A. Geomorphic Principles

1. (5pts) Please describe the basics of process geomorphology.

2. (3pts) In our approach, we envision a delicate balance between what two entities? And why is it considered a balance? If they were no longer in balance, what happens?

3. (2pts) Define, in words, force and work

4. (2pts) Name the two kinds of forces that create landforms

   a._____; b._____

5. (4pts) Give two examples of each:

   For a: _____ For b:_____

   _____ _____

6. (4pts) Our approach to understanding geomorphology and geomorphic change is based on the equilibrium approach. Please briefly explain.

7. 4. (6pts) Define the following three states of equilibrium

   a. Static

   b. Steady-state

   c. Dynamic

8. (4 pts) Since much of the climatic forcing is dependent on the heat balance of the earth, discuss solar radiation and the transfer of heat through the atmosphere.

9. (4 pts) What are the main components of the resisting framework and how do each affect the resisting framework?

10. (3pts) Define a threshold, name the two types of thresholds giving an example of each (do not use a fluvial geomorphic example).

11. (3pts) Define complex response and describe one example (do not use a fluvial geomorphic example).

12. (3pts) What is the importance of time in our interpretation of balance in geomorphology?

13. (5pts) Briefly discuss climate change and geomorphic response.

STREAMS, DELTAS, PEDIMENTS

14. (4 pts) Our approach to understanding geomorphology and geomorphic change is based on the equilibrium approach. Please briefly explain in the context of fluvial processes and landform change. Clearly identify the driving force, erosion processes and resisting framework.

15. (4 pts) Give an example of a geomorphic threshold in fluvial geomorphology. Under what conditions could it be exceeded, and how would the landform change after it is exceeded?

16. (4 pts) Explain complex response using an example from fluvial geomorphology.

17. (6 pts) Rivers and streams collect little water from rainfall directly. Most of the water comes from groundwater. Name the 3 ways water is routed through the ground and draw a hydrograph (discharge versus time) to illustrate your understanding of the response time of each component. Include in your drawing the precipitation event. Be sure to accurately draw the curves so the component discharges sum to the total runoff. Label your graph.

18. (3 pts) Draw the hydrograph and its components for a disconnected stream in response to a precipitation event. Describe why this is different from a connected stream.

19. (4 pts) What is the interrelationship (balance) between riparian (stream side) vegetation, groundwater, and channel incision. This is a classic example of a balance of forces. Think back to the video on stream restoration in eastern Oregon.

20. (4 pts) Name the driving force that causes stream flow and the main resisting force that keeps the water flowing at reasonable speeds. Finally, if there were no resisting force, what would the response of the water be?

    a. Driving force:_____

    b. Resisting force:_____

c. Stream response to no resistance: _____

21. (6 pts) Describe in words the meaning of the Reynolds and Froude numbers. Also write the equation for each and remember to define the terms of the equations. Why are the equations useful?

22. (2pts) Sediment is transported in a stream in two ways, name them.

a._____

b._____

23. (3pts) Identify 3 forces acting on sediment in moving water and control its motion.

a. _____

b. _____

c. _____

24. (4pts) Describe the seasonality of bank erosion and the processes that control the seasonal nature. A diagram may help.

25. (5pts) Streams are composed of pools and riffles. They are maintained by sediment erosion and deposition. Briefly explain how. A diagram may help.

26. (4pts) In a river meander, briefly describe the cross-sectional flow pattern in the pool and its causes. Also, what is the overall flow pattern as the water moves down stream as a consequence of the cross-sectional flow pattern. A diagram may help.

27. (3pts) Draw a plan-view picture of a meandering stream (one complete wavelength). Indicate where erosion occurs and where <u>that</u> material is deposited.

28. (2pts) Say the path length of the stream you drew in the previous question is 4.0 m long and the straight line between the start and end is 3.0 m long. What is the sinuosity?

29. (4pts) Explain how increased sinuosity affects flow speed, then modify the equation for shear stress or Mannings equation to account for sinuosity

30. (4pts) How does sinuosity affect basal shear stress, and therefore, sediment transport. Modify the equation for basal shear stress to include sinuosity, λ. Identify all terms and the units.

31. (4pts) Describe the formation of a floodplain.

32. (6pts) Putting it all together: Given your knowledge of stream flow, pools and riffles, meanders, and flood plains, describe the potential environmental problems associated with contaminated sediment on the river bottom.

33. (3pts) Name three ways in which you could reconstruct the discharge of a former flood using geomorphic evidence?

    a. _____

    b. _____

    c. _____

34. (2pts) Define a terrace and the two types of terraces?

35. (3pts) What are the causes for terrace formation? In turn, how can terraces be used to infer past events?

36. (2pts) What causes an alluvial fan or a delta?

37. (2pts) Name two kinds of alluvial fans. They describe, in part, the mode of formation.

    a._____ b. _____

38. (3pts) Surface coloration of fans indicates the age of various deposits. Please describe the 3 broad categories of colors and how they relate to the age of the deposit.

39. (2pts) Generally speaking, the area of the alluvial fan is governed by what major factor?

40. (3pts) What is segmentation and what causes it?

41. (6pts) Describe the sedimentological characteristics of 3 different facies types on alluvial fans.

42. (2pts) Both rivers and channels on alluvial fans form levees. Why?

43. (6pts) Deltas are like alluvial fans. One major difference, however, is that the energy of the ocean typically modifies the deltas in ways that alluvial fans are not. Because of these processes, deltas form different shapes. Name the process that control constructive and destructive deltas.

44. (3pts) Draw a cross section of a delta, name the major parts. Also draw the general stratigraphy and label them also.

45. (3pts) River paths in deltas are unstable. Rivers deposit sediment at the end of the delta enlarging the delta and lengthening the river channel. At some point the river avulses and creates a new path to the ocean (or lake). Why does this happen? Describe the processes involved.

46. (4 pts) Thinking back to the original concepts of the class and the balance of forces and processes, name the two main processes that form the delta and name one marine process that affects its shape?

    a. _____

    b. _____

    c. _____

47. (2pts) What is a pediment?

48. (2 pts) Draw a cross-section of the mountain-basin labeling the component parts.

49. (2pts) Describe the possible role that weathering and sheet wash may play in the maintenance of a pediment.