

Note: Partial credit for answers is up to the grader. Reward partial points at your own discretion.

Section 1

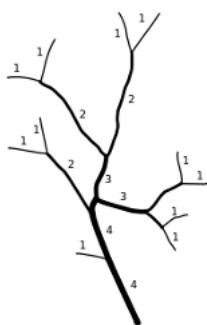
1. C
2. Southwest to Northeast
3. Alpine Lake
4. Tributaries; shows branches at the top that merge together; Tributaries have branches that merge together while distributaries have single lanes of water that branch out

Section 2

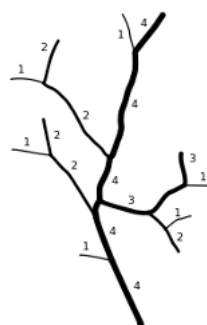


Using the following diagram, determine the stream order of the main river using the following ordering systems(think about which way each system orders channels, top-down or bottom-up?):

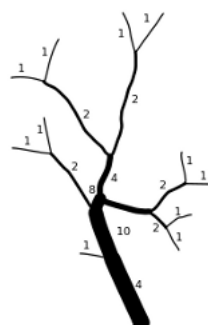
5. Strahler(3)
6. Horton(4)
7. Shreve(8)
8. Hack(1)
9. Topological(1)



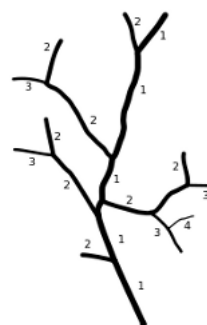
Strahler



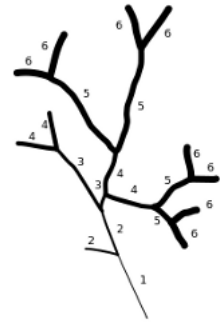
Horton



Shreve



Hack



Topological

Section 3

10. $= 10/7 = 1.43$ (1. Is also fine if they followed sig figs)
11. Braided
12. Dendritic
13. Trellis

14. Braided Streams form when a single clear-cut channel cannot be created due to too much-unconsolidated sediment being in the water; this leads to multiple, shallow channels being formed as sediment piles up and forces water to move around these piles of sediment, similar to a delta.

Section 4

15. B
16. Competence and maximum clast size of a river are directly related; the higher the clast size a river can hold, the greater its competence.
17. Breccia would be found high up a river system where river velocity is generally higher; mudstone would be found lower where river velocity is lower
18. B; it carries more volume of water, therefore can hold more sediment
19. At the ends of rivers, the discharge and velocity of a river tend to decrease; a decrease in velocity means a decrease in competence so sediments begin to fall out bc the river cannot carry it; a decrease in discharge means a decrease in capacity so sediment also begins to fall out this way. Both of these phenomena cause a build-up of sediment, causing water to split up to avoid piles of sediment building up.

Section 5

20. Some options: uplift, subsidence, isostatic rebound, orogeny
21. Ice age or glacial melting → causes changes to Eustatic sea level
22. A waterfall is when water travels over land which dramatically changes the base level, causing water to drop from a higher base level to a lower base level
23. The base level of a delta is very similar to that of the global base level, though it is slightly higher
24. The contour lines are very close to each other; they indicate very dramatic change in elevation over short distances
25. Steeper river gradient generally leads to increased downcutting

Section 6

26. Along an alluvial fan, the gradient is very steep and then suddenly becomes nearly flat
27. An Oxbow lake forms when a meandering stream meanders so extremely to the point that a meander disconnects from the main river and a new, straighter channel takes its place.
28. Increased river gradient, causing increased downcutting and thus a more exaggerated cutbank in meandering streams.
29. Drainage reversal is when the cardinal direction that water flows in a drainage basin changes. There are many examples: one is Miocene drainage reversal of Amazon River, South America
30. Antecedent streams erode the rock below them as fast as it uplifts.

Section 7

- 31. Intermittent Stream
- 32. Ephemeral Stream
- 33. A stream gauge first measures the cross-sectional area of the river channel and then separately measures the velocity of the river; the cross-sectional area multiplied by the velocity gives the discharge.
- 34. The lag time between peak rainfall and discharge is lower in urban cities than in rural areas
- 35. Urban cities have more impermeable surfaces like roads and concrete, which decreases the amount of water that infiltrates the ground and increases runoff.
- 36. b.

Section 8

- 37. Area A is more likely to flood because volcanic rocks are less permeable than gravel.
- 38. The water table is higher than the river's surface level
- 39. The intensive usage of groundwater decreases the water table level to below the stream's base level, causing water to infiltrate into the ground from the river.



- 40.
- 41. Water begins to rise up once the pressure under ground is too extreme; this causes the water to rise up to an area of lower pressure

Section 9

- 42. Limestone; limestone dissolves most easily in water to create karst environments
- 43. a.
- 44. Sinkhole; forms when rock underneath the ground is eroded, causing the surface to collapse inwards
- 45. Disappearing streams; are found mostly in karst environments because the rock is easily dissolved by the acidic water as compared to other types of rock, creating a path of flow for water underground.
- 46. $\text{HCl} + (\text{carbonates}) \rightarrow \text{H}_2\text{O} + \text{CO}_2 + (\text{extra molecule})$

Section 10

- 47. Yes; the isotherms are layered vertically, showing thermal stratification
- 48. Decreased temperature means increased DO content.
- 49. The inflow and outflow in the lake must be close to equal
- 50. A steeper thermocline causes stronger thermal stratification.