

Name: _____

Earth 50: First Midterm (100 pts Total)

October 24, 2005

Possible Multiple Choice (48 pts; 3 pts each)

1. Earth's core is?
 - a. is less dense than the mantle
 - b. is characterized by an inner liquid core
 - c. composed mostly of iron and nickel
 - d. is composed of high pressure silicate minerals

2. The lithosphere
 - a. includes only continental crust
 - b. is a rigid, solid layer typically about 10-200 km thick
 - c. marks the boundary between continental and mantle rocks
 - d. is a "soft" layer below the crust
 - e. is a zone of high velocity associated with mantle melting

3. Which of the following features develop where plates diverge and new crust is formed?
 - a. a mid-ocean ridge
 - b. an abyssal plain
 - c. a seamount chain
 - d. a fracture zone
 - e. a trench

4. At a transform boundary, tectonic plates do what?
 - a. slide past each other
 - b. move toward each other
 - c. do not move
 - d. move over spreading centers
 - e. move away from each other

5. The most abundant mineral group in Earth's crust is
 - A) feldspar.
 - B) mica.
 - C) olivine.
 - D) pyroxene.
 - E) quartz.

6. Which of the following pairs of rock have the same chemical composition?
 - a. rhyolite-granite
 - b. rhyolite-diorite
 - c. basalt-diorite
 - d. basalt-andesite
 - e. andesite-gabbro

7. Which of the following is characteristic of basaltic magma?
- basaltic magma forms from the partial melting of granitic crustal rocks
 - the major constituents of basalt are olivine and muscovite
 - basaltic volcanism dominates the igneous activity of ocean island arcs
 - the majority of basaltic magma is created at mid-ocean ridges
 - Basaltic magmas are highly polymerized and do not flow long distances
8. A sandstone composed exclusively of well-rounded, well-sorted particles of quartz, no rock fragments, and no feldspars is likely the product of?
- physical weathering in an arctic environment
 - chemical weathering in a tropical rain forest
 - diagenesis of siliceous ooze
 - deposition from wind transport in a large dune system
 - deposition on a deep sea fan
9. You are in an airplane flying at 35,000 ft and see a volcano with a massive plume of ash rising just outside your window. The plane more likely to be flying over:
- the plains of Kansas
 - the Hawaiian Islands
 - the Andes mountains
 - the mid Atlantic Ridge
10. The age of sedimentary rock layers in Europe can be correlated with those in North America by using
- the principle of superposition.
 - cross-cutting relationships.
 - tracing their physical continuity.
 - fossils and the notion of faunal succession.
 - similarity of the rock types and sequences.
11. Formation of metamorphic rock NEVER involves which of the following?
- formation of new minerals from old
 - increase in density
 - complete melting of the material from which it formed
 - change in orientation of mineral from which it formed
 - change in shape of mineral grains
12. An example of oxidation of minerals during weathering includes:
- decay of olivine to form clays
 - dissolution of calcite to form caves
 - formation of carbonic acid by combination of H_2O and CO_2
 - formation of Fe-oxides by reaction of H_2O and pyrite (FeS_2)
 - liberation of Ca ions by acid hydrolysis of micas

13. Large crystals (phenocrysts) in otherwise aphanitic (glassy) volcanic rocks result form:
- rapid cooling of most of the rock, but slow crystal growth in bubbles in the lava
 - slow cooling of lavas beneath a thin, rapidly chilled outer layer of lava
 - partial crystallization of magma before it is erupted.
 - growth of crystals within cooled lavas long after they were erupted
 - “plucking” of crystals out of surrounding crystalline rocks as the lava is erupted
14. A basaltic magma is crystallizing Mg-rich olivine, which is efficiently separated from the liquid, will cause the chemistry of the remaining liquid to:
- not change
 - decrease in Mg content
 - decrease in Si content
 - experience a dramatic increase in Na content
15. Mid-ocean ridge basalts have remarkably uniform composition. This can be attributed to:
- the low melting temperature of olivine
 - partial melting of peridotite at an invariant point
 - the basaltic nature of the upper mantle
 - complete melting of the mantle
16. Which rock type represents the highest grade of metamorphism?
- phyllite
 - slate
 - schist
 - gneiss
 - zeolite facies

Short Answer Questions (52 pts)

1. (5 pts) Elevations of the Earth's surface are bimodal; the mean elevation of continental areas is about 840 m above sea level and the mean depth of the seafloor is about 3700 m below sea level. What accounts for this bimodal distribution of elevations?

2. (5 pts) In explorations of other solar systems, a new planet has been found. List and briefly discuss three features that might provide evidence that the planet was tectonically active.

3. (5 pts) Amphiboles and pyroxenes both exhibit two cleavages, but the angles of these cleavage planes are quite different. What aspect of their silicate structures accounts for the different cleavage angles?

4. (5 pts) What kinds of igneous rock would you expect to find if you drilled a hole in a mid ocean ridge? How might the texture of these rocks change with depth in the drill hole?

5. (5 pts) What sequence of events might be responsible for a sequence of formations that has mudstone with abundant root casts and mudcracks at the base, overlain by a sandstone containing marine fossils, which is, in turn, overlain an abundantly burrowed shale containing marine fossils?

6. (6 pts) Sketch a cross section of an ocean-continent convergent margin, indicating:
a. the most likely location of hornfels and blueschist facies metamorphic rocks,

b. why do blueschists form where you have indicated? What combination of high or low temperature and high or low pressure are needed to generate blueschist?

7. (6 pts) The map shows the distribution of sediment grain size in Devonian sandstone and conglomerate from the Pocono Mountains of the East Coast, United States.

a. On the map below, draw an arrow pointing toward the likely direction of transportation of sediments.

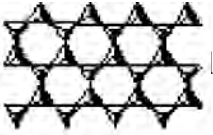

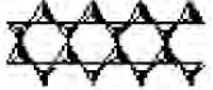




b. Name two other criteria that you might be able to observe in these sedimentary rocks that could indicate the direction of transportation.



8. (5 pts) The oceans contain appreciable amounts of sodium in solution (Na). What is the process by which the Na is delivered from crystalline rocks to the ocean?

9. (5 pts) Metamorphic rocks formed at high temperatures and pressures are metastable under conditions at the earth's surface. What is the main reason why such rocks do not revert to their original mineralogy when exposed at the surface?

10. (5 pts) Given the silicate structures shown in the figure below,
 a) match the silicate structure to the silicate group name:

A)		Tectosilicate
B)		Phyllosilicate
C)		Inosilicate (single chain)
D)		Sorosilicate
E)		Cyclosilicate
F)		Inosilicate (double chain)
E)		Nesosilicate

b) give an example of a common mineral from the following groups:

- a) tectosilicate
- b) phyllosilicate
- c) Nesosilicate