

PA South-Eastern Regionals

Geologic Mapping



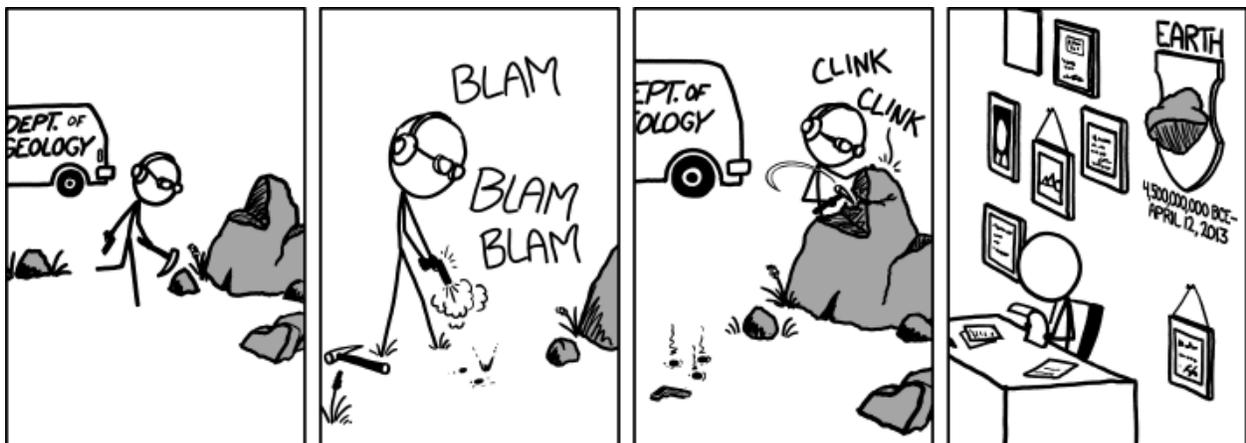
Exploring the World of Science

Name(s): _____

School: _____

Team: _____

Tie Breakers: 71, 72, 73, 74, 75, 76, 77, 78, 79, 80...



Multiple Choice (2 points each)

1. In a Deltaic Environment, what horizon would most likely have the lowest permeability?
 - a. Topset Beds
 - b. Delta Plain
 - c. Foreset Beds
 - d. Delta Front
 - e. Bottomset Beds

2. Which of the following statements is false regarding evidence to suggest that Africa and South America were once joined?
 - a. The two continents fit together well along their true edges at an ocean depth of 900m
 - b. Both continents contain fossils of the plant *Glossopteris* and the aquatic reptile *Mesosaurus*
 - c. Rocks that are about 550 million years old match up perfectly across the continents
 - d. Both continents show compatible evidence of a glacial period during the Carboniferous time
 - e. The Caledonides mountain range matches up across the two continents in both placement and age

3. Which of the following was not part of Gondwana?
 - a. Eurasia
 - b. Africa
 - c. India
 - d. Australia
 - e. Antarctica

4. Which of the following statements about paleomagnetism, with respect to spreading ridges, is false?
 - a. There is a clear paleomagnetic signal in rocks to either side of a spreading ridge
 - b. Rocks along spreading ridges all show normal polarity, no matter what their age
 - c. There is evidence that Earth's magnetic poles reverse approximately every half-million years
 - d. The paleomagnetic pattern on one side of a ridge is a mirror image of that on the other side of the ridge
 - e. All the world's spreading ridges show evidence of paleomagnetic reversals in the adjacent ocean rocks

5. If you were to collect samples of sea floor basalt from the following locations, which sample would be the oldest?
 - a. Along the Mid-Atlantic Ridge
 - b. Where the Mid-Atlantic Ridge is exposed above water in Iceland
 - c. 2 miles east of the Mid-Atlantic Ridge
 - d. 2 miles west of the Mid-Atlantic Ridge
 - e. Along the coast of Western Africa

6. When a mantle plume rises from the outer core boundary to the Earth's surface, it results in a:
 - a. Hot spot
 - b. Volcanic island arc
 - c. Subduction zone
 - d. Suture zone
 - e. Spreading center

7. The inside of the Earth is not completely molten because:
 - a. It never gets hot enough to melt rocks deep in the earth
 - b. The melting temperature of rocks increases as pressure increases
 - c. The earth would collapse in on itself if it had a fully liquid interior
 - d. The geothermal gradient inside the Earth is constant
 - e. None of the above because the inside of the Earth is completely molten

8. The top of Mt. Everest exhibits (1) _____ which indicates that (2) _____.

a. (1) a suture zone	(2) it must be an ocean-continent plate boundary
b. (1) a crater	(2) it must be an extinct cinder-cone volcano
c. (1) constant elevation	(2) the collision between India and Asia has ceased
d. (1) glacial features	(2) used to be near the south pole in Gondwana
e. (1) sea shell fossils	(2) it is made of old ocean floor uplifted during collision

9. The boundary between the Crust and the Mantle is called the (1) _____ while the boundary between the Core and the Mantle is called the (2) _____.

a. (1) Moho	(2) Wegener Discontinuity
b. (1) Mojo	(2) S-Wave Barrier Zone
c. (1) M-Boundary	(2) Wegener Discontinuity
d. (1) Moho	(2) Gutenberg Discontinuity
e. (1) M-Unconformity	(2) Gutenberg Discontinuity

10. What is thought to be the reasoning behind Earth's magnetic field?
 - a. Magnetic minerals are common at temperatures above the Curie point
 - b. The Earth has a magnetic iron-nickel core
 - c. The liquid outer core creates an electric current which induces a magnetic field
 - d. All planets have magnetic fields when they go through differentiation
 - e. Magnetic resonance rotates on an axis with respect to Mercury's position in space

11. The pile of sediments scraped off the top of an oceanic plate where it begins to subduct is called:
- A trench
 - A forearc
 - A volcanic island arc
 - An accretionary wedge
 - A pluton
12. The Appalachians formed after the breakup and subsequent reassembling of what supercontinent?
- Pangaea
 - Gondwana
 - Rodinia
 - Madagascar
 - Nubia
 - Ur
13. What is the name of the tectonic plate that used to exist off the west coast of North America but has long since been subducted?
- Juan da Fuca plate
 - Farallon plate
 - Cocos plate
 - Cascadian plate
 - Califarin plate
14. Which of the following is the term commonly used to describe the true shape of the Earth?
- Sphere
 - Oblate Spheroid
 - Spherical Geoid
 - Oblate Geoid
 - Elliptical Geoid
15. Which compound would most likely be found in the Upper Mantle?
- SiO_2
 - Mg_2SiO_4
 - Fe_2SiO_4
 - Fe_2Ni^-
 - FeSiO_6

16. Banded Iron Formations (BIF's) are distinctive units of sedimentary rock that are almost always of what age?
- Present – 0.5 MYA
 - 40.5 – 60.5 MYA
 - 60.5 – 240 MYA
 - 299 – 318 MYA
 - 320 – 500 MYA
 - 520 MYA and Later

17. What condition is needed for a rock to express ductile deformation?
- Low Pressure
 - High Temperature
 - Low Temperature
 - Within 2.7km from surface
 - Must be a silicate

18. Which of the following symbols represents a Syncline where its identity and existence is certain, and location is inferred?



19. Which of the following characteristics best describes the igneous rock most likely to be found along the outside of a stratovolcano?
- Mafic & Coarsely Grained
 - Mafic & Finely Grained
 - Ultramafic & Coarsely Grained
 - Felsic & Coarsely Grained
 - Felsic & Finely Grained

20. Which of the following is true concerning the relationship between dam construction and earthquakes?
- Dams can decrease earthquake damage because the water's movement can counterbalance the ground's movement
 - Dams can decrease the possibility of an earthquake because the water lubricates the fault preventing stress from building up
 - Dams can decrease the possibility of an earthquake because the water can precipitate minerals that seal the fault
 - Dams can increase the possibility of an earthquake because the water stresses fault blocks and lubricates faults
 - Dams can increase the possibility of an earthquake because the potential for catastrophe due to flooding is so much greater

Free Response

21. What is the true thickness of a sill of dip 20° , height 150m, and width 500m? (5pts)

22. A sandstone bed strikes 067° and dips 21° SE. In the bedding plane, it is observed that there are slickensides pitching at 58 degrees east. What is the trend and plunge of the slickensides? (Give trend as an azimuth. No Cardinal Direction needed for plunge) (5pts for trend, 5pts for plunge, 10 pts total)

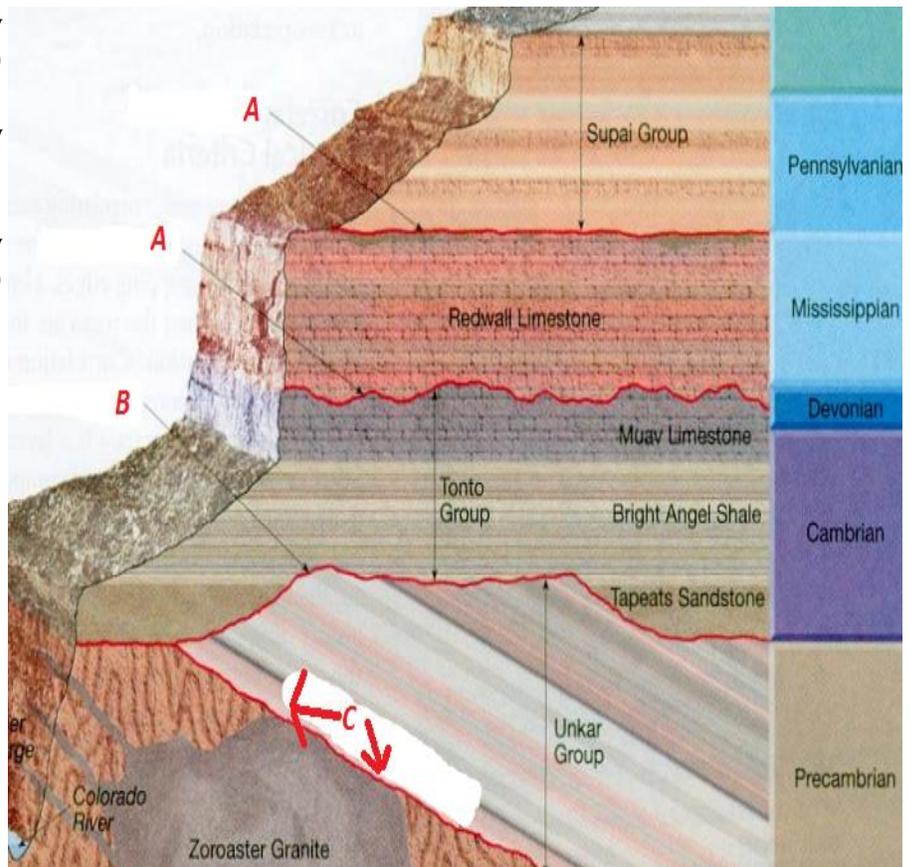
Use the figure to the right for questions 23-26.

23. What type of unconformity Does "A" represent? (2pts)

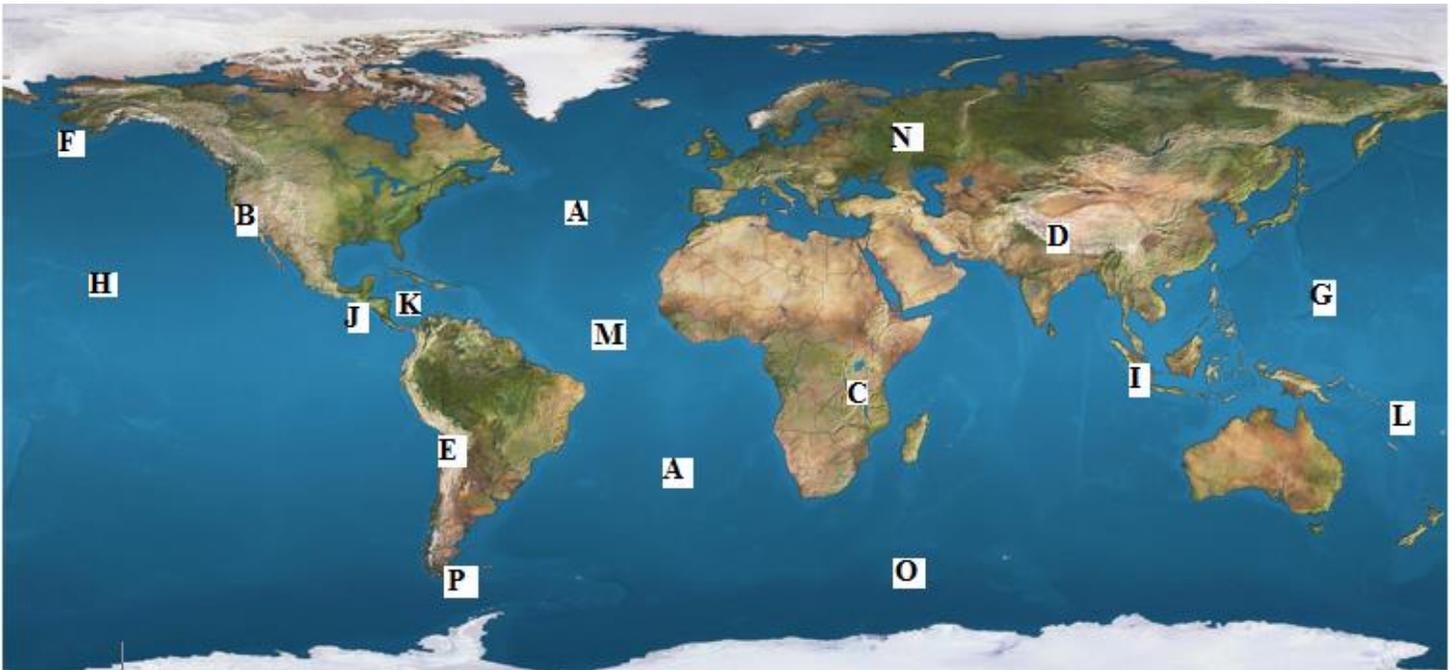
24. What type of unconformity Does "B" represent? (2pts)

25. What type of unconformity Does "C" represent? (2pts)

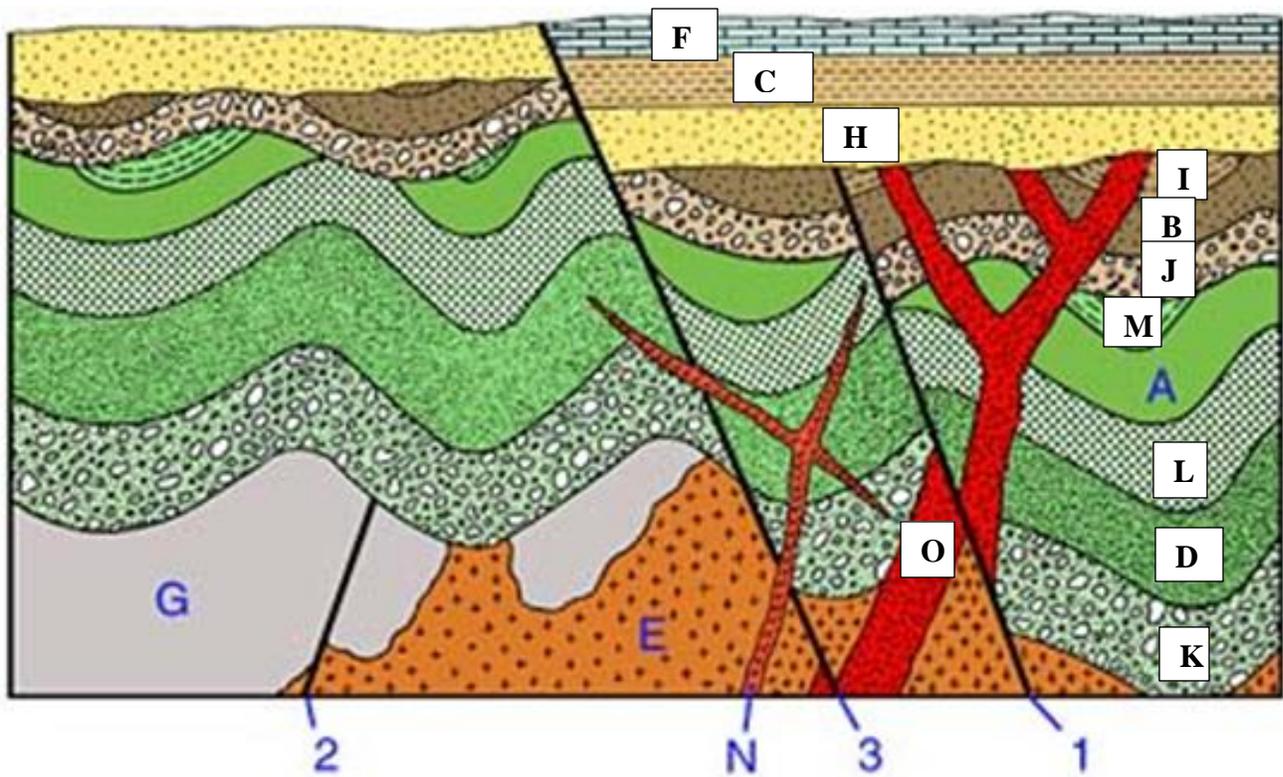
26. Based on the cross-section provided, what United States' feature is this diagram from? (2pts)



Use the map below to answer questions 27-37. Fill your answers in on the answer sheet.



27. What type of tectonic boundary would you find at letter "A"? (1pt)
28. What type of tectonic boundary would you find at letter "B"? (1pt)
29. What type of tectonic boundary would you find at letter "C"? (1pt)
30. What type of tectonic boundary would you find at letter "F"? (1pt)
31. What type of tectonic boundary would you find at letter "G"? (1pt)
32. What is the name given to the feature at letter "M"? (1pt)
33. Other than a Reverse Fault, what type of Fault would you find at letter "M"? (2pts)
34. With respect to letters A, B, D, E, G, & K, which letter represents a mountain range formed from two converging continental plates? (2pts)
35. With respect to letters A, B, D, E, G, & K, which letter represents a mountain range formed from an oceanic-continental plate collision? (2pts)
36. With respect to letters A, G, H, L, N, & O, which letter represents the area with the oldest crust? (2pts)
37. With respect to letters A, B, G, H, & L, which letter represents the area with the youngest crust? (2pts)
38. When looking directly under the Andes Mountain Range, what is the name of the plate that is closest to the core? (2pts)



Use the figure above to answer questions 39-46

39. Order all of the Lettered Events from Youngest to Oldest. (0.5pts per event)
40. Order the Numbered Faults from Oldest to Youngest. (0.5pts per event)
41. What type of Fault is Fault #1? (1pt)
42. What type of Fault is Fault #2? (1pt)
43. With respect to Fault #3, which letter would be on the side of the footwall? F or G? (1pt)
44. What is the name given to the igneous body marked by letter O? (2pts)
45. What is the name given to the igneous body marked by letter E? (2pts)
46. Assuming this cross-section is representative of an orogeny, what Lettered Strata would represent the youngest strata at the time of orogeny? (2pts)

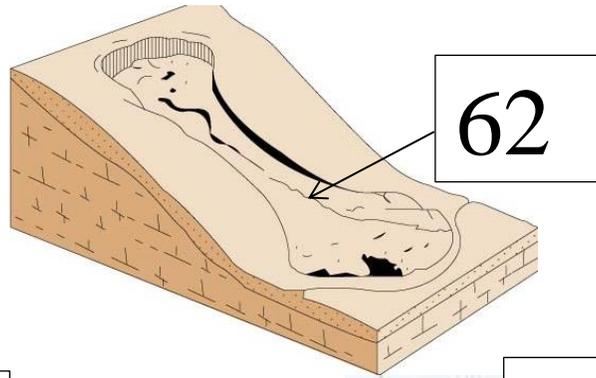
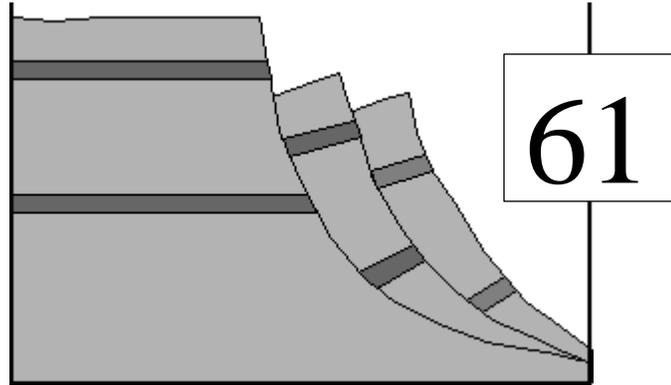
47. If the time is 1200 UTC in Greenwich, England, what time is it in a small fishing village in Russia, with a longitude of 67.5 degrees east? (*Hint: Think about how many degrees, with respect to longitude, there are on the earth, and how many hours there are per rotation of the Earth.*) (5pts)
48. What is the name given to the feature which marks 0 degrees Latitude? (2pts)
49. What is the name given to the feature which marks 180 degrees Longitude? (2pts)
50. On a USGS 7 ½-minute topographic quadrangle map, longitude and latitude coordinates are given at each corner of the map, and in thirds along the each side of the map. What is the span (in minutes and seconds) of one of these thirds? (3pts)
51. Looking at the same type of map as in #50, UTM coordinates are also showed by tick marks. What is the (real-life) distance, in **meters**, between tick marks ⁶07 and ⁶09? (3pts)

Use the Figure, on the next page, to answer questions 52-59.

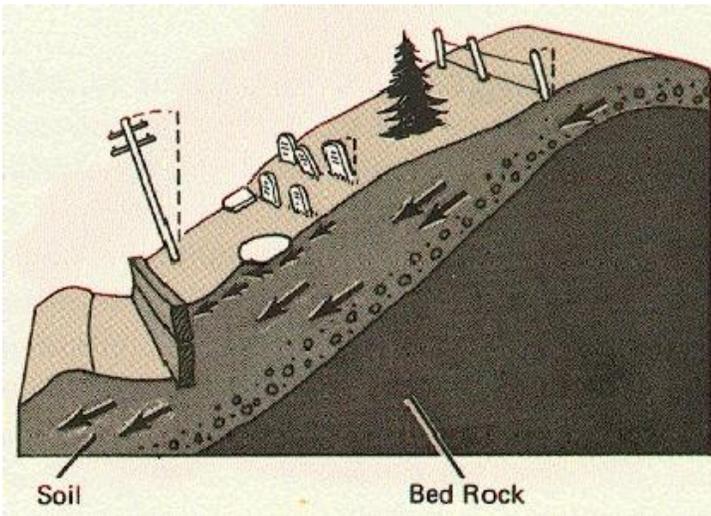
The Figure is a section of the USGS 7 ½ minute Deep Lake Quadrangle in Wyoming

52. What is the Index Contour Interval (in ft)? (2pts)
53. What is the Map Contour Interval (in ft)? (2pts)
54. Give an appropriate elevation of the mountain peak located at UTM 4980700N, 627500E? (2pts)
55. What is the marked elevation of the mountain peak located at Longitude 109° 24' 45" (2pts)
56. What Cardinal Direction is Wyoming Creek flowing at Longitude 109° 25' 00"? (2pts)
57. Looking at the mountain at UTM 4981700N, 626410E. Which side of the mountain is the steepest? (2pts)
58. If a large amount of snow were to melt on the south side of the peak mentioned in #57, which creek would the water end up flowing into? (2pts)
59. 2 inches on the Deep Lake Quadrangle Map is equivalent to how many feet on the ground? (3pts)
60. Given the two UTM points below, calculate the distance from A to B in miles. (1mi = 1.6093km) **A** – 4520293N, 258804W **B** – 4487474N, 752877W (5pts)

For questions 61-64, look at the numbered figure and give the Mass Wasting Event or Geological Hazard that is prominent in the photo. (3pts each)

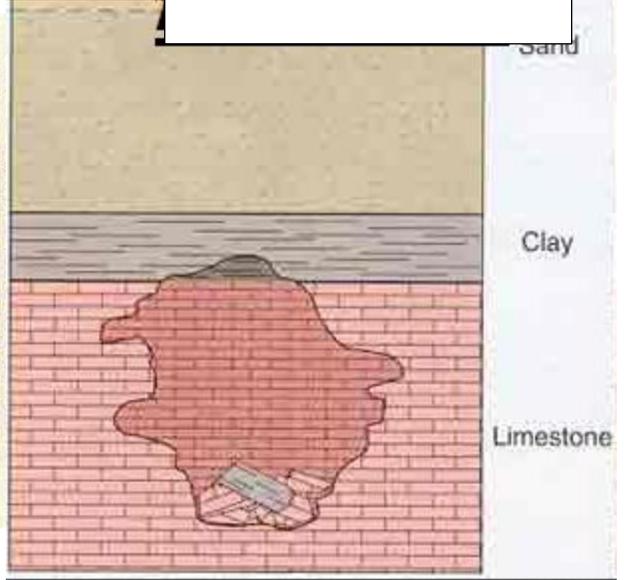


63



64

What hazard may occur?

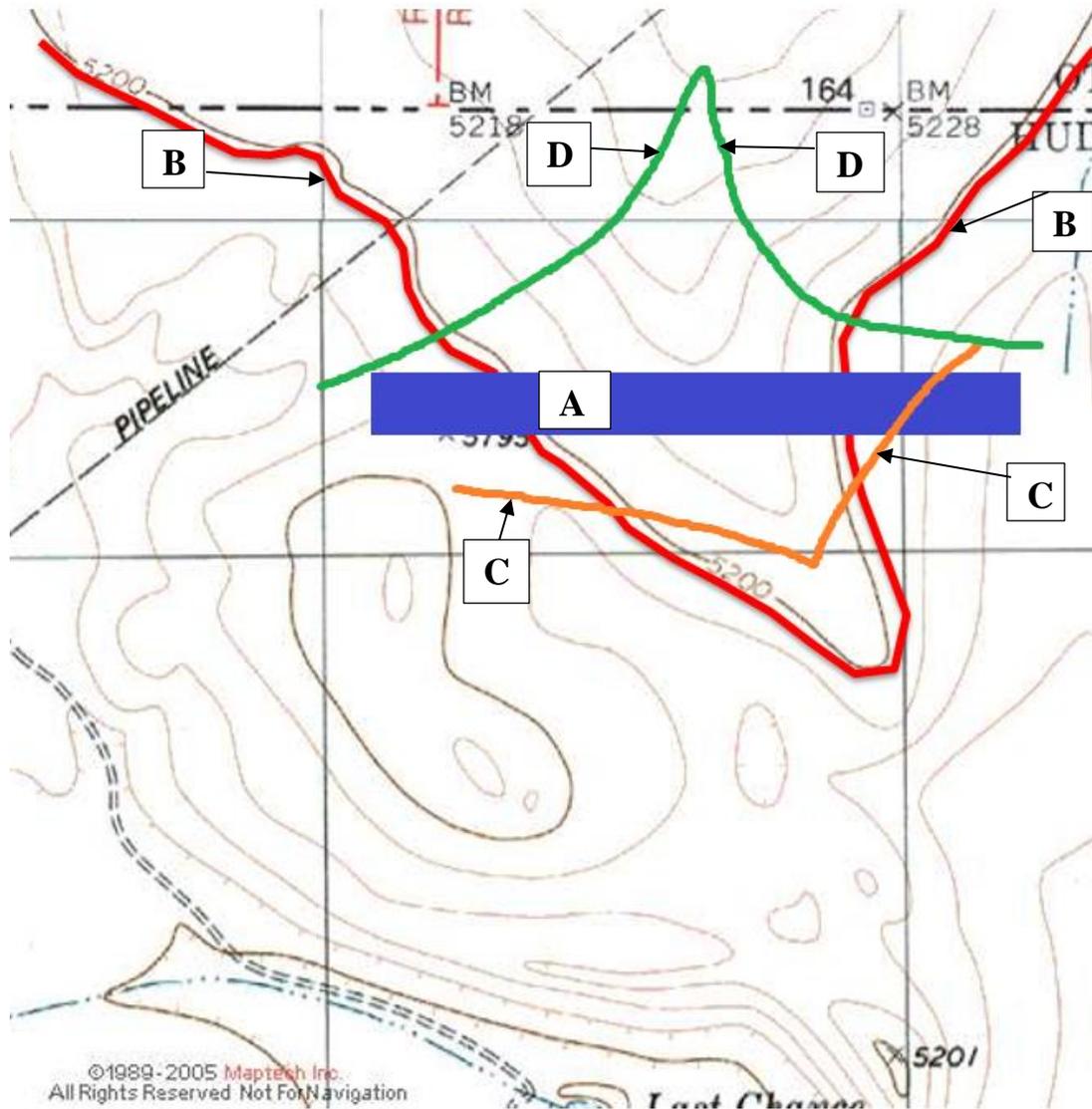


Use the Topographic Map (provided by the proctor), and Background Info below, on the Delaware Water Gap to answer questions 65-70.

Background Info: Over 200 Million years ago, the Delaware Water Gap did not exist. Originally, Kittatinny Mountain was a significant drainage divide between a river flowing to the North and a river flowing to the South. The composition along most of the topographic map is either Limestone, Quartz Sandstone, Shale, or Conglomerate.

65. The river flowing to the South originally flowed straight South towards the sea. Assuming the topography to the North of Kittatinny Mountain has not largely changed, what direction was the river to the North flowing before the Delaware Water Gap formed? (*N, NE, S, SW, etc...*) (2pts)
66. What valley would the Northern River most likely have flown through? (2pts)
67. Using knowledge of erosion, and lithology of rocks that are mainly seen in certain environments, what is most likely the composition of Kittatinny Mountain? (2pts)
- Limestone & Sandstone
 - Sandstone & Shale
 - Conglomerate & Shale
 - Limestone & Conglomerate
 - Conglomerate & Sandstone
 - Limestone & Shale
68. Using the idea of Headward Erosion, how did the water gap form? (4pts)
- Northern Winds eroded out the weaker shale and limestone area of Kittatinny Mountain until the rivers could meet
 - Southern Winds from the sea converged into one crevice in the mountain, widening the gap through erosion until the rivers could meet
 - The Northern River started to change direction and ran along side of the mountain, slowly eroding away at the gap until it could flow through and meet the Southern River
 - The Southern River slowly eroded away at the origin of the stream channel, leading to the river cutting through the mountain until it met with the Northern River
 - Glaciers that created the Valleys seen to the North of the topographic map, and further North in Pennsylvania, carved out the water gap, as seen in the Mt. Minsi glacial striations
69. What Drainage Pattern is most prominently observed currently at the Delaware Water Gap? (3pts)
70. If a large amount of snow melted at the large black oval notated on the map, what marked river or creek would the resulting water end up in first? (2pts)

Use the Following figure for questions 80-83. (2pts each)



80. The outcrop pattern of the bed, represented by the “A” Box, dips...
- Downstream
 - Upstream
 - Horizontal
 - Vertical
81. The outcrop pattern of the bed, represented by the “B” Line, dips...
- Horizontal
 - Vertical
 - Anywhere from 1-45 degrees
 - Anywhere from 46-89 degrees
 - Cannot Be Determined

(continuing off of image from previous page)

82. The outcrop pattern of the bed, represented by the “C” Line, dips upstream...
- At an angle Greater Than the stream gradient
 - At an angle Less Than the stream gradient
 - At an angle Equal to the stream gradient
 - Cannot Be Determined
83. The outcrop pattern of the bed, represented by the “D” Line, dips downstream...
- At an angle Greater Than the stream gradient
 - At an angle Less Than the stream gradient
 - At an angle equal to the stream gradient
 - Cannot Be Determined

For questions 84-89, refer to the Geologic Map (handed out by proctor)

84. Look on the Northern Side of the Figure for the, larger of the two, Red Oval. The Red Oval is largely encompassed by blue and pink represented beds. What geologic feature is seen in this area of the map with respect to the bedrock map? *(The feature technically is larger than the oval) (3pts)*
85. Look at the Southern Side of the Figure for the, smaller of the two, Red Oval. The Red Oval is encompassed by multiple color represented beds. What geologic feature is seen inside of the Red Oval here? *(3pts)*
86. On the Geologic Map, what is the youngest bedding seen in the section shown? Give the geological abbreviation given to the formation. *(2pts)*
87. On the Geologic Map, the two oldest beds seen are from what Geologic Period? *(2pts)*
88. With respect to the fault in the bottom left-hand corner of the section of the Geologic Map (enclosed by a red box), what type of fault is present? *(2pts)*
89. With respect to the same fault from question #88, which side of the fault, North or South, represents the Footwall? *(1pt)*