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: (3 Things)

A. Method of Understanding the World

B. A Body of Knowledge Gained from This Method

C. What We Can Now Do With This Knowledge and Technology

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

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.

Answer: Because earth processes can deal with all kinds of things. Such as natural desasters, affecting politics, comsumers and citizens.

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

Answer: The Nebular Theory is about how the Solar System is formed from the Big Bang.

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*).

Answer:

A. Atmosphere

B. Biosphere

C. Geosphere

D. Heterosphere

**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?

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

Answer: The two crusts differ in both thickness and creation. The ocieanic crust has a thickness of 7km and tipicaly younger and more dense, while the continental crust is thicker with a thickness of 70km, older and less dense.

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

Answer: These are referring to the plates that are located just under the top of the crust and the upper part of the mantle. The plates are about 200km while the whole

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

Answer: The core is composed if Iron and Nickel

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

Answer: the different layers

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?

Answer: The hypothesis attributed to Alfred Wegener is: The Origins of Continents and Oceans The Hypothesis of Continental Drift

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.

Answer:

A. fit of continents: The observation

B. patterns of past glaciation

C. patterns of past climate belts

D. distribution of fossils

E. matching rocks and mountain belts

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

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*.

Answer:

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

Answer:

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

Answer:

**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

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

**Chapter 4 *Igneous Rocks***

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

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: Glassy texture can tell that the mineral had gone through very rapid cooling to the point where no minerls were able to form.

9 How do the holes form in vesicular igneous rocks?

Answer: Holes form in vesicular igneous rocks because of gas trying to escape

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

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?

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.

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)

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 two “forces” (in the general sense) that drive changes on Earth?

2 What are the two sources of heat driving earth processes (one internal, one external)?

3 How has the evolution of Earth affected the evolution of life? How has the evolution of life affected the evolution of Earth?

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

5 What three features (categories) can be used to identify rock types? (hint: texture, composition, layering)

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

7 What is meant by *The Rock Cycle*?

8 What are the connections among Earth’s interior heat, plate tectonics, and the Rock Cycle?