Precambrian History**

What problems do geologists face when trying to understand Precambrian history?

What was happening on Earth during the Hadean?

When is the start and end of the Precambrian?

What are the dominant gases in Earth's atmosphere today?

What is a craton?

What is the age of the oldest rocks on Earth?

What is the age of the oldest sedimentary material on Earth? What does this tell us?

How do we know what gases and vapors were emitted from volcanoes in the Hadean?

Why are there no Precambrian rocks in the oceanic crust?

Why is volcanic outgassing important in Earth history?

Why do scientists think that early life originated with no oxygen requirements?

Why would photochemical dissociation slow down through time?

What type of life existed in the Archean eon?

How did surface water originate on Earth?

What did Earth's first life use for nutrients?

How old are the oldest fossils? What are they?

What is photosynthesis and why is it important?

What processes account for free oxygen in our atmosphere?

What are the two requirements for life? How were they supplied to early life?

How much history (number of years) is preserved in the Grand Canyon?

What is the time span of the Hadean? Archean? Proterozoic?

What defines the end of the Archean and the start of the Proterozoic?

What is Laurentia? When did it form and grow?

What is the Wilson cycle?

What supercontinent existed in the Late Proterozoic?

What evidence do we have for Proterozoic glaciation? How widespread was the glaciation?

Why are Ediacaran fauna important for understanding evolution?

Name 3 present-day organisms that may be represented in the Ediacaran fossil record.

What is an orogen?

What are some differences between Archaean and Proterozoic Eons?

What are the dates of the beginning and end of the Proterozoic?

Why no evidence of glaciation in Antarctic?

What is an ophiolite?

What modern-day continents were once part of Laurentia?

What is the name of the first supercontinent?

How long ago was Earth completely frozen?

Why are Ediacaran fossils mostly trace fossils?

When did Rodinia exist?

How was Earth able to recover from Snowball Earth phase?

What supercontinent was formed 2-1.8 billion years ago?

### **Evolution**

What is natural selection?

What are the four main arguments Darwin put forth for evolution?

Define phyletic gradualism and punctuated equilibrium.

What is the definition of a species?

What is a vestigial structure?

What is an example of a vestigial structure?

What is a homologous structure? An analogous structure?

Define gene pool.

What can cause DNA in a gene pool to vary?

Describe the three types of DNA changes.

Why are the Galapagos Finches famous?

How did Linneaus organize life? How has this been confirmed?

What are the three patterns of evolution? Define them.

What is the concept of inheritance of acquired characteristics? Discuss its success/failure.

Compare and contrast background extinction and mass extinction.