

EPS050 – Review for Midterm 1 (Fall 2009)

The following is a list of key questions derived from the assigned reading and the topics of lectures 1-9, and labs 1-4. The midterm will have short answer questions derived from this study guide. You are allowed a 1-sided, 8.5x11 “cheat” sheet.

Short Answer Questions

1. Explain the principle of “uniformitarianism.”
2. Explain the following stratigraphic principles: (1) Original horizontality, 2) superposition, 3) faunal succession, and 4) cross-cutting relations
3. Given a schematic geologic cross-section (as illustrated in Tuesday 09/29 lecture) work out or unravel the geologic events (or history) that leads to (be prepared to unravel the geologic events from a sample cross-section). What is an unconformity, angular unconformity, a non-conformity?
4. Briefly explain the accretionary model for the early formation of the Earth. What is a likely scenario for the formation of an iron core? Why might the Earth have had a “hot start? What process is likely to have formed the Earth’s atmosphere and oceans?
5. Explain the terms “crust”, “lithosphere”, “mantle”, and “core,” and the types of materials that forms each.
6. What are the similarities or differences between solar elemental abundance and that observed in meteorites? What are the major differences between the composition of the whole Earth and crust? What processes have given rise to these differences?
7. Explain the essence and differences between the theory of continental drift, sea floor spreading, and plate tectonics. What occurred in the 1960s that allowed the proposal of the theory of plate tectonics and furthered its development?
8. What are the basic differences between oceanic and continental crust? How are they thought to be formed? Explain qualitatively the concept of lithospheric plates. What are the three major types of plate boundaries?
9. What is the difference between a compound and a mixture? What is a mineral? What are the main chemical differences among the major mineral groups (silicates, carbonates, oxides, etc). Which minerals are important in the Earth’s mantle?

10. Give important examples of silicate minerals. Which exhibit silicate tetrahedra in 3D networks, sheets, single and double chains, and in isolation. Why does mica (biotite, muscovite) exhibit such perfect cleavage?
11. What are the two basic types of characteristics used to distinguish igneous rocks?
12. What is the difference between a gabbro and a basalt (chemically and texturally), a rhyolite and a granite, a granite and a gabbro? Why are basalts and gabbros generally darker in appearance than rhyolites and granites?
13. In going from more mafic to more silic rocks how do the abundances of Si, Mg, and Fe change? Explain this in terms of Bowen's reaction series.
14. Why does mantle rock (peridotite) melt during extension or rifting of the lithosphere and why is the composition of the magma basaltic? What is a geotherm? How does melting depend on the relative positions of the geotherm and melting curves.
15. What is a solid solution? What is ionic substitution? How does zoned plagioclase form?
16. What is the difference between a pyroclastic flow and a lava flow? How does SiO₂ content factor into these differences? Where are pillow basalts formed? How are shield and strato-volcanos distinguished in terms of eruptive style and general structure?
17. What are the major differences between the 8 planets of our solar system?
18. What 4 elements make up 90% of the mass of the Earth? In contrast, what are the two most abundant elements in our solar system.
19. What does Bowen's reaction series describe? What is meant by a discontinuous series? What is the continuous series? In going from more mafic to more felsic rocks how do the abundances of Si, Mg, and Fe change?
20. Explain how radioactive isotopes can be used to date geologic materials, and what you need to know or measure to date successfully. Why is the K-Ar method more useful for dating older rocks than the C¹⁴ method?
21. What is the difference between a pyroclastic flow and a lava flow? How does SiO₂ content factor into these differences? How are shield and strato-volcanos distinguished in terms of eruptive style and general structure?

22. What is the difference between lithosphere and asthenosphere?
23. Describe 5 important lines of evidence/observations supporting the theory of plate tectonics
24. What is the composition (name) of typical volcanic rocks erupted at a) divergent plate boundaries, b) and island arc where two oceanic-plates meet, c) a convergent boundary where the volcanic arc is on a continent?
25. What is the fundamental building block of the silicate minerals? Sketch it.
26. Why does mica (muscovite, biotite) exhibit such perfect cleavage?
27. What minerals make up chert and limestone? In what settings, and how, do the sediments that make up these rocks form.
28. As shallow depths and low temperatures, mud lithifies to become shale. As this shale is buried, metamorphism changes its mineralogy and texture. List in increasing grade of metamorphism, the rock types that form.
29. Describe processes that lead to regional and contact metamorphism. What can be learned from the foliation of metamorphic rocks? What are the two competing models for the formation of rock salt deposits in the Mediterranean sea and which is favored and why?
30. What is meant by high grade versus low grade metamorphism? What is the role of temperature in metamorphism? Explain the progression from shale to slate to schist to gneiss?
31. How are mineral phase diagrams useful in interpreting metamorphic rocks? How might the P-T histories of blueschist and greenschist rocks have differed?
32. What is zoning in Garnet and why is it important?
33. What is an ophiolite sequence? What is a turbidite sequence? Where do both of these sequences form?
34. Explain how radioactive isotopes can be used to date geologic materials.
35. What is a cosmogenic isotope? What can they be used for?
36. What event in an igneous rock's history is dated by the K-Ar method?

37. Why is the K-Ar method useful for dating much older rocks than the ^{14}C method?
38. Study figure 8.9, 8.10, (10.9, 4th ed) in the book on cross-cutting relationships:
How are cross-cutting relationships used in the dating of geologic materials?
Given a cross-sectional view of deformed geologic units be prepared to unravel the history based on observed cross-cutting relationships.
39. What is meant by congruous dissolution?
40. What is meant by incongruous dissolution?
41. How is CO_2 an important part of the weathering process?
42. Describe the positive feedback between physical and chemical weathering processes.
43. What are the most stable minerals at the Earth's surface and why? How is the rate of weathering of certain minerals related to the Bowen's reaction series for crystal formation from melt, and why?