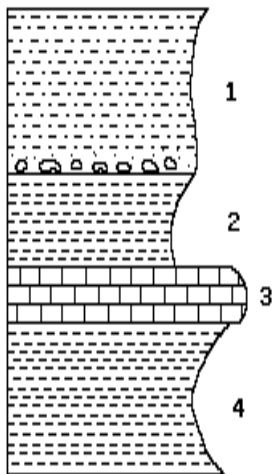


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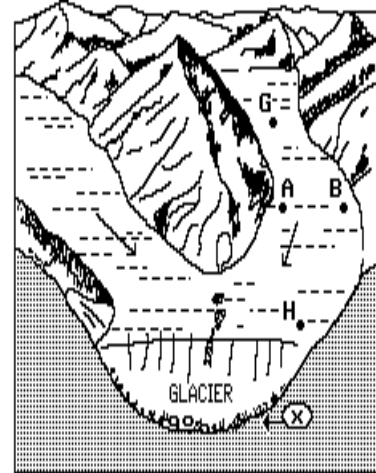
- 1) Particles of soil often differ greatly from the underlying bedrock in color, mineral composition, and organic content. Which conclusion about these soil particles is best made from this evidence?
 - A) They are transported sediments.
 - B) They are residual-sediments.
 - C) They are soluble in water.
 - D) They are uniformly large-grained.
- 2) Which factor has the *least* effect on the weathering of a rock?
 - A) composition of the rock
 - B) exposure of the rock to the atmosphere
 - C) the number of fossils found in the rock
 - D) climatic conditions
- 3) As the gradient of a stream increases, the stream's ability to carry sediment
 - A) decreases
 - B) increases
 - C) remains the same
- 4) Which is the best example of physical weathering?
 - A) the cracking of rock caused by the freezing and thawing of water
 - B) the transportation of sediment in a stream
 - C) the reaction of limestone with acid rainwater
 - D) the formation of a sandbar along the side of a stream
- 5) The diagram below represents a sedimentary rock outcrop.



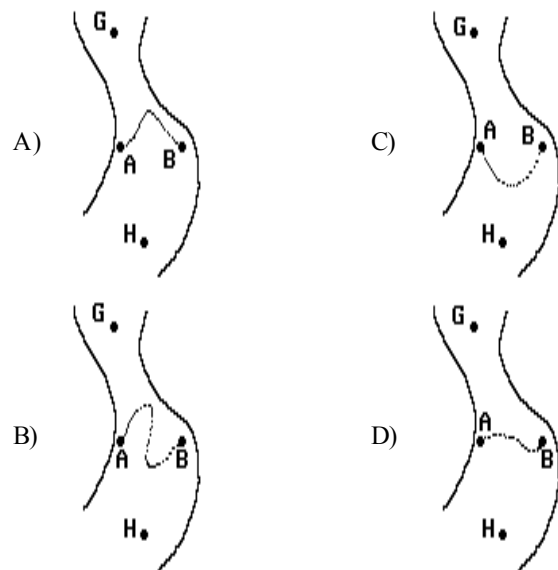
- Which rock layer is the most resistant to weathering?
- A) 1 B) 4 C) 2 D) 3
- 6) Which is the best evidence that erosion has occurred?
 - A) a large number of fossils embedded in limestone
 - B) a soil rich in lime on top of a limestone bedrock
 - C) sediments found in a sandbar of a river
 - D) a layer of basalt found on the floor of the ocean

Questions 7 through 9 refer to the following:





The diagram below represents two branches of a valley glacier. Points *A*, *B*, *G*, and *H* are located on the surface of the glacier. Point *X* is located at the interface between the ice and the bedrock. The arrows indicate the general direction of ice movement.



- 7) Which type of weathering most likely is dominant in the area represented by the diagram?
 - A) acid reactions
 - B) chemical reactions
 - C) biologic activity
 - D) frost action
- 8) Metal stakes were placed on the surface of the glacier in a straight line from position *A* to position *B*. Which diagram best shows the position of the metal stakes several years later?

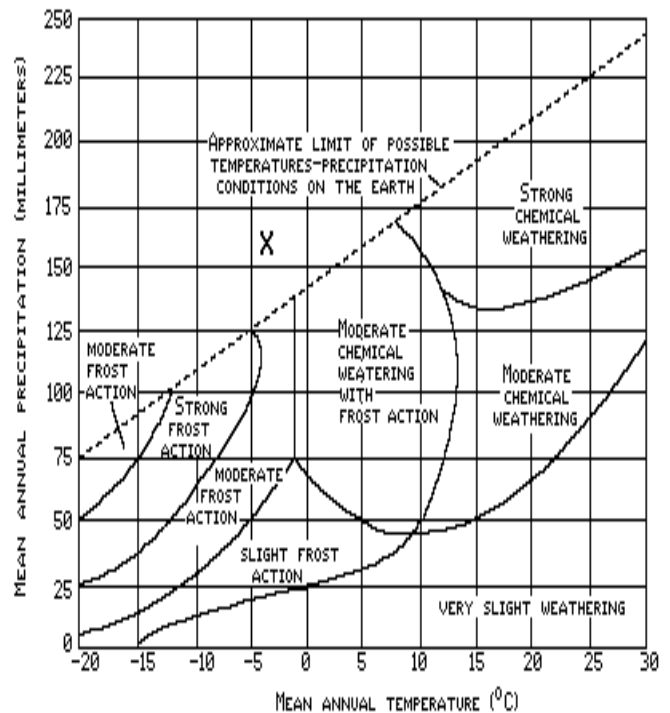


- 9) Which force is primarily responsible for the movement of the glacier?
 - A) gravity
 - B) running water
 - C) ground water
 - D) wind

- 10) During the past 100 years, which erosional agent has been the most dominant in changing the landscape of New York State?
- A) glacial erosion C) stream erosion
B) wind erosion D) wave erosion
- 11) A large rock is broken into several smaller pieces. Compared to the rate of weathering of the large rock, the rate of weathering of the smaller pieces is
- A) the same
B) less
C) greater
- 12) Which change in the climate of New York State would most likely cause the *greatest* increase in chemical weathering of local bedrock?
- A) lower humidity in winter
B) greater precipitation in summer
C) lower temperature in winter
D) higher atmospheric pressure in summer
- 13) Based on the diagrams of rock fragments below, which shows the *least* evidence in erosion?
- A)  C) 
B)  D) 
- 14) What is the slowest stream velocity necessary for a stream to carry the *smallest* boulders? [Refer to the *Earth Science Reference Tables*.]
- A) 800 cm/sec C) 100 cm/sec
B) 300 cm/sec D) 500 cm/sec

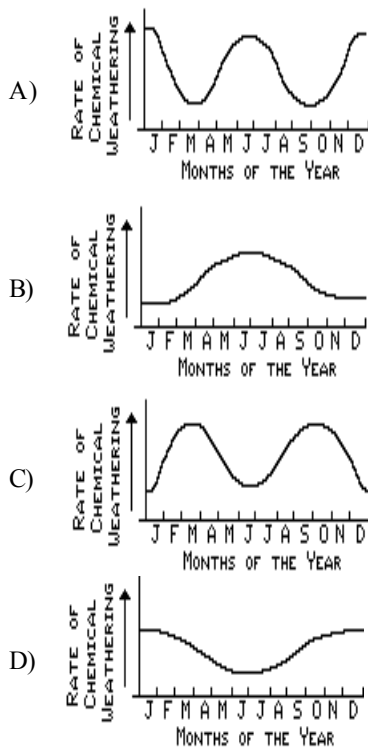
Questions 15 through 19 refer to the following:

The diagram below represents the dominant type of weathering for various climatic conditions.



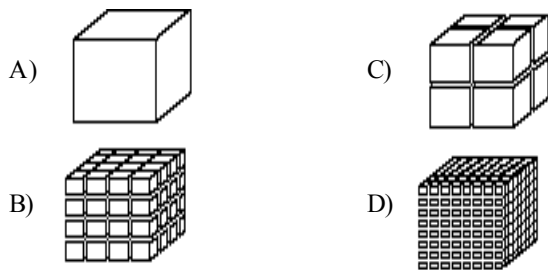
- 15) Why is no frost action shown for locations with a mean annual temperature greater than 13°C?
- A) Large amounts of precipitation fall at these locations.
B) Large amounts of evaporation takes place at these locations.
C) Very little freezing takes place in these locations.
D) Very little precipitation falls at these locations.
- 16) There is no particular type of weathering or frost action given for the temperature and precipitation values at the location represented by the letter X. Why is this the case?
- A) Only chemical weathering would occur under these conditions.
B) These conditions create both strong frost action and strong chemical weathering.
C) Only frost action would occur under these conditions.
D) These conditions probably do not occur on the Earth.

17) Assume that the rate of precipitation throughout the year is a constant. Which graph would most probably represent the chemical weathering of most New York State bedrock?

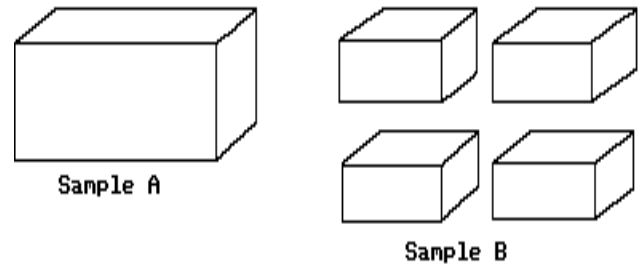


- 18) Which climatic conditions would produce very slight weathering?
- A) a mean annual temperature of -5°C and a mean annual precipitation of 50 mm
 - B) a mean annual temperature of 15°C and a mean annual precipitation of 25 mm
 - C) a mean annual temperature of 5°C and a mean annual precipitation of 50 mm
 - D) a mean annual temperature of 25°C and a mean annual precipitation of 100 mm

19) Four samples of the same material with identical composition and mass were cut as shown in the diagrams below. When subjected to the same chemical weathering, which sample will weather at the fastest rate?



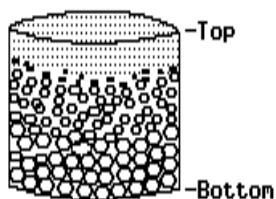
20) The diagram below represents equal masses of two identical rock samples. Sample A is one large block, while sample B was cut into four smaller blocks of equal size.



If subjected to the same environmental conditions, sample B will weather more quickly than sample A. The best explanation for this is that the

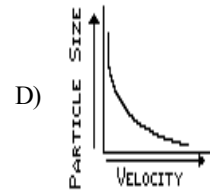
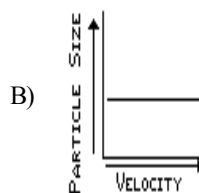
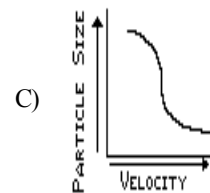
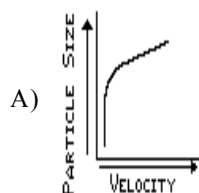
- A) hardness of sample A is greater than that of sample B
- B) surface area of sample B is greater than that of sample A
- C) density of sample A is greater than that of sample B
- D) volume of sample B is greater than that of sample A

- 26) For which movement of earth materials is gravity *not* the main force?
- snow tumbling in an avalanche
 - moisture evaporating from an ocean
 - boulders carried by a glacier
 - sediments flowing in a river
- 27) Stream *A* has a steeper slope than stream *B*. However, the average water velocity of stream *B* is greater than that of stream *A*. Which is the most reasonable explanation for this?
- Stream *B* has a curved streambed.
 - Stream *B* has more friction to overcome along its banks.
 - Stream *B* has a greater volume of water.
 - Stream *B* has a higher average temperature.
- 28) At high elevations in New York State, which is the most common form of physical weathering?
- abrasion of rocks by the wind
 - dissolving of minerals into solution
 - oxidation by oxygen in the atmosphere
 - alternate freezing and melting of water
- 29) In which type of climate does chemical weathering usually occur most rapidly?
- hot and wet
 - cold and wet
 - hot and dry
 - cold and dry
- 30) According to the *Earth Science Reference Tables*, which stream velocity would transport cobbles, but would *not* transport boulders?
- 50 cm/sec
 - 400 cm/sec
 - 200 cm/sec
 - 100 cm/sec
- 31) The diagram below represents a core sample of a sedimentary deposit found at a particular location. The deposition most likely occurred as a result of



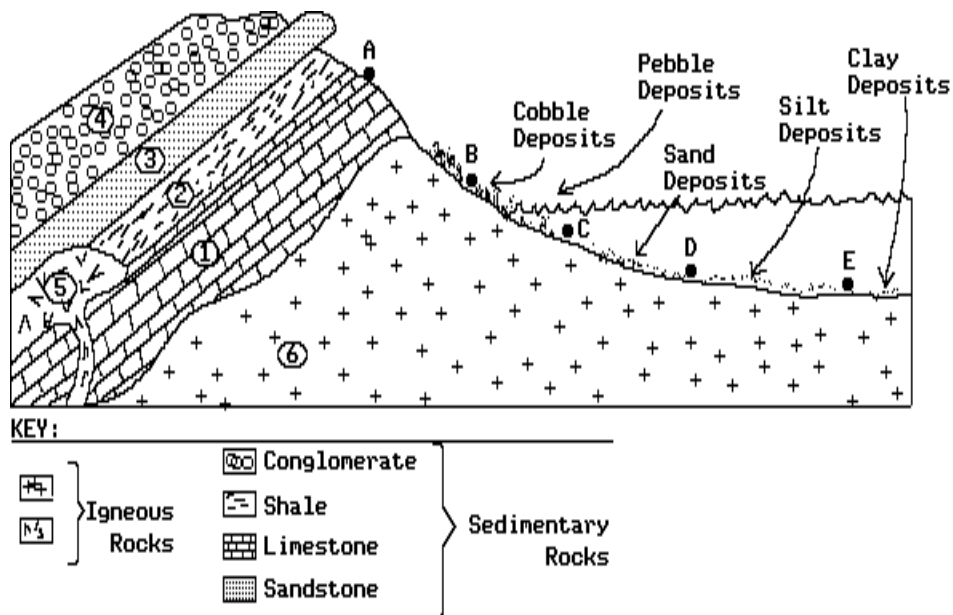
- an avalanche on a mountainside
 - dropping directly from a glacier
 - dropping of weathered rock fragments from a cliff
 - a decrease in the velocity of a stream
- 32) According to the *Earth Science Reference Tables*, a stream flowing at a velocity of 100 centimeters per second can transport
- silt, sand, and pebbles, but not cobbles
 - silt, but not sand, pebbles, or cobbles
 - silt, sand, pebbles, and cobbles
 - silt and sand, but not pebbles or cobbles

- 33) Which erosional force acts alone to produce avalanches and landslides?
- sea waves
 - winds
 - running water
 - gravity
- 34) Which sediment is the *largest* that could be carried by a stream flowing at a velocity of 100 centimeters per second? [Refer to the *Earth Science Reference Tables*.]
- sand
 - cobbles
 - silt
 - pebbles
- 35) Which graph best represents the relationship between the maximum particle size that can be carried by a stream and the velocity of the stream?



- 36) The chemical composition of a residual soil in a certain area is determined by the
- method by which the soil was transported to the area
 - slope of the land and the particle size of the soil
 - minerals in the bedrock beneath the soil and the climate of the area
 - length of time since the last crustal movement in the area occurred
- 37) Water is a major agent of chemical weathering because water
- has a density of about one gram per cubic centimeter
 - has the highest specific heat of all common earth materials
 - cools the surroundings when it evaporates
 - dissolves many of the minerals that make up rocks
- 38) A river transports material by suspension, rolling, and
- transpiration
 - solution
 - sublimation
 - evaporation
- 39) Which characteristic of a transported rock would be most helpful in determining its agent of erosion?
- age
 - physical appearance
 - density
 - composition

- 40) 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.

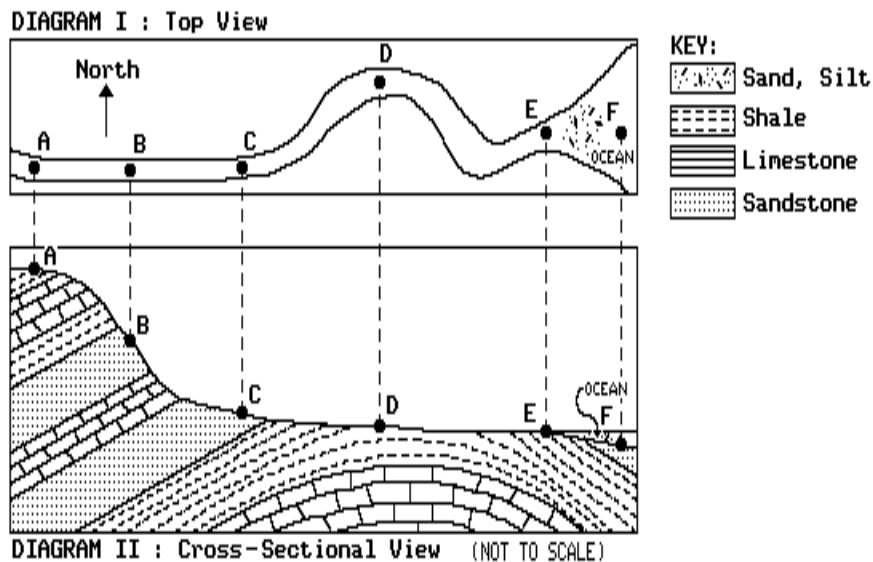


Which rock unit appears to be the most resistant to weathering and erosion?

- A) 1 B) 2 C) 4 D) 3

Questions 41 and 42 refer to the following:

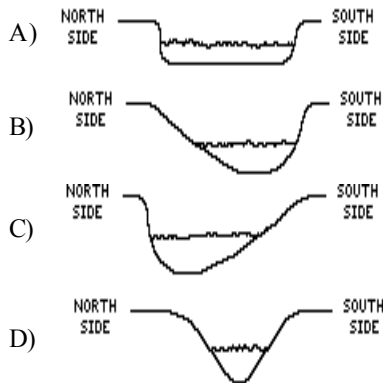
Diagram I below represents a map view of a stream with reference points A through F within the stream bed. Diagram II represents a geologic cross section of the area over which the stream flows. [Assume that the volume of the stream is constant.]



- 41) At which point would the stream's velocity most likely be greatest?

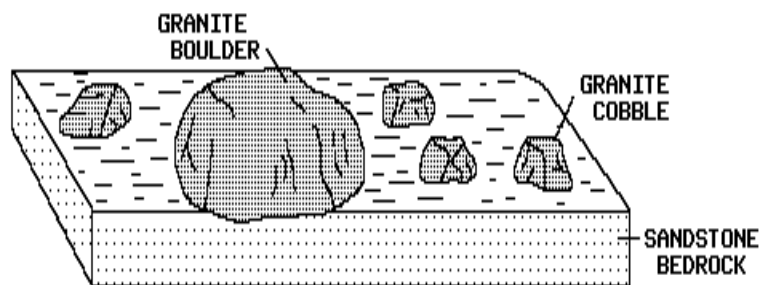
- A) D B) E C) B D) A

- 42) An observer looks downstream from a location just above point *D* and draws a cross section of the streambed at point *D*. Which diagram would probably best represent this cross section?



Questions 43 and 44 refer to the following:

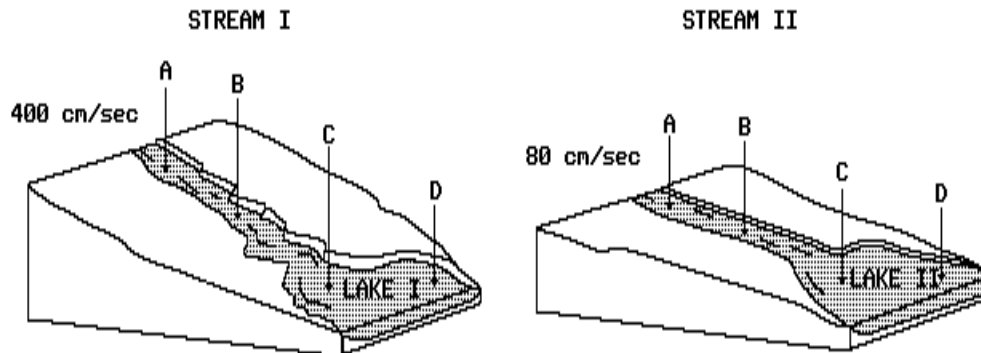
The diagram below represents a surface and cross-sectional view of a portion of the Earth 15 kilometers from a mountain range.



- 43) The processes that change the boulder and cobbles to soil are weathering and
- metamorphism
 - cementation of sediments
 - biological activity
 - melting of rock material
- 44) The granite boulder and the granite cobbles have similar chemical compositions. Compared to the rate of weathering of the boulder, the rate of weathering of an equal mass of cobbles is probably
- slower due to particle size
 - slower due to location
 - faster due to location
 - faster due to particle size

Questions 45 through 47 refer to the following:

A mixture of colloids, clay, silt, sand, pebbles, and cobbles is put into stream *I* at point *A*. The water velocity at point *A* is 400 centimeters per second. A similar mixture of particles is put into stream *II* at point *A*. The water velocity in stream *II* at point *A* is 80 centimeters per second.



- 45) If a sudden rainstorm occurs at *both* streams above point *A*, the erosion rate will
- increase for both streams
 - increase for stream *I*, but not for stream *II*
 - not change for either stream
 - increase for stream *II*, but not for stream *I*
- 46) Which statement best describes what happens when the particles are placed in the streams? [Refer to the *Earth Science Reference Tables*.]
- Stream *I* will move all particles that are added at point *A*.
 - Stream *II* cannot move sand.
 - Stream *I* cannot move sand.
 - Stream *II* will move all particles that are added at point *A*.
- 47) Which statement is the most accurate description of conditions in *both* streams?
- The greatest deposition occurs at point *B*.
 - The velocity of the stream is the same at point *B* as at point *C*.
 - The particles will have a greater velocity than the water in the stream.
 - Particles are carried in suspension and by bouncing along the bottom.

Questions 48 through 50 refer to the following:

The table below shows the results of an investigation of four different types of rocks, weathering over a period of 30 minutes. Equal masses of similar-sized samples of rocks *A*, *B*, *C*, and *D* were placed in identical containers half-filled with water. Each container was shaken uniformly for 5 minutes and the remaining samples of rocks were removed from the water. Their masses were determined and recorded in the data table. The remaining samples of rocks were put back into the containers half-filled with water and the procedure was repeated five times.

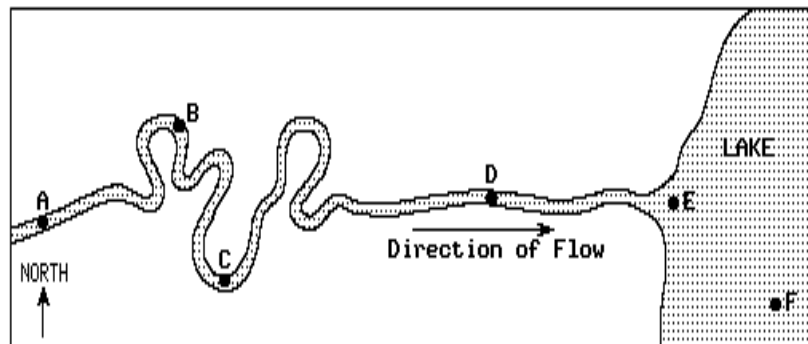
DATA TABLE

Time (min)	Mass of Rock Samples Remaining (grams)			
	A	B	C	D
0	200	200	200	200
5	160	200	120	200
10	125	200	60	195
15	100	190	20	170
20	75	180	0	150
25	55	175	0	135
30	50	175	0	125

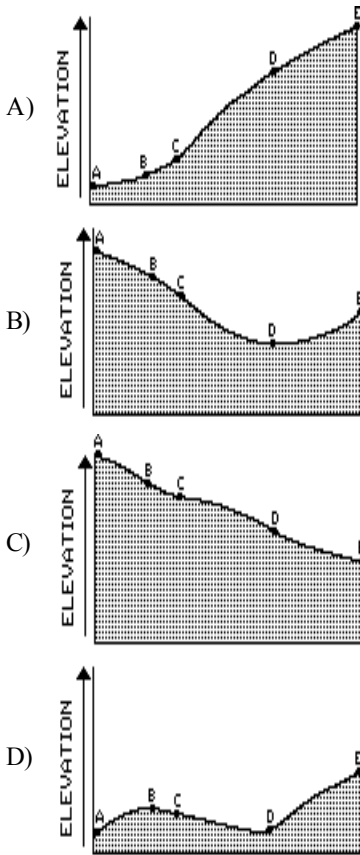
- 48) After 20 minutes, the rate of abrasion decreased for all rock samples. A major factor that explains this is the
- hardening of the minerals
 - smoothing of the rock samples
 - sharpening of the edges of the rock samples
 - compacting of the rock samples
- 49) According to the data table, the mass of rock samples remaining at the end of 30 minutes was different for each sample. The best inference to be made is that the mass differences were the result of different
- rates of shaking of the containers
 - containers being used for shaking
 - rock sample composition
 - masses of rock samples being used
- 50) Which rock sample was most resistant to the abrasive action caused by the shaking of the containers?
- D*
 - B*
 - A*
 - C*

Questions 51 through 53 refer to the following:

The map below shows a stream flowing into a lake. Letters *A* through *F* represent locations in the stream and lake.



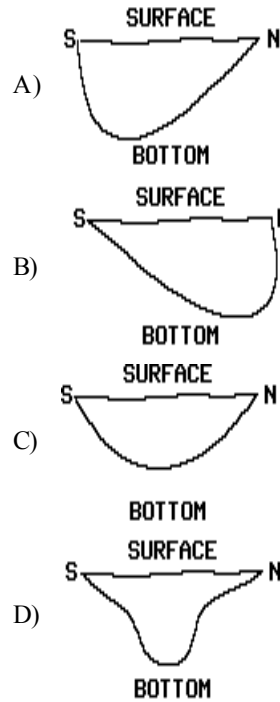
51) Which diagram best represents the change in the stream's elevation from location *A* to location *E*?



52) The velocity of this stream at point *B* depends on the stream's

- A) discharge, only
- B) slope and discharge, only
- C) slope, discharge, and channel shape
- D) slope, only

53) Which diagram best represents the cross section of the stream at location *C*? [Note that letters *N* and *S* represent the north and south sides of the stream.]



54) 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

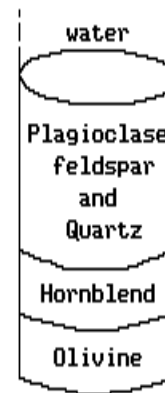
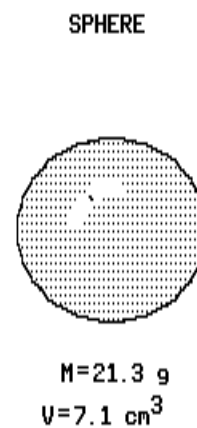
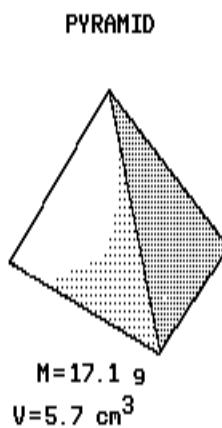
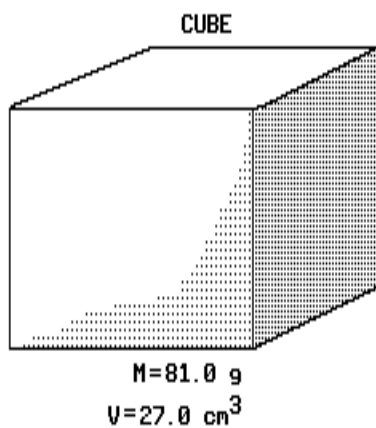


Figure A

According to the *Earth Science Reference Tables*, when the mineral particles were collected from deposits on the stream bed, the stream velocity at the time of deposition was approximately

- A) 50 cm/s
- B) 150 cm/s
- C) 200 cm/s
- D) 100 cm/s

- 55) The diagrams below represent three solid objects made of the same uniform material. The name of each shape is shown, along with its mass (M) and volume (V).



If the pyramid is ground into a powder, the rate at which the powder would chemically weather, compared to the original pyramid, would be

- A) slower because the surface area will be less
B) faster because the surface area will be less
C) faster because the surface area will be greater
D) slower because the surface area will be greater