EES 2510 Earth Systems Fall 2018

Review Questions for Exam 1

**Chapter 1 *Introduction***

1 What distinguishes science from other ways of understanding the world?

Answer: There are three things that distinguish science from other ways of understanding the world.

A: Method of Understanding the World

B: A Body of Knowledge Gained from this Method

C: The New Things You Can Do with this Knowledge and Technology

2 In my explanation, what are the three ways of describing what science is or is good for?

Answer:

A: The first reason, Method of Understanding the World; this first reason deals with observation and how it is the judge of what is true.

B: The second, Body of Knowledge gained from this World;

C: Lastly, The New Things You Can Do with this Knowledge and Technology;

3 Be sure you can explain how geologists can formulate theories about Earth processes that operate too slowly for humans to observe directly.

4 Explain why you have a civic duty to do well in this course.

5 Describe the Nebular Theory of the origin of the Solar System.

Answer: The nebular theory describes how when the big bang occurred, overtime in the mass of mineral particles, some started to collect together and form the beginnings of the milky way. As time went on slowly the globs of plasma started to shape and form into the sun and planets that now make up our solar system.

6 How did Earth come to have a layered nature?

7 How do the crust, mantle, and core differ?

8 How was Earth’s ocean formed?

9 How was Earth’s atmosphere formed? How has it changed since it was formed?

10 Be sure you can name Earth’s four subsystems (that is, the *\_\_\_-spheres*).

**Chapter 2 *Plate Tectonics***

1 How do the crust, mantle, and core differ? How and why does the inner core differ from the outer core?

Answer: The crust, mantle, and core differ in materials that make each section, as well as different levels of thickness for each…In addition, the outer core and inner core differ as well specifically with…

2 How does continental crust differ from oceanic crust? What are typical thicknesses of both?

Answer: the continental crust differs from the oceanic crust differ. The typical thickness of the two crusts differ with the continental crust being 70km, the thicker crust and the oceanic crust is only 7km, a thinner crust.

3 What are the *lithospheric plates*? What layers of the Earth do they include? What layer separates them from the bulk of the mantle?

4 What is the likely composition of the core (two elements)?

Answer: The two core elements that compose the core are iron and nickel.

5 How is the interior of the Earth divided by the *state* of the materials?

6 How does the lithosphere differ from the asthenosphere? How thick is each?

7 Be sure you can explain the origin of the asthenosphere in terms of actual temperature and melting temperature.

8 Explain how gravity can help move lithospheric plates.

9 Explain an older idea that attributed plate movement entirely to heat within Earth’s interior.

\* Not a question but a statement: *The current view is that plate motion is driven by heat and gravity.*

10 What *hypothesis* is attributed to Alfred Wegener?

11 What five (5) lines of evidence supported the hypothesis of *Continental Drift*? You should be able to name these and also explain how they supported the idea.

12 Why was the hypothesis of Continental Drift *not widely accepted* as a scientific theory?

Answer: The hypothesis of Continental Drift is not widely accepted as a scientific theory because even though there is evidence to prove its existence, there was nothing to prove how it occurred, where it came from what started this continental drift.

13 Describe the process of *sea floor spreading* that occurs at mid-ocean ridges.

14 What are the *three types of plate boundaries*?

15 Why is it important to consider the *type of crust* at plate boundaries?

16 Describe the features that form at *divergent* plate boundaries within *continental crust*.

17 Describe the features that form at *divergent* plate boundaries within *oceanic crust*.

18 Describe the features that form at *convergent* plate boundaries with *oceanic crust* against *continental crust*.

19 Describe the features that form at *convergent* plate boundaries with *oceanic crust* against *oceanic crust*.

20 Describe the features that form at *convergent* plate boundaries with *continental crust* against *continental crust.*

21 Describe the feature that forms at *transform* plate boundaries with *continental crust* against *continental crust*.

**Chapter 3 *Minerals***

1 Be sure to know the differences among these terms: rock, mineral, compound, element (atom).

2 Be sure to know the characteristics that define minerals:

(1) naturally occurring

(2) formed by geologic processes (possibly aided by organisms)

(3) solid

(4) crystalline structure

(5) definite chemical composition

(6) inorganic (this should be taken to mean “not derived from carbohydrates” so that, for example, coal would be excluded; we recognize that carbonate minerals can be produced by organisms)

3 Out of more than 100 chemical elements that have been identified in nature, how many are abundant in Earth's crust? Name the top two. Be sure to recognize the top 8.

4 Why are silicate minerals the most common minerals in rocks?

5 What are the two types of silicateminerals and how do they differ?

6 What shape is formed when one atom of silicon (Si) bonds with four atoms of oxygen (O4)?

7 Name the five ways that these shapes link together into larger crystalline structures.

6 What are two important groups of non-silicate minerals? Where (in what setting) do each of these groups of minerals typically form?

7 Be sure to know the characteristics that are used to identify minerals:

Color, Streak, Luster, Streak, Hardness, Reaction to Acid, Cleavage or Fracture

Answer: Color is for what the mineral looks like, if it gives off a specific color, Luster is the feel of the mineral, or what texture does the mineral have. Streak is when you take the mineral and scratch it against a harder surface, the color of the streak it creates is what you look for. Hardness is how tough the mineral is, there is a hardness scale that you follow, you try to scratch the mineral and if it doesn’t, then the mineral is harder, if the mineral is scratched instead then the mineral is softer than the surface you used. Reaction to Acid, when you take an acid and drop some onto the mineral and observe if there is any reaction at all. Cleavage or Fracture is all about what you can observe from the mineral example. Depending on the observation the mineral can have a rage of different types of cleavage or it is a fracture.

8 What value is there in being able to identify the minerals in any given rock? What’s the point?

Answer: The importance of being able to identify minerals in any given rock because it can reveal so much about the area that it was found from.

**Chapter 4 *Igneous Rocks***

1 How does lava differ from magma? What is the range of temperature for magma?

Answer: Lava is what appears on the surface when a volcano erupts while magma is what lays down below the surface. The temperature range of magma is around 650 C to 1100 C. Compared to a kitchen oven at max is only 260 C = 500 F.

2 When looking at a hand sample of an igneous rock, how would you tell if it is intrusive or extrusive?

3 What does a rock with fine grained texture tell us about its history?

4 What does a rock with coarse grained texture tell us about its history?

5 Why does a magma that cools slowly produce a rock with coarse grained texture?

6 Why does a magma that cools quickly produce a rock with fine grained texture?

7 What does a rock with mixed grained texture tell us about its history?

8 What does a glassy texture tell us about the history of an igneous rock?

Answer: A glassy texture of an igneous rock such as obsidian for example shows that in this rock’s history it went under very rapid cooling and in that process the crystal structures didn’t have enough time to form which is why the glassy texture forms.

9 How do the holes form in vesicular igneous rocks?

Answer: Holes form from Vesicular Igneous Rocks from gas trying to escape from inside the rock itself.

10 What does a rock with pyroclastic texture tell you about its history?

Answer: A rock with a pyroclastic texture occurs during volcanic events. This is when melted or nearly melted rocks and bits and pieces are welded together.

11 How does Bowen’s Reaction Series explain the groupings of minerals that occur in mafic magmas and the rocks they form? in intermediate magmas and rocks? in felsic magmas and rocks?

12 Are igneous rocks classified (named) based on composition, on texture, or on both?

Answer: Igneous Rocks are named based on both composition and texture. They go hand in hand like pairs. Depending on the amount of pressure and the melting temperature of the igneous will result in a specific composition and texture giving us an igneous rock of a certain type.

13 What is similar about the rock “pairs” basalt/gabbro, andesite/diorite, and rhyolite/granite? What is different?

14 Explain the process of decompression melting (use a graph if it helps).

15 Explain the effect of water on the melting of rocks to create magma.

Answer: When water encounters the melting of rocks it will lower the temperature of the rocks and lower the melting temperature thus also powering the pressure on the said rocks. Lower temperature means lower pressure so the rocks will move more towards the surface.

16 How can Bowen’s Reaction Series explain the origin of felsic, intermediate, and mafic magmas originating in a subduction zone? (hint: selective melting as temperature increases)

Answer: Bowen’s Reaction Series explains the origin of the different magmas

17 At what kinds of plate boundaries are igneous rocks likely to form? Describe the process at each.

18 How can igneous rocks form in the middle of tectonic plates?

**Interlude C *Rock Cycle***

1 What are the three main types of rocks? How does each form?

2 Which of the earth’s dynamic subsystems (that is, the *–spheres*) interact in the formation of sedimentary rocks?

3 Which processes within the area of Plate Tectonics are involved in the formation of igneous rocks?

4 Which processes within the area of Plate Tectonics are involved in the formation of metamorphic rocks?

5 What is meant by *The Rock Cycle*?

6 What are the connections among Earth’s structure (crust, mantle, core), plate tectonics, and the Rock Cycle?