

Chapter 14

1. How does a dam on a river change the long profile? How is sediment transport impacted?
2. How do streams transport material? – (three modes)
3. What controls competence and capacity of streams and rivers?
4. Discuss differences between meandering rivers and braided rivers. How do they appear? What controls the differences?
5. Discuss how rivers change from headwaters to mouth.
6. What are the patterns of sediment deposition along the channel of meandering rivers?
7. Discuss the empirical semi-log plot of flood frequency.
8. Discuss the catastrophic floods that shaped the landscape of eastern Washington – Cause? Appearance?
9. Draw a cross-section through a river valley. Show the flood plain, channel, terraces, and natural levee. Explain the origin of each.
10. Draw a cross-section through a river valley illustrating a period of aggradation followed by degradation followed by a later period of aggradation. Discuss the factors controlling aggradation and degradation.

Chapter 15

1. What is the relative amount of water in oceans, ice, surface water (rivers/lakes), and ground water?
2. Draw cross-section from ridge to a valley showing: recharge and discharge zones, aeration zone, water table, saturated zone and flow lines of ground water.
3. What is difference between porosity and permeability? Controls on porosity and permeability?
4. Darcy's law describes what makes groundwater move. Explain what Darcy's law is and draw several example cross sections to illustrate higher vs lower flow rates.
5. Draw a cross-sections showing an aquifer, an aquiclude, and an artesian well.
6. What is a "cone of depression" and how does it impact the production of water from a well?
7. What does "water mining" mean? Give an example of an aquifer being mined and discuss long term societal impact.
8. What is karst topography? Its appearance and cause? What controls dissolution and precipitation of calcium carbonate?
9. What are the important geologic questions in consideration of underground storage of hazardous waste?

Chapters 16 and 19

1. Compare current earth climate with climate over last 4.5 By. Are we colder or hotter than average? When have there been "Ice Ages"?
2. What unusual properties of water and ice have important impact on geologic and climate processes.

3. How is the $^{18}\text{O}/^{16}\text{O}$ ratio used as a climate proxy? In marine sediments? In glacial ice?
4. What factors control whether a glacier retreats or expands?
5. How does ice move within a glacier? What are the differences between temperate and polar glaciers? How do ice particles move from the accumulation zone to the ablation zone?
6. What is the relationship between the equilibrium line, accumulation, ablation, and steady-state behavior?
7. Discuss features of cirques, glacial valleys, and fjords. What is a hanging valley? Why does it form?
8. Discuss glacial landforms: above/below ice, striations, valley shape, erratics, horns, arêtes.
9. Discuss location and reasons for: medial, lateral, and terminal moraines
10. In outcrop, what are the visible differences between glacial till and glacial outwash?
11. Discuss climate trends over last 30 My. What has happened during last 2.5 My? How many “Ice Ages” have there been during the Pleistocene? Why were only four ice ages recognized in the continental geologic record? What is the nature of the evidence for the additional Pleistocene ice ages?
12. Discuss features of the last 2 My marine sediment oxygen isotope record.
13. What was the “Little Ice Age”? Its cause? Its impact?
14. The Milankovitch cycles are the “pace makers” for continental glaciation. Explain.
15. Discuss the record of CO_2 and methane recovered from ice cores.
16. Discuss the “carbon cycle” and its impact on climate.
17. Explain the “Greenhouse” effect. What gasses are responsible? Which is most important?
18. What is a GCM? What is needed to run one? What does one learn? Discuss the use of GCMs in comparison with the geologic climate record? What are the predictions? What are the unknowns?
19. Discuss Cretaceous climate. How different from current conditions? What caused the differences?

Chapter 20

1. What early 20th century evidence supported movement of continents? Why were the observations not universally accepted as proof that continents moved?
2. What observations and theory were critical for the general acceptance of plate tectonics during the 1960s.
3. Discuss how paleomagnetic data are used to reconstruct the opening of ocean basins.
4. What is a polar wander path? How can one tell whether the continent or the magnetic pole has moved?
5. The rate of mid-ocean spreading can progressively change along the ridge axis. Explain.
6. Why does the history of spreading ridges only extend back 175 million years?
7. Define and describe plate tectonic connections: terrane, ophiolite, mélange, fore-arc ridge, fore-arc basin, island/volcanic arc, back-arc basin, passive margin, craton, orogen, shield.

8. What geographic features in the Pacific Northwest are associated with the fore-arc ridge, fore-arc basin, volcanic arc, back arc basin.
9. What were Pangea and Rodinia? When did they exist?
10. What is a suture zone?
11. Describe the expected sediments (type and stratigraphic order) that would be deposited on a passive margin as the ocean basin expands.
12. Describe the steps associated with continental rifting. What pattern of rift zones is common?
13. Former convergent zones can be identified with adjacent and parallel geologic trends. Describe.
14. Fold and thrust mountain ranges are characteristic of what plate boundary type? Name three fold and thrust mountain ranges.
15. What is a detachment or decollement? Illustrate with a cross-section.
16. Describe the evolution of plate boundaries along the west coast of North America over the last 80 My.
17. When did the San Andreas fault form?

Northwest Tectonics

1. What stresses are acting on Washington state?
2. Discuss the Seattle fault and basin. Where? Why? How deep? Associated earthquakes?
3. What are the major geologic structures associated with western Washington? Their cause?
4. The Puget lowland is filled with glacial era sediments. Discuss their stratigraphy and surface features.
5. What information is available from Geomap Northwest? How is it useful?
6. Discuss earthquake hazards in western Washington. The three sources? Expected sizes? Recurrence intervals? Impact on populated areas?
7. Discuss the Seattle basin in terms of planning for future earthquakes. How does it impact damage prediction?
8. Describe the damage associated with the 2001 Nisqually earthquake. How much? What sort? How geographically distributed?