

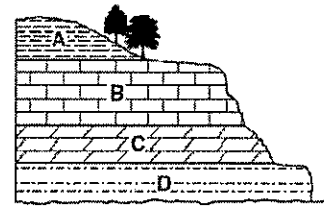
NAME: _____

WEATHERING, EROSION, AND DEPOSITION NOTES

Log onto YouTube and search for jocrisci channel.

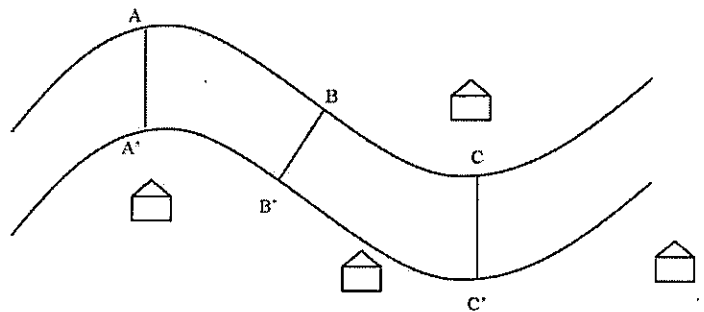
WEATHERING (Videos 4.1 & 4.2)

1. Why are streets and highways damaged so much more in the winter months than in the summer months in most of the United States?
2. Sandstones cemented by calcite usually weather much more rapidly than those cemented by quartz. Why?
3. With specific reference to weathering, explain why Egypt is a good location for a monument such as Cleopatra's Needle, and why New York City is a poor location.
4. The Earth is 4.6 billion years old. For most of its history, the forces of weathering and erosion have been attacking its surface. Why then do mountains still exist? Shouldn't the continents have been worn down flat by now?
5. On the diagram to the right, which layer is most resistant to weathering? How can you tell? The least?
6. What are the two major materials of which soil is composed?



EROSION (Video 4.3, 4.4, 4.5, 4.6, 4.7 ESRT 6c)

1. How are landscapes eroded by a glacier different from the landscapes eroded by a stream?
2. Why does one gram of finely ground up salt dissolve quicker than one gram of coarsely ground salt?
3. What two factors does the velocity of a stream depend on?
4. Given the diagram of a meandering stream to the right, you should be able to identify the points of maximum and minimum velocity, where erosion and deposition are greatest, and how the water depth varies at different points across the stream.
5. What effect does stream velocity have on the size of the sediments that can be transported? (As.....)
6. You should be able to use the reference tables [page 1 (ruler) & 6 (graph)] to determine if a particle is a cobble, boulder, etc.



DEPOSITION (Video 4.8)

1. How are sediments deposited by a glacier different from the sediments deposited by a stream? (Two differences)
2. What effect does particle size have on settling time? (As.....)
3. What effect does particle shape have on settling time? (As)
4. How will unsorted sediments look after being deposited in water?

Weathering, Erosion, & Deposition Facts

- Videos 4.1 & 4.2
1. Physical weathering is the / breaking down of rocks into smaller pieces (sediments)
 2. Frost action occurs as / water seeps in crack, freezes and expands
 3. Abrasion occurs when / rocks rub and become smaller and rounder in a stream or wind
 4. Chemical weathering / changes the chemical composition of the rock, best example is rust also cave formation and acid rain
 5. Moist and warm climates favor / chemical weathering
 6. Moist and cold climates favor / physical weathering (good for frost action)
 7. As particle size decreases / surface area increases and the rate of weathering increases
 8. Resistant layers of rock / stick out and forms cliffs or escarpments
 9. Soils develop as a result of / weathering and biological activity
- Videos 4.3 - 4.7 ESRT 6c
10. Erosion is the / movement of sediment
 11. The five agents of erosion are / water, glaciers, wave action, wind, and mass movements
 12. The primary **force** that drives the agents of erosion is / gravity
 13. The primary **agent** of erosion is / water
 14. Streams valleys are / V-shaped
 15. Stream velocity depends on / gradient (steepness or slope) and volume (amount) of water
 16. The outside of a meander bend is / fast and erodes (elbow)
 17. The inside of a meander bend is / slow and deposits (dent)
 18. The size of the particles that can be transported / increases as stream velocity increases
 19. Evidence of gravity erosion is / unsorted and angular (sharp) rocks at base of cliff.
 20. Longshore drift moves / sand along the beach in the direction of the ocean current
 21. Glacial landscapes show / U-shaped valleys, erratics (large boulders), kettle lakes, moraines drumlins, & scratched bedrock (striations)
 22. Outwash plains form as / a glacier melts and rivers carry small sediments (sorted) away from the glacier
 23. Glaciers advance from the / north, they formed Long Island, left sand and gravel (moraines)
 24. Wind erosion creates / sand dunes, the windward side of a sand dune has a gentle slope
- Video 4.8
25. Deposition / is the dropping or stopping of sediments after erosion
 26. Water and wind deposits are / sorted by size and layered
 27. Gravity and glacial deposits are / unsorted and not layered
 28. When a river enters the ocean / it slows down, deposits & called a **delta** (horizontal sorting)
 29. The particles that settle out first are / larger, most dense, and roundest
 30. Watershed is a / geographic area where all the rainwater flows into a river

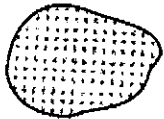


Weathering, Erosion and Deposition

Weathering: _____

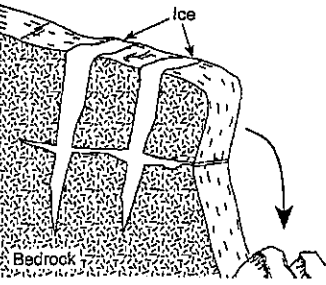
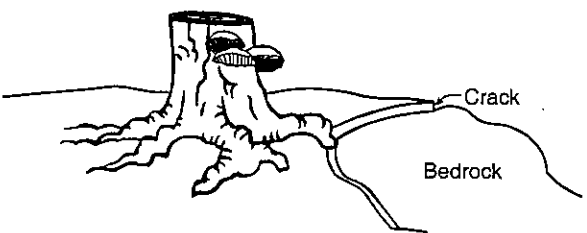
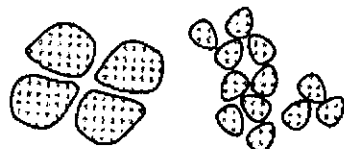
Types of Weathering: _____ and _____

Physical Weathering





Types of Physical Weathering:

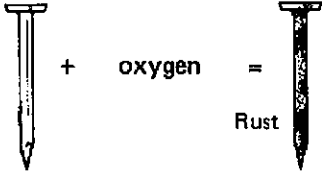
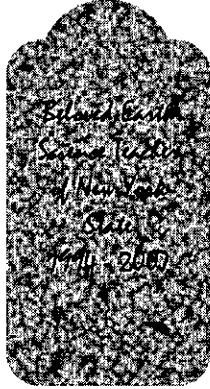
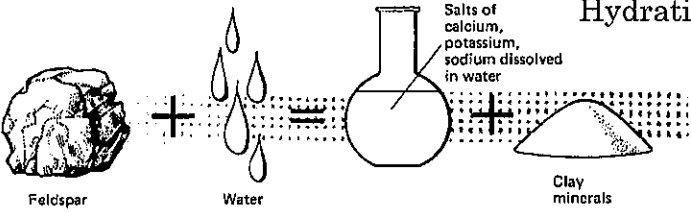
<p>Frost Wedging</p> 	<p>Root Action</p> 
<p>Abrasion</p> 	<p>Exfoliation</p>

Fact(s) to memorize: 1 - 6

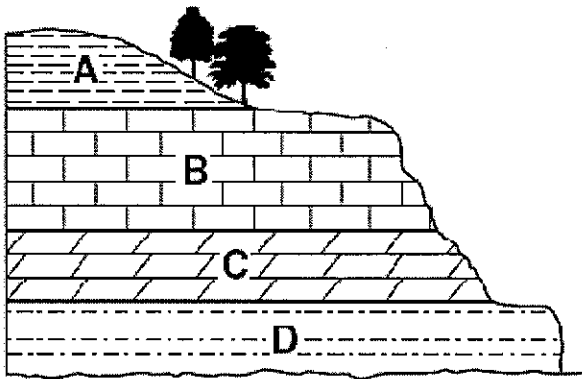
Chemical Weathering



Types of Chemical Weathering:

<p>Oxidation</p>  <p>+ oxygen = Rust</p>	<p>Carbonation</p> 
<p>Hydration</p>  <p>Feldspar + Water = Salts of calcium, potassium, sodium dissolved in water + Clay minerals</p> <p>Chemical weathering of feldspar by water.</p>	

Composition of the Rocks



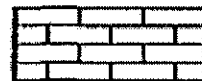
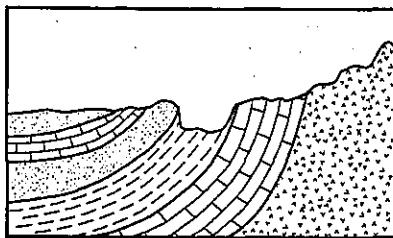


Factors that Effect Weathering

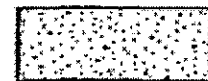
Factor	Physical Weathering	Chemical Weathering
Climate		
Exposure		
Composition		

1. In which type of climate would the rate of chemical weathering be the greatest?
 (1) warm and dry (2) cold and dry (3) warm and moist (4) cold and moist
2. In which climate does physical weathering by frost action most easily occur?
 (1) dry and hot (2) dry and cold (3) moist and hot (4) moist and cold
3. Chemical weathering will occur most rapidly when rocks are exposed to the
 (1) hydrosphere and lithosphere (3) hydrosphere and atmosphere
 (2) mesosphere and thermosphere (4) lithosphere and atmosphere

4. The diagram below represents a geologic cross section. Which rock layer is least resistant to weathering?



(1)



(3)



(2)



(4)

5. Why will a rock weather more rapidly if it is broken into smaller particles?
 (1) the mineral structure of the rock has changed
 (2) the smaller particles are less dense
 (3) the total mass of the rock and the particles is reduced
 (4) there is more surface area exposed

Soil

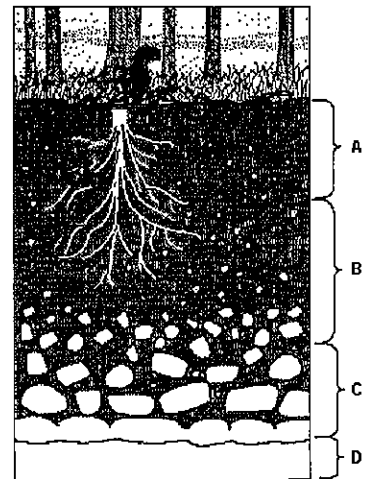
Fact(s) to memorize: 9



Residual Soil

Transported Soil

1. Particles of soil often differ greatly from the underlying bedrock in color, mineral composition, and organic content. Which conclusion about these soil particles is best made from this evidence?
 - A. They are residual sediments.
 - B. They are transported sediments.
 - C. They are uniformly large-grained.
 - D. They are soluble in water.
2. Which factors most directly control the development of soils?
 - A. soil particle sizes and method of deposition
 - B. bedrock composition and climate characteristics
 - C. direction of prevailing winds and storm tracks
 - D. earthquake intensity and volcanic activity
3. The diagram to the right shows a soil profile formed in an area of granite bedrock. Four different soil horizons, *A*, *B*, *C*, and *D*, are shown. Which soil horizon contains the greatest amount of material formed by biological material?
 - A. *A*
 - B. *B*
 - C. *C*
 - D. *D*
4. The formation of soil is primarily the result of
 - A. stream erosion and mass movement
 - B. stream deposition and runoff
 - C. precipitation and wind erosion
 - D. weathering and biological activity
5. Soil that contains large quantities of calcium was most likely formed by the weathering of
 - A. rock salt
 - B. quartzite
 - C. coal
 - D. limestone



Erosion

Fact(s) to memorize: 10 - 13



Erosion: _____

Agents of
Erosion _____

Force of Erosion: _____

1. The composition of sediments on Earth's surface usually is quite different from the composition of the underlying bedrock. This observation suggests that most
 - (1) bedrock is formed from sediments
 - (2) sediments are residual
 - (3) bedrock is resistant to weathering
 - (4) sediments have been transported
2. On Earth's surface, transported materials are more common than residual materials. This condition is mainly the result of
 - (1) recrystallization
 - (2) erosion
 - (3) folding
 - (4) subduction
3. Most of the surface materials in New York State can be classified as
 - (1) igneous rock
 - (2) coastal plain deposits
 - (3) metamorphic rocks
 - (4) transported soils
4. Granite pebbles are found on the surface in a certain area where only sandstone bedrock is exposed. Which is the most likely explanation for the presence of these pebbles?
 - (1) The granite pebbles were transported to the area from a different region.
 - (2) Some of the sandstone has been changed into granite.
 - (3) The granite pebbles were formed by weathering of the exposed sandstone bedrock.
 - (4) Ground water tends to form granite pebbles within layers of sandstone rock.
5. By which processes are rocks broken up and moved to different locations?
 - (1) evaporation and condensation
 - (2) weathering and erosion
 - (3) burial and cementation
 - (4) compaction and transportation
6. Transported rock materials are more common than residual rock materials in the soils of New York State. Which statement best explains this observation?
 - (1) Solid rock must be transported to break.
 - (2) Weathering changes transported rock materials more easily than residual rock materials.
 - (3) Most rock materials are moved by some agent of erosion at some time in their history.
 - (4) Residual rock materials form only from bedrock that is difficult to change into soil.



Water
Erosion

Lined writing area for notes on Water Erosion.

Streams

Stream:

Includes:

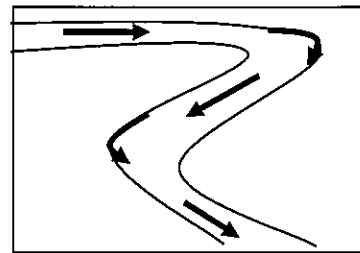
Velocity of a stream is influence by the following:

(1) Gradient :

(2) Volume:

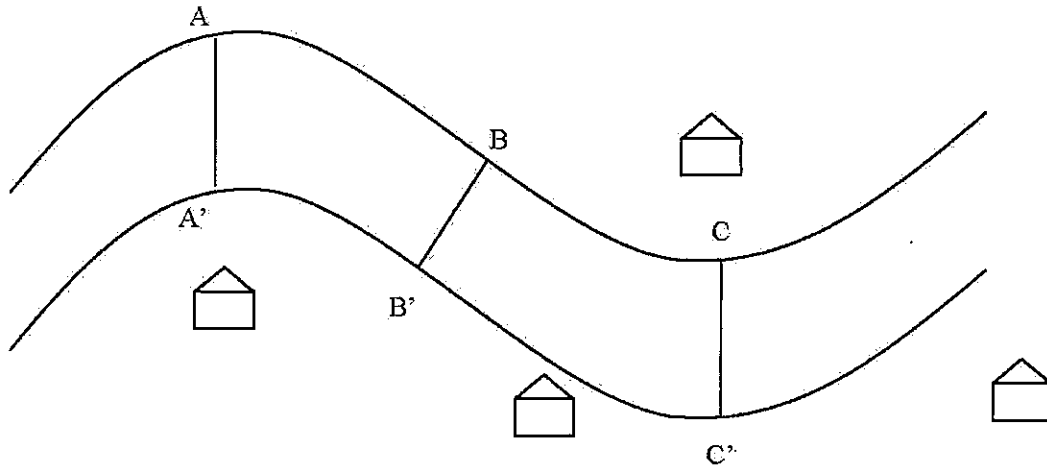
- discharge

Oxbow Lake:




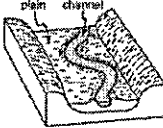
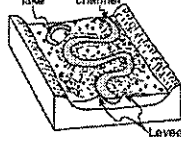
Meander -

Shape of a Stream

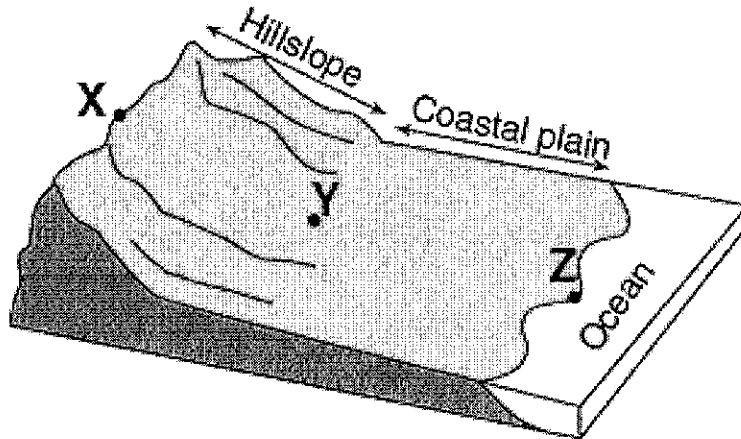


<p>A ----- A'</p>	<p>B ----- B'</p>	<p>C ----- C'</p>
-------------------	-------------------	-------------------

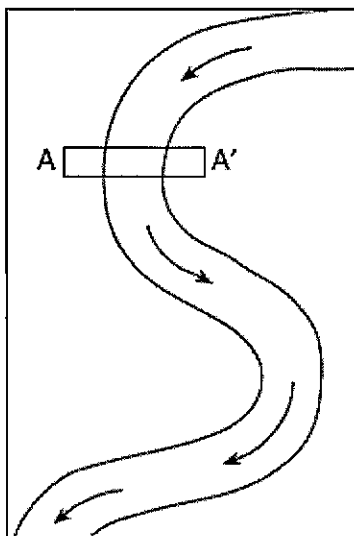
Life of a Stream

<p style="text-align: center;">Youth</p> <p style="text-align: center; font-size: small;">Straight channel</p>  <p style="text-align: center; font-size: small;">Narrow, V-shaped valley</p>	
<p style="text-align: center;">Mature</p> <p style="text-align: center; font-size: small;">Flood plain Winding channel</p>  <p style="text-align: center; font-size: small;">Wider valley with sloping walls</p>	
<p style="text-align: center;">Old Age</p> <p style="text-align: center; font-size: small;">Oxbow lake Meandering channel</p>  <p style="text-align: center; font-size: small;">Levees</p> <p style="text-align: center; font-size: small;">Broad valley with wide, swampy flood plain</p>	

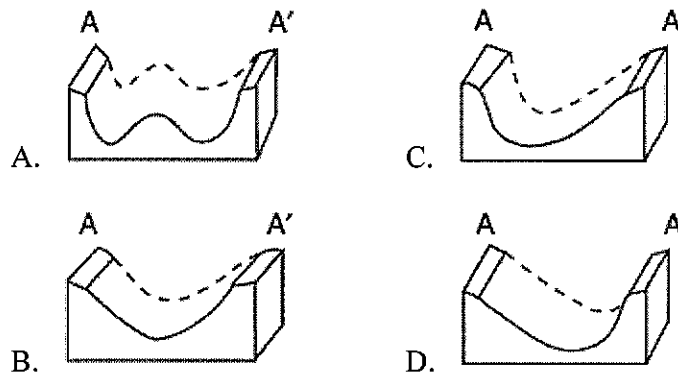
1. Based on what you just learned about stream shape and age draw in the shape of the stream from X to Y then Y to Z in the diagram below.



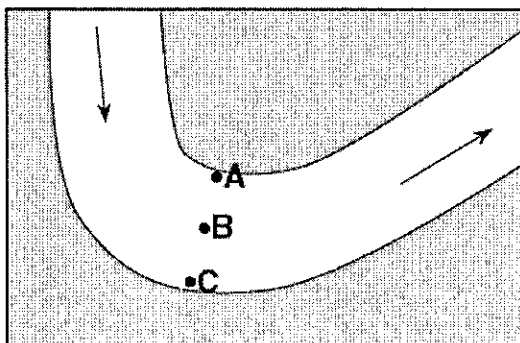
2. The map below shows a meandering river. A-A' is the location of a cross section. The arrows show the direction of the river flow.



Which cross section best represents the shape of the river bottom at A-A'?

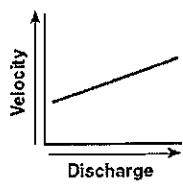


3. The map below shows the bend of a large meandering stream. The arrows show the direction of stream flow. Letters A, B, and C are positions on the streambed where erosion and deposition data were collected. Place a check mark in each of the correct the locations where erosion and deposition are dominant and where equilibrium exists between the two processes.

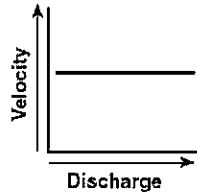


	Erosion	Equilibrium	Deposition
A			
B			
C			

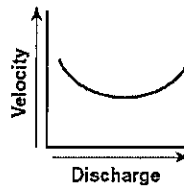
4. Which graph best represents the relationship between the discharge of a stream and the velocity of stream flow?



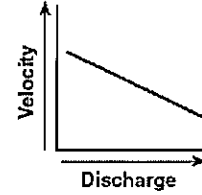
A.



B.



C.



D.

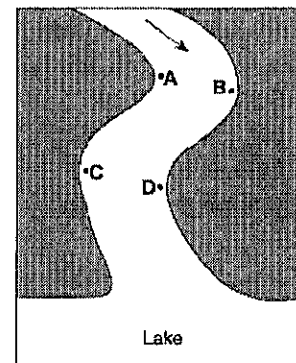
5. Deposition within a meandering stream usually occurs on the inside of the curves because the

- A. water velocity decreases
- B. stream gradient increases
- C. water is deeper
- D. stream is narrower

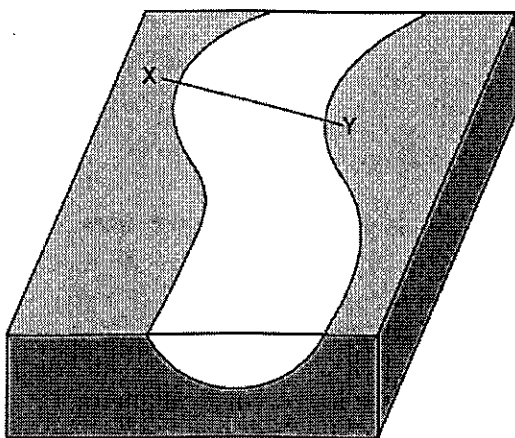
6. The map below shows a meandering stream as it enters a lake. The arrow shows the direction of stream flow. Points *A* through *D* represent locations on the surface of the stream.

The greatest stream velocities are found closest to points

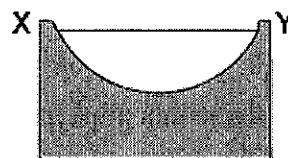
- A. *A* and *B*
- B. *B* and *C*
- C. *C* and *D*
- D. *D* and *A*



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



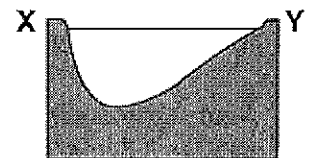
Which cross section best represents the shape of the stream channel at line *XY*?



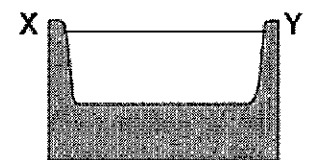
A.



B.



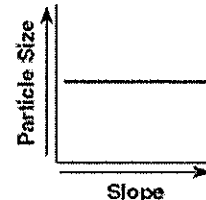
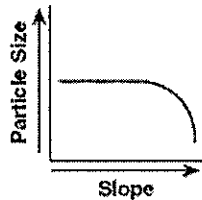
C.



D.

Stream Velocity Questions (ESRT Page 6)

1. Which graph best represents the relationship between the slope of a river and the particle size that can be transported by that river?

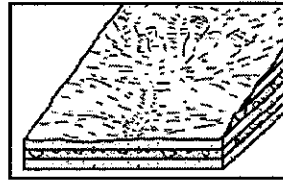


2. Which statement best describes the general relationship between stream velocity and the size of the sediment particles transported by the stream?
- A. As the stream velocity decreases, the diameter of the sediments transported increases.
 - B. As the stream velocity decreases, the diameter of the sediments transported remains the same.
 - C. As the stream velocity increases, the diameter of the sediments being transported decreases.
 - D. As the stream velocity increases, the diameter of the sediments being transported increases.
3. Heavy spring rains cause the velocity of a stream to increase from 10 cm/s to 100cm/s. As a result of the increase in runoff, the largest diameters of the sediment particles being transported could increase from
- A. 0.1 cm to 10 cm
 - B. 0.2 cm to 2.3 cm
 - C. 1.0 cm to 6.4 cm
 - D. 6.4 cm to 25.6 cm
4. Which of the following particle diameters best represents largest particles that a stream flowing with a water velocity equal to 0.2 cm/s can transport?
- A. 0.0004 cm
 - B. 0.003 cm
 - C. 0.1 cm
 - D. 1.3 cm
5. As the velocity of a stream transporting pebbles, sand, silt, and clay decreases from 30 cm/s to 0.1 cm/sec, some sediment deposition will occur. Which choice below best describes the sediments that will be deposited as a result of the decrease in stream velocity?
- A. pebbles, sand and some silt
 - B. clay and some silt
 - C. pebble, sand, silt, and most of the clay
 - D. only some sand and clay
6. What is the minimum velocity that a stream must have in order to transport particles with diameters equal to 0.04 cm?
- A. 0.5 cm/s
 - B. 1.0 cm/s
 - C. 1.5 cm/s
 - D. 2.0 cm/s
7. If the greatest velocity of a river was 10 centimeters per second, what was the approximate diameter of the largest particles that the river could have carried?
- A. 1.0 cm
 - B. 2.0 cm
 - C. 10.0 cm
 - D. 0.2 cm

Drainage Patterns

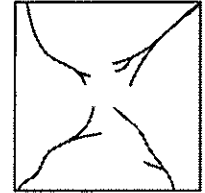
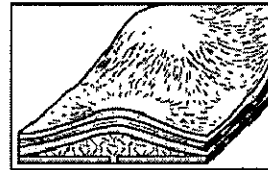
Drainage patterns:

Dendritic:

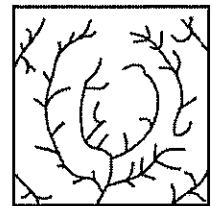
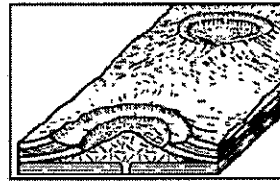


- usually on undisturbed, horizontal rock layers

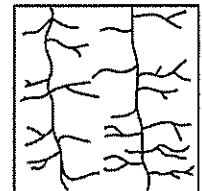
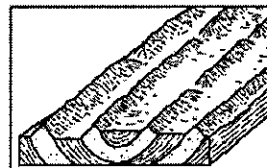
Radial:



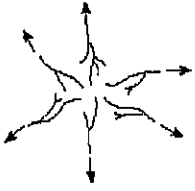
Annular:



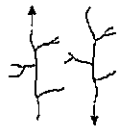
Rectangular:



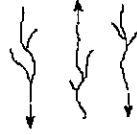
1. Which stream-drainage pattern most likely developed on the surface of a newly formed volcanic mountain?



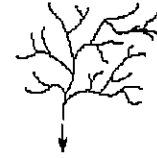
A.



B.

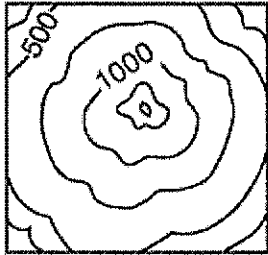


C.

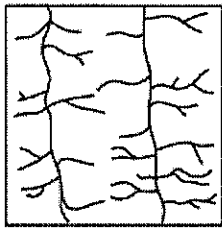


D.

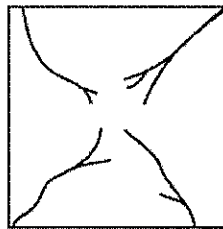
2. The topographic map below shows a particular landscape.



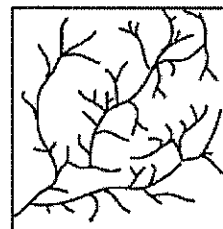
Which map best represents the stream drainage pattern for this landscape?



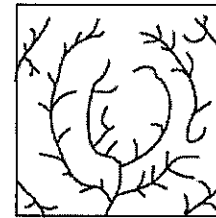
A.



B.

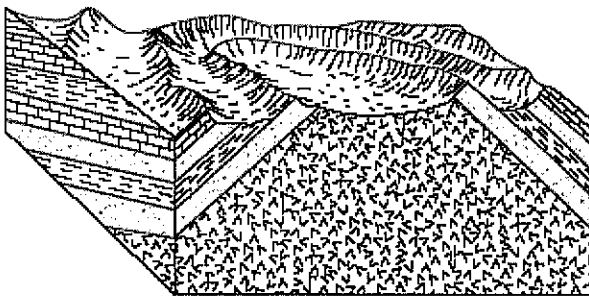


C.

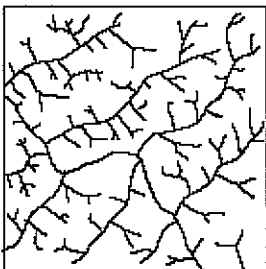


D.

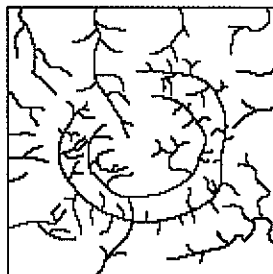
3. The block diagram below represents a deeply eroded dome.



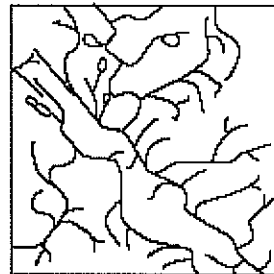
Which map shows the stream drainage pattern that would most likely develop on this deeply eroded dome?



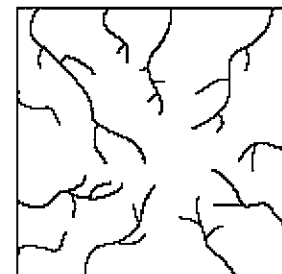
A.



B.

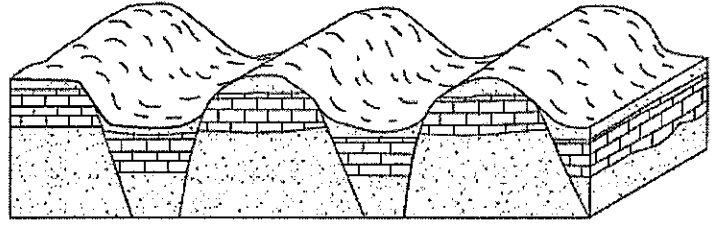


C.



D.

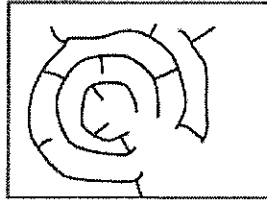
4. The block diagram below shows a region that has undergone faulting.



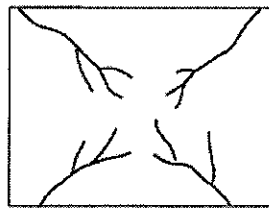
Which map shows the stream drainage pattern that would most likely develop on the surface of this region?



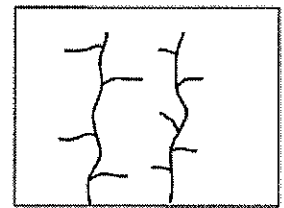
A.



B.

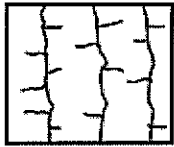


C.



D.

5. The maps below labeled *A*, *B*, and *C* show three different stream drainage patterns. Which factor is primarily responsible for causing these three different drainage patterns?



A



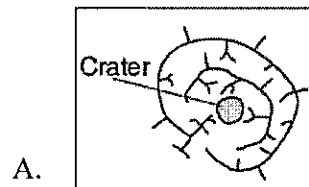
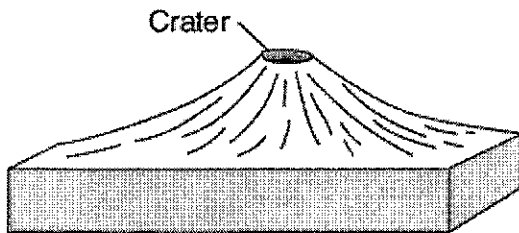
B



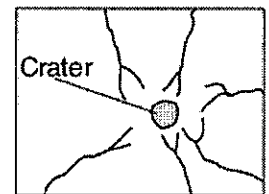
C

- A. amount of precipitation
- B. bedrock structure
- C. stream discharge
- D. prevailing winds

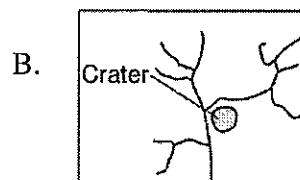
6. The block diagram below shows a volcano. Which map shows the stream drainage pattern that most likely formed on the surface of this volcano?



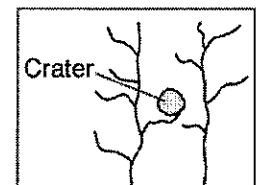
A.



C.



B.



D.

**Gravity
Erosion**

Fact(s) to memorize: 19

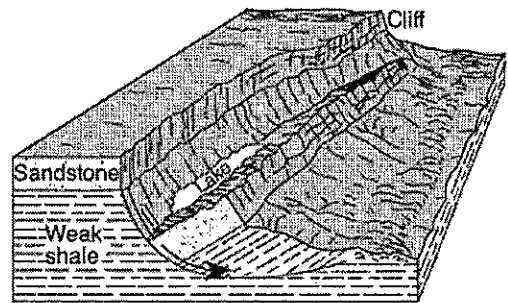
- For which movement of earth materials is gravity *not* the main force?
 - sediments flowing in a river
 - boulders carried by a glacier
 - snow tumbling in an avalanche
 - moisture evaporating from an ocean



- The block diagram below shows a displacement of rock layers.

Which process describes the downward sliding of the rock material?

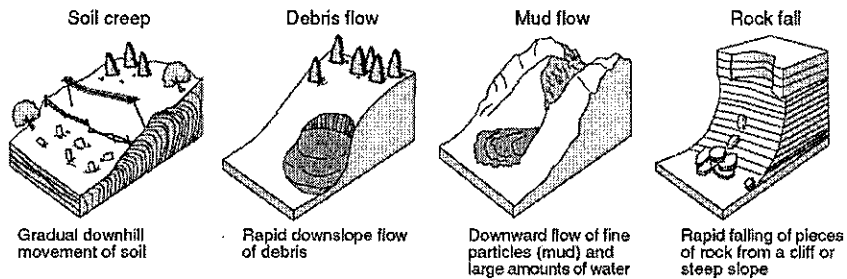
- tidal changes
- glacial erosion
- mass movement
- lava flow



- The diagrams below represent four different examples of one process that transports sediments.

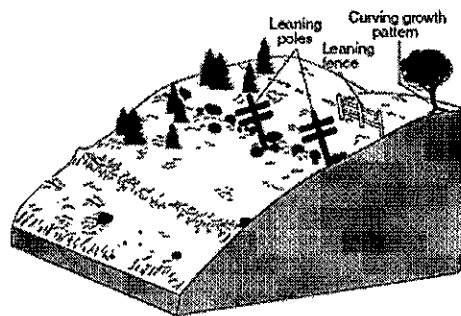
Which process is shown in these diagrams?

- chemical weathering
- wind action
- mass movement
- rock abrasion



- The diagram below shows the surface features of a landscape. Based on the features shown, which erosional agent had the greatest effect on tree growth and the structures that humans have built on this landscape?

- running water
- moving ice
- prevailing wind
- mass movement



- A landslide is an example of
 - river deposition
 - glacial scouring
 - mass movement
 - chemical weathering

Wave
Erosion



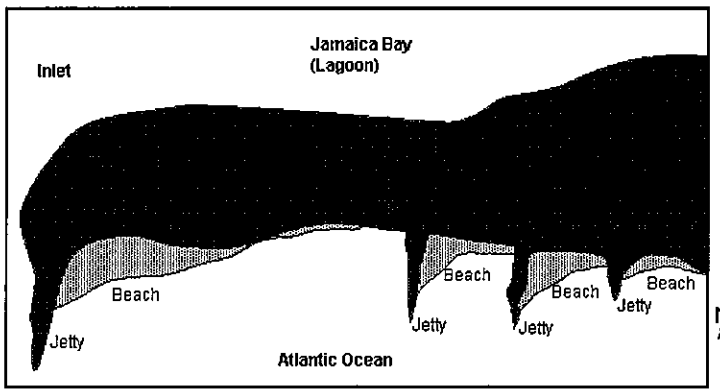
Creates beaches - _____

Barrier island- _____

Longshore Current - _____

Jetties and groins - _____

1. The map shows Rockaway Peninsula, part of Long Island, New York's south shore.



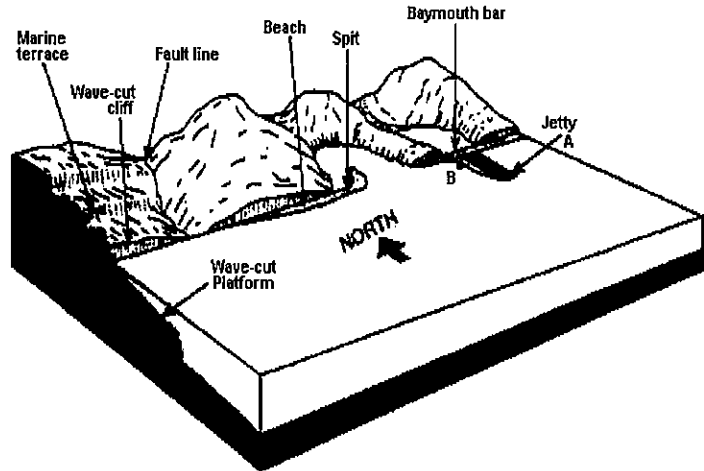
Toward which direction is sand being transported along the shoreline within the zone of breaking waves?

- A. northeast
- B. south
- C. southeast
- D. west

2. The diagram represents a shoreline along which several general features have been labeled.

What is the most likely source of the waves approaching this coastline?

- A. variations in water temperature
- B. density differences within the water
- C. the rotation of Earth
- D. surface winds



3. Refer to the diagram above. Which statement best describes the longshore current that is modifying this coastline?

- A. The current is flowing northward at a right angle to the shoreline.
- B. The current is flowing southward at a right angle away from the shoreline.
- C. The current is flowing eastward parallel to the shoreline.
- D. The current is flowing westward parallel to the shoreline.

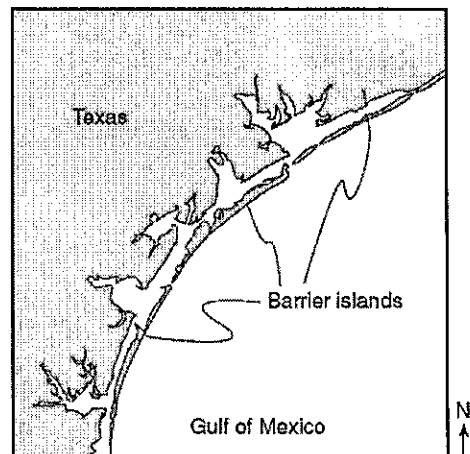
4. The long, sandy islands along the south shore of Long Island are composed mostly of sand and rounded pebbles arranged in sorted layers. The agent of erosion that most likely shaped and sorted the sand and pebbles while transporting them to their island location was

- A. glaciers
- B. landslides
- C. wind
- D. ocean waves

5. The map below shows barrier islands in the ocean along the coast of Texas.

Which agent of erosion most likely formed these barrier islands?

- A. mass movement
- B. wave action
- C. streams
- D. glaciers

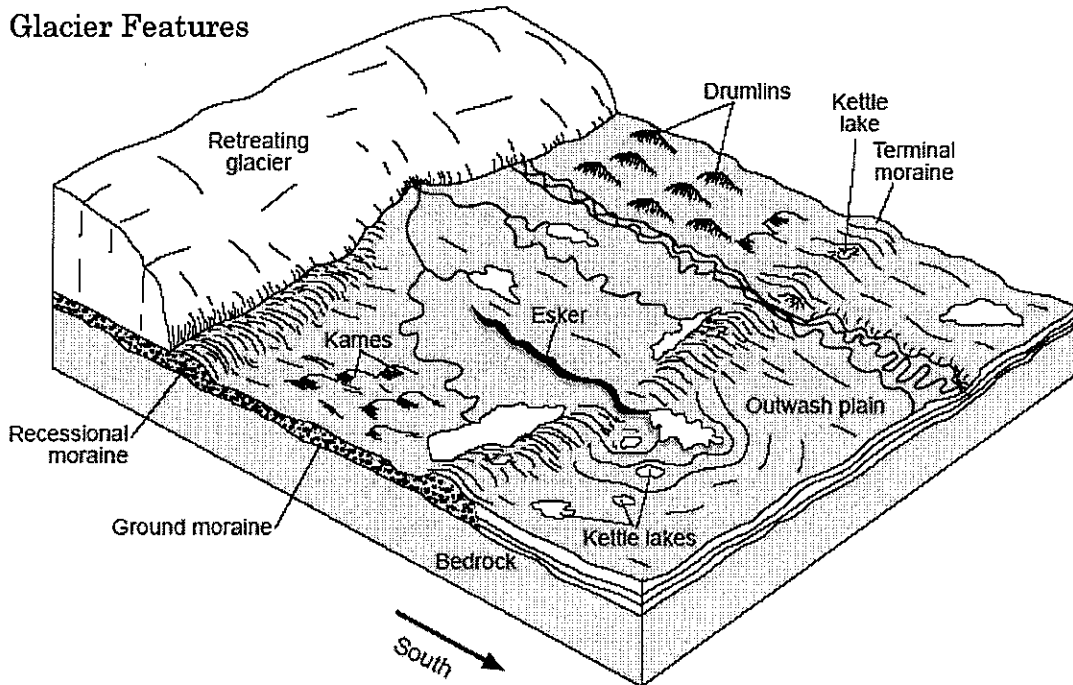




Glacial Erosion

Handwriting practice lines consisting of multiple sets of dashed lines on a solid background.

Continental Glacier Features



Esker

Two horizontal lines for writing the definition of an esker.

Till _____

Erratic _____

Moraine _____

Terminal Moraine _____

Recessional moraine _____

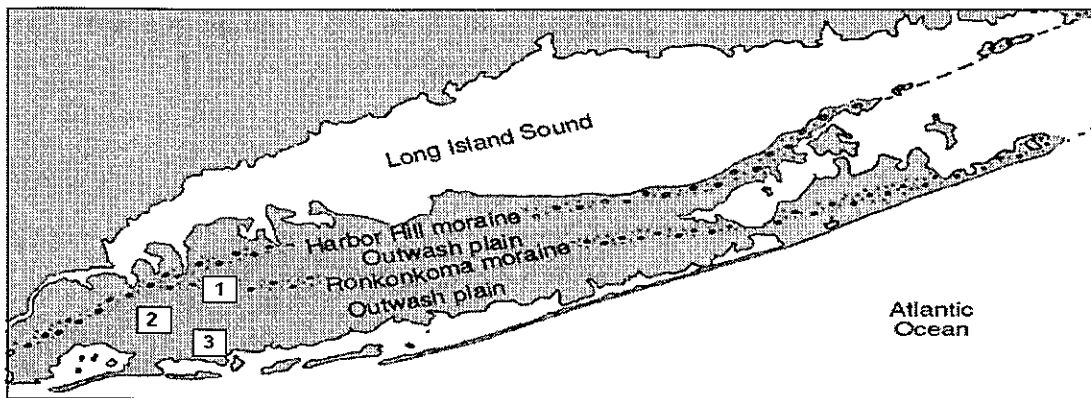
Outwash plain _____

Drumlins _____

Kames _____

Kettle Lake _____

Map C

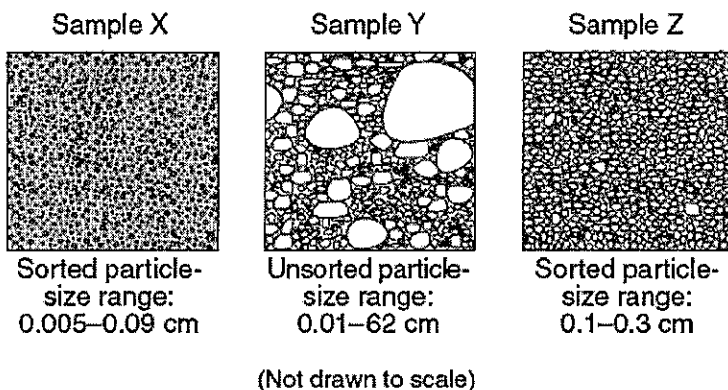


The diagrams below represent three sediment samples labeled X, Y, and Z.

These samples were collected from the three numbered locations marked on the map C.

1. Which choice correctly indicates the location from which each sample was most likely collected?

- A. 1 = Z, 2 = Y, 3 = X
- B. 1 = X, 2 = Z, 3 = Y
- C. 1 = Y, 2 = X, 3 = Z
- D. 1 = Y, 2 = Z, 3 = X



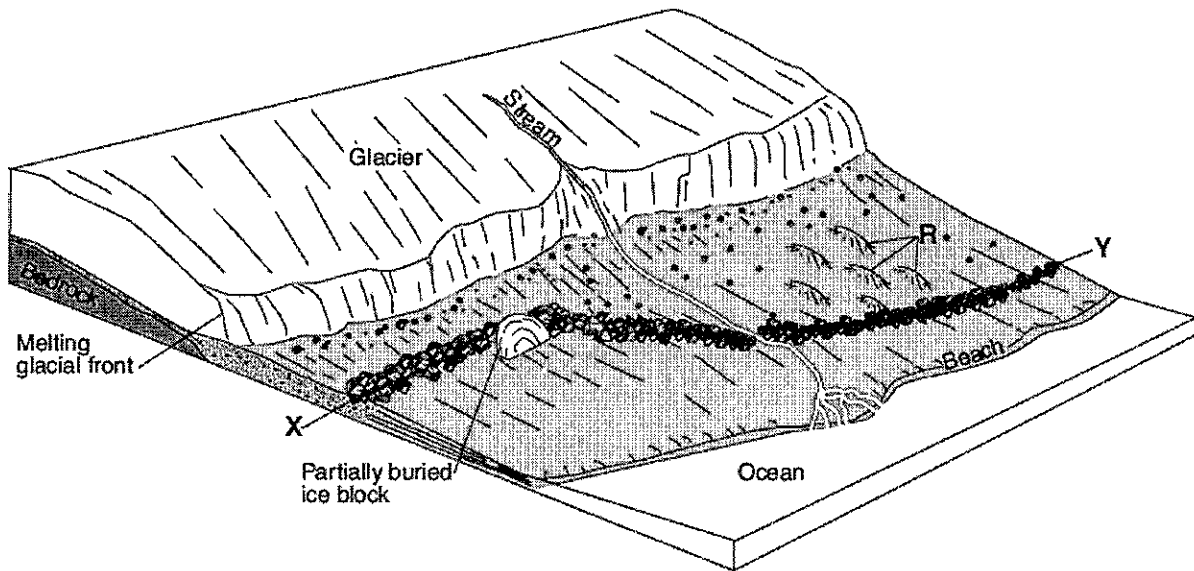
2. The cross section below represents the sediments beneath the land surface along one of the reference lines shown on the map.



Along which reference line was the cross section taken?

- A. AB
 - B. CD
 - C. EF
 - D. GH
3. A major difference between sediments in the outwash and sediments in the moraines is that the sediments deposited in the outwash are
- A. larger
 - B. sorted
 - C. more angular
 - D. older

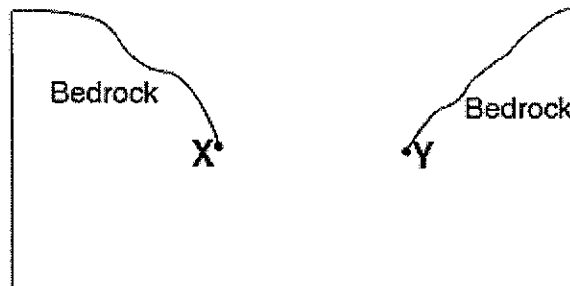
Base your answer to the question on the diagram below, which shows the edge of a continental glacier that is receding. *R* indicates elongated hills. The ridge of sediments from *X* to *Y* represents a landscape feature.



4. The elongated hills labeled *R* are most useful in determining the
 - A. age of the glacier
 - B. direction the glacier has moved
 - C. thickness of the glacier
 - D. rate at which the glacier is melting

 5. Which feature will most likely form when the partially buried ice block melts?
 - A. drumlin
 - B. moraine
 - C. kettle lake
 - D. finger lake

 6. The ridge of sediments from *X* to *Y* can best be described as
 - A. sorted and deposited by ice
 - B. sorted and deposited by melt water
 - C. unsorted and deposited by ice
 - D. unsorted and deposited by melt water
-
7. 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.

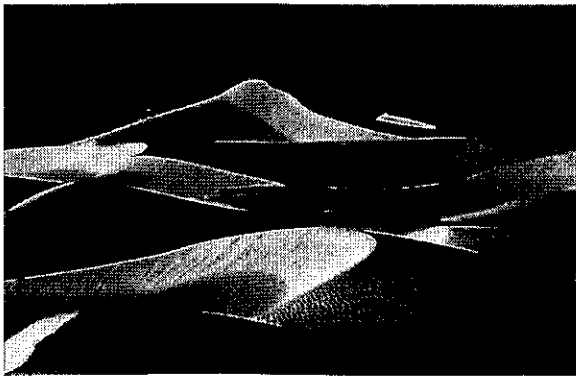
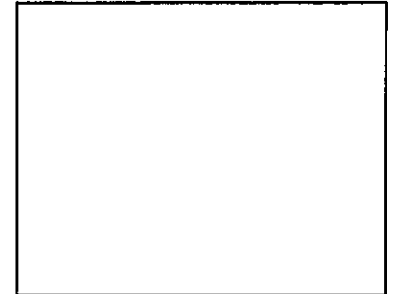


Fact(s) to memorize: 24



Wind
Erosion

A large rectangular area with horizontal dashed lines for writing.



What direction was this agent moving? Explain

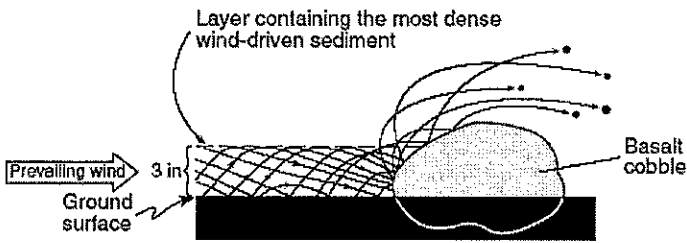
1. The particles in a sand dune deposit are small and very well-sorted and have surface pits that give them a frosted appearance. This deposit most likely was transported by
 - A. ocean currents
 - B. glacial ice
 - C. gravit
 - D. wind
2. The picture below shows a geological feature in the Kalahari Desert of southwestern Africa.

Which process most likely produced the present appearance of this feature?

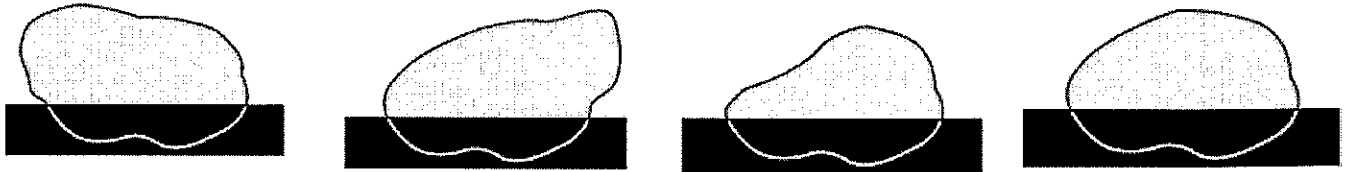
- A. wind erosion
- B. volcanic eruption
- C. earthquake vibrations
- D. plate tectonics



3. The cross section below shows the movement of wind-driven sand particles that strike a partly exposed basalt cobble located at the surface of a windy desert.



Which cross section best represents the appearance of this cobble after many years of exposure to the wind-driven sand?



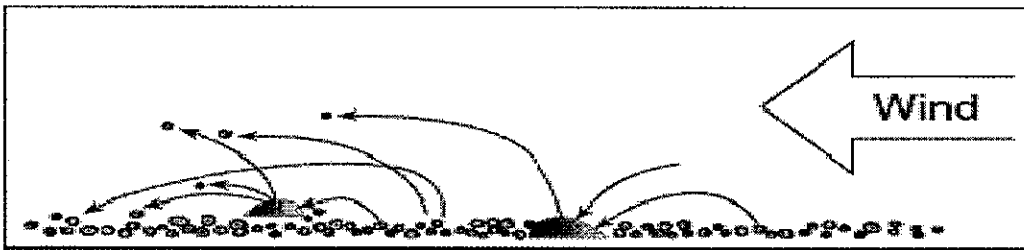
A.

B.

C.

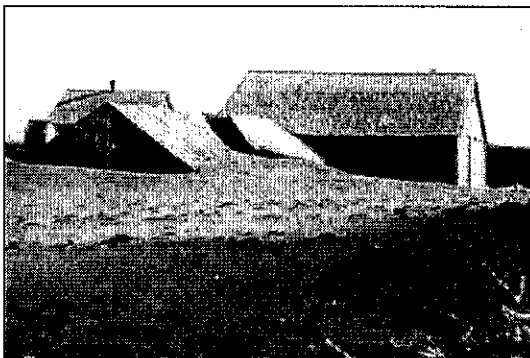
D.

The diagram below shows sand particles being moved by wind.



4. At which Earth surface locations is this process most likely to be observed as a major type of erosion?
- deserts and beaches
 - deltas and floodplains
 - glaciers and moraines
 - mountain peaks and escarpments

5. The photograph below shows farm buildings partially buried in silt.



Which erosional agent most likely piled the silt against these buildings?

- glacial ice
- ocean waves
- wind
- mass movement



Factors that Affect Deposition

Deposition -

Shape

Size

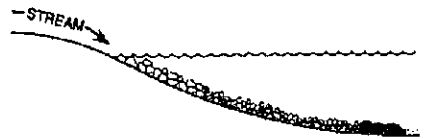
Density

Sorting of Sediments

- Sorted

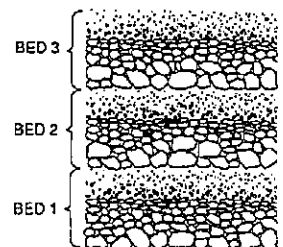
- Unsorted

Horizontal sorting:

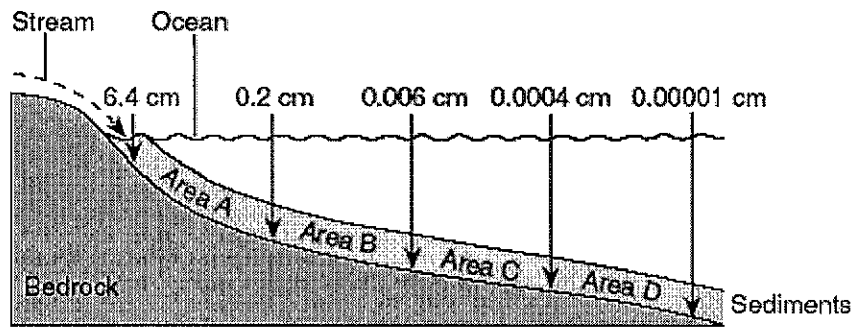


Vertical sorting (Graded Bedding):

Describe the relationship between settling rate and shape -



- The profile below shows the average diameter of sediment that was sorted and deposited in specific areas *A*, *B*, *C*, and *D* by a stream entering an ocean.

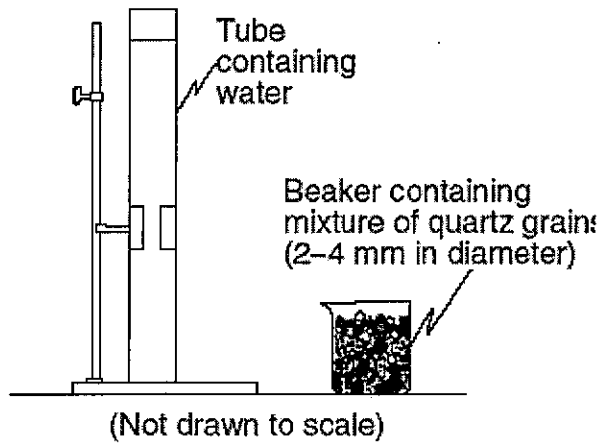


As compaction and cementation of these sediments eventually occur, which area will become siltstone?

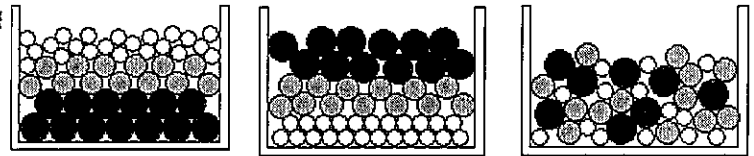
- A*
 - B*
 - C*
 - D*
- Explain why in the diagram above, the particles are deposited in size order after the stream enters the lake.

- Which statement best describes sediments deposited by glaciers and rivers?
 - Glacial deposits and river deposits are both sorted.
 - Glacial deposits are sorted, and river deposits are unsorted.
 - Glacial deposits are unsorted, and river deposits are sorted.
 - Glacial deposits and river deposits are both unsorted.
- When the velocity of a stream suddenly *decreases*, the sediment being transported undergoes an increase in
 - particle density
 - erosion
 - deposition
 - mass movement
- Which change at a particular location in a stream usually causes more sediment to be deposited at that location?
 - decrease in stream velocity
 - decrease in stream width
 - increase in stream slope
 - increase in stream discharge

6. Base your answer to the question on the diagram, which shows a clear plastic tube containing water and a beaker containing a mixture of rounded quartz grains of different sizes.



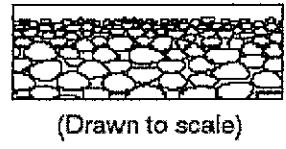
When the rounded quartz grains are poured all at once into the tube, the grains will settle to the bottom of the tube. Which cross section below best shows the approximate grain sizes and pattern of arrangement of the rounded quartz grains at the bottom of the tube?



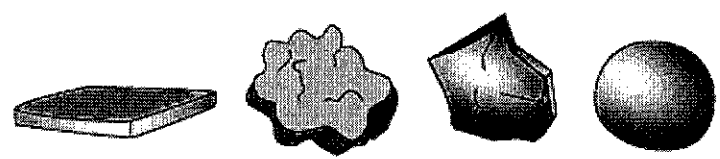
- A. B. C.

7. The pattern of sediment size shown indicates that these sediments were most likely deposited within a

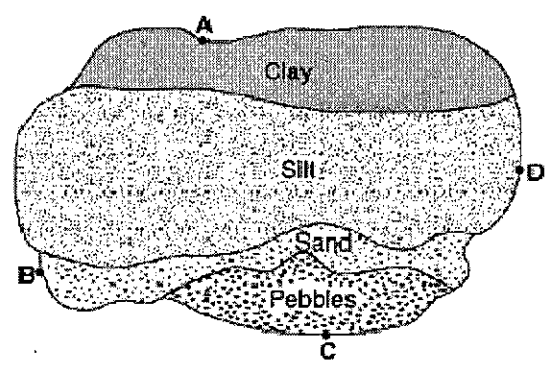
- A. landslide
 B. drumlin
 C. moraine
 D. delta



8. Each of the rock particles below has the same density and volume. Which particle will most likely settle at the fastest rate in moving water?

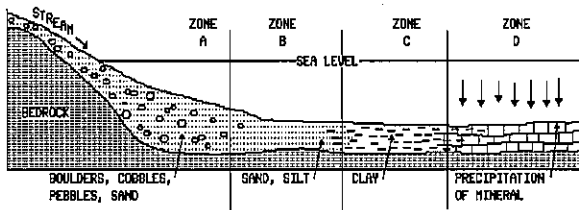


9. The map below shows an overhead view of sediments that have accumulated at the bottom of a lake. Points A through D represent locations on the shoreline of the lake.



A river most likely flows into the lake nearest to location

- A. A
 B. B
 C. C
 D. D



Formation of Deltas



Drainage basin _____

Watershed - _____

Tributary - _____

New York State Stream Drainage Using Page 3 of ESRT and Map 2 Next Page

Directions:

1. On the accompanying NYS river system map and using your ESRT page 3, **find and label** the following rivers/bodies of water

- | | | |
|----------------|-------------|----------------|
| Hudson River | Susquehanna | River |
| Lake Ontario | St. | Lawrence River |
| Delaware River | Mohawk | River |
| Lake Champlain | Lake | Erie |
| Genesee River | Finger | Lakes |

2. Use a **blue pencil** to trace the Hudson River and all of the tributaries to it.
3. Use **green color** to trace all the rivers and tributaries that ultimately flow into the Great Lakes system (that is, Lake Erie, Lake Ontario, and the St. Lawrence). Using that same color, lightly shade in the area of the 2 Great Lakes
4. Use a **purple color to trace** the streams that drain into Lake Champlain. Using that same color, lightly shade in the area of Lake Champlain.
5. Finally, use a **yellow color to trace** the streams of the Delaware and Susquehanna system
6. Use a **RED pencil to draw in the approximate position of the divide** of the major drainage systems in NYS. (*Hint: Trace the line between all the rivers which flow north versus the ones that flow south!*)
7. With a **black pencil** place an X where you think a delta would form on the map of NYS. Explain why you chose to put it where you did.

NYS Drainage

Canada

Lake Ontario

**Finger
Lakes**

**Lake
Erie**

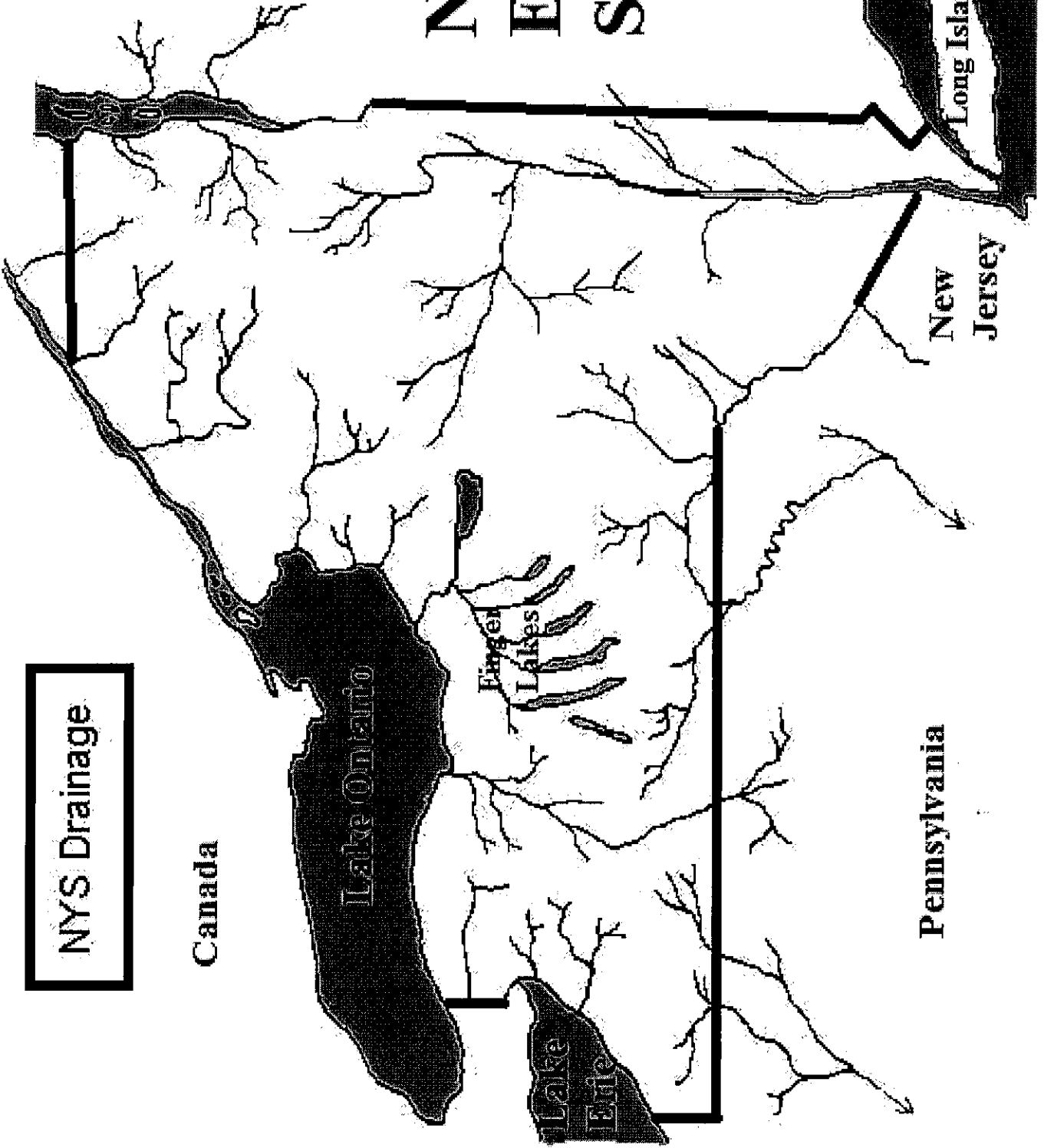
Pennsylvania

**New
Jersey**

Long Island

Atlantic Ocean

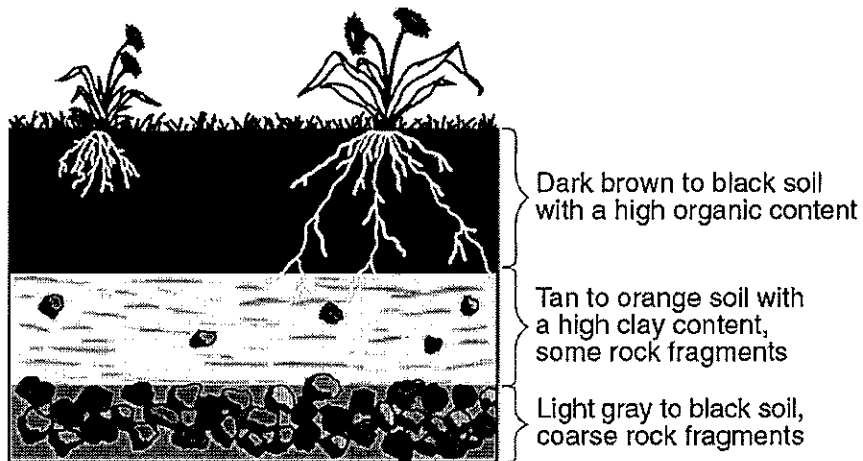
North- Eastern States



	Water	Wind	Waves	Gravity	Glaciers
Sorting					
Sediments Appearance					
Erosional Landscape Features					
Depositional Features					

Weathering, Erosion, and Deposition Review

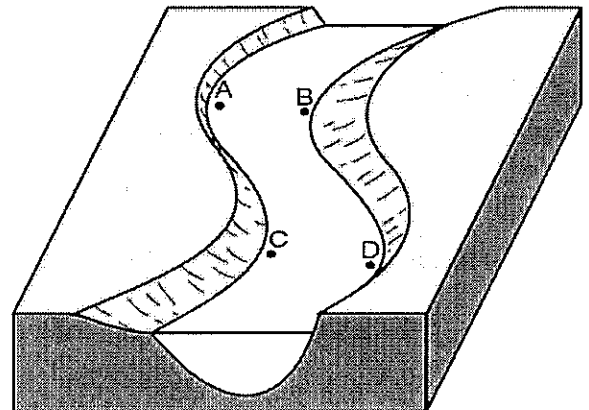
Use the diagram below to answer questions 1-2.



1. What climate conditions will cause the top layer to become thicker?
2. What is the name given to the top layer of soil?

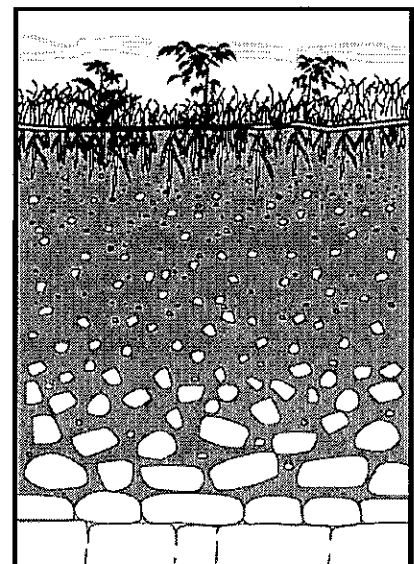
Use the diagram below to answer questions 3-6.

3. Which locations is the water moving the fastest?
4. Which locations will have the most deposition?
5. Label with a large arrow to show the fastest water.
6. Label with a small arrow the slowest water.

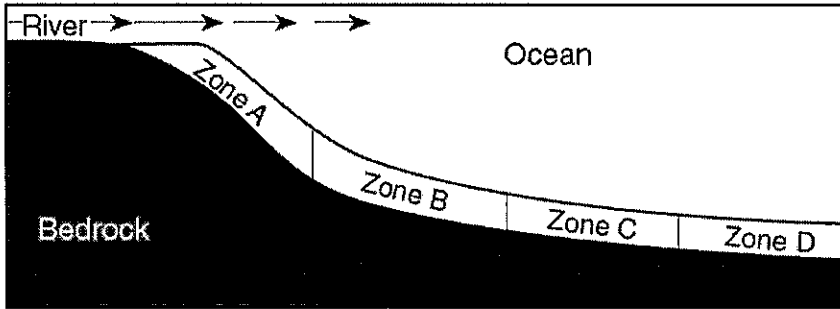


Use the diagram below to answer questions 7-8.

7. Label the area with the highest amount of organic material.
8. Label the area with the least amount of organic material.



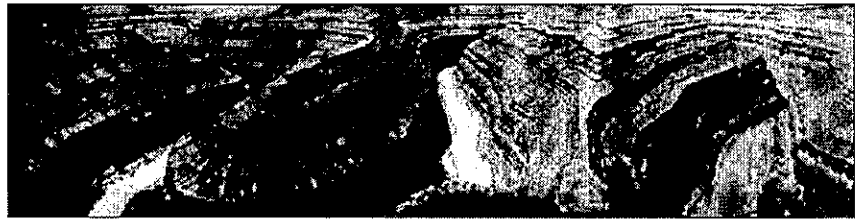
Use the following diagram to answer questions 9-11.



Zone	Major Sediment Sizes
A	0.04 cm to 6 cm
B	0.006 cm to 0.1 cm
C	0.0004 cm to 0.006 cm
D	Less than 0.0004 cm

9. What causes this separation to occur?
10. What rock would form in zone C?
11. What zone would you find conglomerate rocks?
12. State at least two processes that formed this picture.

-
-



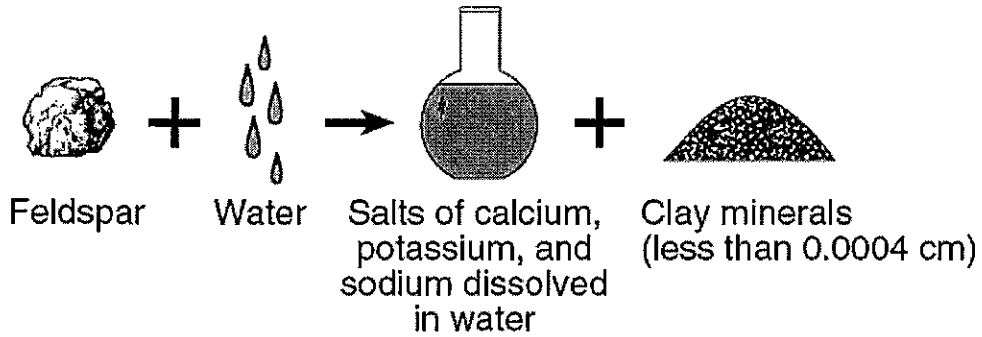
Use the diagrams below to answer questions 13-17.

13. Which samples were deposited by water?
14. Which sample was deposited by three separate river flooding events?
15. Which samples was deposited by a glacier?
16. Which sample will water travel through the slowest?

Column A	Column B	Column C	Column D
Mixed particles (0.00001 cm to 0.5 cm in size)	Uniform-sized particles (0.2 cm)	Sorted particles (0.0001 cm to 0.2 cm in size)	Dry mud (Smaller than 0.0004 cm in size)

17. Which sample would create shale?
18. Which sample could form conglomerate rock?

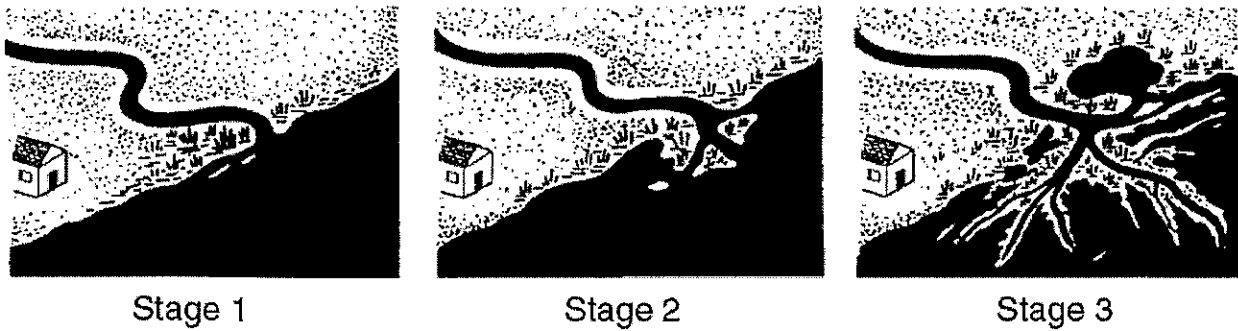
Use the picture below to answer questions 19-21.



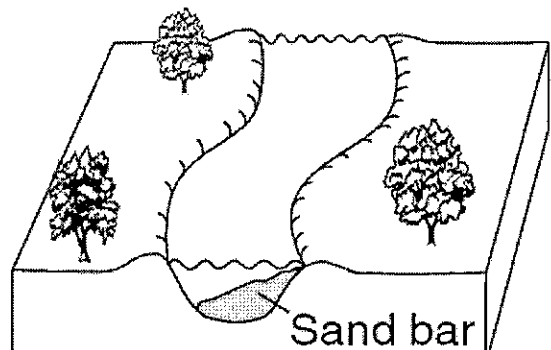
19. What process is occurring in this series of pictures?
20. What sedimentary rock could be formed by the pile of clay minerals formed?
21. How does the surface area of the feldspar piece compare to the surface area of the pile of clay minerals?

Use the picture below to answer questions 22-24.

The diagrams below show three stages of a river delta forming.



22. Which process is increasing between stage 1 and stage 3?
23. How does the size of the sediment change as you move from the shore line to the edge of the delta?
24. Why is the sand bar located in that position in the curve?



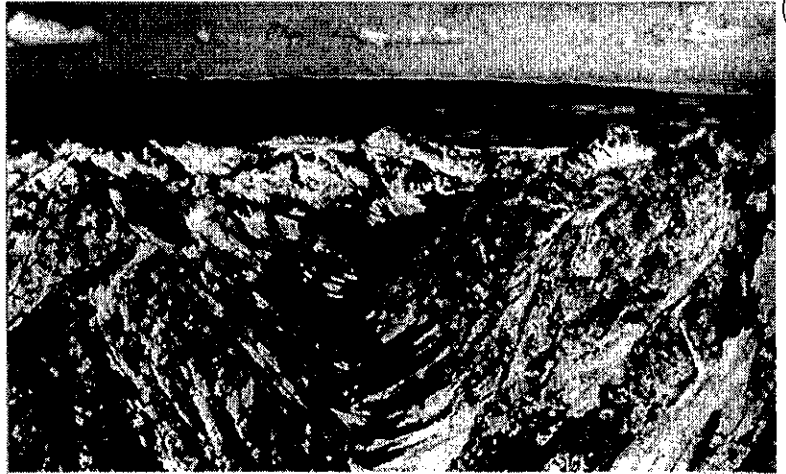
Use the following picture to answer questions 25-27.

25. What characteristic of this valley
Indicates it was formed by a glacier?

26. Describe two additional pieces of
evidence that would be present in
this valley to support your answer.

-
-

27. If this valley was in New York State,
Which general direction would it run?



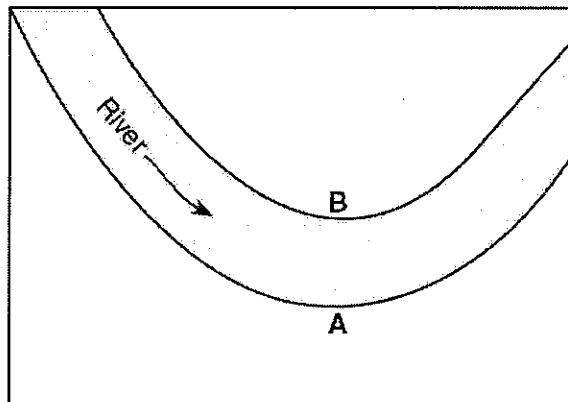
28. This structure is in the desert, what
type of erosion could have formed
this structure?



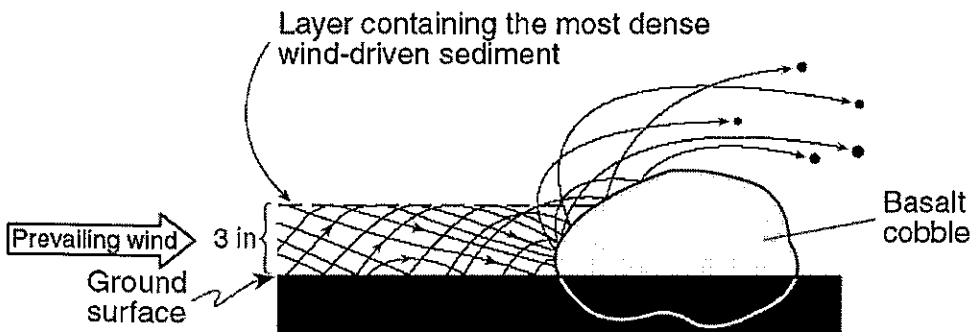
29. This structure is a deposit of sand, silt and clay. What type of deposition is this and where
would it be found?



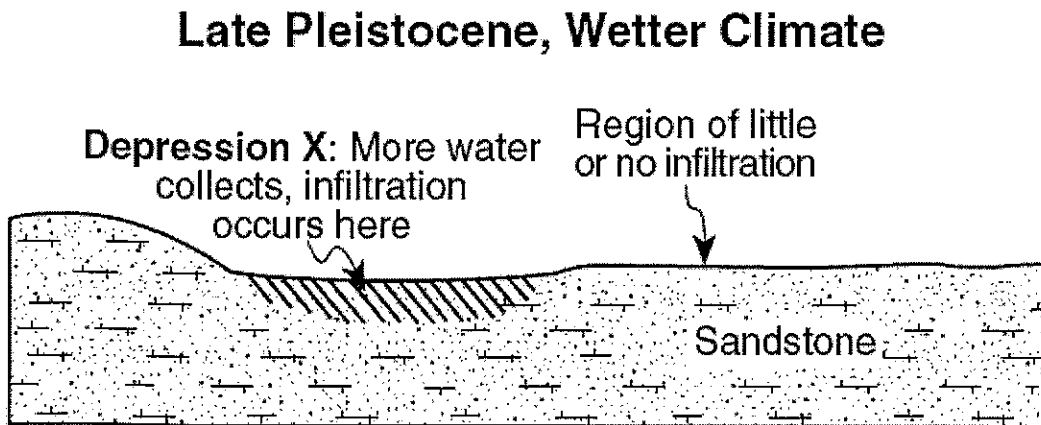
30. How does the speed of the river at location A compare to the speed at location B?



31. What will happen to the shape of this boulder over time under these conditions?



32. What will happen to the calcite cement holding the sandstone together if acidic rainwater infiltrates?



Read the following paragraph and answer questions 33 and 35.

Watching the Glaciers Go

Mountain glaciers and ice caps in tropical areas of the world are melting fast and may vanish altogether by the year 2020. That was the chilling news last year from Lonnie Thompson, a geologist at Ohio State University's Byrd Polar Research Center who has been studying icy areas near the equator in South America, Africa, and the Himalayas for two decades.

It doesn't take a glacier scientist to see the changes. In 1977, when Thompson visited the Quelccaya ice cap in Peru, it was impossible not to notice a schoolbus-size boulder stuck in its grip. When Thompson returned in 2000, the rock was still there but the ice wasn't — it had retreated far into the distance.

Most scientists believe the glaciers are melting because of global warming — the gradual temperature increase that has been observed with increasing urgency during the past decade. Last year a panel of the nation's top scientists, the National Research Council, set aside any lingering skepticism about the phenomenon, concluding definitively that average global surface temperatures are rising and will continue to do so.

"Watching the Glaciers Go,"
Popular Science, vol. #7, January 2002

33. Describe the arrangement of the sediment left behind by the glacier.
34. Where are glaciers usually found?
35. Some glaciers are found near the equator. What landform must be present for glaciers to occur?

Read the following paragraph and answer question 36.

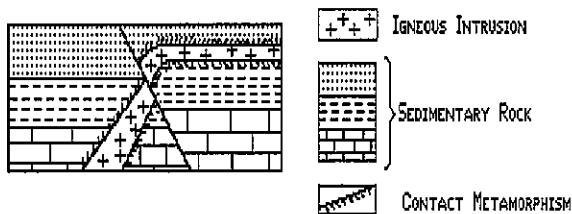
Howe Caverns

Many scientists believe that the formation of the rocks in which Howe Caverns is now found began millions of years ago. At that time, an ocean covered the eastern region of New York State. Hundreds of feet of calcium carbonate (CaCO_3) sediments were deposited in layers along the edge of this ocean. These layers eventually formed the sedimentary rock limestone, which makes up the walls of today's Howe Caverns.

Much later, tectonic forces raised this region of New York State above sea level exposing the rock to weathering and erosion. These tectonic forces cracked the thick limestone, creating pathways for groundwater to infiltrate and gradually increase the size of the cracks. Eventually some of the larger cracks provided pathways for the underground stream, which carved the winding passages of Howe Caverns seen today.

36. Name one test you could use to determine if the walls of the cavern are limestone.

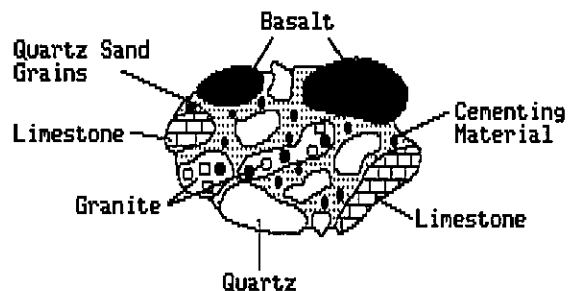
- 12) The best evidence for determining the cooling rate of an igneous rock during its solidification is provided by
- the disintegration of radioactive substances
 - the crystal size of its minerals
 - index fossils
 - faults in the rock
- 13) According to the "Scheme for Igneous Rock Identification" in the *Earth Science Reference Tables*, basalt contains the *greatest* quantity of which mineral?
- mica
 - quartz
 - pyroxene
 - potassium feldspar
- 14) The diagram below represents a portion of the Earth's crust. Which statement best explains why portions of the sedimentary rock layers have the symbol for contact metamorphism?



- Faulting changed the rocks before the igneous intrusion occurred.
 - As the molten material cooled, energy was absorbed by the igneous intrusion.
 - The rock layers were eroded at the interface between the igneous intrusion and the sedimentary rocks.
 - The sedimentary layers were altered by heat at the interface between the igneous intrusion and sedimentary rocks.
- 15) According to the "Scheme for Igneous Rock Identification" in the *Earth Science Reference Tables*, which statement best describes the percentage of plagioclase feldspars in a sample of gabbro?
- Gabbro always contains less plagioclase than pyroxene.
 - Gabbro contains no plagioclase feldspars.
 - Plagioclase feldspars always make up 25% of a gabbro sample.
 - The percentage of plagioclase feldspar in gabbro can vary.
- 16) According to the *Earth Science Reference Tables*, which property would be most useful for identifying igneous rocks?
- types of fossils present
 - kind of cement
 - number of minerals present
 - mineral composition
- 17) Which rocks would most likely be separated by a transition zone of altered rock (metamorphic rock)?
- granite and limestone
 - sandstone and limestone
 - conglomerate and siltstone
 - shale and sandstone
- 18) Most igneous rocks form by which processes?
- erosion and deposition
 - heat and pressure
 - melting and solidification
 - compaction and cementation
- 19) A river carrying pebbles, sand, silt, and clay flows into the ocean. The sediments are sorted by size as they are deposited at different distances from shore. Which sedimentary rock will most likely form from the sediment deposited farthest from shore?
- conglomerate
 - sandstone
 - siltstone
 - shale
- 20) The recrystallization of unmelted material under high temperature and pressure results in
- volcanic rock
 - igneous rock
 - metamorphic rock
 - sedimentary rock
- 21) Which statement best describes a general property of rocks?
- All rocks contain fossils.
 - Most rocks have a number of minerals in common.
 - All rocks contain minerals formed by compression and cementation.
 - Most rocks are composed of a single mineral.
- 22) According to the *Earth Science Reference Tables*, sedimentary rocks formed by compaction and cementation of land-derived sediments are classified on the basis of
- particle size
 - rate of formation
 - composition
 - type of cement
- 23) Which characteristic provides the best evidence about the environment in which a rock was formed?
- the size of the rock
 - the thickness of the rock
 - the texture of the rock
 - the color of the rock
- 24) According to the *Earth Science Reference Tables*, the sedimentary rock, gypsum, forms as a result of
- evaporation of seawater
 - metamorphism of limestone
 - weathering of siltstone
 - faulting and folding of shale

- 25) Large rock salt deposits in the Syracuse area indicate that the area once had
- many terrestrial animals
 - a range of volcanic mountains
 - large forests
 - a warm, shallow sea
- 26) Extremely small crystal grains in an igneous rock are an indication that the crystals formed
- from an iron-rich magma
 - under high pressure
 - deep below the surface of the Earth
 - over a short period of time
- 27) A fine-grained igneous rock contains 11% plagioclase, 72% pyroxene, 15% olivine, and 2% amphibole. According to the *Earth Science Reference Tables*, this rock would most likely be classified as
- rhyolite
 - gabbro
 - basalt
 - granite
- 28) Large crystal grains in an igneous rock indicate that the rock was formed
- under low pressure
 - over a long period of time
 - near the surface
 - at a low temperature
- 29) According to the *Earth Science Reference Tables*, some sedimentary rocks form as the direct result of the
- melting of minerals
 - solidification of molten magma
 - cementation of rock fragments
 - recrystallization of material
- 30) Which rock is most likely a nonsedimentary rock?
- a rock composed of distorted light-colored and dark-colored mineral bands
 - a rock consisting of layers of rounded sand grains
 - a rock containing dinosaur bones
 - a rock showing mud cracks
- 31) According to the "Scheme for Igneous Rock Identification" in the *Earth Science Reference Tables*, compared to basalt, granite is
- more fine grained in texture
 - lighter in color
 - more mafic in composition
 - greater in density
- 32) According to the *Earth Science Reference Tables*, which minerals could *both* be contained in the rocks gabbro and granite?
- quartz and pyroxene
 - plagioclase and nepheline
 - mica and hornblende
 - potassium feldspar and olivine

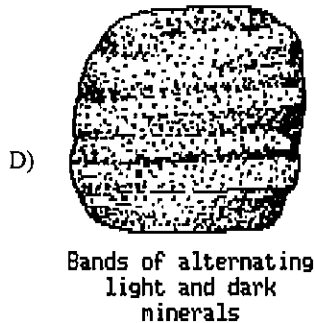
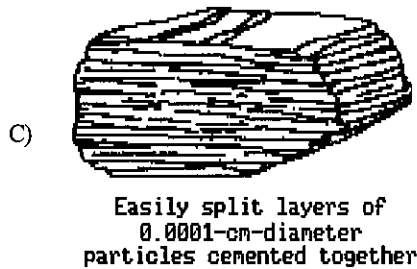
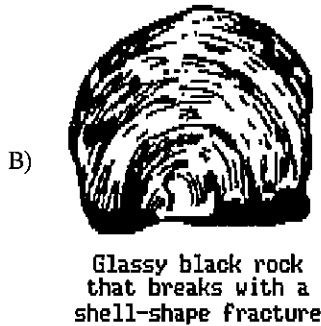
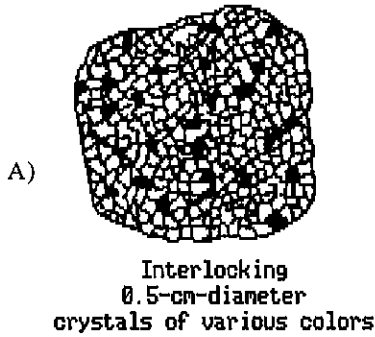
- 33) Sand collected at a beach contains a mixture of pyroxene, olivine, hornblende, and plagioclase feldspar. According to the *Earth Science Reference Tables*, the rock from which this mixture of sand came is best described as
- light-colored with a felsic composition
 - light-colored with a mafic composition
 - dark-colored with mafic composition
 - dark-colored with a felsic composition
- 34) The diagram below represents a conglomerate rock. Some of the rock particles are labeled.



Which conclusion is best made about the rock particles?

- They are the same age.
- They originated from a larger mass of igneous rock.
- They have different origins.
- They all contain the same minerals.

35) The diagrams below represent four rock samples. Which rock took the longest time to solidify from magma deep within the Earth?



- 36) Which observation about an igneous rock would support the inference that the rock cooled slowly underground?
- A) The rock has well-defined layers.
 - B) The rock has large crystals.
 - C) The rock is about 50 percent plagioclase feldspar.
 - D) The rock is light in color and low in density.
- 37) Limestone is a sedimentary rock which may form as a result of
- A) biologic processes
 - B) melting
 - C) recrystallization
 - D) metamorphism

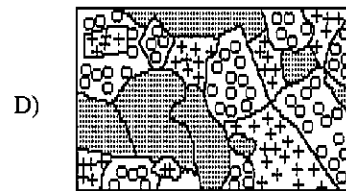
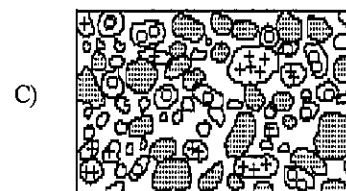
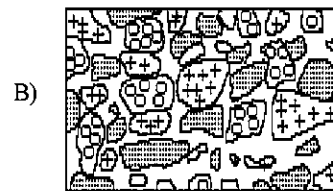
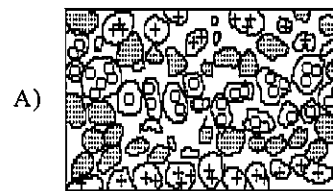
38) Metamorphic rocks result from the

- A) erosion of rocks
- B) compression and cementation of soil particles
- C) cooling and solidification of molten magma
- D) recrystallization of rocks

39) Which rock was formed by the compaction and cementation of particles 0.07 centimeter in diameter? [Refer to the *Earth Science Reference Tables*.]

- A) sandstone
- B) basalt
- C) limestone
- D) shale

40) The diagrams below represent magnifications of rocks. Which is most likely a diagram of a non-sedimentary rock?



- 41) According to the *Earth Science Reference Tables*, a rock that forms directly from land-derived sediments is
- A) gabbro
 - B) granite
 - C) sandstone
 - D) dolostone
- 42) According to the *Earth Science Reference Tables*, rhyolite and granite are alike in that they *both* are
- A) felsic
 - B) fine-grained
 - C) dark-colored
 - D) mafic

- 43) According to the *Earth Science Reference Tables*, which is the best description of the properties of basalt?
- A) fine-grained and felsic
 B) coarse-grained and mafic
 C) coarse-grained and felsic
 D) fine-grained and mafic
- 44) An igneous rock which has crystallized deep below the Earth's surface has the following approximate composition: 70% pyroxene, 15% plagioclase, and 15% olivine. According to the *Earth Science Reference Tables*, what is the name of this igneous rock?
- A) gabbro
 B) rhyolite
 C) basalt
 D) granite
- 45) What is the main difference between metamorphic rocks and most other rocks?
- A) Many metamorphic rocks contain a high amount of oxygen-silicon tetrahedra.
 B) Many metamorphic rocks contain only one mineral.
 C) Many metamorphic rocks have an organic composition.
 D) Many metamorphic rocks exhibit banding and distortion of structure.
- 46) A sediment contains particles that range in diameter from 2 to 4 centimeters. According to the *Earth Science Reference Tables*, which sedimentary rock would be formed when this sediment is compressed and cemented together?
- A) sandstone
 B) shale
 C) siltstone
 D) conglomerate
- 47) According to the *Earth Science Reference Tables*, which mineral is most abundant in gabbro?
- A) quartz
 B) mica
 C) pyroxene
 D) potassium feldspar
- 48) According to the *Earth Science Reference Tables*, which minerals are found in the igneous rocks gabbro and basalt?
- A) pyroxene and potassium feldspar
 B) orthoclase and quartz
 C) olivine and quartz
 D) olivine and pyroxene
- 49) The metamorphism of a sandstone rock will cause the rock
- A) to occupy a greater volume
 B) to be melted
 C) to become more dense
 D) to contain more fossils
- 50) A group of students collected rounded, well-sorted mineral particles from a stream that flowed over only coarse-grained igneous bedrock. They sorted the particles by mineral type and then mixed equal volumes of all four minerals together and poured the mixture into a tube of water. The data table below lists the minerals. Figure A shows the deposit formed on the bottom of the tube as a result of the deposition of the particles.

DATA TABLE

MINERAL	AVERAGE PARTICLE DIAMETER
Plagioclase feldspar	0.2 cm
Quartz	0.2 cm
Hornblende (Amphibole)	0.2 cm
Olivine	0.2 cm

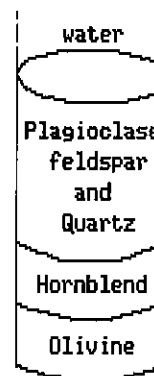
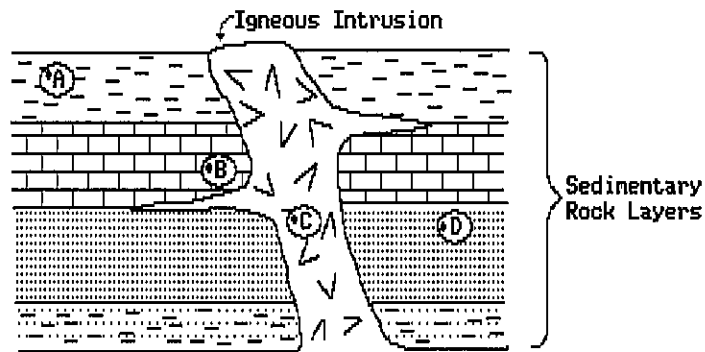


Figure A

The mineral particles collected by the students were most likely weathered from

- A) rhyolite and basalt rocks
 B) gabbro and granite rocks
 C) gabbro rocks, only
 D) rhyolite rocks, only

- 51) The diagram below shows an igneous rock intrusion in sedimentary rock layers.

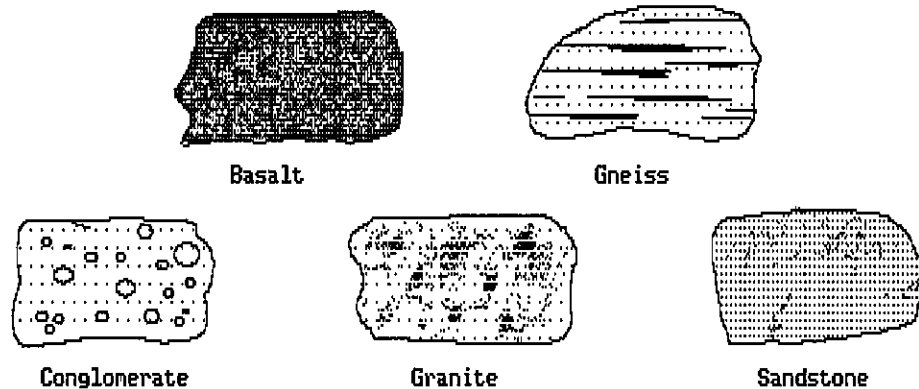


At which point would metamorphic rock most likely be found?

- A) A B) B C) C D) D

Questions 52 through 55 refer to the following:

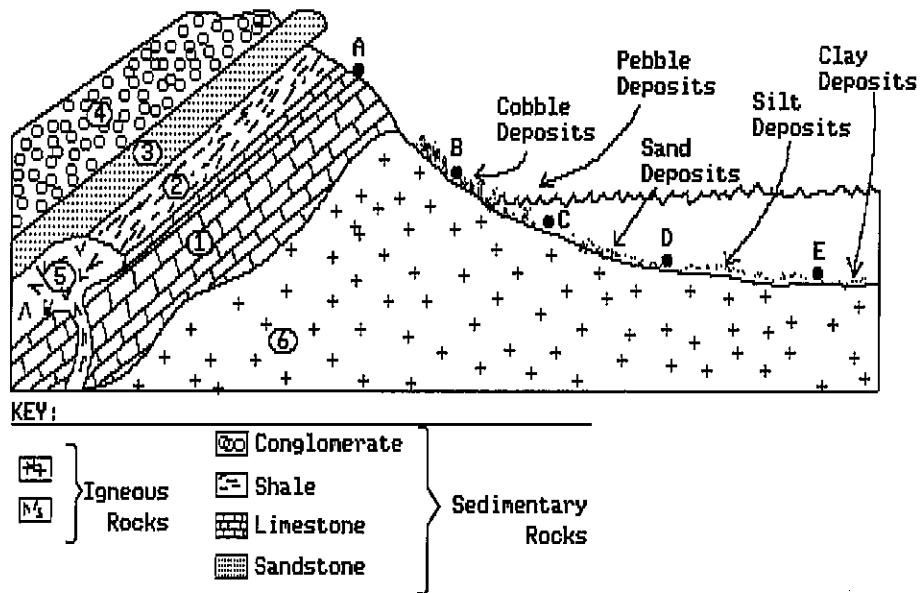
The diagrams below illustrate five rock samples (including metamorphic gneiss). [Refer to the *Earth Science Reference Tables*.]



- 52) The granite most likely was formed by the process of
 A) melting and solidification
 B) erosion and deposition
 C) heating and metamorphism
 D) compaction and cementation
- 53) Which rock is composed of sediments that have a range of sizes and that originate from different rock types?
 A) basalt C) conglomerate
 B) granite D) gneiss
- 54) Which rock was formed by the compression and cementation of sediments with particle sizes ranging from 0.08 to 0.1 centimeter?
 A) basalt C) sandstone
 B) granite D) conglomerate
- 55) Which rock shows banding that formed as a result of recrystallization of unmelted material under high temperature and pressure?
 A) granite C) sandstone
 B) conglomerate D) gneiss

Questions 56 through 58 refer to the following:

The diagram below represents a cross section of a portion of the Earth's crust. The letters indicate points on the Earth's surface. The numbers identify specific rock units.



- 56) Igneous rock unit 6 is a dark-colored mafic rock with large grains. According to the *Earth Science Reference Tables*, it is probably
- A) gabbro C) granite
B) rhyolite D) basalt
- 57) According to the *Earth Science Reference Tables*, rock unit 2 is composed of sediment particles that have the same size range as the particles deposited near point
- A) E B) B C) D D) C
- 58) The crystal size of the minerals contained in rock unit 6 is much larger than the crystal size in rock unit 5. The best explanation for this observation is that the rocks in the two units
- A) cooled at different rates
B) contain different minerals
C) are of greatly different ages
D) contain different-sized sediments

