1. The photograph below shows scratched and polished bedrock produced by weathering and erosion.

Which agent of erosion most likely carried sediment that scratched and polished this bedrock surface?
(1) a moving glacier
(2) running water
(3) wave action
(4) wind

2. The block diagram below represents an igneous dome that uplifted overlying rock layers, which were then weathered and eroded.

Which stream drainage pattern is most likely found on the surface of the area represented by the block diagram?
(1) 
(2) 
(3) 
(4)
3. The block diagram below represents the drainage basins of some river systems separated by highland divides, shown with dashed lines. The arrows show the directions of surface-water flow.

The three areas separated by highland divides are called
(1) meanders
(2) floodplains
(3) watersheds
(4) tributaries

4. Photographs A and B below show two different valleys.

Which list best identifies the agent of erosion that primarily determined the shape of each valley?
(1) photograph A—glacier; photograph B—river  (3) both photographs—river
(2) photograph A—river; photograph B—glacier  (4) both photographs—glacier

5. A group hiking in the Catskill region of New York State finds several large boulders composed of metamorphic rock. These boulders most likely resulted from the weathering of bedrock formed in the
(1) Catskills, and were transported to their present location by mass movement
(2) Catskills, and were transported to their present location by glaciers
(3) Adirondack Mountains, and were transported to their present location by mass movement
(4) Adirondack Mountains, and were transported to their present location by glaciers
5. The entire land area drained by the Mississippi River system is referred to as a drainage basin or a
(1) levee (2) watershed (3) meander belt (4) floodplain

6. At which location would the Mississippi River’s discharge most likely be the greatest?
(1) A (2) B (3) C (4) D

7. Sediments deposited by the river at location B are best described as
(1) sorted and layered (3) unsorted and layered
(2) sorted and not layered (4) unsorted and not layered

8. Which landform is produced at location E where the Mississippi River enters the Gulf of Mexico?
(1) a delta (2) a drumlin (3) an escarpment (4) an outwash plain

9. U-shaped valleys, drumlins, finger lakes, and parallel grooves in bedrock are characteristics of erosion by
(1) mass movement (2) wave action (3) running water (4) glacial ice

10. Glaciers often form parallel scratches and grooves in bedrock because glaciers
(1) deposit sediment in unsorted piles. (3) continually melt and refreeze.
(2) deposit rounded sand in V-shaped valleys. (4) drag loose rocks over Earth’s surface.

11. The large waterfall at Niagara Falls, New York, was originally located at the Niagara Escarpment. Which term best describes an escarpment?
(1) U-shaped valley (2) V-shaped valley (3) cliff (4) drumlin
12. The photograph below shows a valley.

Which agent of erosion most likely produced this valley’s shape?
(1) blowing wind
(2) ocean waves
(3) moving ice
(4) running water

13. The photograph below shows a large boulder of metamorphic rock in a field in the Allegheny Plateau region of New York State.

What is the best evidence that this boulder has been transported by a glacier?
(1) It is located at a high elevation in a mountainous area.
(2) It is less than 25 centimeters in diameter.
(3) Its composition is different from that of the bedrock under it.
(4) It appears to have been intensely metamorphosed.

14. Which statement best describes sediments deposited by glaciers and rivers?
(1) Glacial deposits and river deposits are both sorted.
(2) Glacial deposits are sorted, and river deposits are unsorted.
(3) Glacial deposits are unsorted, and river deposits are sorted.
(4) Glacial deposits and river deposits are both unsorted.

15. The cross section below shows a V-shaped valley and the bedrock beneath the valley.

Which agent of erosion is responsible for cutting most V-shaped valleys into bedrock?
(1) surface winds       (2) running water       (3) glacial ice       (4) ocean waves
16. The elongated hills labeled R are most useful in determining the
(1) age of the glacier (3) thickness of the glacier
(2) direction the glacier has moved (4) rate at which the glacier is melting

17. Which feature will most likely form when the partially buried ice block melts?
(1) drumlin (2) moraine (3) kettle lake (4) finger lake

18. The ridge of sediments from X to Y can best be described as
(1) sorted and deposited by ice (3) unsorted and deposited by ice
(2) sorted and deposited by meltwater (4) unsorted and deposited by meltwater

19. In which New York State landscape region is Elmira located?
(1) Tug Hill Plateau (3) Allegheny Plateau
(2) St. Lawrence Lowlands (4) Erie-Ontario Lowlands

20. Wooden stakes were placed on a glacier in a straight line as represented by A-A' in the diagram below. The same stakes were observed later in the positions represented by B-B'.

The pattern of movement of the stakes provides evidence that
(1) glacial ice does not move.
(2) glacial ice is melting faster than it accumulates.
(3) the glacier is moving faster in the center than on the sides.
(4) friction is less along the sides of the glacier than in the center.
Part 2: Short Answer [+8]

Base your answers to questions 21 through 23 on the diagram below, which shows several different landscape features. Points X and Y indicate locations on the streambank.

21. Explain why the upper valley in the mountains is U-shaped and the lower valley is V-shaped. [1]

22. Identify which point, X or Y, has more stream erosion and explain why the amounts of erosion are different. [1]

23. Explain why the stream meanders on the floodplain, but not in the mountains. [1]
24. Describe one piece of evidence likely to be found on the exposed bedrock surfaces that could indicate the direction this glacier moved. [1]

25. Describe one difference between the arrangement of sediment in the moraines and the arrangement of sediment in the outwash plain. [1]

26. Describe the most likely shape of the valley being formed due to erosion by this glacier. [1]

27. Explain why the glacial ice absorbs less solar radiation than the surrounding exposed bedrock and soil. [1]
28. The diagram below shows a partial cross section of a valley near location A on map III. On this diagram, draw a line beginning at X and ending at Y to show the shape of this valley after it was eroded by glacial ice that flowed down the valley. [1]
29. The arrangement of the drumlins on map B indicates that a large ice sheet advanced across New York State in which compass direction? [1]

30. The drawing below shows a glacial erratic found on the beach of the north shore of Long Island near the Harbor Hill moraine. This boulder is composed of one-billion-year-old gneiss.

Which New York State landscape region has surface bedrock similar in age to this erratic? [1]
31. The diagrams below represent three sediment samples labeled X, Y, and Z. These samples were collected from three locations marked with empty boxes, □, on map C.

[Images of sediment samples X, Y, and Z with particle size ranges]

On map C on the answer sheet, write the letter of each sample in the correct box to indicate the location from which each sample was most likely collected. [1]

32. Explain how the effect of global warming on present-day continental glaciers could affect New York City and Long Island. [1]

33. The map on the answer sheet shows the stream drainage patterns for a region of Earth’s surface. On the map on the answer sheet, draw the two divides that determine the direction in which the streams will flow. [1]
EARTH SCIENCE TEST
Glaciers, Rivers, & Landscapes

Name:_____________________________________________Date:__________________Period:_____

Answer Sheet

**Part 1:**

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

**Part 2:**

21.
22.
23.
24.
25.
26.
27.

Part 1 (20) = ______
Part 2 (8) = ______
Total (28) = ______
Bonus (5) = ______

% = ______