

3rd Review—Earth 50

The exam will be worth 200 pts with about 1/2 devoted to the last third of the class and the other half devoted to the remainder of the course. There will be a problem on the time scale, a cross-section to draw and interpret from a map.

Streams and shorelines

1. The base level for streams and rivers is typically at sea level. In what circumstances might base level differ from sea level?
2. How does the grain size of material transported by a river change along its gradient?
3. Why is there so much clay in the lower reaches of a river?
4. By what mechanisms is sediment transported in a river?
5. Why does it take higher velocities to erode clay than to erode sand?
6. What are some of the characteristics of braided streams? meandering streams?
7. How might the base level change downstream from the Glen Canyon dam? What would happen if the dam were removed?
8. In the Blue Ridge (Appalachian Mtns) many rivers crosscut folded Paleozoic sediments. What is the relative age of the rivers versus folding in this area?
9. What processes are responsible for the formation of marine terraces?
10. How do atolls form?
11. Why is the dominant direction of sediment transport on beaches in San Diego to the south?
12. Why do the levees in New Orleans need to be raised every decade or so?

Glaciers and Hydrologic Processes

1. Is there relatively more water stored in groundwater or in lakes/ivers?
2. Define the following aspects of groundwater systems: water table, aquifer, artesian well, porosity, permeability, and recharge area.
3. What causes groundwater to move?
4. Why can excessive groundwater pumping in coastal regions lead to contamination of the drinking water with salt?
5. What causes karst topography?
6. How does porosity differ from permeability?
7. Define accumulation, ablation, equilibrium line, till.
8. In continental ice sheets, why does the ice flow faster at the edges than in the middle?
9. Why are stream-cut valleys V-shaped and glacier-cut valleys U-shaped?
10. What are the two main climate variables that control whether or not a glacier can exist, and whether it grows or shrinks?
11. How do glaciers move, and how is this movement different when the base of the glacier is frozen to its bed, rather than melted at the bed?
12. What is the ultimate driving force for glacier movement?
13. What forms glacial striations or scratches, and what can these forms tell you about the glacier's movement?
14. How do glaciers affect sea level?

15. How do continental glaciers affect regional weather patterns near glaciated continents?
16. Much of North America was covered by the Laurentide Ice sheet that has since melted. Would you expect the land to rise, stay at the same elevation or sink? The Ice melted ~8000 years ago. Would you expect the land to change elevation in the near future?

Divergent Margins

1. Why is there no crust older than ~180 Ma in the oceans?
2. How does the topography differ between a slow spreading-ridge and a fast spreading ridge?
3. What are the basic structural/mineralogical differences between the various layers of the ocean crust?
4. What are ophiolites, what is their structure, and how do they wind up on land?
5. How would magma chambers likely be different at slow and fast spreading ridges?
6. Why do fast and slow spreading ridges show the same rates of subsidence?
7. What role does water play in metamorphism of the ocean crust?
8. What kinds of processes contribute to the formation and thickening of the ocean lithosphere?
9. How does a transform fault differ from a fracture zone?
10. How might spreading differ on a spherical Earth as opposed to a flat Earth?

Convergent Margins

1. What controls the topographic expression of trenches?
2. Where does most of the sediment come from in accretionary wedges?
3. What kind of processes cause the sediment in an accretionary wedge to be highly deformed?
4. What is the tectonic significance of blueschist blocks in accretionary wedges?
5. What is the role of water in controlling seismicity in a subduction zone?
6. The upper part of a subducting plate in the trench shows extensional earthquakes while the deeply subducted part of the slab shows compressional earthquakes. Why?
7. Why does seismicity stop below about 700 km in a Benioff zone?
8. Why do plates subduct?
9. Why does extension occur behind some arcs, particularly where old lithosphere is being subducted?
10. Describe the process of melt formation under an arc...at what depth does melting start and why?
11. How do the dynamics of continent-continent collision differ from those of ocean-continent collision?

Passive Margins (Chapter 20)

1. What are source rocks?
2. What is the oil window and how does it differ from the 'gas window'?

3. What are several types of hydrocarbon traps and what characteristics make for a good trap?
4. During rifting, the upper and lower crust behave differently...why?
5. What processes contribute to rifting of continental crust?
6. What is a 'failed rift, and what is the relationship between such a rift and nearby active rifts?
7. Why do normal faults flatten out at depth in a rift system?
8. What is a metamorphic core complex and how does it form?
9. What is a décollement and what does it represent?
10. What is the difference between syntectonic and post-rift sedimentation?

Hotspots and mantle Plumes

1. What lines of evidence support the existence of mantle plumes?
2. What physical processes might contribute to generating a mantle plume (i.e. what causes material in the lower mantle to be buoyant and rise)?
3. How would a mantle plume change during it's ascent?
4. What evidence suggests that plumes come from deep in the mantle, perhaps as far down as the core/mantle boundary?
5. How might you test whether plumes are truly stationary?
6. In what part of a mantle plume are melts actually present?
7. How are large oceanic plateaus and flood basalt provinces related to mantle plumes?

California Tectonics

1. Give a general outline of the growth of the North American continent.
2. How is it that formation of the Rockies created deep sedimentary depositional basins?
3. What are tectonic terranes?
4. How is continental crust formed and when has most continental crust formed in Earth history?
5. How do we know the shape and age of the Kula Plate even though almost all of it has been subducted?
6. How is transform faulting initiated along the California coast?
7. What kinds of features are used to reconstruct the history of slip along the San Andreas Fault?
8. Why does the northern part of the San Andreas show more than double the total slip of the southern part of the fault?
9. Where is most of the seismic activity located in the Basin-and-Range?
10. Why are there big mountains along the San Andreas fault system that are often next to deep, sediment-filled basins?