RR#6 - Free Response

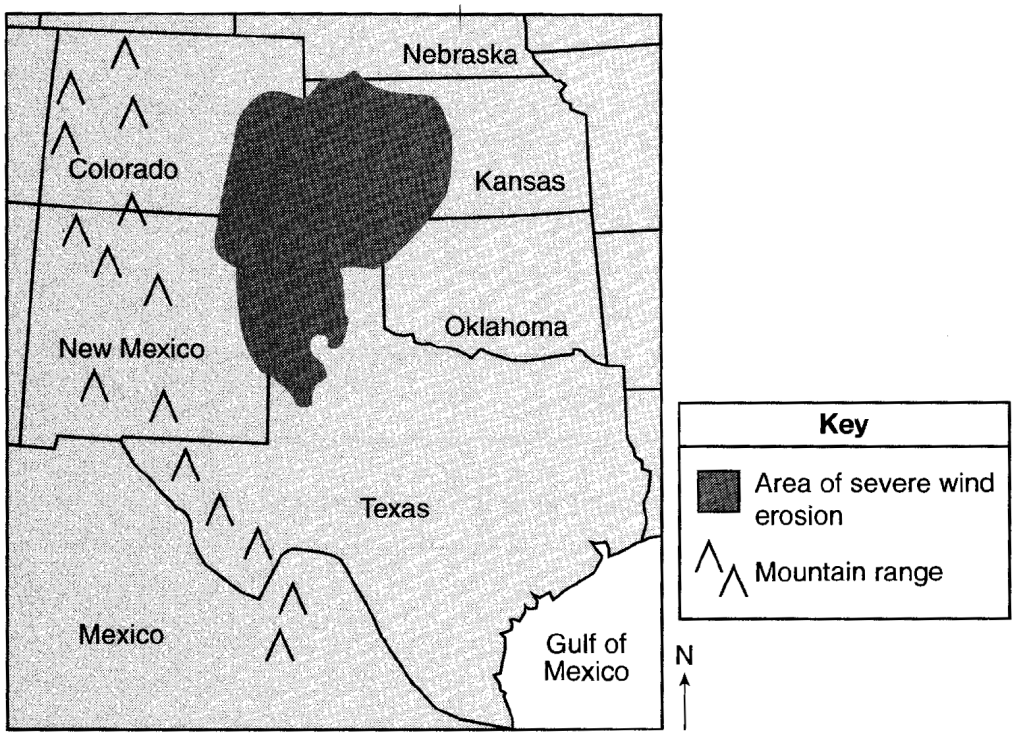
Base your answers to questions **1** through **4** on the passage and map below and on your knowledge of Earth science. The map shows a portion of the Dust Bowl in the southern Great Plains.

The Dust Bowl

In the 1930s, several years of drought affected over 100 million acres in the Great Plains from North Dakota to Texas. For several decades before this drought, farmers had plowed the prairie and loosened the soil. When the soil became extremely dry from lack of rain, strong prairie winds easily removed huge amounts of soil from the farms, forming dust storms. This region was called the Dust Bowl.

In the spring of 1934, a windstorm lasting a day and a half created a dust cloud nearly 2000 kilometers long and caused "muddy rains" in New York State and "black snow" in Vermont. Months later, a Colorado storm carried dust approximately 3 kilometers up into the atmosphere and transported it 3000 kilometers, creating twilight conditions at midday in New York State.

A Portion of the Dust Bowl in the Southern Great Plains



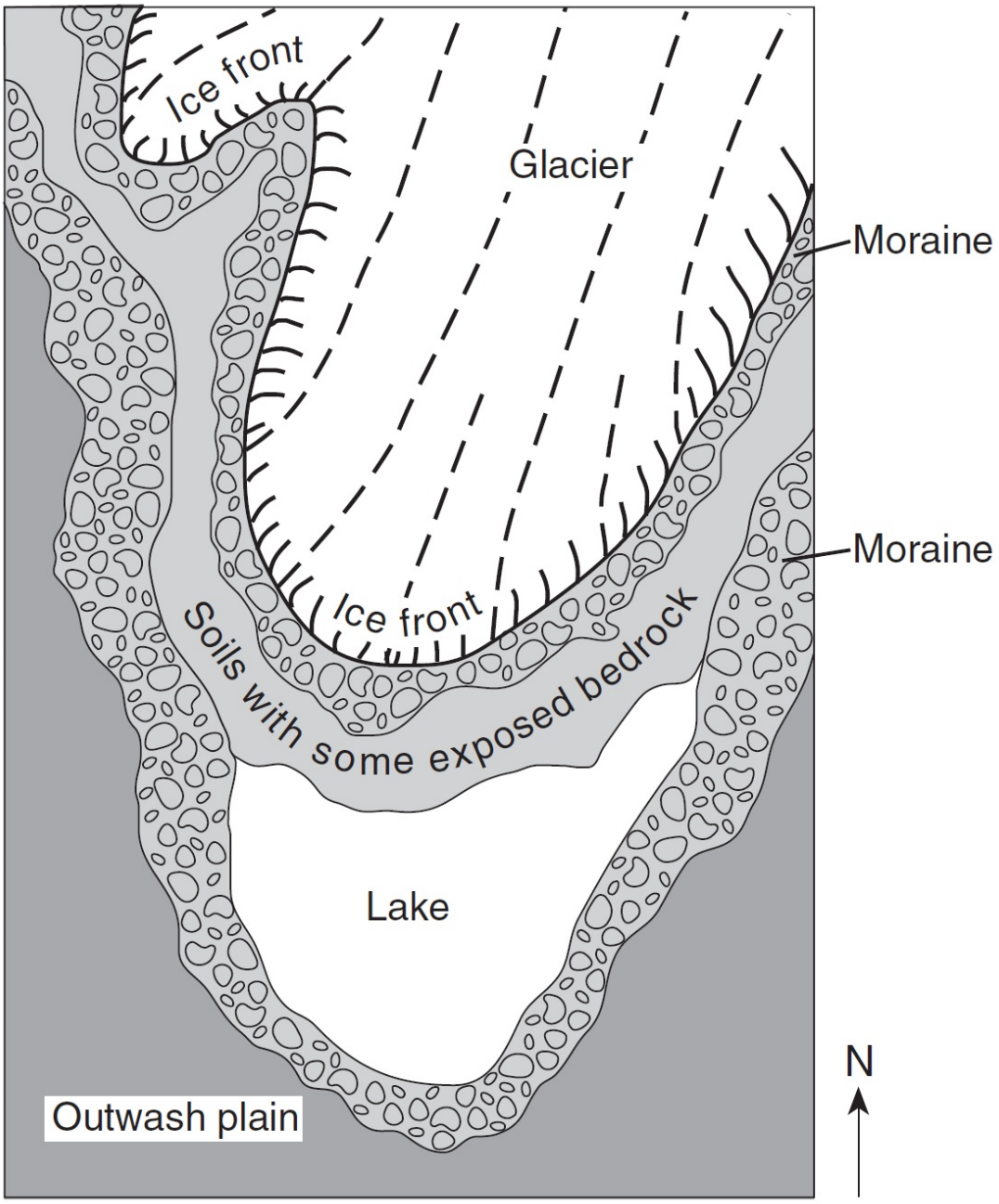
1. Explain why the dust clouds that moved to the east coast of the United States during the 1934 storm were composed mostly of silt and clay particles instead of sand.

2. Identify the name of the layer of the atmosphere in which the dust particles were transported by the Colorado storm to New York State.

3. Describe *one* change in the appearance of the sand particles that were abraded when transported by winds within the Dust Bowl region.

4. Identify *one human activity that was a major cause of the huge dust storms that formed in the Great Plains during the 1930s.*

Base your answers to questions **5** through **8** on the map below and on your knowledge of Earth science. The map shows a retreating valley glacier and the features that have formed because of the advance and retreat of the glacier.



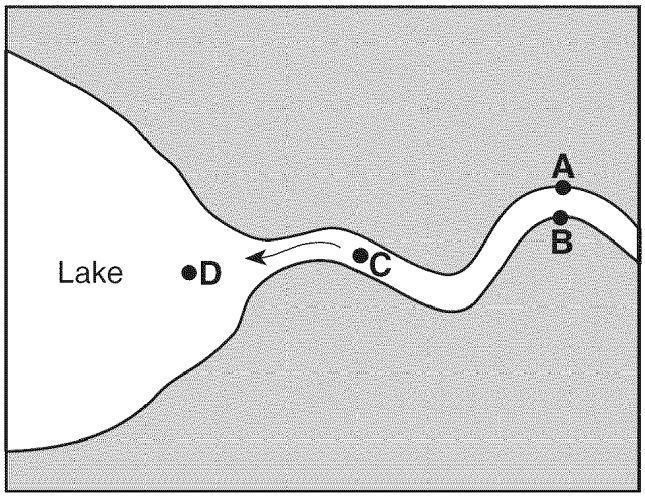
5. Explain why the glacial ice absorbs *less* solar radiation than the surrounding exposed bedrock and soil.

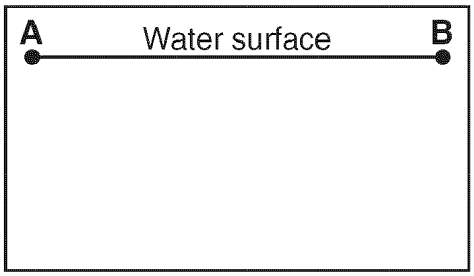
6. Describe the most likely shape of the valley being formed due to erosion by this glacier.

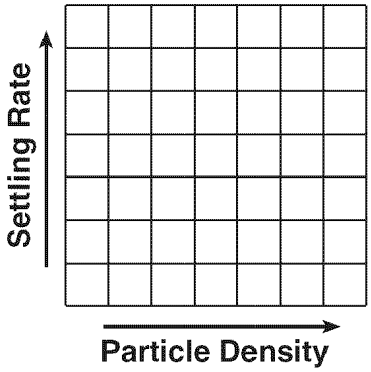
7. Describe *one* difference between the arrangement of sediment in the moraines and the arrangement of sediment in the outwash plain.

8. Describe *one* piece of evidence likely to be found on the exposed bedrock surfaces that could indicate the direction this glacier moved.

Base your answers to questions **9** through **13** on the map below, which shows a meandering stream as it enters a lake. Points *A* through *D* represent locations in the stream.







9. Deposition is affected by particle density. On the grid, draw a line to show the relationship between particle density and settling rate.

10. The stream velocity at point *C* is 100 centimeters per second and the stream velocity at point *D* is 40 centimeters per second. Identify *one* sediment particle most likely being deposited between points *C* and *D*.

11. Describe how the size and shape of most pebbles change when the pebbles are transported in a stream over a great distance.

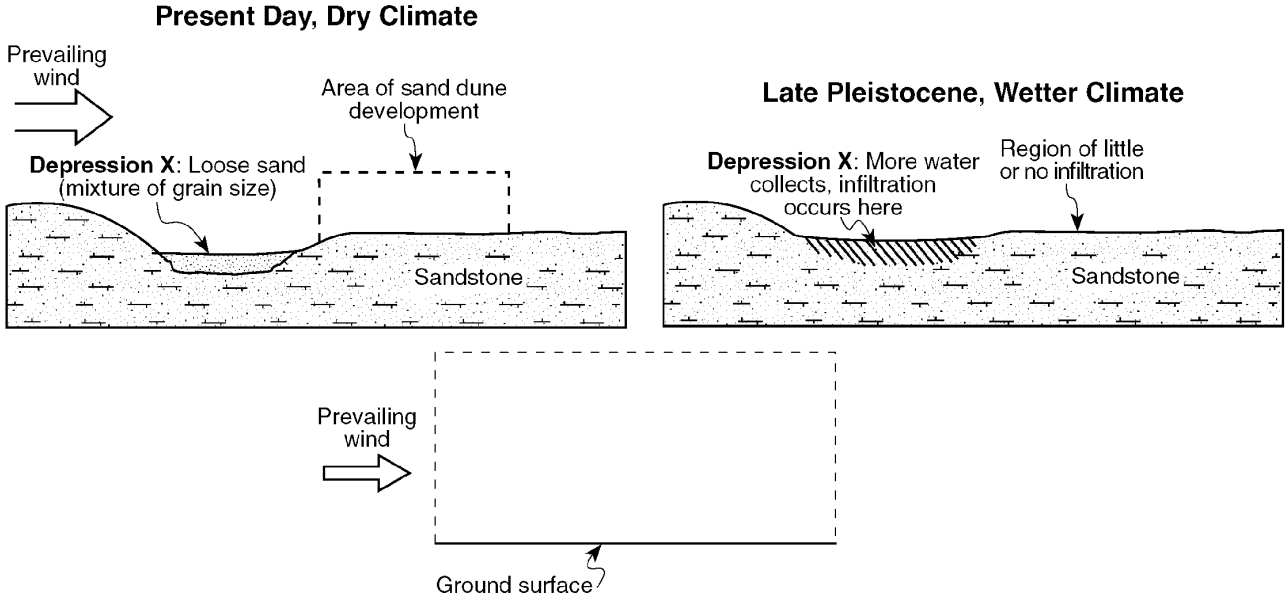
12. State the relationship between stream velocity and the size of the sediment the stream can carry.

13. Draw a cross-sectional view of the general shape of the stream bottom between points *A* and *B*. The water surface line has already been drawn.

Agent of Erosion	Surface Feature Formed
(1)	
(2)	
(3)	

14. Complete the table above, by listing *three* agents of erosion and identifying *one* characteristic surface feature formed by *each* agent of erosion.

15. Base your answer to the following question on the cross section below, which represents a part of Texas where weakly cemented sandstone is exposed at the surface. The mineral cement holding the sandstone grains together is calcite. Area *X* is a circular depression of loose sand that has been partially removed by prevailing winds. Sand dunes have developed downwind from depression *X*.



The cross section above (Late Pleistocene, Wetter Climate) shows this same area of Texas near the end of the last ice age when this area had a much wetter climate. More infiltration of rainwater was occurring at area *X*. Scientists infer that depression *X* was an area where slightly acidic rainwater collected and infiltrated into the sandstone.

Describe the effect that the slightly acidic infiltrating water had on the calcite cement holding the sandstone together.

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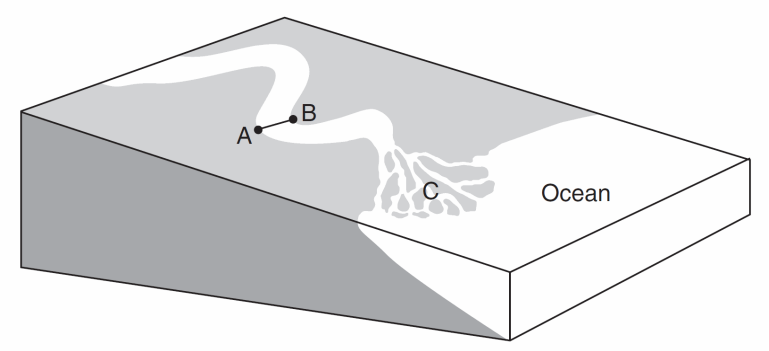
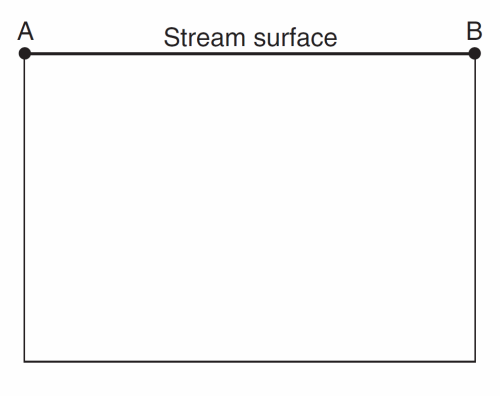
Base your answers to questions **16** through **18** on the block diagram below and on your knowledge of Earth science. The diagram represents a meandering stream flowing into the ocean. Points *A* and *B* represent locations along the streambanks. Letter *C* indicates a triangular-shaped depositional feature where the stream enters the ocean.





16. Identify *two* factors that determine the rate of stream erosion.

17. Identify the triangular-shaped depositional feature indicated by letter *C*.

18. The top of the box represents the stream surface between points *A* and *B*. In the box, draw a line from point *A* to point *B* to represent a cross-sectional view of the shape of the bottom of the stream channel.

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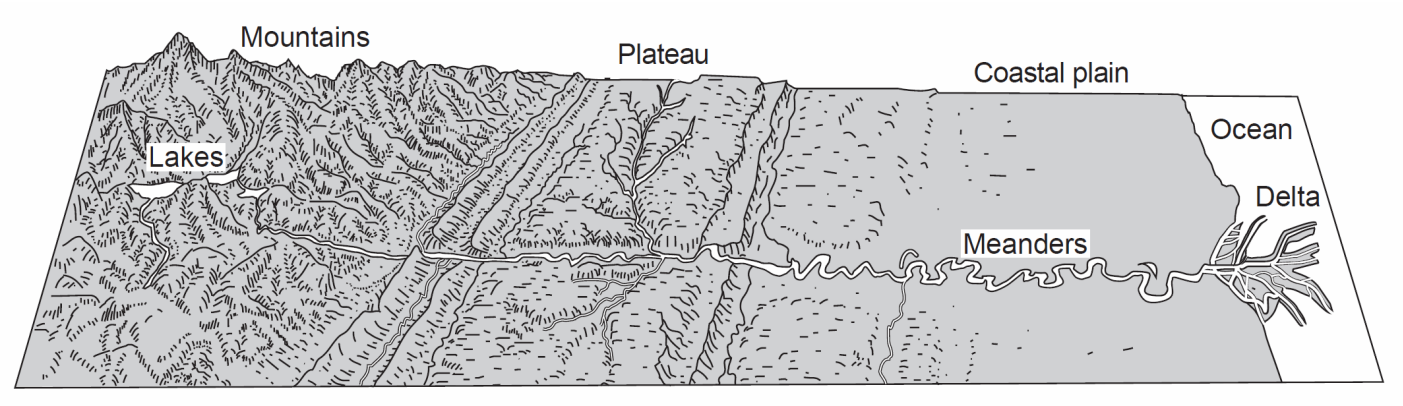
Base your answers to questions **19** through **22** on the landscape diagram below and on your knowledge of Earth science. The diagram represents a long river system from its origin (source) in the mountains to its end (mouth) at the ocean.



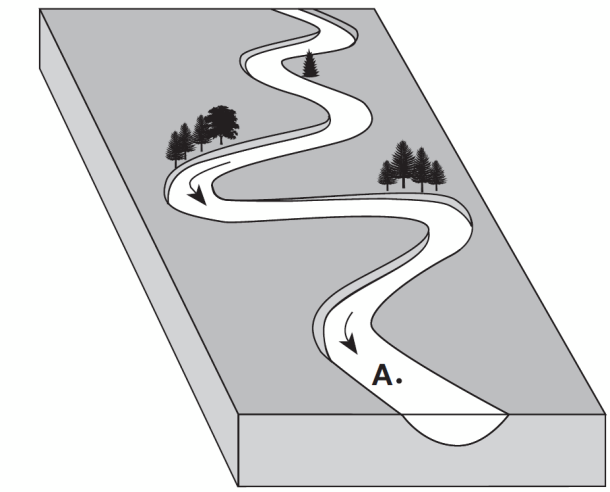
19. State *one* reason for the restriction of the construction of buildings near a meandering river on a coastal plain.

20. Explain why the sediments deposited in the delta are arranged in layers.

21. Identify *one* change that would cause an increase in the rate of stream erosion in the river valley in the mountains.

22. Describe *one* characteristic of the coastal plain that caused the river to develop meanders.

Base your answers to questions **23** and **24** on the block diagram below and on your knowledge of Earth science. The diagram represents a meandering stream. Point *A* represents a location within the meandering stream. Arrows represent the direction of stream flow.

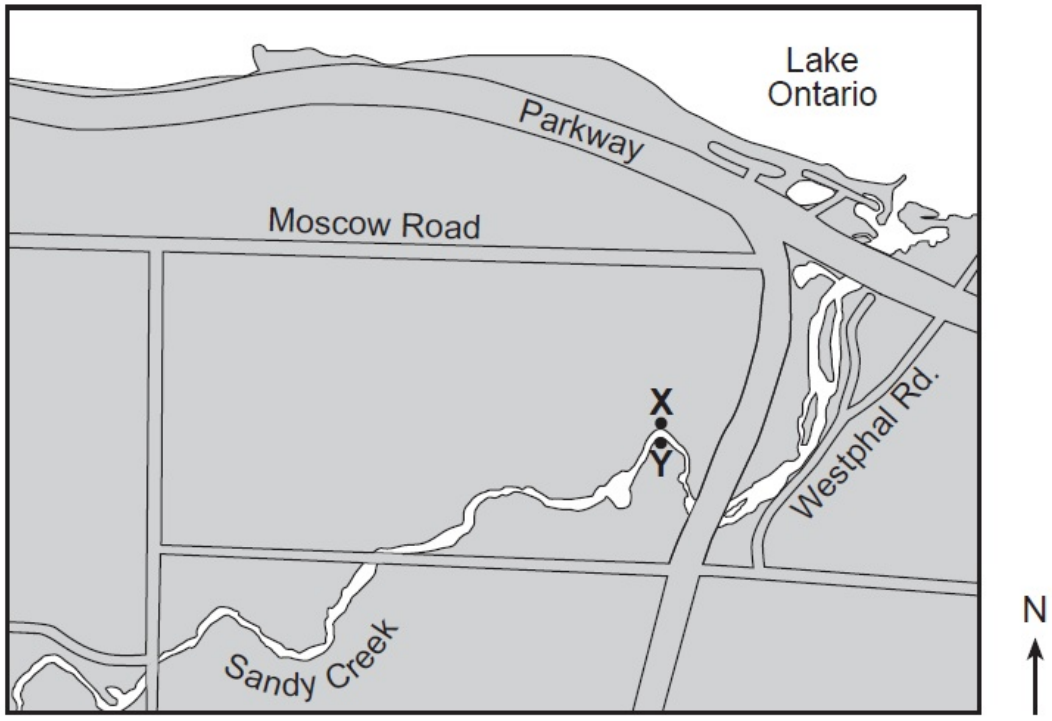


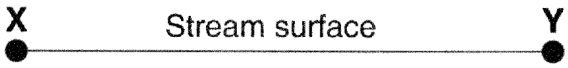
23. Explain why rock particles transported by the stream often become more rounded.

24. Identify the name of the largest sediment particles that can be transported at point *A* when the stream's velocity is 100 cm/s.

_____

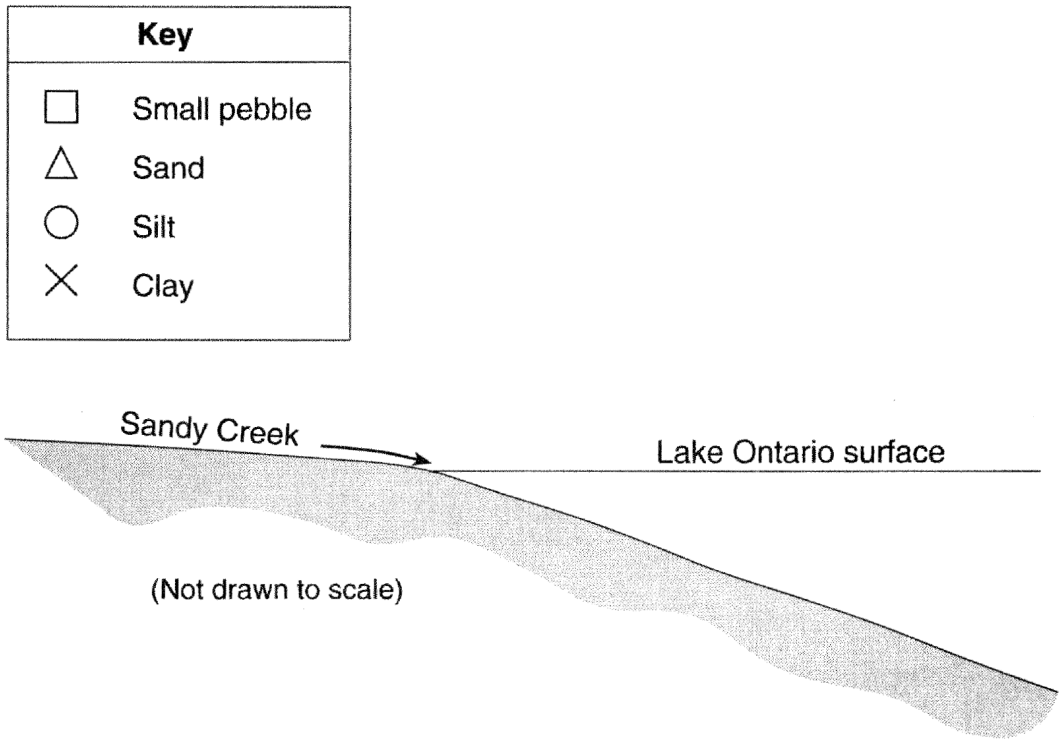
Base your answers to questions **25** through **27** on the map below and on your knowledge of Earth Science. The map shows the location of Sandy Creek, west of Rochester, New York. *X* and *Y* represent points on the banks of the stream.





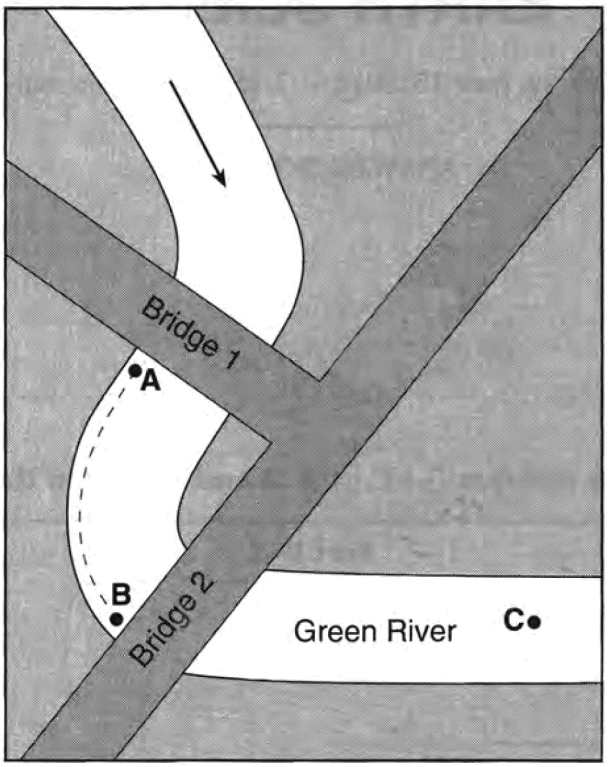
25. Record the minimum velocity this stream needs to transport a 2.0-cm-diameter particle.

26. The symbols representing four sediment particles are shown in the key below. These particles are being transported by Sandy Creek into Lake Ontario. On the cross section below, draw the symbols on the bottom of Lake Ontario to show the relative position where *each* sediment particle is most likely deposited.



27. Explain why sediments are deposited when Sandy Creek enters Lake Ontario.

Base your answers to questions **28** through **30** on the map below, 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.



Travel from A to B

Distance (cm)	**Time** (s)
12,000	240

28. On the map above, place an **X** at the location between the bridges where the greatest amount of deposition is most likely occurring.

29. 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?

30. Determine the rate at which the ball traveled, in centimeters per second, from location *A* to location *B*.