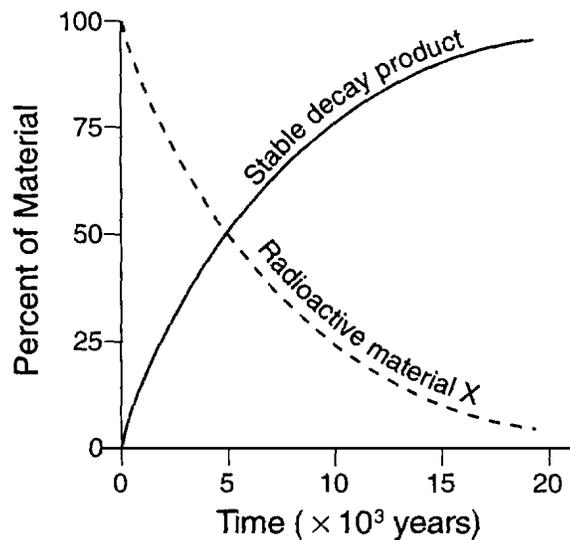


Base your answers to questions 1 through 4 on the graph below, which represents the decay of radioactive material  $X$  into a stable decay product.



1. If radioactive material  $X$  were heated, the length of its half-life period would

- A) decrease                      B) increase  
C) remain the same

2. What is the approximate half-life of radioactive material  $X$ ?

- A) 5,000 yr                      B) 10,000 yr  
C) 50,000 yr                      D) 100,000 yr

3. Which graph best represents the relative percentages of radioactive material  $X$  and its stable decay product after 15,000 years? (**The shaded region represents radioactive material while the non-shaded region represents stable decay products.**)

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

4. Radioactive material  $X$  can only be used to date young geologic material because radioactive material  $X$

- A) has only recently become radioactive  
B) has a relatively short half-life  
C) never existed in older rocks  
D) has only recently been discovered

5. At which location in New York State would one least expect to find fossils in the surface bedrock?

- A) 42° N. 79° W.                      B) 43° N. 76° W.  
C) 44° N. 74° W.                      D) 42° N. 75° W.

6. Approximately what percentage of the estimated age of Earth does the Cenozoic Era represent?

- A) 1.4%                                  B) 5.0%  
C) 11.9%                                  D) 65.0%

7. Most of the surface bedrock found in New York State was formed during which era?

- A) Precambrian                      B) Paleozoic  
C) Mesozoic                              D) Cenozoic

8. What is the age of the most abundant surface bedrock in the Finger Lakes region of New York State?

- A) Cambrian                              B) Devonian  
C) Pennsylvanian                      D) Permian

9. Which radioactive element is used to determine the absolute age of late Pleistocene animal remains?

- A) rubidium-87                      B) uranium-238  
C) potassium-40                      D) carbon-14

10. Which gas became part of Earth's atmosphere mainly as a result of the evolution of life-forms?

- A) oxygen                                  B) nitrogen  
C) helium                                  D) hydrogen

11. Approximately what percent of geologic time since the estimated origin of the Earth is represented by the Precambrian Era?

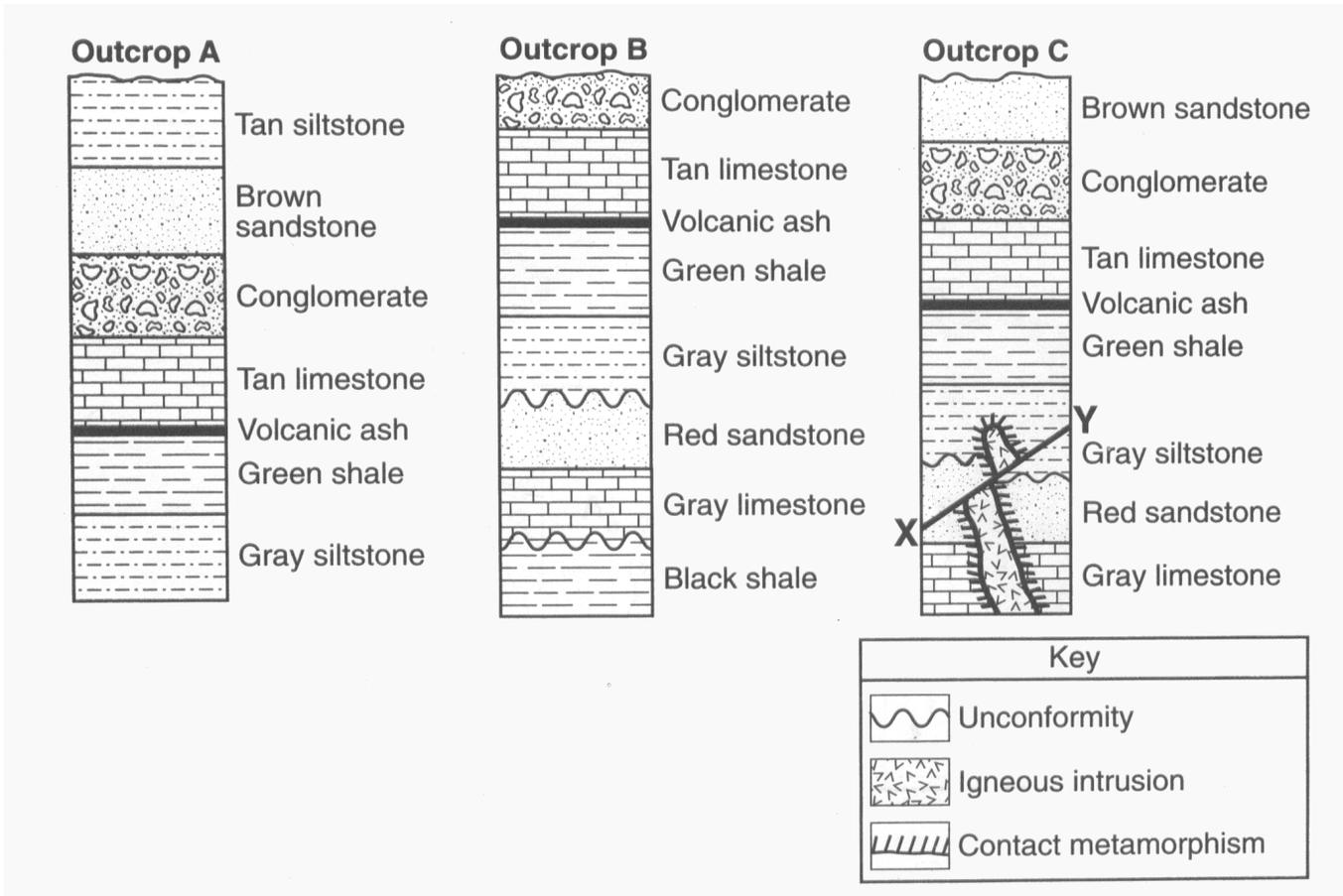
- A) 37%    B) 50%    C) 67%    D) 87%

12. How much of an 800-gram sample of potassium-40 will remain after  $3.9 \times 10^9$  years of radioactive decay?

- A) 50 grams                                  B) 100 grams  
C) 200 grams                                  D) 400 grams

# Regents Review #9

Base your answers to questions 13 through 15 on the cross sections of three rock outcrops, A, B, and C. Line XY represents a fault. Overturning has not occurred in the rock outcrops.



13. The volcanic ash layer is considered a good time marker for correlating rocks because the volcanic ash layer

- A) has a dark color
- B) can be dated using carbon-14
- C) lacks fossils
- D) was rapidly deposited over a wide area

14. Which sedimentary rock shown in the outcrops is the youngest?

- A) black shale
- B) conglomerate
- C) tan siltstone
- D) brown sandstone

15. What is the youngest geologic feature in the three bottom layers of outcrop C?

- A) fault
- B) igneous intrusion
- C) unconformity
- D) zone of contact metamorphism

16. Which group of organisms has the shortest record of life on Earth?

- A) eurypterids
- B) graptolites
- C) birds
- D) placoderm fish

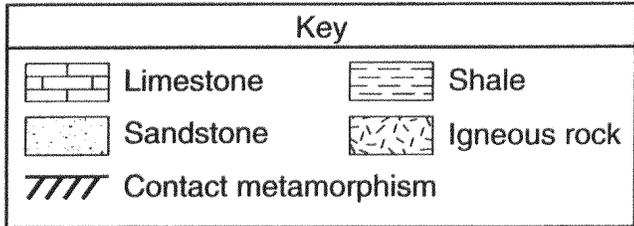
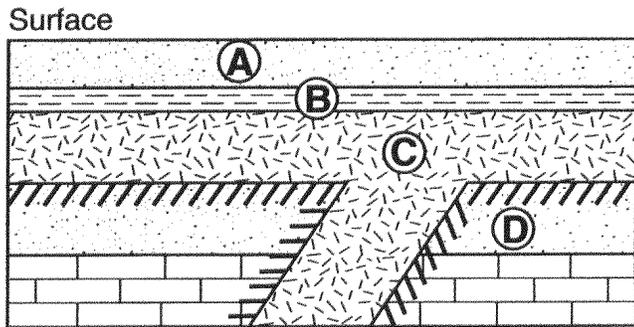
17. One reason *Tetragraptus* is considered a good index fossil is that *Tetragraptus*

- A) existed during a large part of the Paleozoic Era
- B) has no living relatives found on Earth today
- C) existed over a wide geographic area
- D) has been found in New York State

18. Why are radioactive substances useful for measuring geologic time?

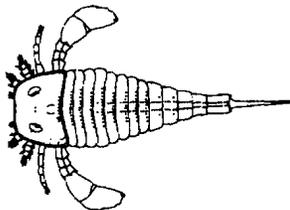
- A) The ratio of decay products to radioactive substances remains constant in rocks.
- B) The half-lives of radioactive substances are short.
- C) Samples of radioactive substances are easy to collect from rocks.
- D) Radioactive substances undergo decay at a predictable rate.

19. The diagram below shows a geologic cross section. Letters *A* through *D* represent different rock units.



Which sequence correctly shows the age of the lettered rock units, from oldest to youngest?

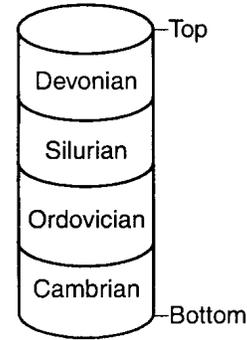
- A) A → B → C → D    B) C → D → A → B  
 C) D → B → A → C    D) D → C → B → A
20. The fossil shown below was found in the surface bedrock in New York State.



In which landscape region was this fossil most likely found?

- A) Adirondack Mountains  
 B) Erie-Ontario Lowlands  
 C) Hudson Highlands  
 D) Newark Lowlands
21. Earth's fossil record shows evidence that
- A) very few life-forms have become extinct  
 B) life-forms existed on land before life-forms existed in water  
 C) more complex life-forms probably have evolved from less complex life-forms  
 D) older bedrock contains a great variety of lifeforms, while younger bedrock contains less variety of life-forms

22. The diagram below represents bedrock of different ages beneath a location in New York State.

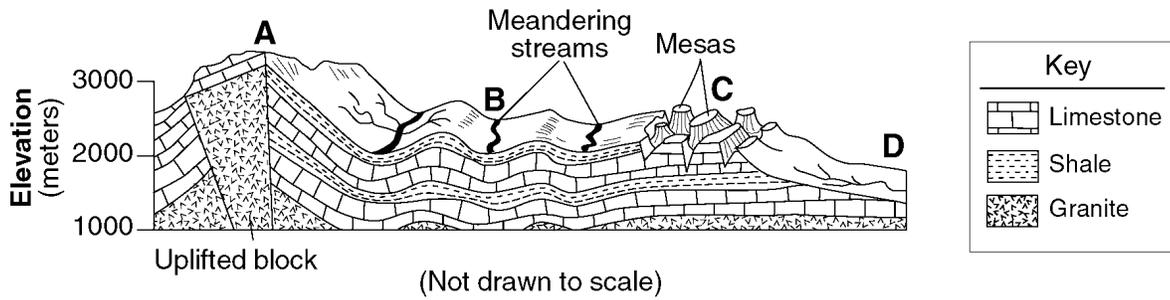


Assuming that the rock layers have not been overturned and that no unconformity exists, at which location is this bedrock found?

- A) Albany                      B) Elmira  
 C) Old Forge                 D) Oswego
23. Devonian-age fossils found in New York State bedrock, such as *Manticoceras* and *Mucrospirifer*, provide evidence that parts of New York State were once
- A) under a shallow sea containing tropical waters  
 B) higher in elevation and eroded extensively by glaciers  
 C) covered by extensive lava flows  
 D) impacted by comets and asteroids
24. Which geologic event occurred in New York State at approximately the same time that eurypterids were becoming extinct?
- A) the opening of the Atlantic Ocean  
 B) the uplift of the Appalachian Mountains  
 C) the formation of the Catskill Delta  
 D) the intrusion of the Palisades Sill
25. If 1 meter = 1 billion years is the scale for a geologic time line, approximately how many meters would represent the Paleozoic Era?
- A) 0.570 m                      B) 0.225 m  
 C) 0.345 m                      D) 0.450 m
26. During which two geologic time periods did most of the surface bedrock of the Taconic Mountains form?
- A) Cambrian and Ordovician  
 B) Silurian and Devonian  
 C) Pennsylvanian and Mississippian  
 D) Triassic and Jurassic

# Regents Review #9

Base your answers to questions 27 through 29 on the geologic cross section and the table below. The cross section represents the bedrock structure beneath four landscape regions, *A*, *B*, *C*, and *D*.



The table below shows characteristics of the four landscape regions *A*, *B*, *C*, and *D*.

Landscape Region	Relief	Bedrock
<i>A</i>	great relief, high peaks, deep valleys	faulted and tilted structure; many bedrock types, including igneous
<i>B</i>	moderate relief, rounded peaks, wide valleys	folded sedimentary bedrock
<i>C</i>	moderate to high relief	horizontal sedimentary bedrock layers
<i>D</i>	very little relief, low elevations	horizontal sedimentary bedrock layers

27. Which terms best describe the surface landscapes of *A*, *B*, *C*, and *D*?

- A) *A*—mountains, *B*—ridges and valleys, *C*—plateau, *D*—plain
- B) *A*—plateau, *B*—plain, *C*—mountains, *D*—ridges and valleys
- C) *A*—plain, *B*—mountains, *C*—plateau, *D*—plain
- D) *A*—ridges and valleys, *B*—plateau, *C*—plain, *D*—mountains

28. The meandering streams shown in landscape region *B* usually form where there are

- A) volcanic cones
- B) gentle gradients
- C) many fractures in the bedrock
- D) numerous escarpments

29. The sharp, angular flat-topped hills (mesas) in landscape region *C* were most likely produced by a climate that was

- A) tropical
- B) humid
- C) dry
- D) polar

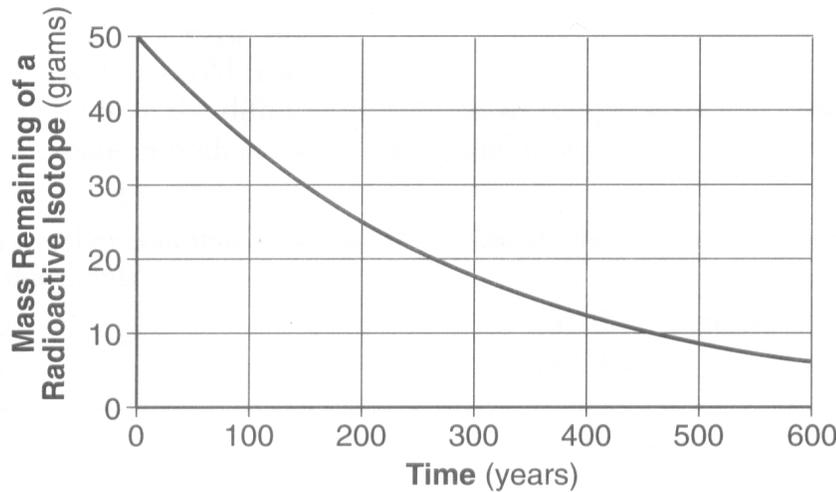
30. The division of Earth's geologic history into units of time called eons, eras, periods, and epochs is based on

- A) absolute dating techniques
- B) fossil evidence
- C) climatic changes
- D) seismic data

31. Evidence indicates that 251 million years ago a mass extinction of many life-forms occurred on Earth. Which form of life became extinct at this time?

- A) trilobites
- B) dinosaurs
- C) mammoths
- D) eurypterids

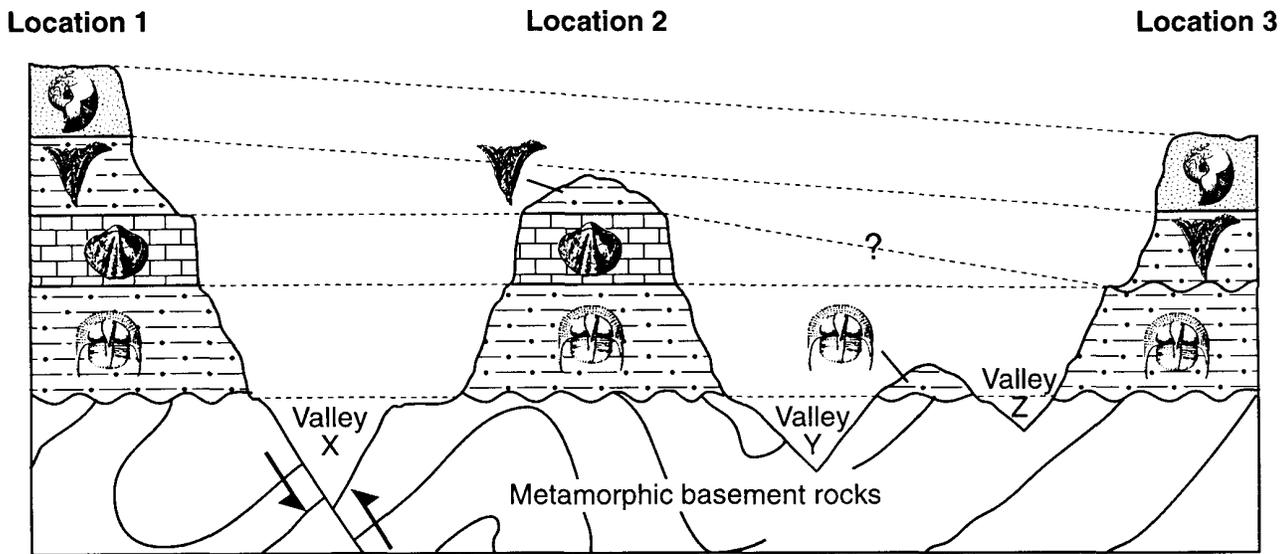
32. The graph below shows the radioactive decay of a 50-gram sample of a radioactive isotope.



According to the graph, what is the half-life of this isotope?

- A) 100 years      B) 150 years      C) 200 years      D) 300 years

33. Base your answer to the following question on the geologic cross section below, which shows a view of rock layers at Earth's surface. The dashed lines connect points of the same age. Major fossils contained within each rock layer are shown. The valleys are labeled X, Y, and Z.



Which fossil would most likely be found in the same siltstone layer as the *Cryptolithus* fossil?

- A)       B)       C)       D) 

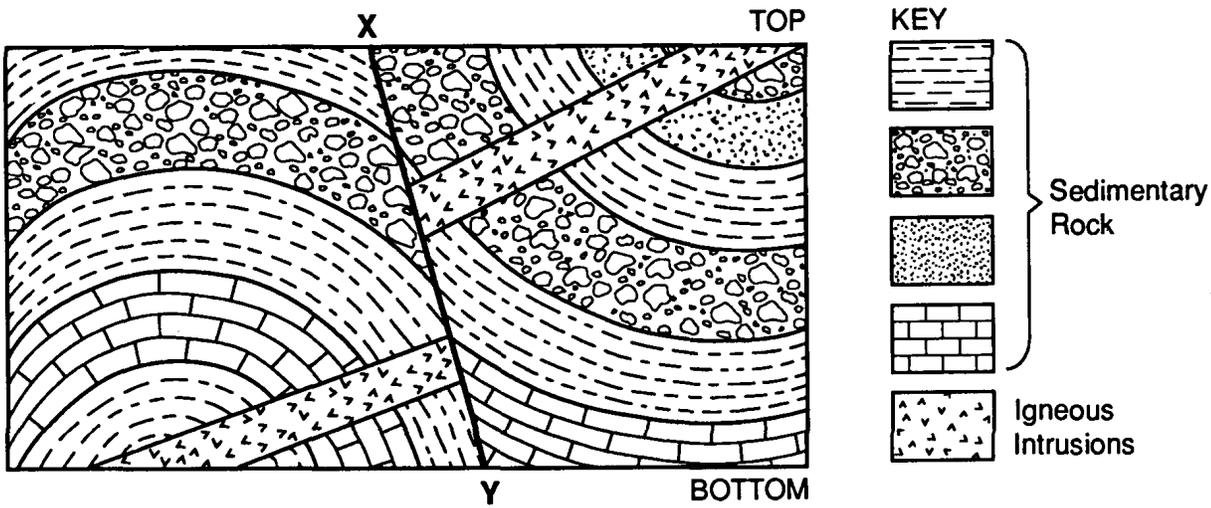
34. Trilobite fossils were recently discovered in Himalayan Mountain bedrock. During which geologic period could these organisms have lived?

- A) Neogene      B) Cretaceous  
C) Triassic      D) Cambrian

35. The best indicator of an area's ancient environmental conditions and climates would be the

- A) type and distribution of fossils  
B) present plant and animal life  
C) banding patterns of metamorphosed rocks  
D) amount of carbon-14 found in sedimentary layers

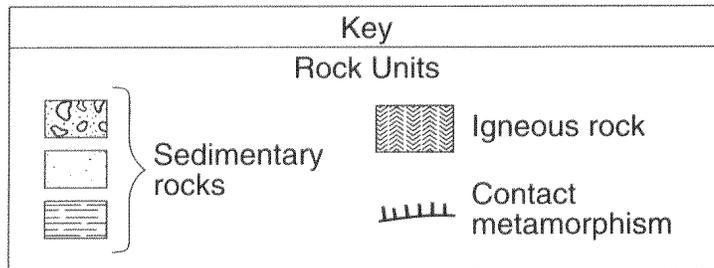
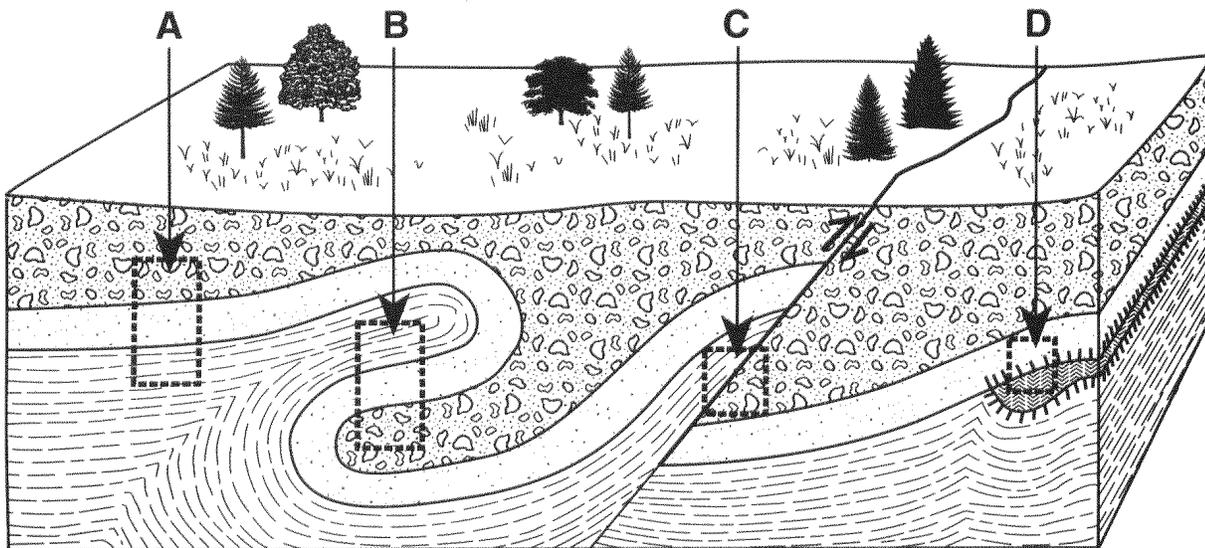
36. The diagram below shows a cross section of the Earth's crust. Line *XY* is a fault.



Which sequence of events, from oldest to youngest, has occurred in this outcrop?

- A) formation of sedimentary layers → igneous intrusion → folding of layers → faulting
- B) igneous intrusion → formation of sedimentary layers → folding of layers → faulting
- C) igneous intrusion → faulting → formation of sedimentary layers → folding of layers
- D) formation of sedimentary layers → folding of layers → igneous intrusion → faulting

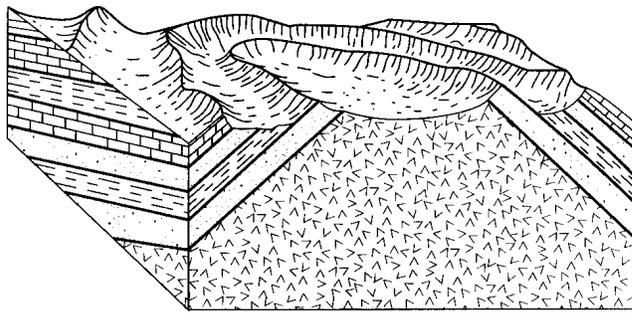
37. The block diagram below of a portion of Earth's crust shows four zones labeled *A*, *B*, *C*, and *D* outlined with dashed lines.



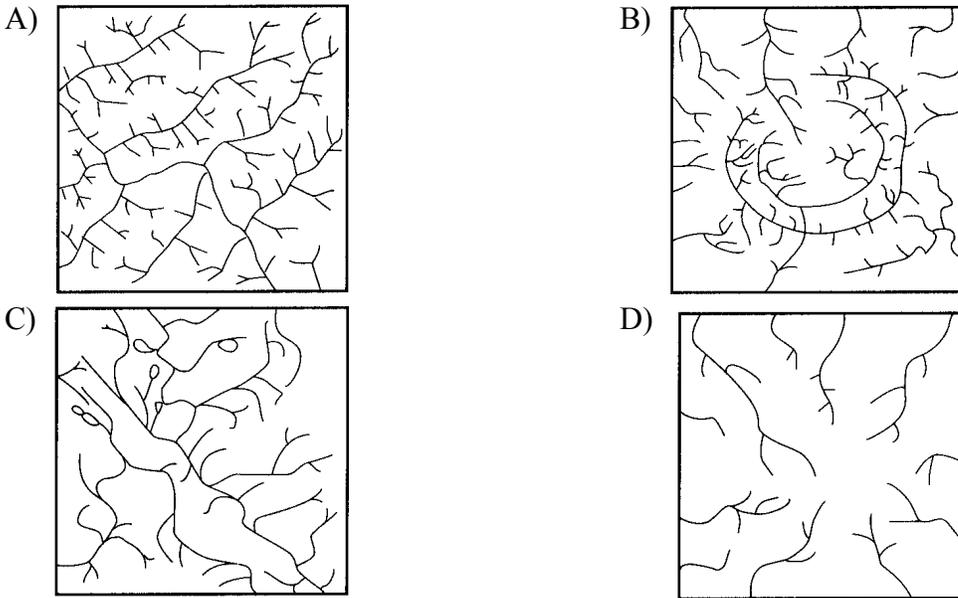
In which zone is a younger rock unit on top of an older rock unit?

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

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

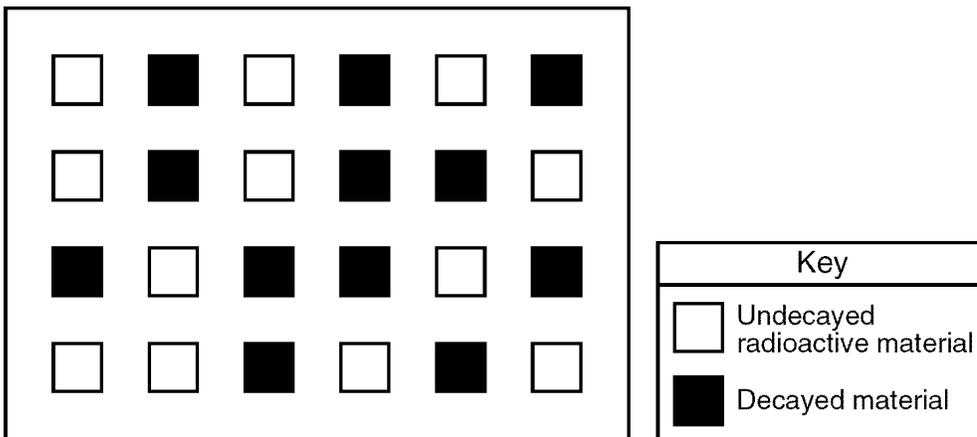


Which map shows the stream drainage pattern that would most likely develop on this deeply eroded dome?



Base your answers to questions 39 and 40 on the diagram below, which represents a model of a radioactive sample with a half-life of 5000 years. The white boxes represent undecayed radioactive material and the shaded boxes represent the decayed material after the first half-life.

**Radioactive Sample After First Half-Life**



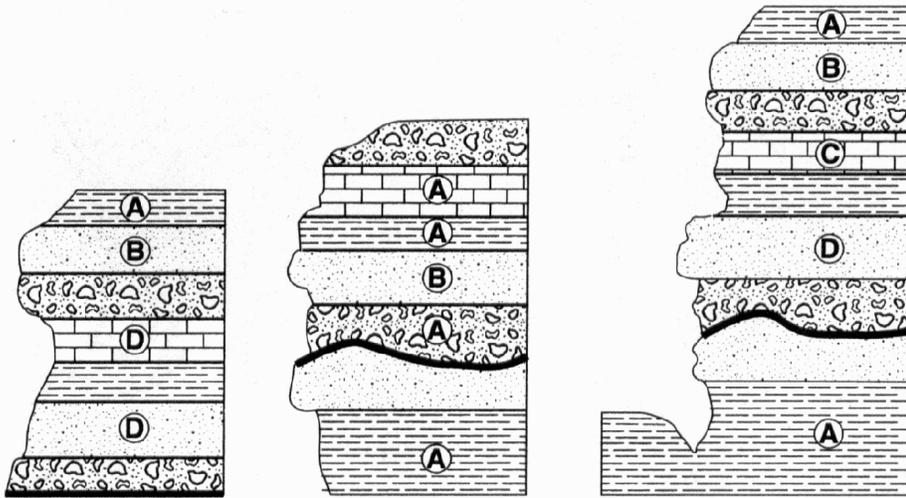
39. Which radioactive isotope has a half-life closest in duration to this radioactive sample?

- A) carbon-14      B) potassium-40      C) uranium-238      D) rubidium-87

40. How many *more* boxes should be shaded to represent the additional decayed material formed during the second half-life?

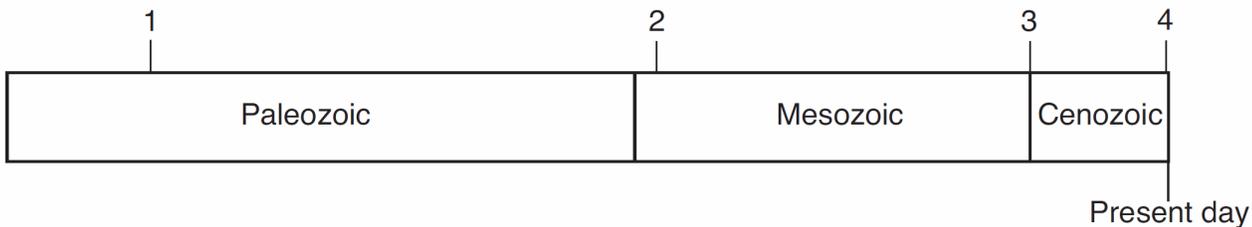
- A) 12      B) 6      C) 3      D) 0

41. The cross sections below represent three widely separated outcrops of exposed bedrock. Letters *A*, *B*, *C* and *D* represent fossils found in the rock layers.



Which fossil appears to have the best characteristics of an index fossil?

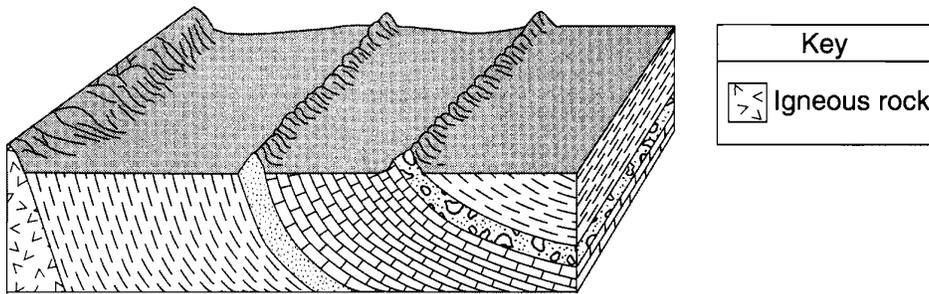
- A) *A*                      B) *B*                      C) *C*                      D) *D*
42. The geologic time line below represents the three most recent geologic eras. The numbers represent events in Earth's history.



Which number best represents when humans are inferred to have first appeared on Earth?

- A) 1                      B) 2                      C) 3                      D) 4
43. Large craters found on Earth support the hypothesis that impact events have caused
- A) a decrease in the number of earthquakes and an increase in sea level
- B) an increase in solar radiation and a decrease in Earth radiation
- C) the red shift of light from distant stars and the blue shift of light from nearby stars
- D) mass extinctions of life-forms and global climate changes
44. The presence of which index fossil in the surface bedrock most likely indicates that a forest environment once existed in the region?
- A) *Aneurophyton*                      B) *Cystiphyllum*
- C) *Centroceras*                      D) *Bothriolepis*
45. The characteristic of the radioactive isotope uranium-238 that makes this isotope useful for accurately dating the age of a rock is the isotope's
- A) organic origin
- B) constant half-life
- C) common occurrence in sediments
- D) resistance to weathering and erosion
46. Which two locations are found in the same major geographic landscape province?
- A) Albany and Old Forge
- B) Elmira and Riverhead
- C) Jamestown and Slide Mountain
- D) Massena and Mount Marcy

47. The block diagram below shows a landscape region.



Key	
	Igneous rock

Which stream drainage pattern would most likely develop at the surface of this region?

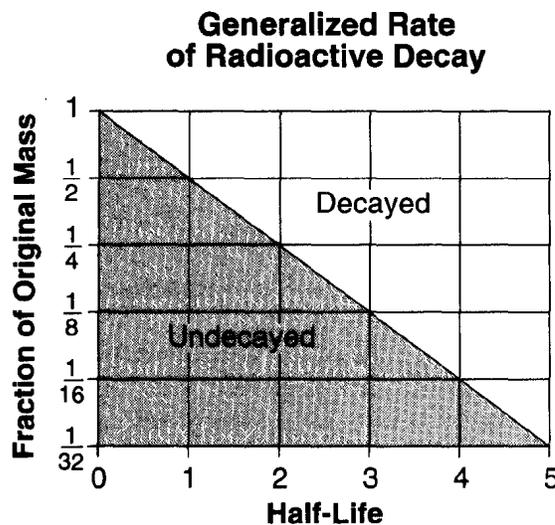
A)

B)

C)

D)

Base your answers to questions 48 and 49 on the graph below, which shows the generalized rate of decay of radioactive isotopes over 5 half-lives.



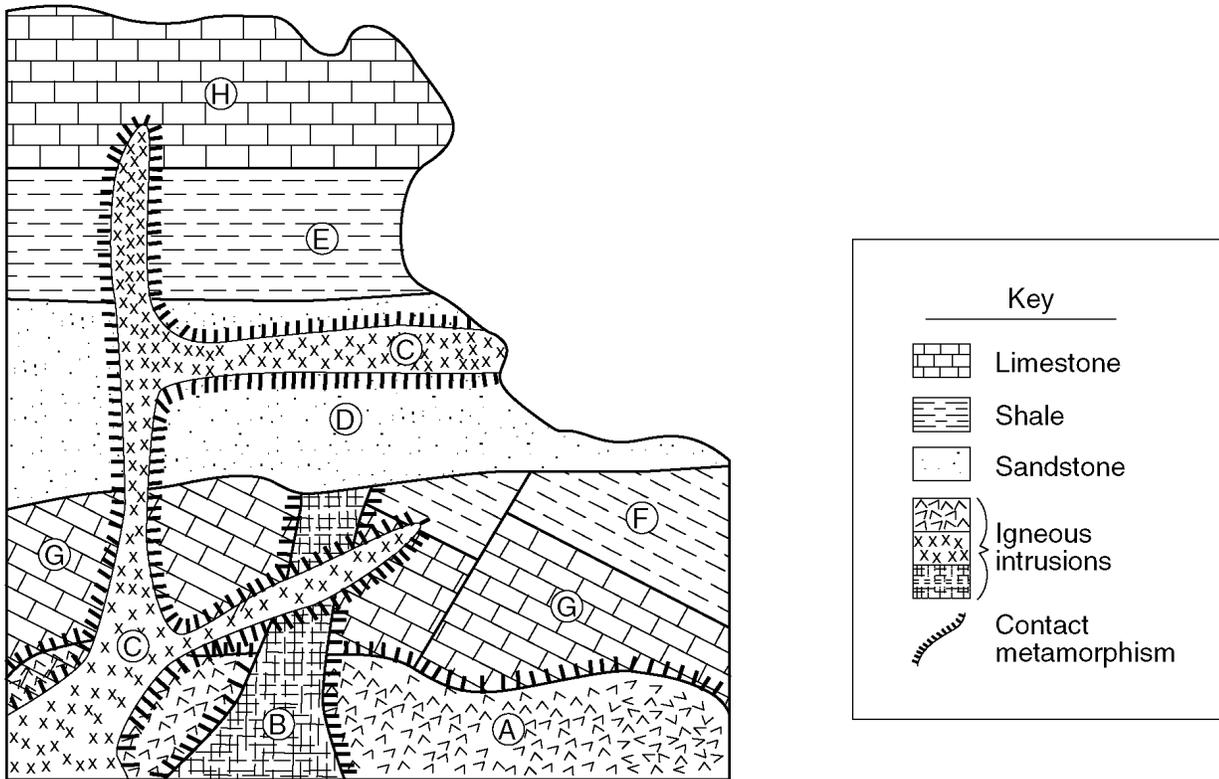
48. If the original mass of a radioactive isotope was 24 grams, how many grams would remain after 3 half-lives?

- A) 12                      B) 24                      C) 3                      D) 6

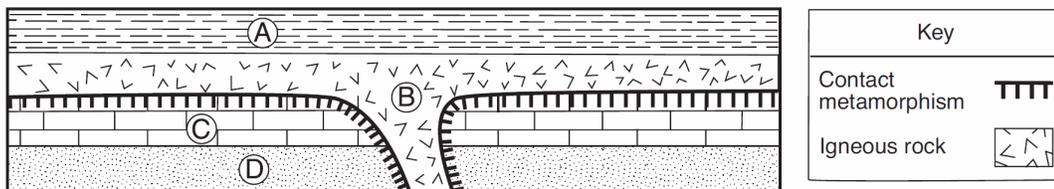
49. Which radioactive isotope takes the greatest amount of time to undergo the change shown on the graph?

- A) carbon-14              B) potassium-40              C) uranium-238              D) rubidium-87

Base your answers to questions 50 and 51 on the diagram below, which shows a cross section of Earth's crust.



50. The most apparent buried erosional surface is found between rock units  
 A) *A* and *B*      B) *C* and *D*      C) *D* and *F*      D) *E* and *H*
51. Which statement gives an accurate age relationship for the bedrock in the cross section?  
 A) Intrusion *A* is younger than intrusion *C*.      B) Intrusion *C* is younger than intrusion *B*.  
 C) Intrusion *B* is older than intrusion *A*.      D) Intrusion *C* is older than layer *E*.
- 
52. The cross section below shows four rock units, *A*, *B*, *C*, and *D*.



Which rock unit is youngest in age?

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

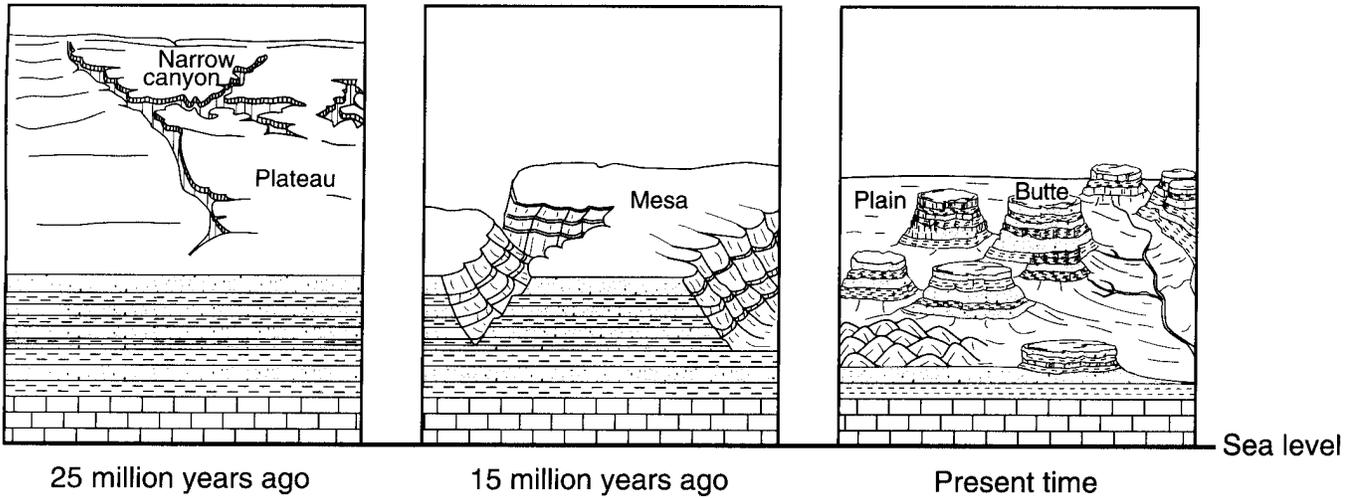
53. Which two landscape regions in New York State have the oldest surface bedrock?

- A) Allegheny Plateau and Newark Lowlands  
 B) Tug Hill Plateau and Erie-Ontario Lowlands  
 C) Taconic Mountains and the Catskills  
 D) Adirondack Mountains and Hudson Highlands

54. A whalebone that originally contained 200 grams of radioactive carbon-14 now contains 25 grams of carbon-14. How many carbon-14 half-lives have passed since this whale was alive?

- A) 1      B) 2      C) 3      D) 4

55. The sequence of bedrock cross sections below represents the same landscape region over a period of geologic time.



This sequence best represents

- A) an arid region that experienced mostly uplifting forces
- B) an arid region that experienced mostly erosional forces
- C) a humid region that experienced mostly uplifting forces
- D) a humid region that experienced mostly erosional forces

56. The table below gives information about the radioactive decay of carbon-14. Part of the table has been deliberately left blank for student use.

Half-life	Mass of Original Carbon-14 Remaining (grams)	Number of Years
0	1	0
1	$\frac{1}{2}$	5,700
2	$\frac{1}{4}$	11,400
3	$\frac{1}{8}$	17,100
4	$\frac{1}{16}$	
5		
6		
7		

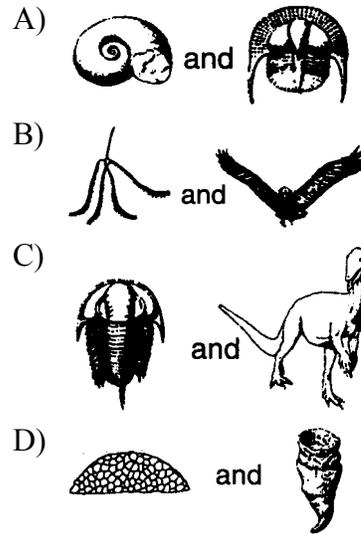
After how many years will  $\frac{1}{128}$  gram of the original carbon-14 remain?

- A) 22,800 yr
- B) 28,500 yr
- C) 34,200 yr
- D) 39,900 yr

57. Which geologic event occurred most recently in New York State?

- A) A continental glacier covered most of the State.
- B) The entire State was uplifted from below sea level.
- C) The Palisades Sill intruded.
- D) The Taconic Mountains formed.

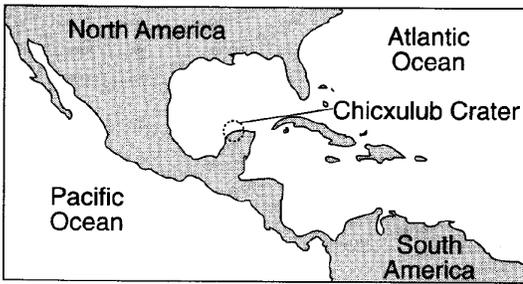
58. Which pair of index fossils can be found in Ordovician bedrock?



59. Which statement is best supported by the fossil record?

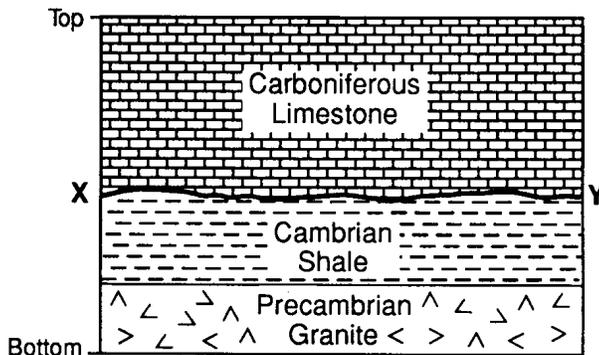
- A) Fossils are found in nearly all rocks.
- B) Fossils are found only in areas that were once under water.
- C) Most early life-forms that left fossil remains are now extinct.
- D) Most early life-forms that left fossil remains still exist today.

60. The map below shows the location of Chicxulub Crater created 65.5 million years ago by an asteroid impact.



This impact event occurred at the same time as the

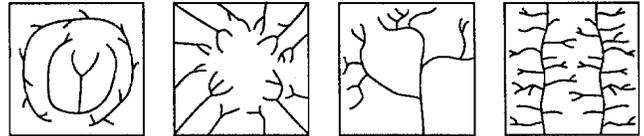
- A) extinction of the dinosaurs  
 B) initial opening of the Atlantic Ocean  
 C) formation of the Catskill Delta  
 D) evolution of the first mammals
61. Which statement best explains why no Permian age bedrock is found in New York State?
- A) The extinction of many life-forms occurred at the end of the Permian Period.  
 B) Only rocks of igneous origin formed in New York State during the Permian Period.  
 C) Permian-age rocks have been metamorphosed and cannot be identified.  
 D) Permian-age rocks were either eroded away or never formed in New York State.
62. The diagram below shows a cross-sectional view of part of the Earth's crust.



What does the unconformity (buried erosional surface) at line *XY* represent?

- A) an area of contact metamorphism  
 B) a time gap in the rock record of the area  
 C) proof that no deposition occurred between the Cambrian and Carboniferous periods  
 D) overturning of the Cambrian and Carboniferous rock layers

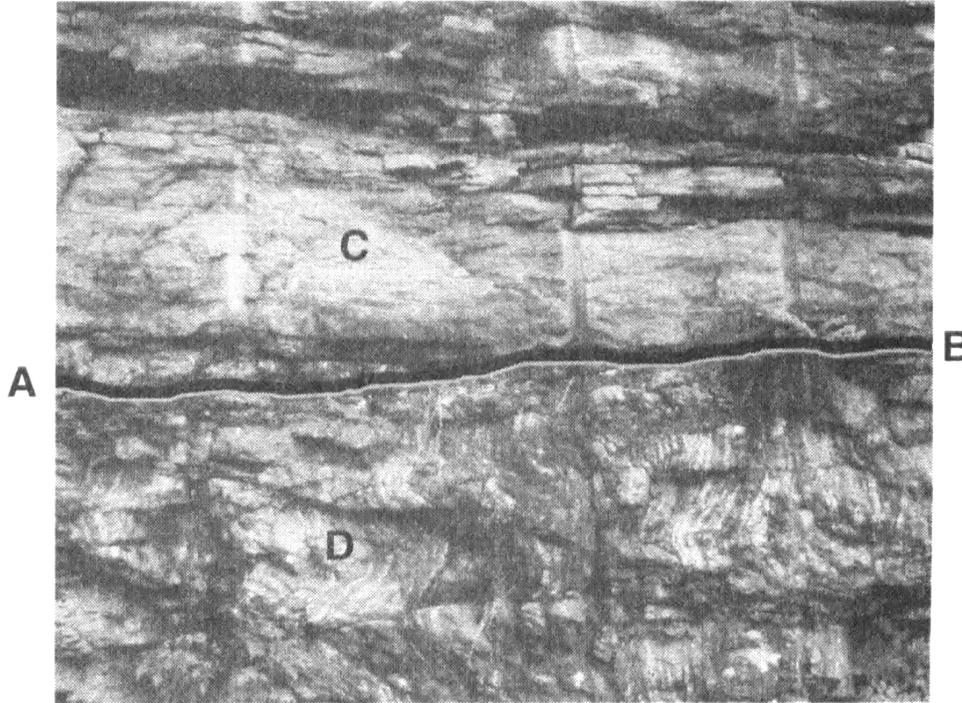
63. The maps below represent four different stream drainage patterns.



Which factor most likely caused the differences in these patterns?

- A) time  
 B) climate  
 C) human activities  
 D) bedrock structure
64. What elevation and bedrock structure are generally found in the Catskills?
- A) low elevation and horizontal sedimentary bedrock structure  
 B) high elevation and horizontal sedimentary bedrock structure  
 C) low elevation and folded metamorphic bedrock structure  
 D) high elevation and folded metamorphic bedrock structure
65. Which is the most probable reason that few Precambrian fossils are found today?
- A) Precambrian organisms had few, if any, hard parts.  
 B) No life existed during the Precambrian Era.  
 C) Precambrian fossils are abundant but not readily observable.  
 D) No sedimentary rocks were formed during the Precambrian Era.
66. A rock contains uranium-238, which has a half-life of  $4.5 \times 10^9$  years. If the rock is crushed and heated, the half-life of the uranium-238 it contains will
- A) decrease  
 B) increase  
 C) remain the same
67. The presence of eurypterid fossils in New York State bedrock indicates that
- A) eurypterids lived in land environments  
 B) eurypterids first appeared on Earth during the Devonian Period  
 C) most of New York State was once a mountainous region  
 D) areas of New York State were once covered with shallow seas

68. Base your answer to the following question on the photograph below, which shows a bedrock outcrop. Line *AB* is an unconformity between sandstone *C* and metamorphic rock *D*.



After the metamorphism of rock *D*, which sequence of events most probably formed unconformity *AB*?

- A) flooding → deposition → erosion → uplift
- B) uplift → erosion → flooding → deposition
- C) deposition → flooding → uplift → erosion
- D) erosion → flooding → uplift → deposition

Base your answers to questions 69 and 70 on the passage below.

### Fossils and the History of Earth's Rotation

Data from coral fossils support the hypothesis that Earth's rotation rate has been slowing down by about 2.5 seconds per 100,000 years. Scientists believe this is due to the frictional effects of ocean tides. This slowing rotation rate decreases the number of days in the year.

Scientists have discovered that corals produce a thin layer of shell every day, resulting in growth rings. These daily layers are separated by yearly ridges.

The Devonian coral fossil, *Pleurodictyum*, has approximately 400 growth rings between each yearly ridge, which suggests that there were about 400 days in a year during the Devonian Period.

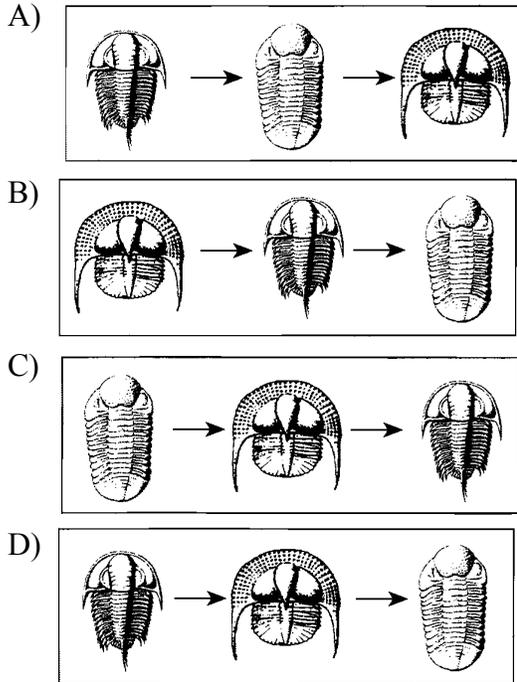
Supporting this hypothesis, scientists have found coral from the Pennsylvanian Period that have about 390 growth rings per year, while present-day corals have about 365 growth rings per year.

69. What inference can be made about the number of growth rings per year for a coral from the Permian Period and Ordovician Period compared to the number of growth rings per year for the Devonian coral, *Pleurodictyum*?
- A) Ordovician coral would have fewer, but Permian coral would have more.
  - B) Ordovician coral would have more, but Permian coral would have fewer.
  - C) Both Ordovician and Permian coral would have fewer.
  - D) Both Ordovician and Permian coral would have more.

70. Approximately how many fewer Earth days per year are there today than there were during the Devonian Period?

- A) 10                      B) 25                      C) 35                      D) 40

71. Which fossil sequence is in order from oldest to youngest?



72. According to available fossil evidence, which set of events is listed in the correct order from earliest to most recent?

- A) extinction of trilobites, extinction of armored fishes, extinction of dinosaurs  
 B) appearance of first corals, appearance of earliest insects, appearance of earliest reptiles  
 C) decline of brachiopods, appearance of earliest amphibians, appearance of earliest grasses  
 D) peak development of eurypterids, appearance of earliest birds, appearance of earliest chordates

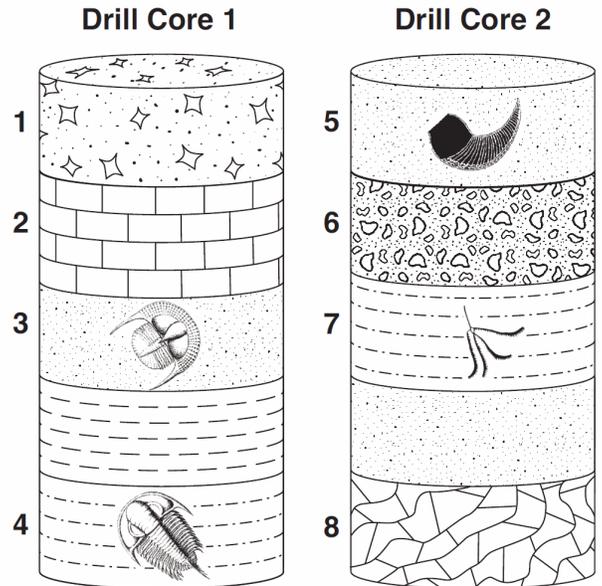
73. Which group of organisms, some of which were preserved as fossils in early Paleozoic rocks, are still in existence today?

- A) brachiopods                      B) eurypterids  
 C) graptolites                      D) trilobites

74. Which change is most likely to occur in a landscape region that is uplifted rapidly by folding?

- A) The climate will become warmer.  
 B) The stream drainage patterns will change.  
 C) The composition of the bedrock will change.  
 D) The hillslopes will become less steep.

75. The drill-core samples below were taken from two locations 1000 kilometers apart. Rock layers 1 through 8 have been labeled. Some index fossils are shown in the layers.



Which numbered layers most likely formed at the same time?

- A) 1 and 6                      B) 2 and 8  
 C) 3 and 5                      D) 4 and 7

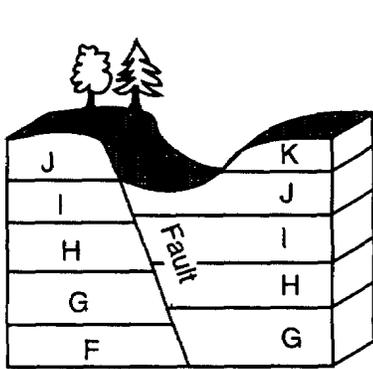
76. An environmental scientist needs to prepare a report on the potential effects that a proposed surface mine in New York State will have on the watershed where the mine will be located. In which reference materials will the scientist find the most useful data with which to determine the watershed's boundaries?

- A) topographic maps  
 B) geologic time scales  
 C) tectonic plate maps  
 D) planetary wind maps

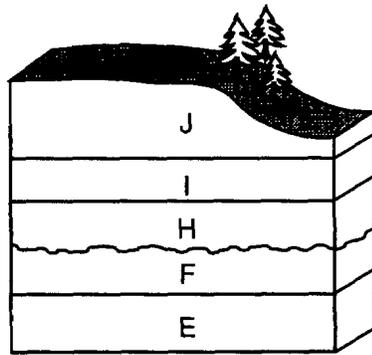
77. Which New York landscape region is composed primarily of Cretaceous through Pleistocene unconsolidated sediments?

- A) Champlain Lowlands  
 B) Erie-Ontario Lowlands  
 C) Hudson-Mohawk Lowlands  
 D) Atlantic Coastal Lowlands

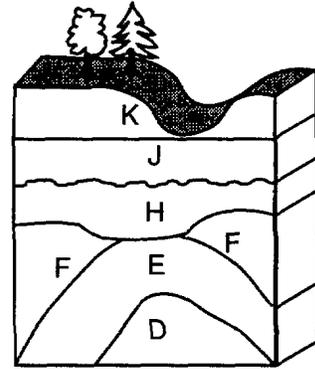
Base your answers to questions 78 through 82 on the block diagrams below, which represent three widely separated outcrops. All rock layers are sedimentary. No overturning has occurred. Layers labeled with the same letter are the same age.



Evansburg  
Outcrop



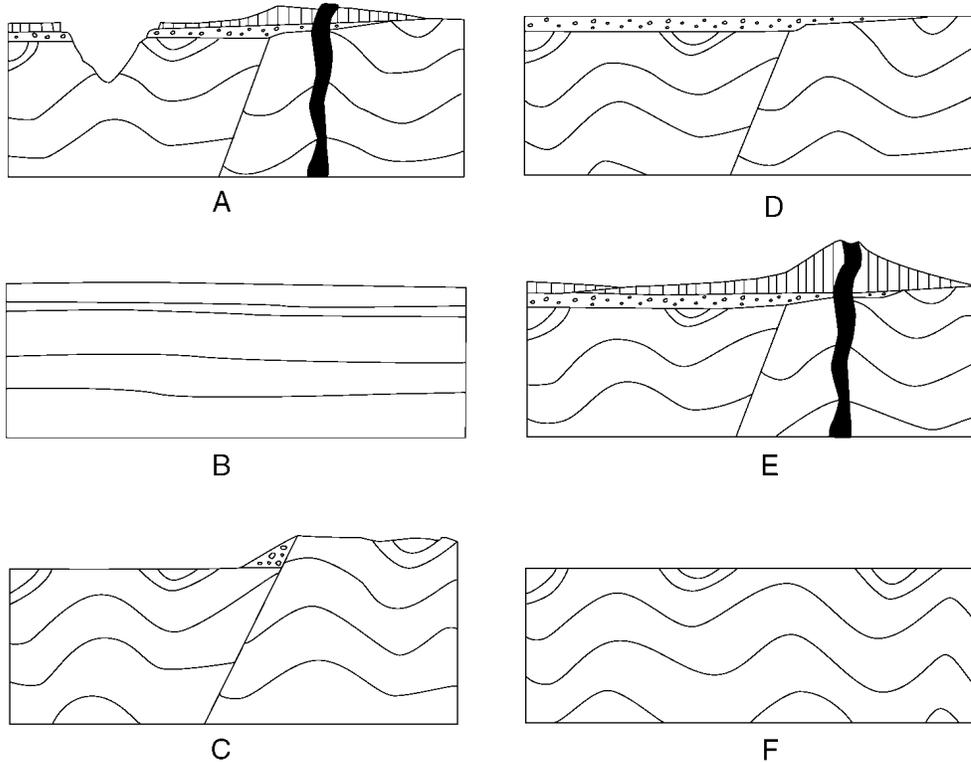
Smithtown  
Outcrop



Hiltonia  
Outcrop

78. Layer *I* is of Permian age. Which fossil could be found in layer *H*?
- A) early flowering plant  
B) early human  
C) early reptile  
D) early dinosaur
79. Which geologic process that affected layer *F* happened first?
- A) deposition of the sediments in layer *F*  
B) erosion of the surface of layer *F*  
C) folding of layer *F*  
D) faulting of layer *F*
80. Which order of events occurred at the Hiltonia Outcrop between the formation of layer *F* and the beginning of the deposition of layer *H*?
- A) uplift → erosion → faulting → deposition  
B) folding → uplift → erosion → subsidence  
C) subsidence → erosion → deposition → faulting  
D) folding → erosion → faulting
81. The fault in the Evansburg Outcrop is younger than
- A) *G*, only  
B) *J*, only  
C) *G* and *J*, only  
D) *F*, *G*, *H*, *I*, and *J*
82. Which method would provide the most reliable evidence for the idea that layer *J* was deposited at the same time in each location?
- A) measuring the percentage of the mineral cement in each *J* layer  
B) measuring the thickness of each *J* layer  
C) comparing the mineral composition of each *J* layer  
D) comparing the fossils in each *J* layer
- 
83. The gases in Earth's early atmosphere are inferred to have come primarily from
- A) meteor showers  
B) melting of glacial ice  
C) volcanic eruptions  
D) evaporation of seawater
84. In which New York State landscape region have fossilized footprints of *Coelophysis* dinosaurs been found in the surface bedrock?
- A) Allegheny Plateau  
B) Tug Hill Plateau  
C) Hudson-Mohawk Lowlands  
D) Newark Lowlands

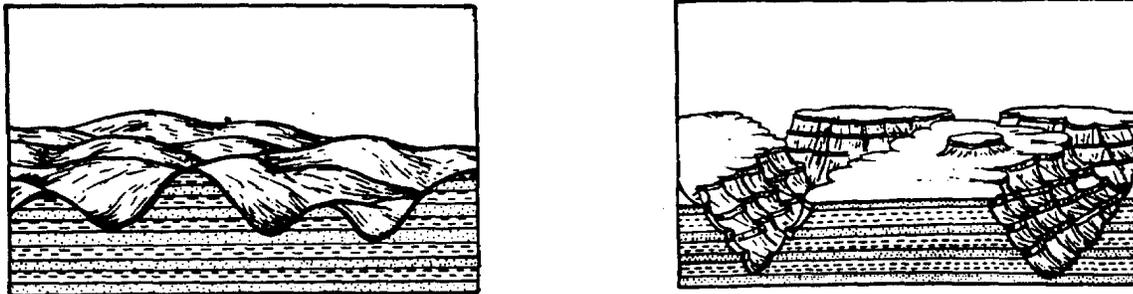
85. Geologic cross sections *A* through *F* shown below represent different stages in the development of one part of Earth's crust over a long period of geologic time.



What is the correct order of development from the original (oldest) stage to the most recent (youngest) stage?

- A) *B – D – C – F – A – E*
- B) *B – F – C – D – E – A*
- C) *E – A – D – F – C – B*
- D) *E – A – F – C – D – B*

86. The diagrams below represent two different plateaus.



Which factor was probably most important in causing one plateau to develop smooth, rounded surface features and the other plateau to develop sharp, angular surface features?

- A) type of bedrock
- B) amount of folding
- C) time
- D) climate

87. The largest meteorite impact crater in North America formed approximately 1,850 million years ago, which was during the

- A) Middle Archean Era
- B) Early Proterozoic Era
- C) Early Jurassic Period
- D) Late Cretaceous Period

88. Which event occurred earliest in geologic history?

- A) appearance of the earliest grasses
- B) appearance of the earliest birds
- C) the Grenville Orogeny
- D) the intrusion of the Palisades Sill

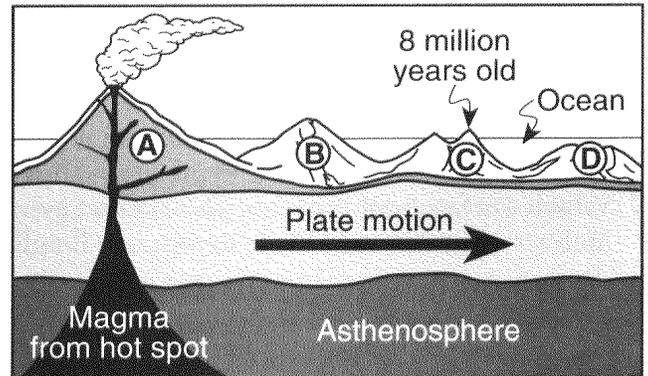
89. The cartoon below represents the time of the last dinosaurs and the earliest mammals.



The cartoon could represent the boundary between which two units of geologic history?

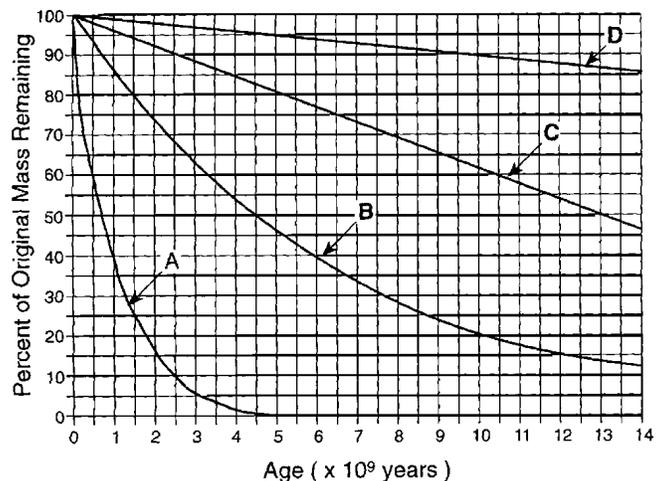
- A) Archean and Proterozoic
  - B) Precambrian and Paleozoic
  - C) Ordovician and Silurian
  - D) Mesozoic and Cenozoic
90. Which type of surface bedrock is commonly found in New York State between Elmira and Ithaca?
- A) granite
  - B) quartzite
  - C) shale
  - D) marble
91. Organisms that later became good index fossils lived over a
- A) wide geographic area and existed for a long geologic time
  - B) wide geographic area and existed for a short geologic time
  - C) limited geographic area and existed for a long geologic time
  - D) limited geographic area and existed for a short geologic time

92. The cross section below shows the direction of movement of an oceanic plate over a mantle hot spot, resulting in the formation of a chain of volcanoes labeled A, B, C, and D. The geologic age of volcano C is shown.



What are the most likely geologic ages of volcanoes B and D?

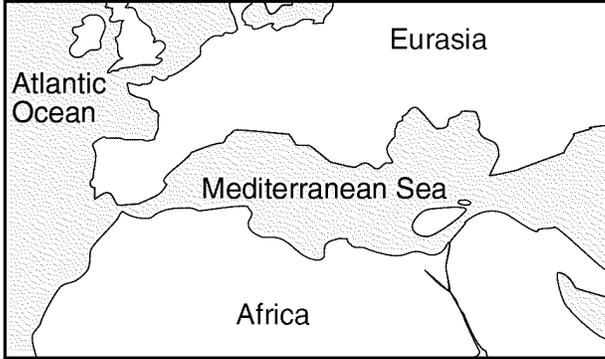
- A) B is 5 million years old and D is 12 million years old.
  - B) B is 2 million years old and D is 6 million years old.
  - C) B is 9 million years old and D is 9 million years old.
  - D) B is 10 million years old and D is 4 million years old.
93. Base your answer to the following question on the graph below which shows the decay rates of four radioactive substances, A, B, C, and D.



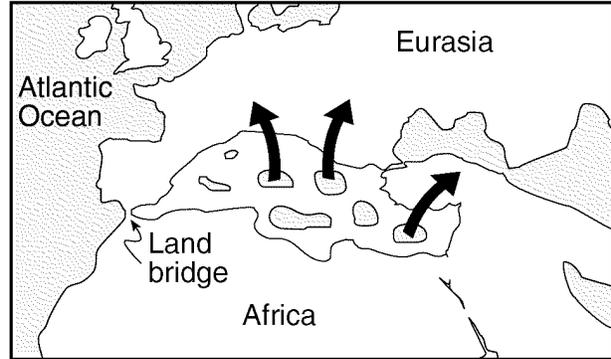
The half-life of these radioactive substances depends on the

- A) pressure acting on the material
- B) amount of the material
- C) temperature of the material
- D) composition of the material

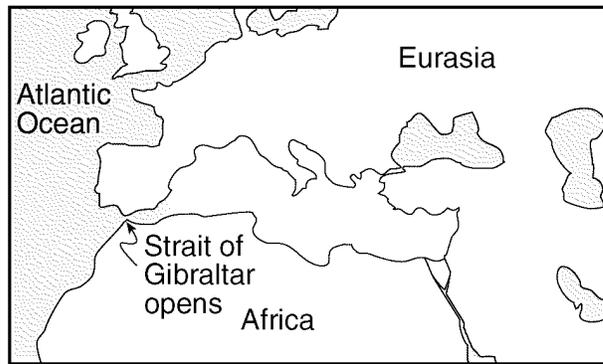
94. Base your answer to the following question on the maps below, which show changes in the distribution of land and water in the Mediterranean Sea region that scientists believe took place over a period of 6 million years.



**About 10 Million Years Ago**



**About 8 to 5.5 Million Years Ago  
Evaporation from Mediterranean Sea**



**About 4 Million Years Ago  
Mediterranean Sea Refills  
with Atlantic Ocean Water**

During which geologic time period did the changes shown in the maps take place?

- A) Cambrian      B) Cretaceous      C) Permian      D) Neogene

95. Which geologic event is associated with the Grenville Orogeny?

- A) the formation of the ancestral Adirondack Mountains  
 B) the advance and retreat of the last continental ice sheet  
 C) the separation of South America from Africa  
 D) the initial opening of the Atlantic Ocean

96. Chemical evaporite bedrock is found approximately 20 kilometers south of Rochester, New York. This bedrock most likely formed during which geologic time interval?

- A) Silurian Period  
 B) Devonian Period  
 C) Pleistocene Epoch  
 D) Pennsylvanian Epoch

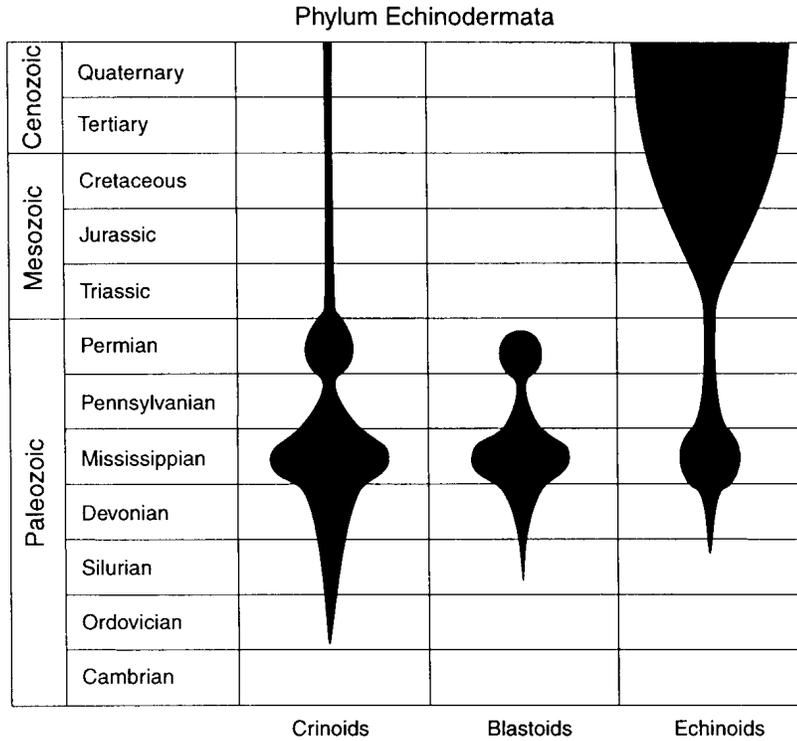
97. Which event occurred at the time of the Alleghenian Orogeny?

- A) the extinction of many kinds of marine animals  
 B) the extinction of many kinds of land animals  
 C) the development of primitive aquatic plants  
 D) the development of birds and mammals

98. Which rock is most likely the oldest?

- A) conglomerate containing the tusk of a mastodont  
 B) shale containing trilobite fossils  
 C) sandstone containing fossils of flowering plants  
 D) siltstone containing dinosaur footprints

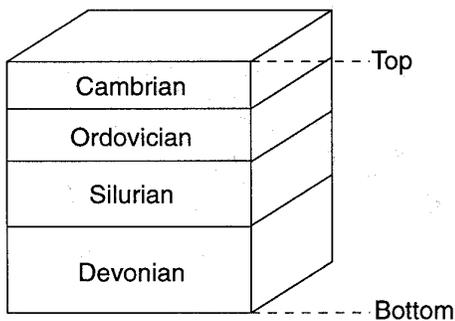
99. The diagram below shows the abundance of organisms called crinoids, blastoids, and echinoids throughout different geologic periods. The number of species living at any given time is represented by the width of the blackened areas.



Which statement about crinoids, blastoids, and echinoids is best supported by the diagram?

- A) They are now extinct.
- B) They came into existence during the same geologic period.
- C) They existed during the Devonian Period.
- D) They have steadily increased in number since they first appeared.

100. The diagram below represents a cross section of a series of rock layers of different geologic ages.



Which statement provides the best explanation for the order of these rock layers?

- A) The oldest layer is on the bottom.
- B) A buried erosional surface exists between layers.
- C) The layers have been overturned.
- D) The Permian layer has been totally eroded.