True of False. For the statements that are TRUE place the letter "Q" on your answer sheet. For statements that are FALSE, place the letter R on your answer sheet. (1 point each)

1. The "Great Ice Age" glaciers were most extensive and active in the Northern Hemisphere.

2. Sublimation is the loss of water by melting and infiltration at the base of the glacier.

3. Glacial ice is brittle at thicknesses less than approximately 40 meters.

4. Plucking is an erosional process that occurs due to melting and refreezing of meltwater in rock fractures.

5. U-trough valleys are characteristic of continental glaciers.

6. Glacial drift refers to the poorly sorted and unstratified sediment rafted by continental and valley glaciers.

7. The difference between glacial till and outwash is the removal of the fine fraction by running water.

8. Moraines are formed from outwash bulldozed by the glacier along its terminus.

9. According to the Milankovitch theory, small irregularities in Earth's rotation and orbit were sufficient to have caused Pleistocene glaciation.

10. The vast expanse of the Pleistocene glaciers and the limited extent of valley glaciers show that continental glaciers and ice caps flow more rapidly than valley glaciers.

Multiple Choice. Choose the best answer for the following questions and record it on your answer sheet. (1 point each)

11. During an Ice Age, which of the following occur?
    Q. warm, dry climates outside the glaciated area are more humid and cool
    R. continental and valley glaciers advance
    S. sea level is lowered
    T. R and S
    U. all of the above

12. Glaciers exist at
    Q. high latitudes and/or high altitudes R. high latitudes and/or low altitudes
    S. low latitudes and/or high altitudes T. low latitudes and/or low altitudes
    U. will soon exist nowhere due to global warming

13. Which of the following erosional landforms would be found in the zone of accumulation of a valley glacier?
    Q. cirques, arêtes, and eskers R. cirques, eskers, and moraines
    S. cirques, arêtes, and horns T. arêtes, horns, and moraines
    U. cirques, horns, and moraines

14. Which is NOT characteristic of a glacial trough?
    Q. a broad, flat valley floor R. steep, often vertical valley walls
    S. V-shaped cross-section T. truncated spurs
    U. None of the above

15. The critical depth of snow and ice needed to cause the ice below to deform and flow is
    Q. 4 meters. R. 40 meters. S. 400 meters. T. 4 kilometers.

16. Each dark/light couplet in a sequence of varves represents
    Q. one year. R. about 10 years. S. about 1000 years. T. about 1000000 years.

17. The best explanation for short periods of glacial advance that span only a few centuries includes
    Q. plate tectonics.
    R. Milankovitch cycles.
    S. frequent volcanic eruptions coupled with variations in solar energy.
    T. all of the above

18. Glacial abrasion produces
    Q. rock flour. R. glacial polish. S. glacial striations. T. all of these

19. Medial moraines form when
    Q. two terminal moraines merge.
    R. two lateral moraines merge.
    S. an end moraine is over-ridden by a glacier.
    T. a mountain peak is surrounded on all sides by glaciers.

20. During periods of glacial advances the Sahara Desert was covered by
    Q. glaciers. R. forests. S. a shallow sea. T. volcanoes.

Completion. Write the answer that best completes the following statements. (2 points each)

21. A(n) _____ is large outburst flood that usually occurs when a glacially dammed lake drains catastrophically.

22. _____ are alternating bands of light and dark ice seen on a glacier surface.

23. _____ rounded, well-bonded snow that is older than one year, it has a density greater than 550 kg/m^3 (35 lb/ft^3).

24. _____ is flow that occurs when glacier motion is decelerating down-slope.

25. _____ is the sliding of a glacier over bedrock, the process is generally aided by the presence of meltwater at the rock/ice boundary.

26. _____ are nearly vertical channels in ice that is formed by flowing water; they usually found after a relatively flat section of glacier in a region of transverse crevasses.

27. In the 1860's, _____ proposed an Astronomical Theory of the Ice Ages

2008

28. _____ is sometimes called the "Father of Glaciology".

29. Variation in the _____ of the Earth's orbit around the sun has periods of about 400,0000 years and 100,000 years.

30. ____ is the variation in the tilt of the Earth's axis has a period of about 41,000 years.

31. A sharp mountain peak surrounded on all sides by cirques is a____.

32. According to the _____ theory, glacial-interglacial episodes of the Pleistocene may be due to variations in the eccentricity of Earth's orbit, the tilt of the axis and the precession of the equinoxes.

33. Today glaciers cover about ____ of the surface of the land.

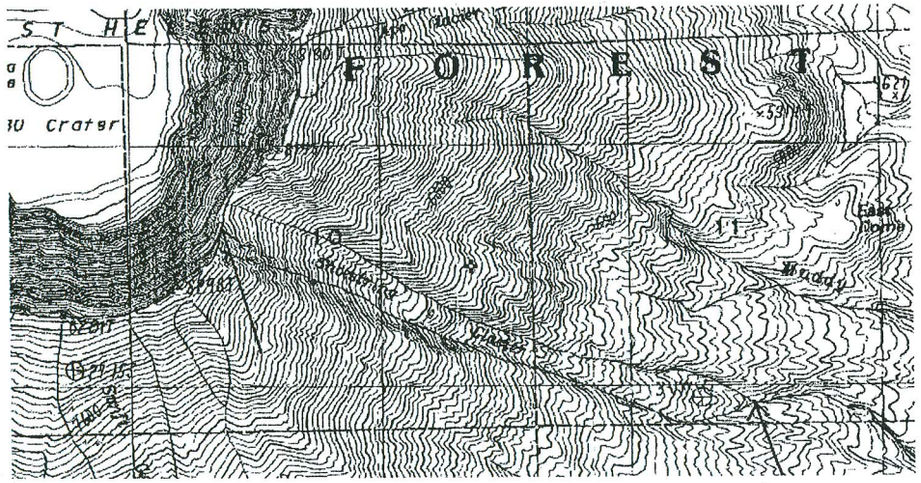
34-36. If wastage exceeds accumulation, a glacier will 34.____, but if accumulation exceeds wastage, a glacier will 35. _____; and if wastage and accumulation are in balance, the glacier will be 36. ____.

37. In a valley glacier, the highest velocity is in the zone of____

38. _____ occurs when glacial ice freezes in the cracks and crevices of a bedrock projection and pulls it loose.

39. Depressions that form from a block of ice left in the outwash produced a ____.

40. _____ occurred between the 14th and 19th centuries.



Shoestring Glacier, Mt. St. Helens 1:24000 scale

Maps and calculations (Please use SI units when doing measurement and calculation.)

41. Find the length of Shoestring Glacier between the points of the two arrows. (10 pts)

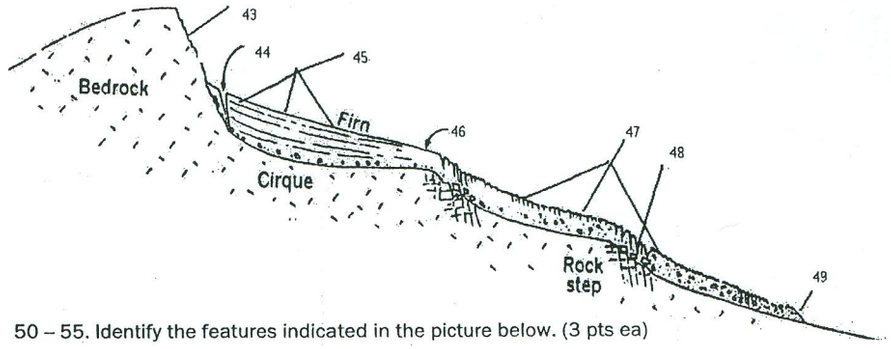
42. Calculate the area of Shoestring glacier. (20 pts)

TR7-18

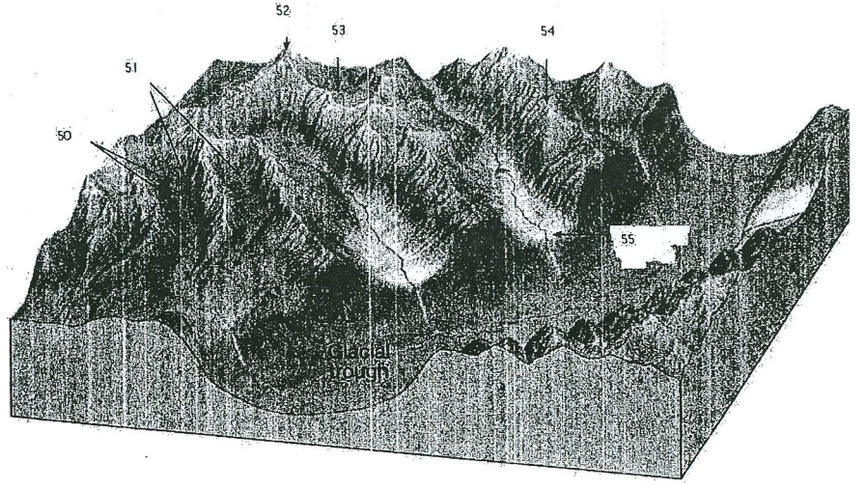
DYNAMIC PLANET (CONT.)

Feature identification

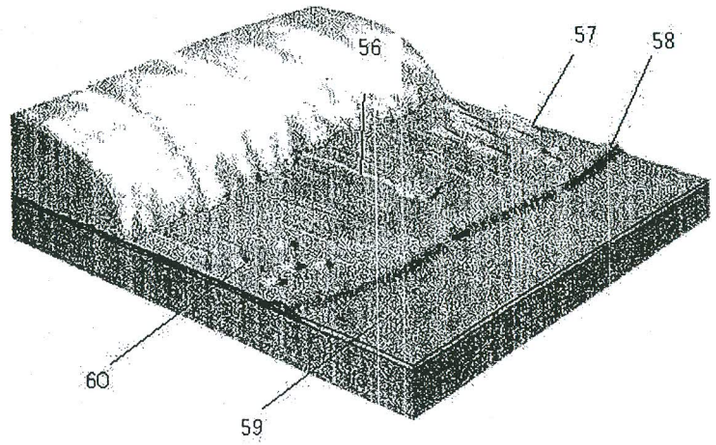
43 – 49. Identify the features indicated in the picture ~~above~~ below. (3 pts ea)



50 – 55. Identify the features indicated in the picture below. (3 pts ea)

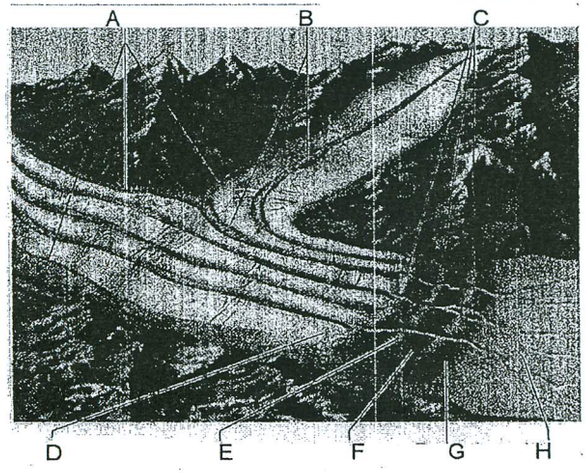


56 – 60 Identify the features indicated in the picture below. (3 pts ea)

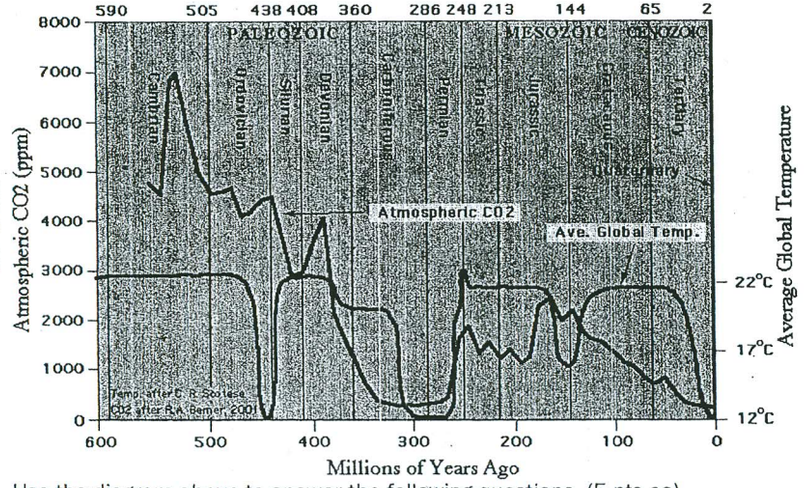


2006

For numbers 61 to 68 choose the letter that best describes the lettered feature. (3 pts ea)



61. End moraines
62. Ground moraine
63. Lateral moraine
64. Medial moraine
65. Outwash
66. Recessional moraine
67. Terminal moraine
68. Terminus of glacier



TB7-19

Use the diagram above to answer the following questions. (5 pts ea)

69. During what geologic period(s) was atmospheric CO_2 the highest?

70. During what geologic period(s) was the average global temperatures lowest?

Team # B-____ State _____ School _____

1. Q	2. R	~~3. Q~~	~~4.~~ Q	5. R	~~6.~~ R	7. Q
~~8.~~ R	9. Q	10. R	~~11.~~ V	12. Q	13. S	14. S
15. R	16. Q	17. S	18. T	19. R	~~20.~~ R	

21. Jokulhlaup	22. OGIVES	23. FIRN or NÉVÉ
24. Compressional flow	25. basal Sliding	26. moulins
27. James Croll	28. LOUIS AGASSIZ	29. ECCENTRICITY
30. OBLIQUITY	31. HORN	32. Milankovitch
33. 10%	34. RETREAT	35. ADVANCE
36. STAGNATE/equilibrium	37. Accumulation	38. PLUCKING
39. Kettle	40. little ice age	

41. 2448m

42. .344 Km^2

43. headwall	44. bergschrund	45. zone of accumulation
46. Firn line	47. Zone of Ablation	48. Crevasse
49. END MORAINE	50. Finger Lakes	51. CIRQUE
52. horn	53. TARN	54. ARÊTE
55. hanging valley	56. ESKER	57. drumlin
58. END MORAINE	59. kettle lake	60. Kame

61. C 62. ~~A~~F 63. A 64. B 65. H 66. E 67. G 68. D

69. CAMBRIAN

70. ORDOVICIAN, CARBONIFEROUS, PERMIAN, TERTIARY

DYNAMIC PLANET (CONT.)

2007