August 2012

17 The block diagram below shows part of a meandering stream. Line XY shows the location of a stream cross section.

Which cross section best represents the shape of the stream channel at line XY?

(1)  
(3)  
(2)  
(4)  
19 The cross section below shows layers of sediments deposited in a region of Wisconsin that has experienced several periods of glaciation. Descriptions of the sediments in layers A through F are included.

Which two layers of sediments were probably deposited directly by glaciers?
(1) A and D  
(2) B and F  
(3) C and E  
(4) D and E

20 A river’s current carries sediments into the ocean. Which sediment size will most likely be deposited in deeper water farthest from the shore?
(1) pebble  
(2) sand  
(3) silt  
(4) clay

21 Which mineral would most likely become rounded at the fastest rate when tumbled along a stream bottom?
(1) garnet  
(2) pyroxene  
(3) plagioclase feldspar  
(4) selenite gypsum

30 The diagram below represents the setup for an experiment for studying groundwater. Tubes A, B, C, and D contain equal volumes of sediments. Within each tube, the sediments are uniform in size, shape, and packing. A test for water retention was conducted by first filling each tube with water and then draining the water into beakers.

(Not drawn to scale)
Which graph represents the general relationship between the sediment size and the amount of water retained by the sediments after the tubes had drained?

35 The sequence of block diagrams below shows stages of development of a landscape. The stages are labeled A, B, and C.

Which sequence of geologic processes best describes the events that created each stage shown?
(1) erosion → subsidence and deposition → uplift and faulting
(2) uplift and deposition → flooding → folding and erosion
(3) metamorphism → erosion and deposition → volcanic eruptions
(4) uplift and erosion → subsidence and erosion → folding

Base your answers to questions 42 through 44 on the cross sections below, which represent a particular location of the channel of the San Juan River in Utah. Changes in river discharge (Q), in cubic meters per second, and sediment deposits before, during, and after a flood are shown.

42 During the time from September 9 to October 14, the thickness of the sediment deposits at the bottom of the San Juan River’s channel
(1) decreased, only
(2) increased, only
(3) decreased and then increased
(4) increased and then decreased
43 On October 14, during the flood, the discharge of the San Juan River changed dramatically. The change in the river’s discharge at this location was related to an increase in the river’s
(1) velocity   (2) gradient   (3) channel length   (4) sediment deposits

44 If the greatest velocity of the San Juan River on December 9 was 10 centimeters per second, what was the approximate diameter of the largest particles that the river could have carried?
(1) 1.0 cm    (2) 2.0 cm    (3) 10.0 cm   (4) 0.2 cm

June 2012

15 Which agent of erosion most likely formed the drumlins and finger lakes in New York State?
(1) running water   (2) moving ice   (3) wave action   (4) mass movement

26 The diagram below represents three identical beakers filled to the same level with spherical beads.

If the packing of the beads within each beaker is the same, which graph best represents the porosity within each beaker?

Base your answers to questions 34 and 35 on the diagram and data table below. The diagram shows the equipment used to determine the factors affecting the rate of erosion in a stream. The data table shows the time it took a 10-gram sample of quartz sand to move 100 centimeters down the rain gutter under various conditions.
In this experiment, the water velocity could be increased by
(1) decreasing the slope of the rain gutter  
(2) increasing the amount of water from the faucet  
(3) lowering the flexible hose  
(4) widening the rain gutter

What is the relationship between the water velocity and the rate of erosion?
(1) If the water velocity decreases, the rate of erosion increases.
(2) If the water velocity increases, the rate of erosion increases.
(3) If the water velocity remains constant, the rate of erosion decreases.
(4) If the water velocity remains constant, the rate of erosion increases.

Base your answers to questions 42 through 45 on the laboratory experiment described below.
The weathering of four different rock samples with different masses was studied. Each rock sample was placed in a separate beaker containing 500 milliliters of a dilute acid for 10 minutes. Bubbling was observed in some of the beakers. The data table below shows the mass of each sample, in grams, before placement in the acid and after removal from the acid.

<table>
<thead>
<tr>
<th>Data Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rock</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>limestone</td>
</tr>
<tr>
<td>granite</td>
</tr>
<tr>
<td>gneiss</td>
</tr>
<tr>
<td>marble</td>
</tr>
</tbody>
</table>
42 Which Earth process is being modeled in this experiment?
(1) physical weathering in the hydrosphere  (3) chemical weathering in the hydrosphere
(2) physical weathering in the mesosphere  (4) chemical weathering in the mesosphere

43 Which table correctly shows the classification of the rock samples based on the amount of weathering during this experiment?

<table>
<thead>
<tr>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>limestone granite gneiss</td>
<td>granite gneiss</td>
</tr>
<tr>
<td>(1)</td>
<td>(3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>limestone granite gneiss</td>
<td>marble</td>
</tr>
<tr>
<td>(2)</td>
<td>(4)</td>
</tr>
</tbody>
</table>

44 Approximately what percentage of the marble sample remained after the experiment?
(1) 0.4%  (2) 8.0%  (3) 20.7%  (4) 99.6%

45 Which property of the gneiss sample prevented it from weathering?
(1) crystalline texture  (2) mineral composition  (3) density  (4) cleavage

Base your answers to questions 59 through 61 on the map in your answer booklet, which represents two bridges that cross the Green River. Letters A, B, and C represent locations in the river. A ball was dropped from bridge 1 at location A and the distance and travel time to location B were recorded. The results are shown in the data table below.

<table>
<thead>
<tr>
<th>Distance (cm)</th>
<th>Time (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12,000</td>
<td>240</td>
</tr>
</tbody>
</table>

59 On the map below, place an X at the location between the bridges where the greatest amount of deposition is most likely occurring. [1]
60 Determine the rate at which the ball traveled, in centimeters per second, from location A to location B. [1]

61 After a thunderstorm, the velocity of the river at location C was 100 centimeters per second. What was the largest type of sediment transported by the river at this location? [1]

January 2012

18 A plane traveling in a straight line from Watertown to Utica would fly over which landscape region?
(1) Tug Hill Plateau  (3) St. Lawrence Lowlands
(2) Adirondack Mountains  (4) Champlain Lowlands

19 Which graph best represents the correct relationship between the discharge of a river and the particle size that can be transported by that river?
31 Which graph shows the general relationship between soil particle size and the capillarity of the soil?

(1)  

(2)  

(3)  

(4)  

33 The block diagram below shows a volcano.

Which map shows the stream drainage pattern that most likely formed on the surface of this volcano?

(1)  

(2)  

(3)  

(4)
A cross section of Niagara Falls is shown below.

Which two rock units appear to be most resistant to weathering and erosion?
(1) Lockport dolostone and Whirlpool sandstone  
(2) Rochester shale and Albion sandstone and shale  
(3) Clinton limestone and shale and Queenston shale  
(4) Thorold sandstone and Queenston shale

Base your answers to questions 46 through 48 on the diagram below, which shows the edge of a continental glacier that is receding. R indicates elongated hills. The ridge of sediments from X to Y represents a landscape feature.

46 The elongated hills labeled R are most useful in determining the
(1) age of the glacier  
(2) direction the glacier has moved  
(3) thickness of the glacier  
(4) rate at which the glacier is melting

47 Which feature will most likely form when the partially buried ice block melts?
(1) drumlin  
(2) moraine  
(3) kettle lake  
(4) finger lake
48 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

Base your answers to questions 72 through 75 on the diagram below, which shows several different landscape features. Points X and Y indicate locations on the streambank.

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

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

74 Explain why the stream meanders on the floodplain, but not in the mountains. [1]

75 The beach consists of particles with diameters from 0.01 cm to 0.1 cm. Identify the sedimentary rock that will form when burial and cementation of these sediments occur. [1]
21 Which sediment is most easily picked up and transported by the wind?
(1) cobbles  (2) pebbles  (3) sand  (4) silt

27 New York’s Tug Hill landscape region is classified as a plateau because this region has a
(1) high elevation with distorted bedrock
(2) high elevation with nearly horizontal layers of bedrock
(3) low elevation with distorted bedrock
(4) low elevation with nearly horizontal layers of bedrock

28 Which two locations are found in the same major geographic landscape province?
(1) Albany and Old Forge  (3) Jamestown and Slide Mountain
(2) Elmira and Riverhead  (4) Massena and Mount Marcy

30 The map below shows a meandering stream as it enters a lake. The arrow shows the direction of stream flow. Points A through D represent locations on the surface of the stream.

The greatest stream velocities are found closest to points
(1) A and B  (3) C and D
(2) B and C  (4) D and A
The diagram below shows columns A, B, C, and D that contain different sediments.

Equal volumes of water were poured through each column. Which column of sediment retained the most water?
(1) A  (2) B  (3) C  (4) D

Base your answers to questions 83 through 85 on the cross section below, which represents a glacier moving down a mountain valley. The water from the melting glacier is flowing into a lake. Letter A represents a location on the bottom of the lake.

83 Describe the most likely shape of a cross section of the glacial valley as viewed from the lake. [1]

84 After the glacier melts, what evidence might be found on the surface of the bedrock indicating that the glacier had passed over the surface? [1]

85 Sediments found at location A range in diameter from 0.0004 to 0.006 centimeter. What name is given to this size sediment? [1]
18 The cross section below shows the general bedrock structure of an area containing three different landscape regions, A, B, and C.

Which list correctly identifies the type of landscapes represented by letters A, B, and C?
(1) $A =$ plain, $B =$ plateau, $C =$ mountain  
(2) $A =$ mountain, $B =$ plateau, $C =$ plain  
(3) $A =$ mountain, $B =$ plain, $C =$ plateau  
(4) $A =$ plateau, $B =$ plain, $C =$ mountain

21 The map below shows an overhead view of sediments that have accumulated at the bottom of a lake. Points A through D represent locations on the shoreline of the lake.

A river most likely flows into the lake nearest to location
(1) $A$
(2) $B$
(3) $C$
(4) $D$
28 A stream’s velocity decreases from 100 cm/s to 5 cm/s. Which size sediment particles will still be transported by the stream?
(1) pebbles, sand, silt, and clay  (2) sand, silt, and clay, only  (3) silt and clay, only  (4) clay, only

34 The block diagram below shows a portion of Earth’s crust.

Which stream drainage pattern is most likely present on this crustal surface?
44 At which location would the Mississippi River’s discharge most likely be the greatest?
(1) A (2) B (3) C (4) D

45 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

46 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
The Niagara River began to flow over the Niagara Escarpment about 12,000 years ago when the last Pleistocene ice sheet melted and retreated north from the Niagara Escarpment. Since that time, Niagara Falls has eroded upriver, leaving a deep, steep-sided valley that is 11,000 meters long. The top bedrock layer of the escarpment is the Lockport dolostone which lies above the Rochester shale. The shale is more easily weathered than the dolostone. This causes the dolostone to be undercut. As a result, the dolostone breaks off in large blocks that tumble to the base of Niagara Falls.

51 In which New York State landscape region is Niagara Falls located? [1]

52 Toward which compass direction is the location of Niagara Falls likely to move in the future? [1]