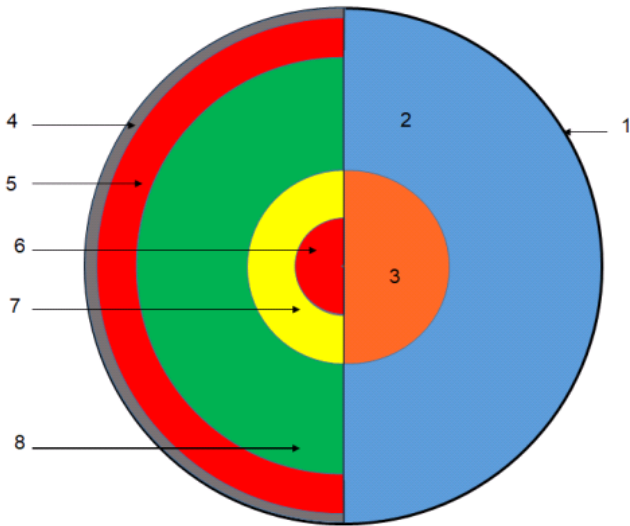


1. You will have 50 minutes to take this test.
2. The Image Sheet is attached as a file.
3. All questions have their point value indicated. This test has a total of 169 points.
4. Give answers for bidirectional measurements (e.g. strike) in 180° azimuth form, clockwise from north. For numerical questions, answers within a reasonable range will earn full credit. For angular measurements, answer in degrees - other numerical units will be specified when asked for. You do not need to provide the unit, only the number. For questions that can be answered by one or more letter, write only the capital letters, separating multiple letters by only a comma if needed (e.g. "B" or "A,C").
5. The embedded images are of lower resolution than the original, therefore the full size versions of Images 3, 10, and 12 are attached for reference. Image 14 (attached) contains a standard USGS stratigraphic color key - use this to interpret the age of stratigraphic units where applicable.
6. Ties will be broken by comparing each question in order.

Section A

Image 1



1. (1.00 pts) For questions 1-8, answer according to the numbers marked on Image 1.

2. (1.00 pts)

3. (1.00 pts)

4. (1.00 pts)

5. (1.00 pts)

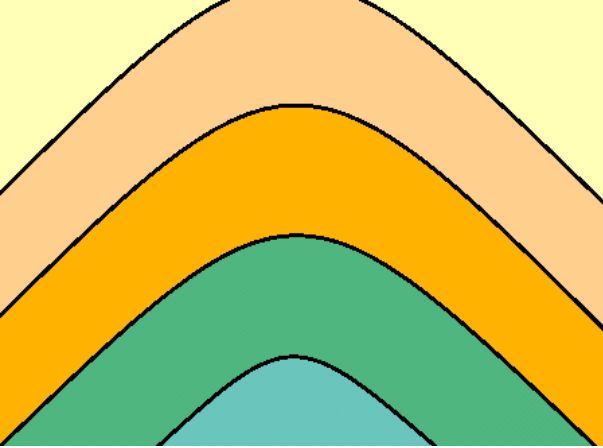
6. (1.00 pts)

7. (1.00 pts)

8. (1.00 pts)

Section B

Image 2



9. (1.00 pts) Refer to Image 2 for Section B. What type of geologic structure is primarily shown in the image?

- ☐ A) Fault
- ☐ B) Fold
- ☐ C) Nonconformity
- ☐ D) Depositional bed

10. (1.00 pts) Are these layers overturned?

- ☐ A) Yes
- ☐ B) No

11. (1.00 pts) Which of these best describes the geologic structure in the image?

- ☐ A) Normal fault
- ☐ B) Monocline
- ☐ C) Syncline
- ☐ D) Anticline
- ☐ E) Reverse fault
- ☐ F) None of these

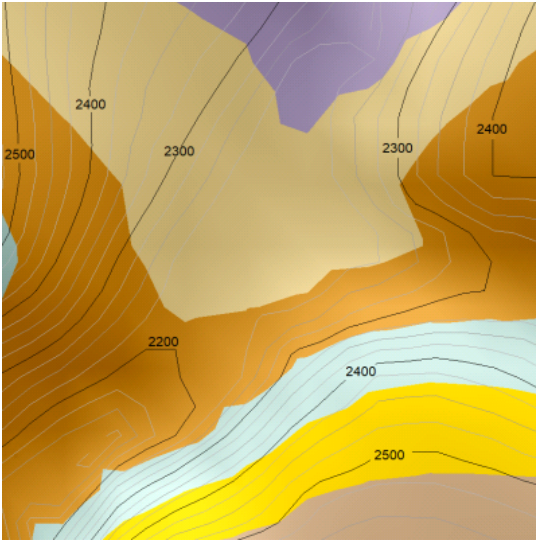
12. (5.00 pts) Which 5 geologic periods are represented in this image?

13. (4.00 pts)

Unconformities are not marked on this image - however, based on the layers shown, is there an unconformity among these strata? If so, which geologic period(s) are missing in this image?

Section C

Image 3



14. (2.00 pts) Refer to Image 3 for the questions in Section C. Are the strata in this image tilted?

- ☐ A) Yes
- ☐ B) No

15. (5.00 pts) This map is 1 km on each side, and the altitude is measured in meters. What is the strike and dip of the strata in this image?

16. (4.00 pts) All of the strata in this image are the same thickness. What is this thickness, in meters?

Section D

17. (3.00 pts)

You're examining a rock layer outcropping on a canyon cliff face. The cliff is dipping at a 75 degree angle, in the same direction as the outcrop, which you observe to have an apparent thickness of 3.4 cm. You ascend to the flat ground on the top of the canyon and find another outcrop of the same layer, 560 meters above the first outcrop and 900 meters directly opposite the dip direction. What is the dip angle of this rock layer?

18. (3.00 pts) What is the angle of incidence between the lower outcrop and the cliff face?

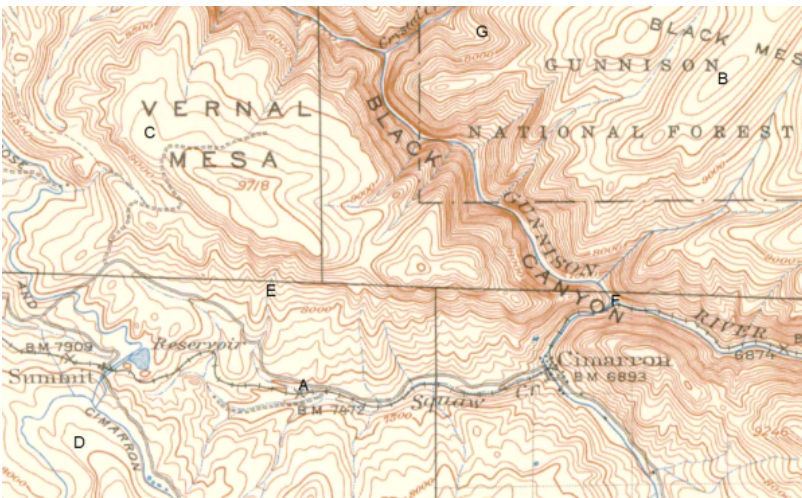
19. (3.00 pts) What is the true thickness of the rock layer in centimeters?

Section E

Image 4



Image 5



20. (1.00 pts) Refer to Image 4 for the questions in Section E. What type of structure is this?

- ☐ A) Moraine
- ☐ B) River Delta
- ☐ C) Subduction basin
- ☐ D) Alluvial Fan

21. (2.00 pts) What type of depositional environment is this?

- ☐ A) Fluvial
- ☐ B) Glacial
- ☐ C) Alluvial
- ☐ D) Marine

22. (2.00 pts)

Consider Image 5. Which of the locations marked on this map could be plausible locations where you could find the depositional environment from the previous questions.

Section F

23. (1.00 pts) Which of these projections is conformal?

- ☐ A) Gnomonic
- ☐ B) Mercator
- ☐ C) Albers
- ☐ D) Stereographic

24. (1.00 pts) Which type of projection is area-preserving?

- ☐ A) Gnomonic
- ☐ B) Mercator
- ☐ C) Albers
- ☐ D) Stereographic

25. (3.00 pts) Which two of these useful properties of map projections cannot coexist in the same projection?

(Mark **ALL** correct answers)

- ☐ A) Preservation of area
- ☐ B) Preservation of local distance
- ☐ C) Preservation of local direction
- ☐ D) Preservation of geometry

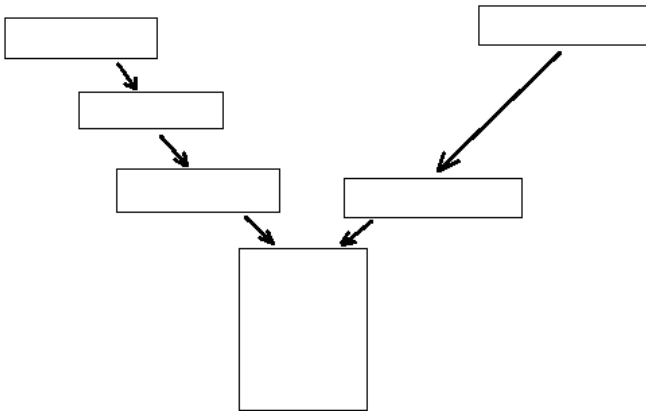
Section G

26. (8.00 pts)

Fluvial and alluvial deposition are related but generally distinct. How do these two depositional environments differ in terms of their location, size, and composition/structure?

Section H

Image 6



27. (1.00 pts) Refer to Image 6 for the questions in Section H. What is the name of the diagram shown in this image?

- ☐ A) Wilson Cycle
- ☐ B) Bowen's Reaction Series
- ☐ C) Phillips relationship

28. (1.00 pts) What type of elements are usually placed on this diagram?

- ☐ A) Minerals
- ☐ B) Rock types
- ☐ C) Depositional environments
- ☐ D) Geologic structures

29. (6.00 pts) What are the names of the two sides of this diagram? What is the primary difference between them?

30. (3.00 pts) Can the two sides of this diagram manifest at the same time? Why or why not?

31. (3.00 pts) This diagram primary classifies its elements vertically according to what property?

Section I

Image 7

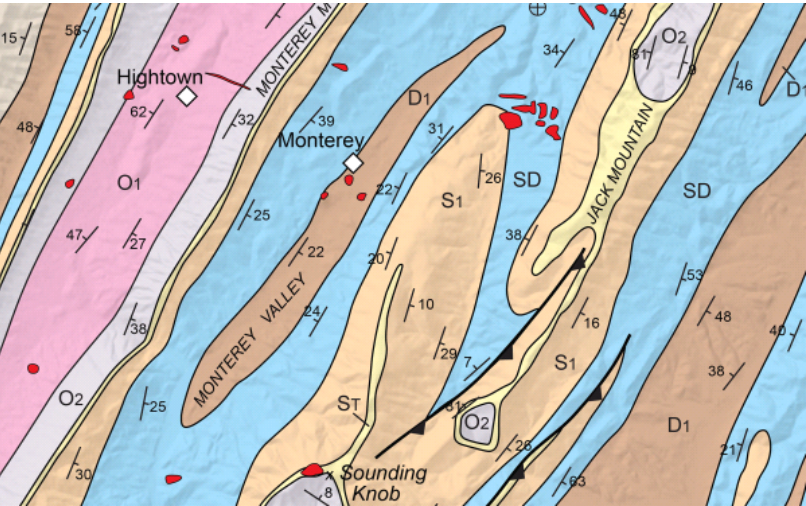
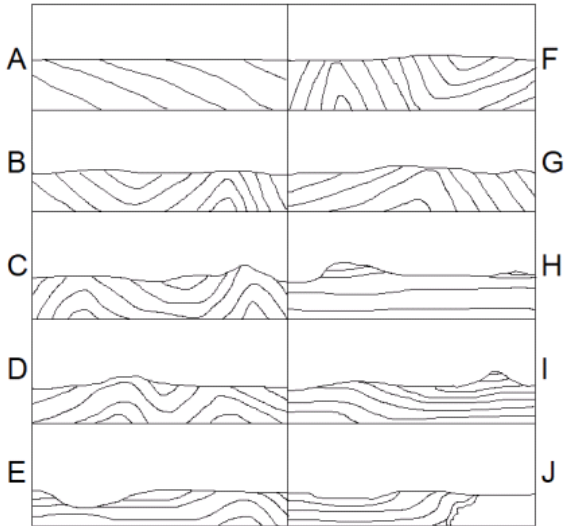


Image 8



32. (1.00 pts) Refer to Image 7 for the questions in Section I. What geologic structure is shown in this image?

33. (1.00 pts) What is the approximate axial strike angle of this structure? Round to the nearest 10 degrees

34. (2.00 pts) How many limbs, full or partial, are visible in this image?

35. (2.00 pts) What geologic era are the strata in this image from?

36. (2.00 pts) What do the numbers next to the markers on this map indicate?

37. (4.00 pts) Order the units in this map from oldest to youngest. Label the red-colored unit as "m".

38. (1.00 pts) What type of faulting is shown in this image?

- ☐ A) Normal
- ☐ B) Reverse
- ☐ C) Strike-Slip

39. (1.00 pts) What type of forces are primarily acting on the region shown in this map?

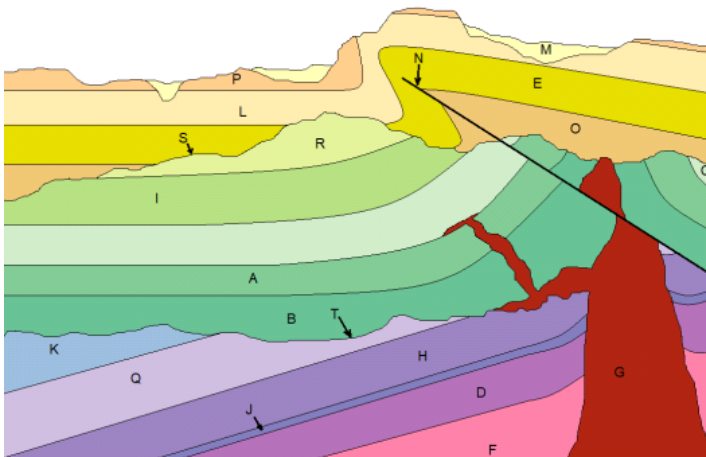
- ☐ A) Tension
- ☐ B) Shear
- ☐ C) Compression
- ☐ D) None of these

40. (1.00 pts) What type of geologic structures make up the red-colored unit?

41. (5.00 pts) Refer to Image 8. Which of these best represents what an east-west cross section of this region would look like?

Section J

Image 9



42. (11.00 pts)

Refer to Image 9 for the questions in this section. Order these stratigraphic units from oldest to youngest. Use the letter U to represent the folding event in the purple and pink units.

43. (3.00 pts)

Which geologic period(s) of the Phanerozoic, if any, are not represented in this cross section?

44. (2.00 pts)

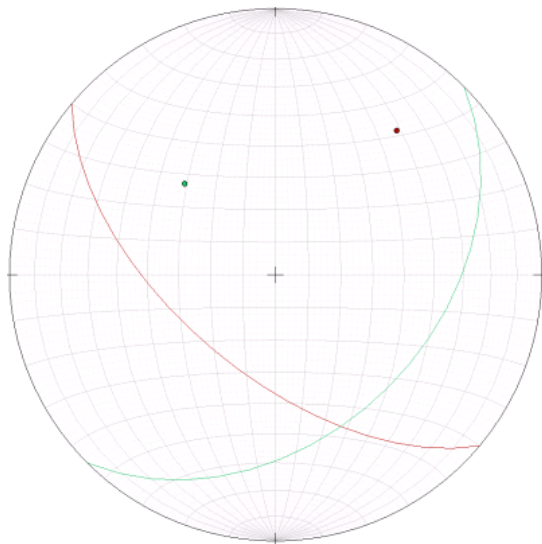
What type of fault is shown in this cross-section? (be specific)

45. (2.00 pts)

The fault from the previous question has produced what type of folding?

Section K

Image 10



46. (1.00 pts)

Refer to Image 10 for the questions in this section. What type of diagram is shown in this image?

- ☐ A) H-R diagram
- ☐ B) Stereonet
- ☐ C) Cross section
- ☐ D) Drill core

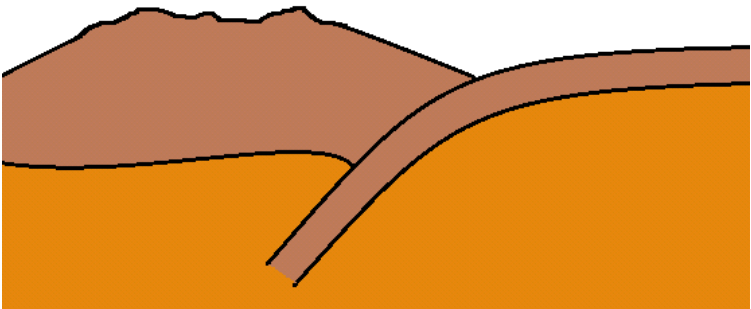
47. (4.00 pts) For this type of diagram in general, what do dots represent? What do curves represent?

48. (3.00 pts) In this specific diagram, what do the dots represent?

49. (8.00 pts) What is the strike and dip of each of the two geologic structures shown here? Refer to the structures as "green" and "red".

Section L

Image 11



50. (1.00 pts) Refer to Image 11 for the questions in this section. What type of plate boundary is shown in this image?

- ☐ A) Convergent
- ☐ B) Divergent
- ☐ C) Transform
- ☐ D) None of these

51. (2.00 pts) The left plate is (continental/oceanic) and the right plate is (continental/oceanic).

52. (1.00 pts) Which process is depicted in this image?

- ☐ A) Obduction
- ☐ B) Ridge push
- ☐ C) Inversion

☐ D) Subduction

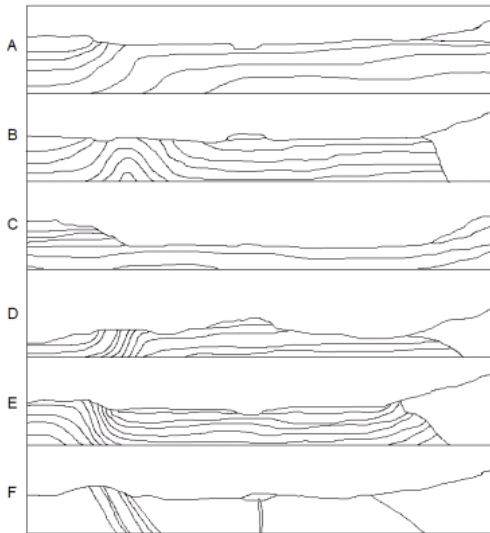
53. (4.00 pts) What physical properties cause the right plate to sink beneath the left plate? How does the chemistry of the plates affect this?

Section M

Image 12



Image 13



54. (2.00 pts)

Refer to Images 12 and 13 for the following set of questions. Suppose that the portion of the map in Image 12 is 33.1 cm horizontally. What is this length in real life, in kilometers?

55. (2.00 pts) What is the scale factor of this map? Give only the larger number, excluding the "1:".

56. (4.00 pts) Most of the rocks towards the west and east date from which two geologic periods, respectively?

57. (2.00 pts) What type of geologic structure dominates the region shown in this map?

58. (3.00 pts) The structure from the previous question was created by what subsurface structure?

59. (4.00 pts) What type of depositional environment is at Letter A? What type of depositional environment is at Letter B?

60. (1.00 pts) The streams and rivers in this area primarily flow in which cardinal direction? (answer with one of the 8 primary and secondary cardinal directions)

61. (1.00 pts) Consider the mountain towards the northeast of this map. What geological forces created this mountain?

62. (1.00 pts) Which of these best describes the overall geographic structure of this map?

- ☐ A) Continental margin
- ☐ B) Valley
- ☐ C) Mountain
- ☐ D) Floodplain

63. (4.00 pts) Consider the presence of the unit Km_f towards the northeast of this map. Why is this unit outcropping in this area?

64. (1.00 pts) What is the contour interval of this map, in feet?

65. (2.00 pts) What is the magnetic declination of this map, to the nearest 0.1 degrees?

66. (3.00 pts) The magnetic declination reading for this map was produced in 1985. Where is the region in this map most likely located?

- ☐ A) Georgia
- ☐ B) Wisconsin
- ☐ C) Oregon
- ☐ D) Pennsylvania
- ☐ E) Utah
- ☐ F) Texas

67. (6.00 pts) Consider Image 13. Which letter best represents the cross section of this map as taken across the southwest-northeast line on the map?

The End