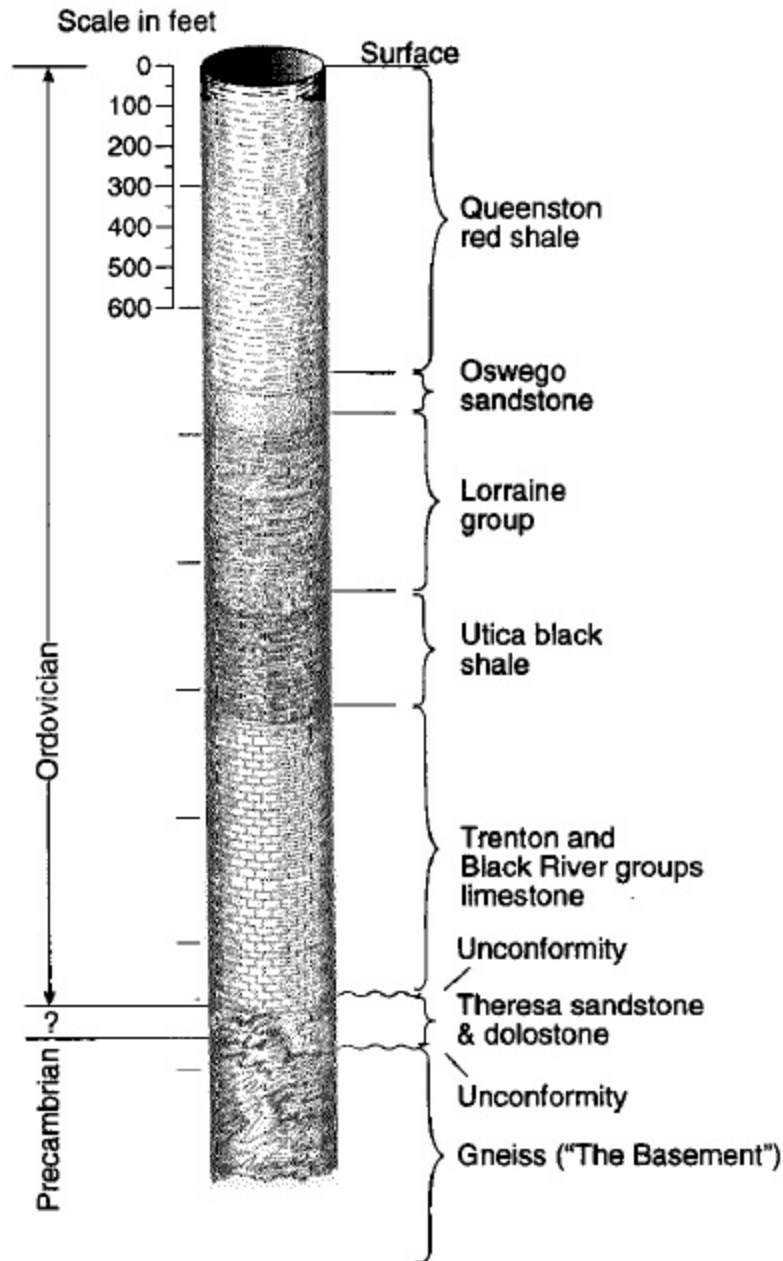


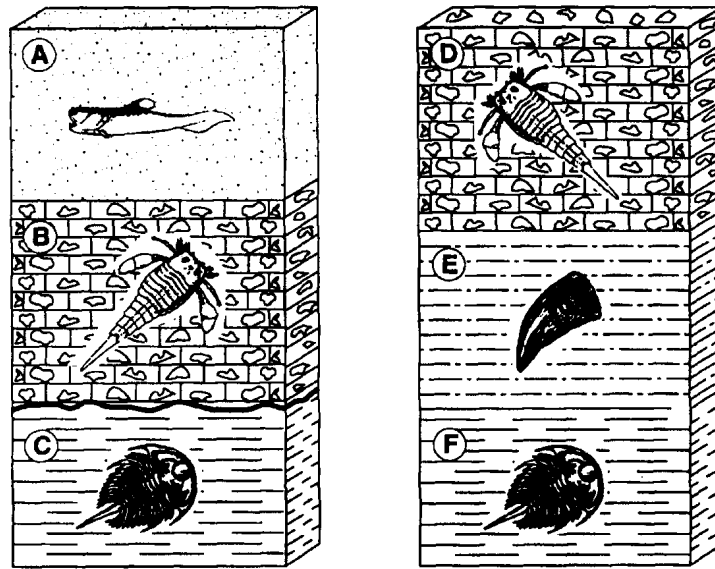
1. Base your answer to the following question on the Earth Science Reference Tables, the core section below, and your knowledge of Earth Science. The core section shows the subsurface bedrock geology for a location north of Buffalo, New York.



Which rock type is found at a depth of 1,800 feet at this location?

- A) Oswego sandstone  
B) "Basement" gneiss  
C) Trenton limestone  
D) Theresa sandstone

Base your answers to questions 2 through 6 on the diagrams below which represent two rock outcrops found several miles apart in New York State. Individual rock layers are lettered, and fossils and rock types are indicated.



2. According to the "Scheme for Sedimentary Rock Identification" in the Earth Science Reference Tables, which rock layer was formed mainly from organically formed sediments in seawater?
 

A) *A*                      **B) *B***                      C) *E*                      D) *F*
3. Based on the given rock and fossil which two letters most likely indicate parts of the same layer?
 

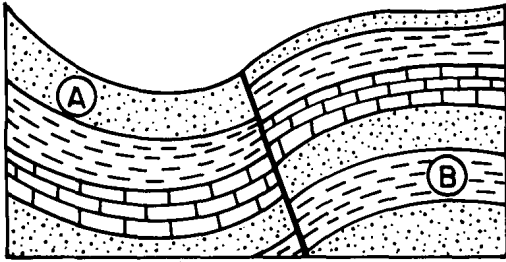
A) *A* and *F*                      **B) *B* and *D***                      C) *C* and *E*                      D) *D* and *A*
4. Which processes were directly involved in the formation of these rock layers?
 

A) melting and solidification                      B) heating and pressure  
**C) compaction and cementation**                      D) conduction and convection
5. An unconformity (buried erosional surface) is represented by the interface between which two layers?
 

A) *A* and *B*                      **B) *B* and *C***                      C) *D* and *E*                      D) *E* and *F*
6. In which sequence are the rock layers listed in order from oldest to youngest?
 

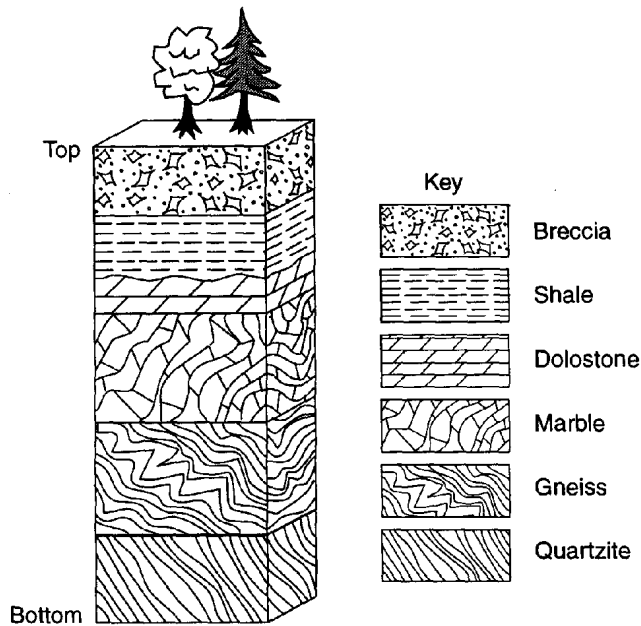
A) *F, B, E, D*                      B) *C, A, F, D*                      C) *F, E, C, A*                      **D) *C, E, D, A***

7. The diagram below represents a cross section of a portion of the Earth's crust where no overturning of the rock layers has occurred. Two rock layers are labeled *A* and *B*.



Which statement describes the most likely sequence of events?

- A) **Deposition occurred before folding or faulting.**  
 B) Faulting occurred before folding of the rock layers.  
 C) Faulting occurred before the formation of rock layer *A*.  
 D) Folding occurred before the formation of rock layer *B*.
8. Base your answer to the following question on the diagram below, which represents a cross section of rock layers that have not been overturned.



If the breccia layer formed during the Carboniferous Period, the shale layer below it could have formed during which geologic time period?

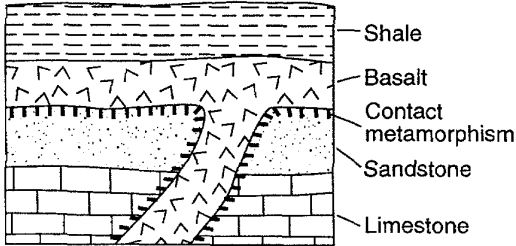
- A) Cretaceous      B) Triassic      C) Permian      **D) Carboniferous**

9. Which feature of a sandstone rock layer usually is the youngest?

- A) sand grains that make up the rock
- B) cement that binds the sand grains together
- C) fossils found in the rock

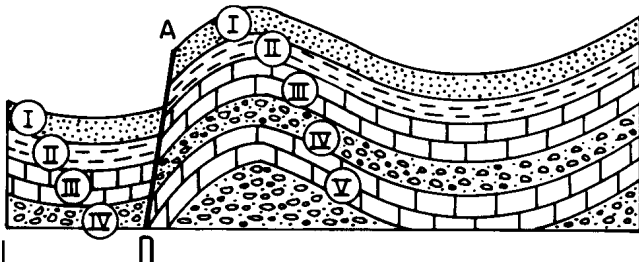
**D) faults that have broken the rock**

10. Which statement correctly describes an age relationship in the geologic cross section below?



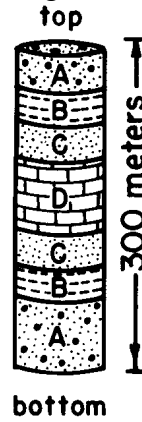
- A) The sandstone is younger than the basalt.
- B) The shale is younger than the basalt.**
- C) The limestone is younger than the shale.
- D) The limestone is younger than the basalt.

11. The diagram below represents a cross section of a portion of the Earth's crust. The rock layers shown have not been overturned. Which geologic event occurred *first*?



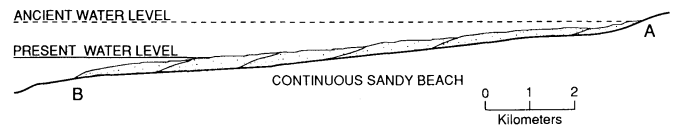
- A) faulting along line AB
- B) folding of the region
- C) formation of rock layer I
- D) formation of rock layer IV**

12. The diagram at the right represents a core drilling in a region consisting of only four sedimentary rock layers, A, B, C, and D. Which geologic event could explain the order of the rock layers in the core drilling?



(not to scale)

- A) Volcanic activity caused rapid deposition of the sedimentary layers.
  - B) Large-scale erosion caused a gap in the time record.
  - C) Extensive folding caused the rock layers to overturn.**
  - D) Intrusion of igneous material occurred sometime between the deposition of layer A and layer D.
13. The diagram below shows an area where sea level gradually dropped over a period of thousands of years. A continuous sandy beach deposit stretching from A to B was created.

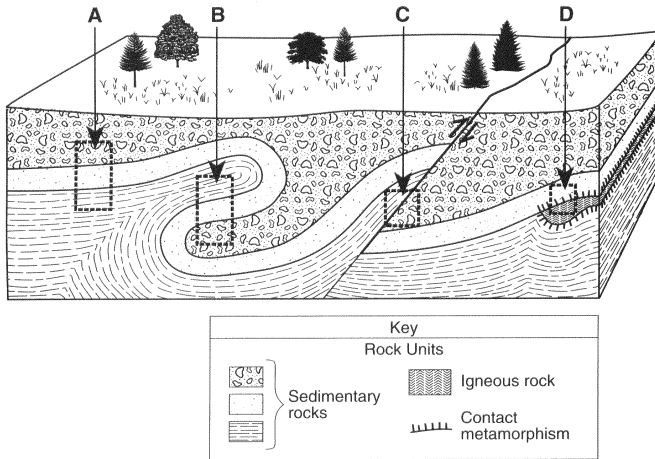


Which statement about the beach deposit would most likely be true?

- A) It is older at A than at B.**
  - B) It is older at B than at A.
  - C) It is the same age at A and B.
14. The age of an igneous intrusion is 50 million years. What is the most probable age of the rock immediately surrounding the intrusion?
- A) 10 million years
  - B) 25 million years
  - C) 40 million years
  - D) 60 million years**

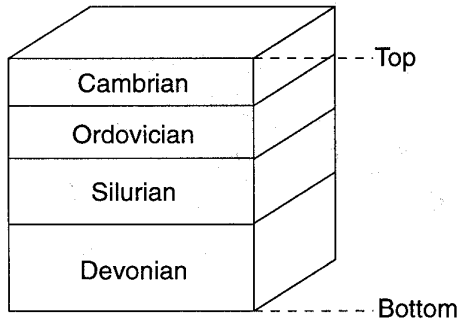


15. The block diagram below of a portion of Earth's crust shows four zones labeled *A*, *B*, *C*, and *D* outlined with dashed lines.



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

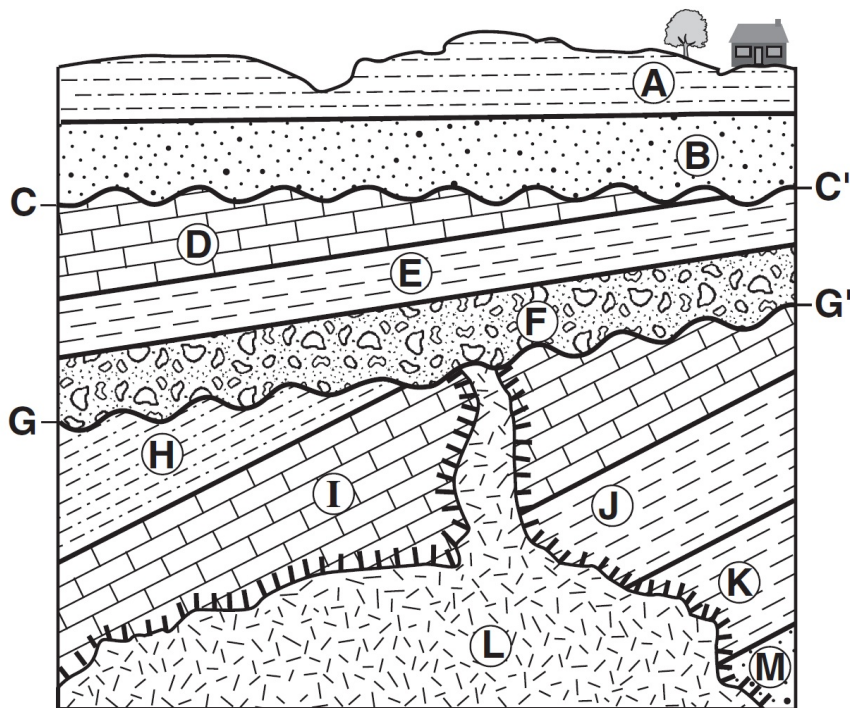
- A) *A*    B) *B*    C) *C*    D) *D*
16. The diagram below represents a cross section of a series of rock layers of different geologic ages.





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.

Base your answers to questions 17 through 20 on the cross section below and on your knowledge of Earth science. The cross section represents rock units that have *not* been overturned. Lines *CC'* and *GG'* represent unconformities. The geologic ages of some of the lettered rock units are shown below the cross section.

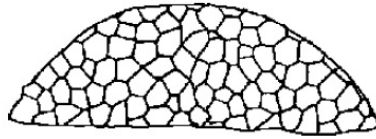
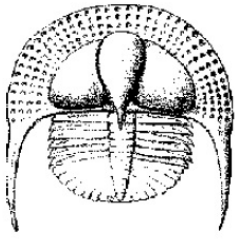


Rock Unit Geologic Age
B = Cretaceous Period
E = Permian Period
J = Silurian Period
M = Cambrian Period

Key	
	Igneous intrusion
	Contact metamorphism

17. Why is there *no* contact metamorphism indicated between rock unit *L* and rock unit *F*?
- A) Conglomerate does not metamorphose.
  - B) The intrusion was not hot enough to metamorphose rock unit *F*.
  - C) The contact metamorphism within rock unit *F* eroded away.
  - D) Rock unit *F* was deposited after the intrusion of rock unit *L*.**
18. Which inference about rock units *D*, *E*, and *H* can best be supported by evidence in the cross section?
- A) They contain mostly sand-sized sediment.
  - B) They contain both land and marine fossils.
  - C) They were altered by contact metamorphism.
  - D) They were deposited as horizontal layers and were later tilted.**

19. The diagrams below represent three index fossils found in one of the rock units.

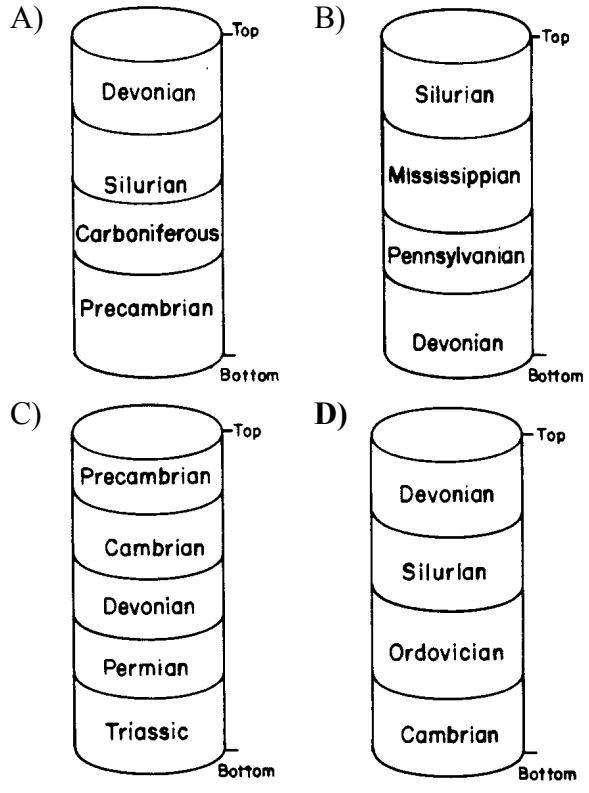


These fossils are most likely found in

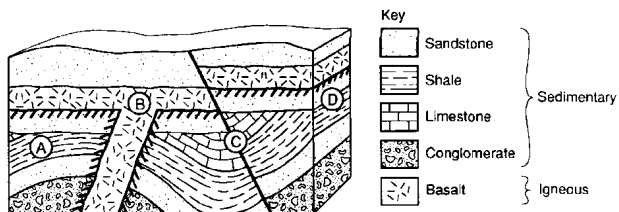
- A) rock unit *I*    B) rock unit *J*    C) **rock unit *K***    D) rock unit *M*
20. Which rock unit was formed most recently?  
 A) *A*    B) *F*    C) *L*    D) *M*

21. The presence of coal in Antarctica indicates that
- A) forests can grow on continental glaciers
  - B) coal can form in cold climates
  - C) **Antarctica's climate was once warmer**
  - D) Antarctica currently has areas of tropical climate

22. A deep drill core was taken through the bedrock at Ithaca, New York. Assume the rock layers have not been overturned and that no unconformity exists. Which diagram best represents the drill core obtained?



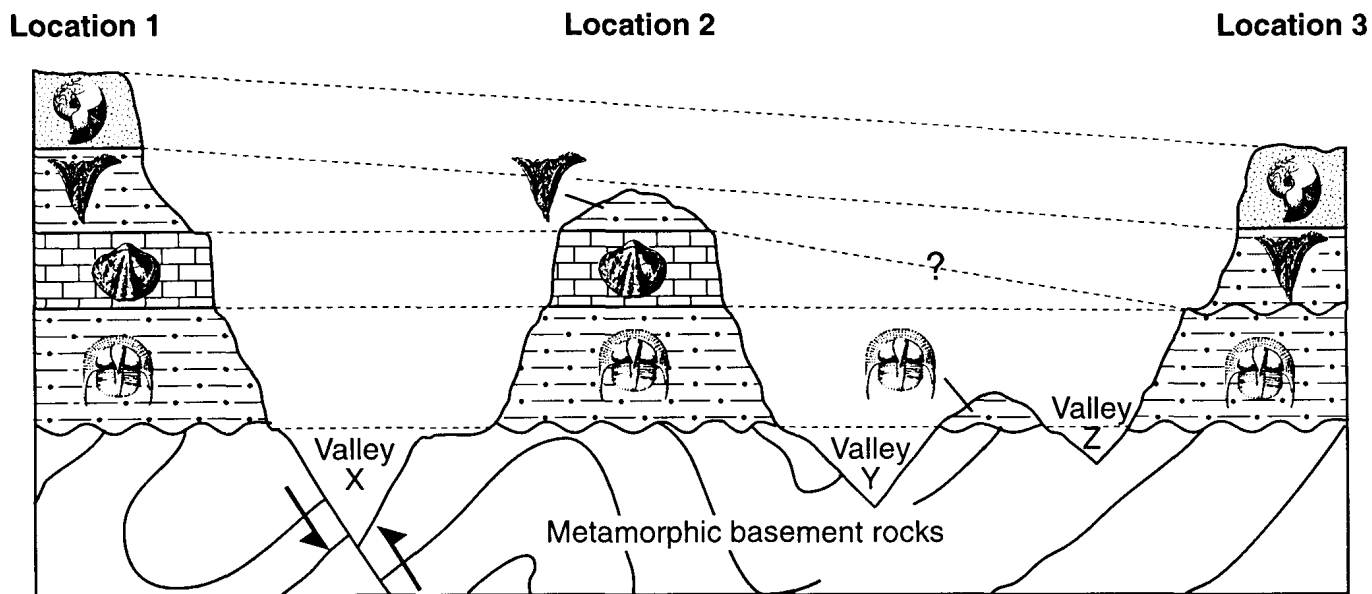
23. Base your answer on the geologic cross section below.



Which geologic event occurred most recently?

- A) folding at *A*
  - B) the intrusion at *B*
  - C) faulting at *C***
  - D) the unconformity at *D*
24. Base your answer to the following question on

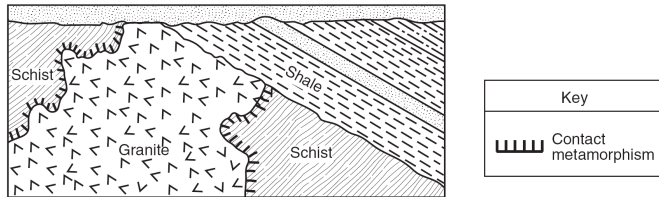
the geologic cross section below, which shows a view of rock layers at Earth's surface. The dashed lines connect points of the same age. Major fossils contained within each rock layer are shown. The valleys are labeled *X*, *Y*, and *Z*.



In this region, valley *X* is more deeply eroded than either valley *Y* or valley *Z*. The most likely explanation for this occurrence is that the metamorphic rock near *X* has been

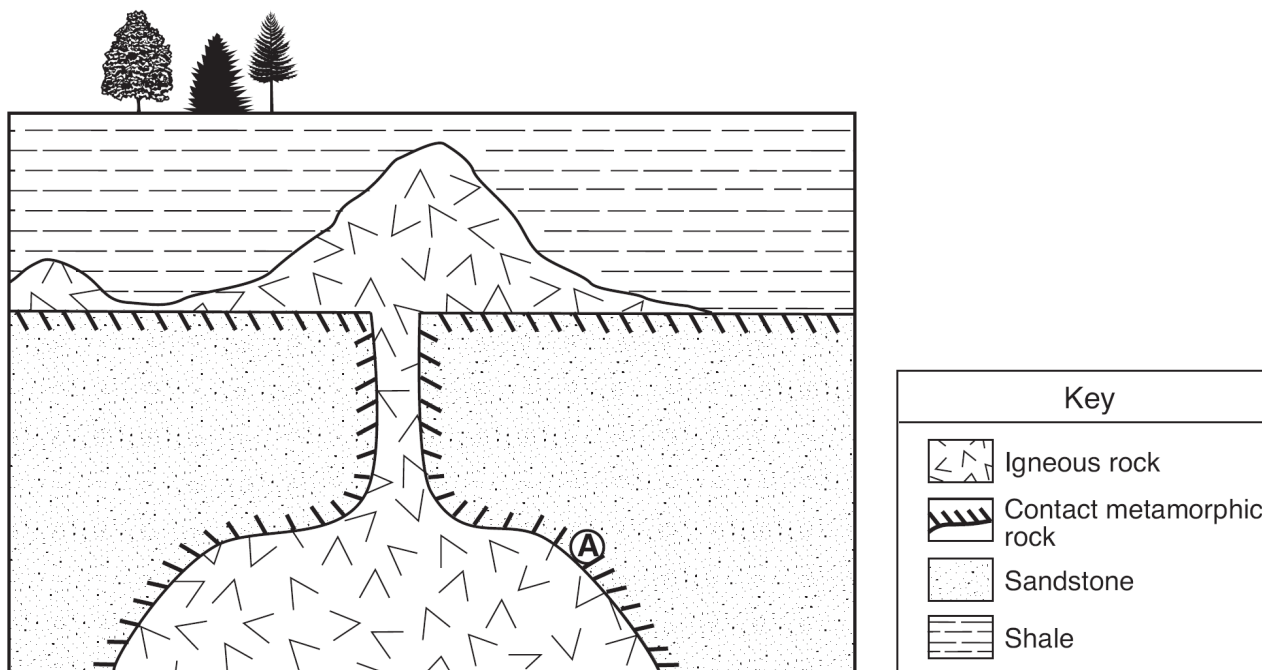
- A) weakened by faulting**
- B) folded by pressure
- C) intruded by melted rock
- D) covered by sedimentary rocks

25. The geologic cross section below shows a complex structure containing a granite intrusion.



If the granite intrusion occurred 24 million years ago, what are the most probable ages of the schist and shale, in millions of years?

- A) schist – 25; shale – 23
  - B) schist – 25; shale – 26
  - C) schist – 23; shale – 25
  - D) schist – 23; shale – 20
26. Base your answer to the following question on the geologic cross section below. Location *A* is within the metamorphic rock.



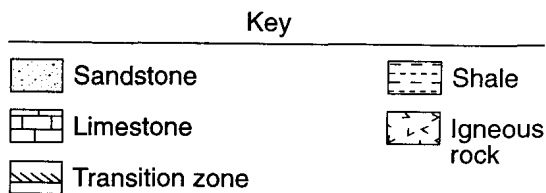
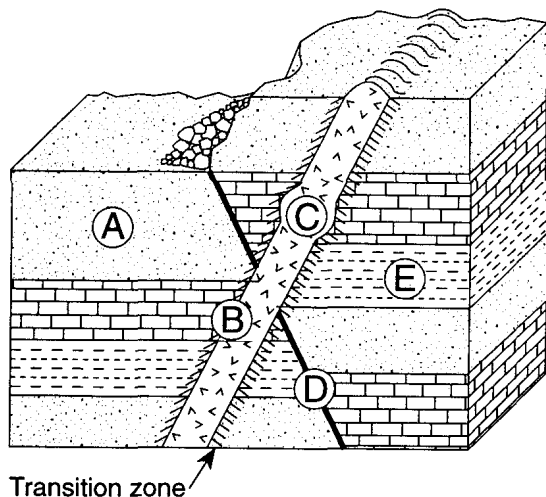
Which rock is the youngest?

- A) shale
- B) sandstone
- C) igneous rock
- D) rock at location *A*

27. Evidence of mass extinctions of life-forms is preserved in the fossil record. It is inferred that some of these extinctions occurred because of

- A) earthquakes
- B) asteroid impacts
- C) solar eclipses
- D) tsunami

28. Base your answer to the following question on the geologic cross section shown below.



The most recently formed rock unit is at location

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

Base your answers to questions 29 and 30 on the data table below and on your knowledge of Earth science. The data table shows information on six major mass extinction events that occurred many million years ago (mya) in Earth's history.

**Some Major Mass Extinctions in Earth's History**

Approximate Time (mya)	Certain Life-Forms That Became Extinct
65.5	all dinosaurs and all ammonoids
200	many species of nautiloids, ammonoids, mammal-like reptiles, and early dinosaurs
251	all trilobites and 90% of other marine species and 70% of land species
376	many species of corals, brachiopods, and trilobites
444	more than half of brachiopod species, many trilobite species, and some coral species
520	small shelly fossil species and some early trilobite species

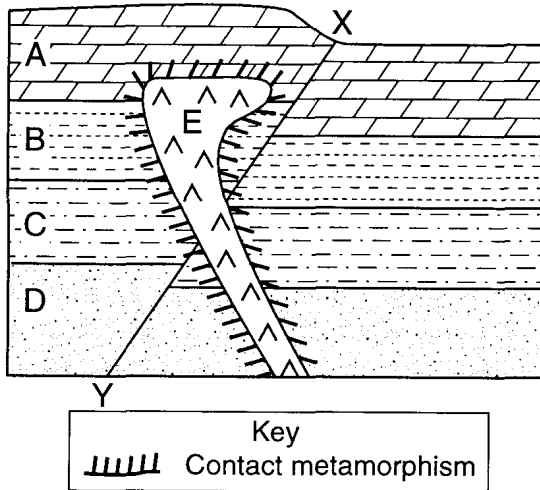
29. More than half of brachiopod species became extinct at the end of the

- |                             |                    |
|-----------------------------|--------------------|
| A) Devonian Period          | B) Silurian Period |
| <b>C) Ordovician Period</b> | D) Cambrian Period |

30. Which event is generally accepted as the cause of the mass extinction that occurred 65.5 million years ago?

- A) volcanic eruption
- B) continental collision
- C) asteroid impact**
- D) sea-level change

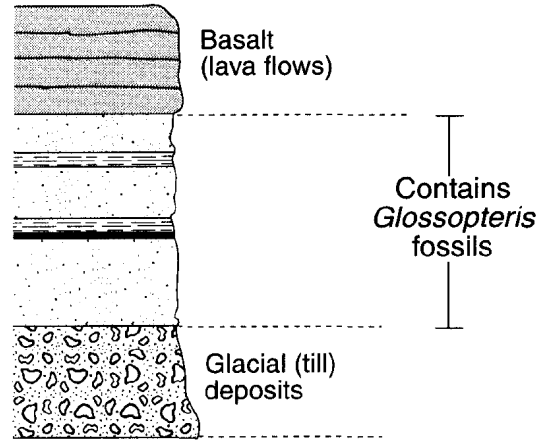
31. The geologic cross section below shows sedimentary rock layers *A*, *B*, *C*, and *D*, which have not been overturned. *E* is an igneous intrusion. Line *XY* represents a fault.



Which geologic event occurred most recently?

- A) deposition of sediments for rock layer *A*
- B) formation of the fault
- C) intrusion of the igneous material *E***
- D) cementation of sediments for rock layer *D*

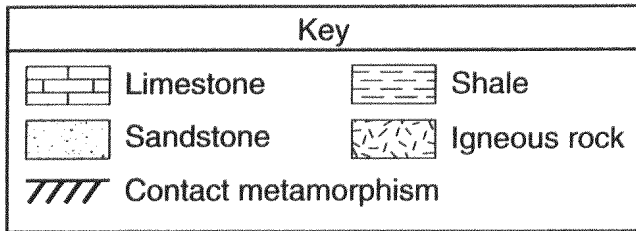
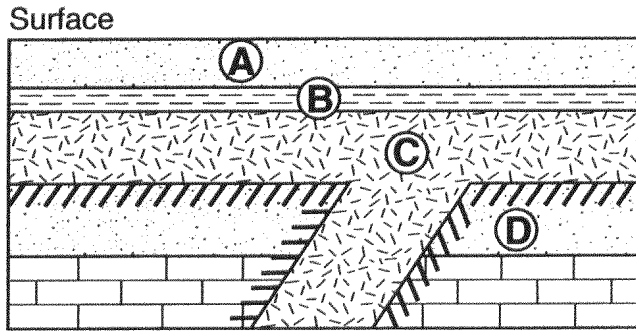
32. The cross section below shows a rock sequence that has not been overturned.



Which event occurred last at this location?

- A) Shale was deposited.
  - B) Glacial till was deposited.
  - C) Basaltic lava flows solidified.**
  - D) *Glossopteris* flourished and then became extinct.
33. Scientists infer that oxygen in Earth's atmosphere did *not* exist in large quantities until after
- A) the first multicellular, soft-bodied marine organisms appeared on Earth
  - B) the initial opening of the Atlantic Ocean
  - C) the first sexually reproducing organisms appeared on Earth
  - D) photosynthetic cyanobacteria evolved in Earth's oceans**

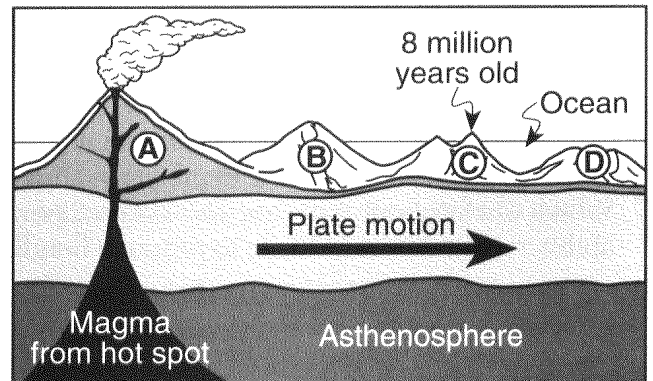
34. The diagram below shows a geologic cross section. Letters *A* through *D* represent different rock units.



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

- A)  $A \rightarrow B \rightarrow C \rightarrow D$     B)  $C \rightarrow D \rightarrow A \rightarrow B$   
 C)  $D \rightarrow B \rightarrow A \rightarrow C$     D)  $D \rightarrow C \rightarrow B \rightarrow A$

35. 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.

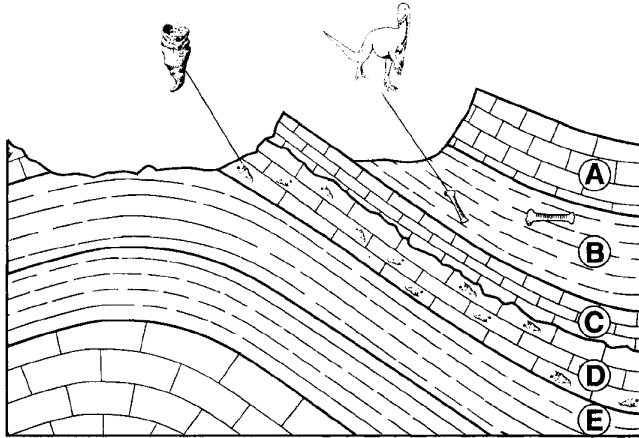


What are the most likely geologic ages of volcanoes B and D?

- 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.



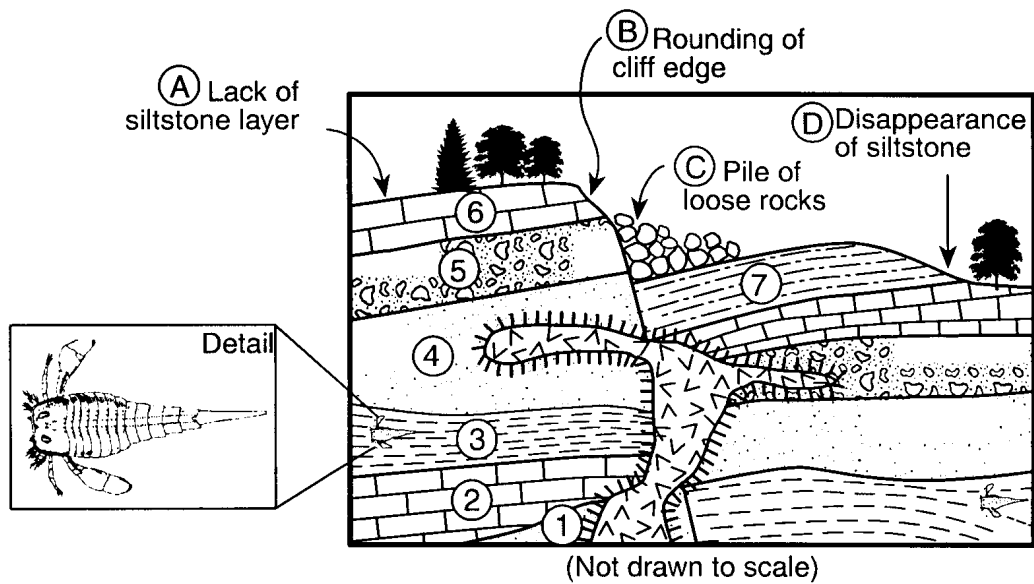
Base your answers to questions 36 and 37 on the geologic cross section below of a region of Earth's crust. Rock layers A through E have been labeled. Two index fossils are shown and their locations within the rock layers are indicated.



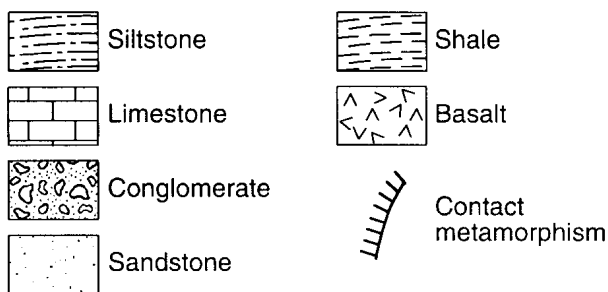
36. What caused the valleys and ridges in this area?
- A) Some rock layers are folded more than others.
  - B) Rock layers were not deposited in the valley areas.
  - C) Some rock layers are more resistant to weathering and erosion than others.**
  - D) Folding caused the ridge rocks to undergo regional metamorphism.
37. Evidence of tectonic activity in this cross section is provided by the
- A) folding and tilting of the rock layers**
  - B) faulting and movement of the rock layers
  - C) igneous intrusion into the rock layers
  - D) collision of crustal plate boundaries in the rock layers



41. Base your answer to the following question on the diagram below of a cross section of a portion of Earth's crust. Letters *A* through *D* represent landscape features, and numbers 1 through 7 represent rock layers. The detail shows a fossil found in layer 3.



Key



What is the correct sequence of events from oldest to most recent in the geologic history of this area?

- A) deposition of layers from 1 to 7 → intrusion of basalt → faulting
- B) deposition of layers from 1 to 7 → faulting → intrusion of basalt**
- C) deposition of layers from 7 to 1 → intrusion of basalt → faulting
- D) deposition of layers from 7 to 1 → faulting → intrusion of basalt

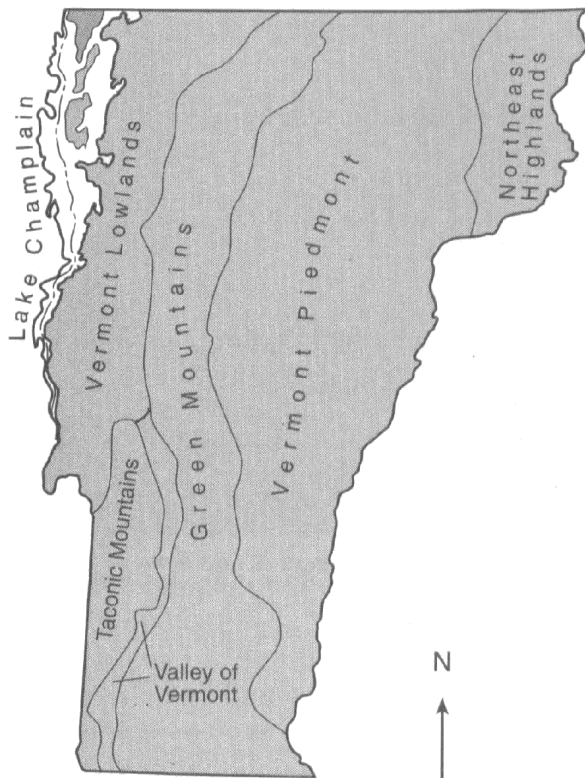
- 
42. Base your answer to the following question on the passage and map below. The map shows the generalized landscape regions of Vermont.

### Landscape Regions of Vermont

Most of Vermont's landscape regions consist of ancient, weathered mountains that were covered by several ice sheets during the last ice age. When the ice melted, sand, cobbles, and boulders were deposited throughout the state, Vermont is divided into six landscape regions.

- (1) The Vermont Lowlands region has a mild climate, with Lake Champlain moderating its temperature.
- (2) The Green Mountains run the length of Vermont and were formed over 400 million years ago. Most of the bedrock is metamorphic and the region is known for its deposits of talc and asbestos.
- (3) The Taconic Mountains extend into New York State. Slate and marble are commonly mined in this region.
- (4) The Valley of Vermont is a narrow valley between two mountain ranges. Most of the bedrock in the region is limestone and marble.
- (5) The Vermont Piedmont covers the largest area of the state. This region consists of rolling hills and valleys. Granite mining is an important industry.
- (6) The Northeast Highlands is a mountainous region composed of granite bedrock.

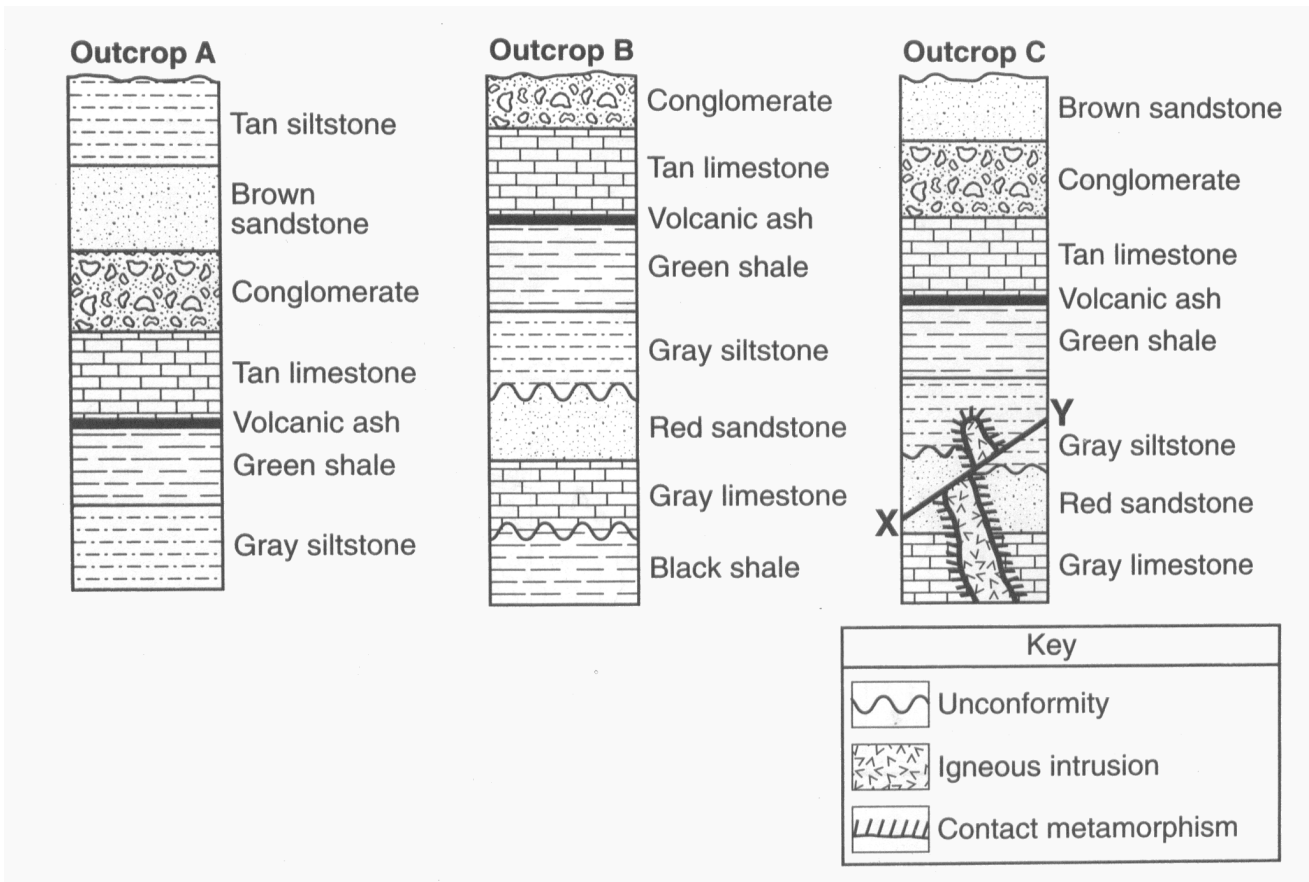
### Generalized Landscape Regions of Vermont



During which geologic period did a major orogeny form the Taconic Mountains?

- A) Cretaceous      B) Permian      C) Devonian      **D) Ordovician**
-

Base your answers to questions 43 and 44 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.



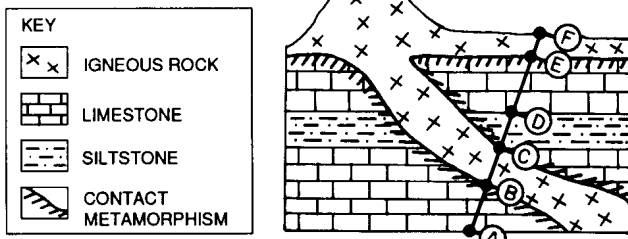
43. Which sedimentary rock shown in the outcrops is the youngest?

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

44. 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

45. The diagram below represents a cross section of a portion of the Earth's crust.

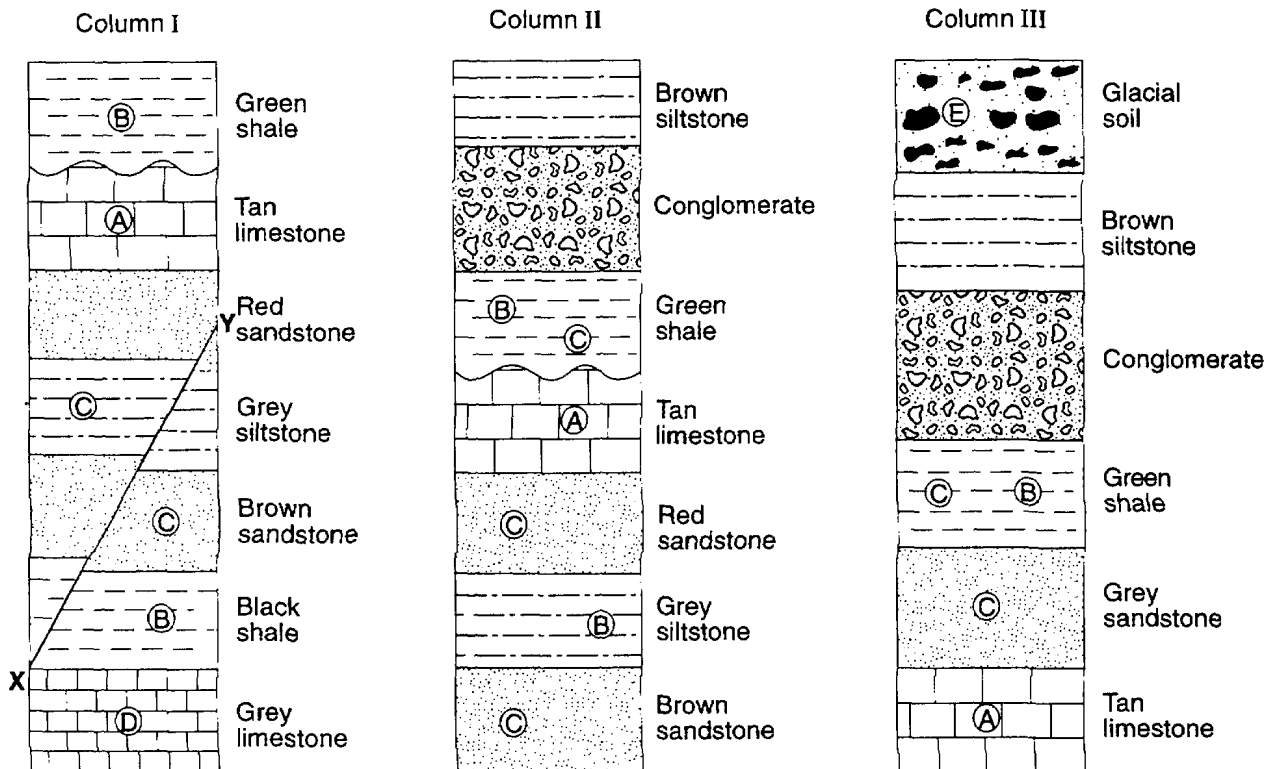


Which graph best indicates the relative age of the rock units along line *AF*?



Base your answers to questions 46 through 48 on the diagram below which shows three geologic columns representing widely separated rock outcrops. Letters *A* through *E* represent fossils found in the outcrops. Line *XY* represents a fault in column I. The layers have not been overturned.

### Rock Outcrops



46. What is the oldest layer shown?

- A) glacial soil
- B) brown sandstone
- C) tan limestone
- D) grey limestone

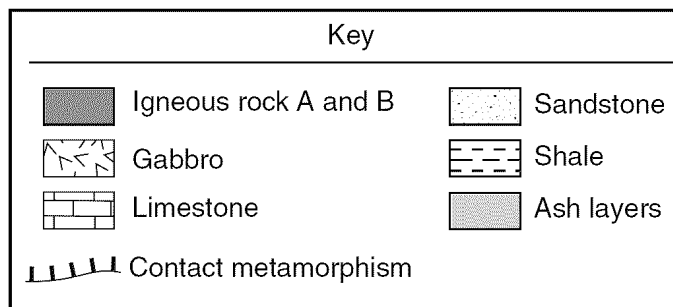
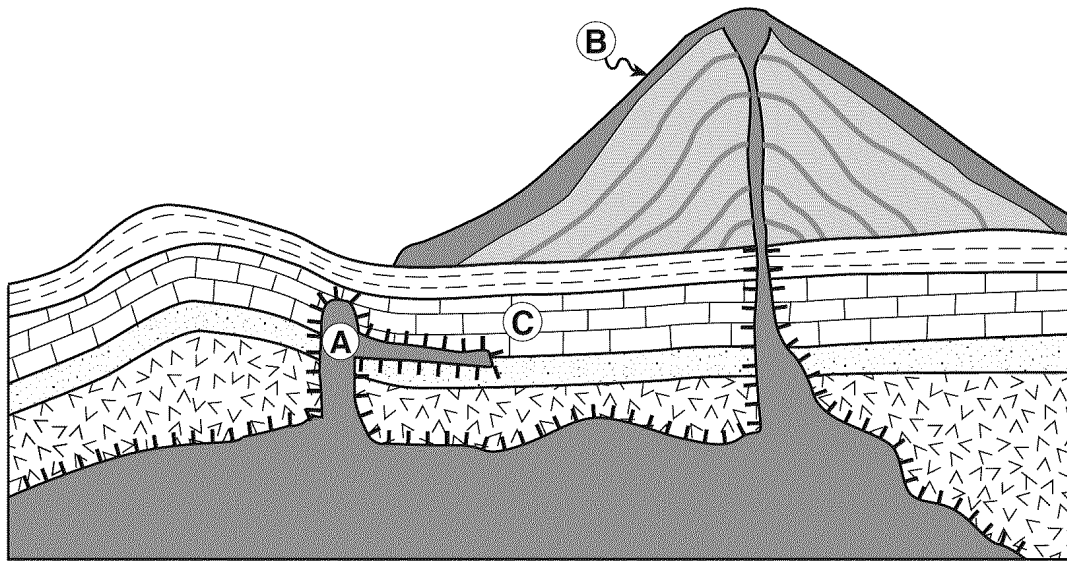
47. Which rock would most likely be produced by the metamorphism of the grey limestone?

- A) quartzite
- B) slate
- C) marble
- D) gneiss

48. When did fault *XY*, located in column I, most likely occur?

- A) before the formation of the grey limestone
- B) during the formation of the grey siltstone
- C) during the formation of the black shale
- D) after the formation of the red sandstone**

Base your answers to questions 49 and 50 on the geologic cross section below. The large cone-shaped mountain on Earth's surface is a volcano. Letters *A*, *B*, and *C* represent certain rocks.



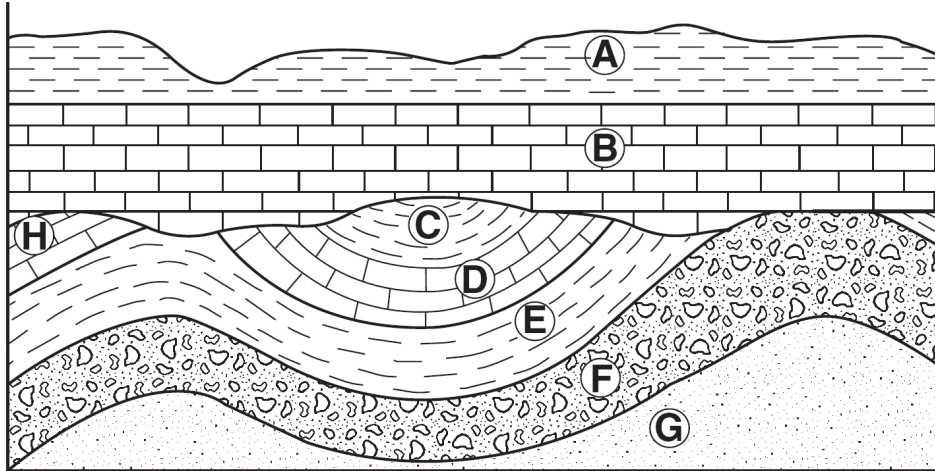
49. Rock *B* is most likely which type of igneous rock?

- A) granite
- B) peridotite
- C) pegmatite
- D) basalt**

50. Which statement correctly describes the relative ages of rocks *A* and *C* and gives the best supporting evidence from the cross section?

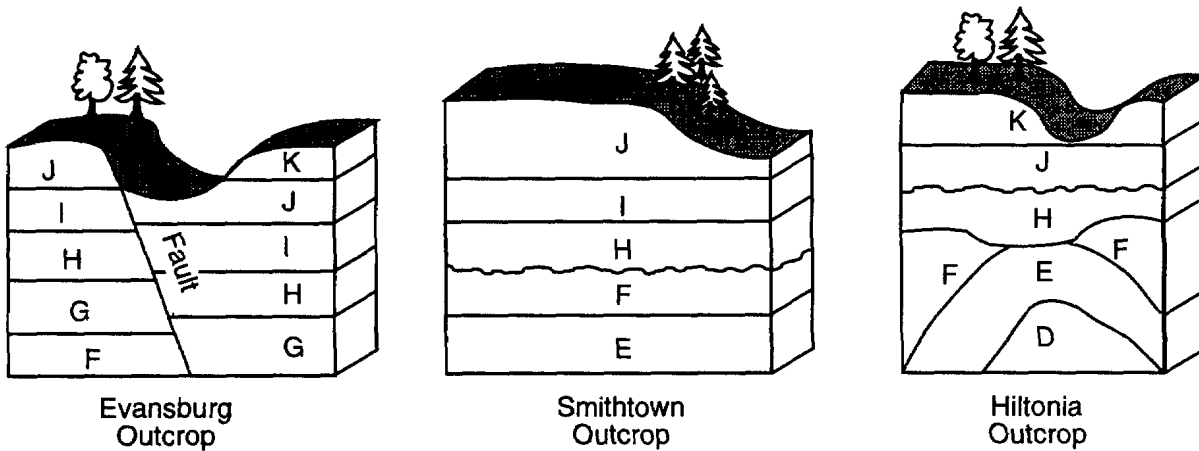
- A) *A* is younger than *C*, because *A* is a lower sedimentary rock layer.
- B) *A* is younger than *C*, because the intrusion of *A* metamorphosed part of rock layer *C*.**
- C) *A* is older than *C*, because *A* has older index fossils.
- D) *A* is older than *C*, because the intrusion of *A* cuts across rock layer *C*.

Base your answers to questions 51 and 52 on the geologic cross section below in which overturning has not occurred. Letters *A* through *H* represent rock layers.



51. Which two letters represent bedrock of the same age?
- A) *A* and *E*      B) *B* and *D*      C) *F* and *G*      **D) *D* and *H***
52. The folding of rock layers *G* through *C* was most likely caused by
- A) erosion of overlying sediments      B) contact metamorphism  
**C) the collision of lithospheric plates**      D) the extrusion of igneous rock

Base your answers to questions 53 through 57 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.



53. 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
54. 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



55. 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***

56. 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*

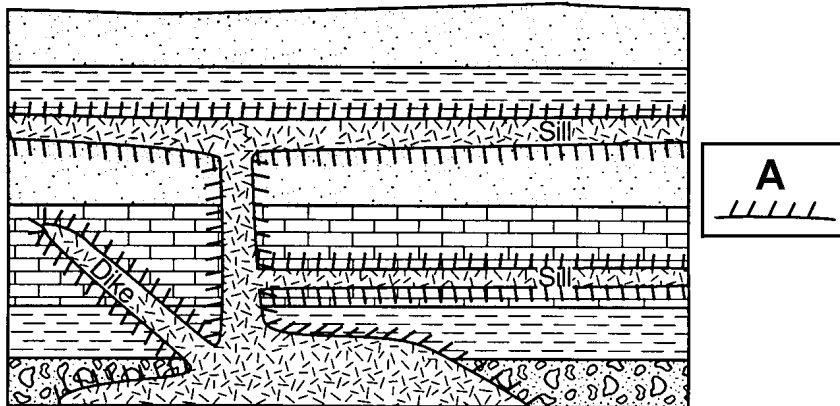
57. Which method would provide the most reliable evidence for the idea that layer *J* was deposited at the same time in each location?

- 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**


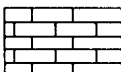

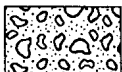
58. What is the relative age of a fault that cuts across many rock layers?

- A) **The fault is younger than all the layers it cuts across.**
- B) The fault is older than all the layers it cuts across.
- C) The fault is the same age as the top layer it cuts across.
- D) The fault is the same age as the bottom layer it cuts across.

Base your answers to questions 59 and 60 on the geologic cross section below. Overturning has not occurred. The dike and sills shown in the cross section are igneous intrusions.



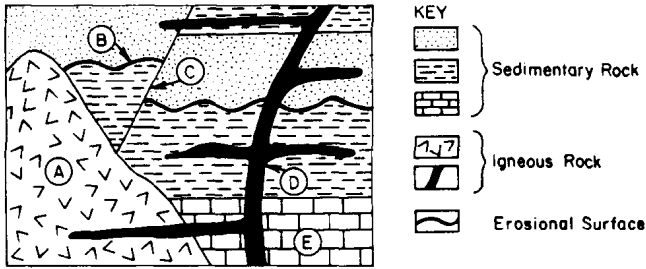
59. Which rock type is the oldest?

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

60. Which feature is represented by symbol *A* along the edges of the dike and sills?

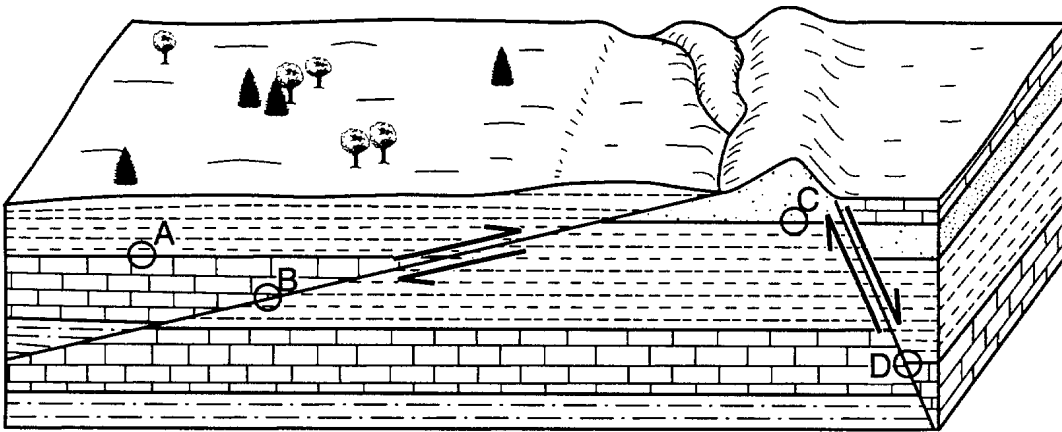
- A) **contact metamorphic rock**
- B) an unconformity
- C) a glacial moraine
- D) index fossils

61. The geologic cross section below represents a portion of the Earth's crust.



Which geologic event occurred last?

- A) the formation of rock *A*
  - B) the erosion of surface *B*
  - C) the faulting along line *C*
  - D) the intrusion of rock *D***
62. The accumulation of water vapor, carbon dioxide, and nitrogen in Earth's early atmosphere approximately 4 billion years ago resulted mainly from
- A) outgassing from Earth's interior**
  - B) radioactive decay
  - C) photosynthesis by the earliest land plants
  - D) convection currents in Earth's outer core
63. The geologic cross section below represents an area where faulting has occurred. Rock layers have not been overturned.



Within which circled area does older rock directly overlie younger rock?

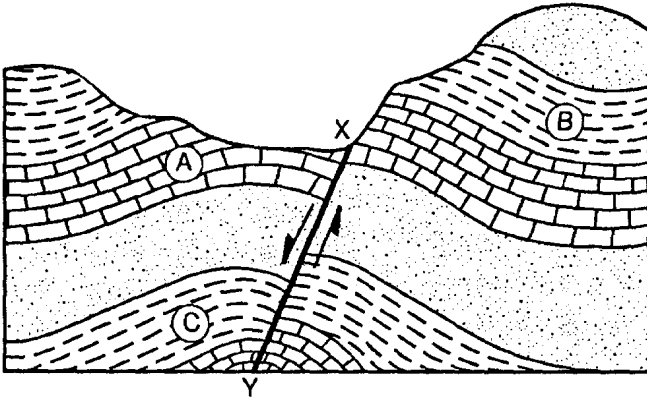
- A) *A*
  - B) *B***
  - C) *C*
  - D) *D*
- 
64. Unless a series of sedimentary rock layers has been overturned, the bottom rock layer usually
- A) contains fossils
  - B) is the oldest**
  - C) contains the greatest variety of minerals
  - D) has the finest texture

---

65. Which sequence of geologic events is in the correct order, from oldest to most recent?

- A) oceanic oxygen begins to enter the atmosphere → earliest stromatolites → initial opening of the Iapetus Ocean → dome-like uplift of the Adirondack region begins
  - B) dome-like uplift of the Adirondack region begins → initial opening of the Iapetus Ocean → oceanic oxygen begins to enter the atmosphere → earliest stromatolites
  - C) initial opening of the Iapetus Ocean → earliest stromatolites → oceanic oxygen begins to enter the atmosphere → dome-like uplift of the Adirondack region begins
  - D) earliest stromatolites → oceanic oxygen begins to enter the atmosphere → initial opening of the Iapetus Ocean → dome-like uplift of the Adirondack region begins**
- 

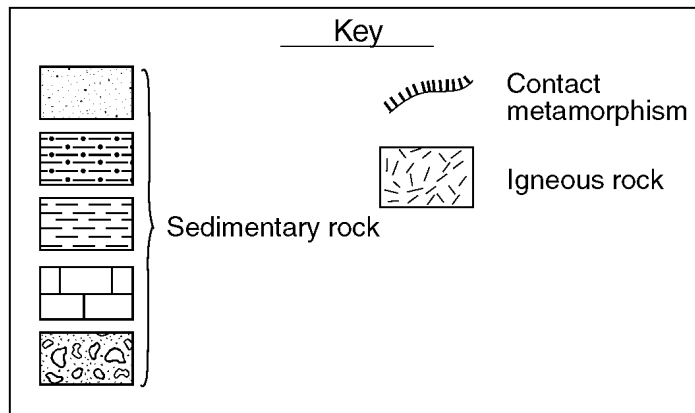
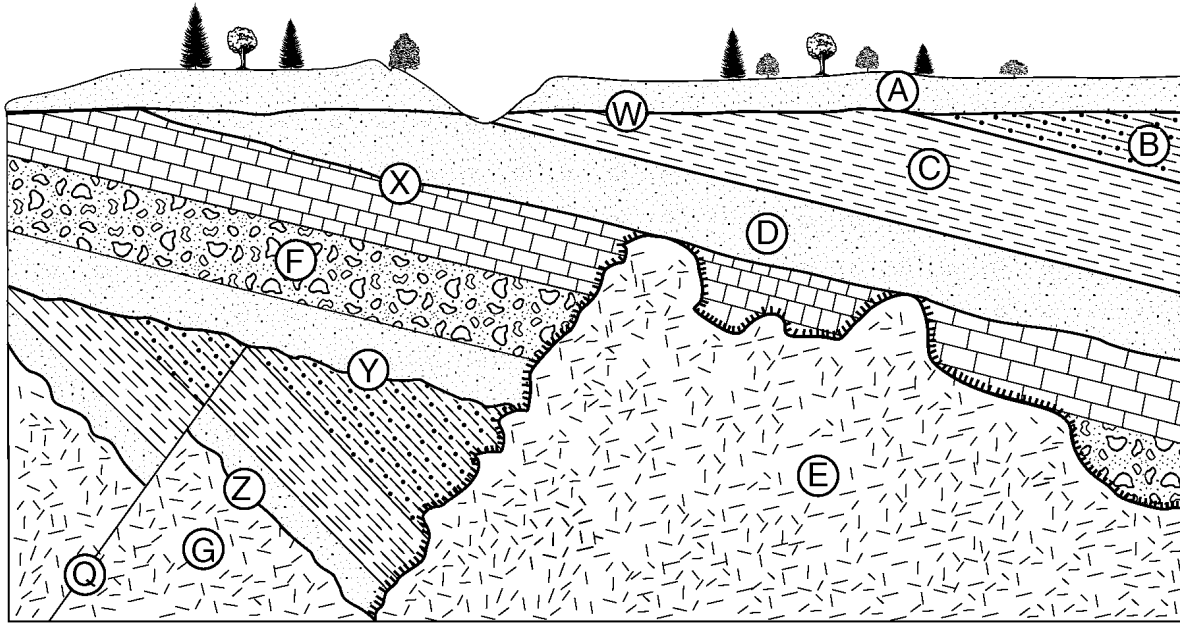
66. The diagram below represents a cross section of a portion of the Earth's crust.



Which geologic event is the most recent?

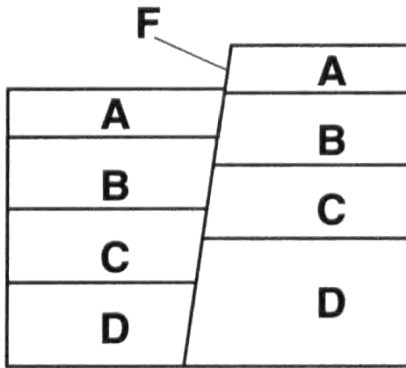
- A) erosion of the surface of rock layer A**
  - B) folding of rock layer B
  - C) deposition of rock layer C
  - D) faulting along line XY
67. Which plate tectonic events occurred as the Iapetus Ocean closed?
- A) Taconian orogeny and Grenville orogeny
  - B) Taconian orogeny and Acadian orogeny**
  - C) Alleghenian orogeny and Acadian orogeny
  - D) Alleghenian orogeny and Grenville orogeny
-

Base your answers to questions 68 through 70 on the geologic cross section of bedrock shown below. A through G identify rock layers and Q represents a fault. Lines W, X, Y, and Z are locations of unconformities. The rocks have not been overturned.



68. The movement of bedrock along fault Q most probably produced
- A) gaps in the rock record
  - B) an earthquake**
  - C) a volcanic lava flow
  - D) zones of contact metamorphism
69. The unconformities shown in the cross section represent
- A) buried erosional surfaces**
  - B) locations of index fossils
  - C) volcanic ash deposits
  - D) boundaries between oceanic and continental crust
70. Which rock most likely formed in the zone of contact between rock E and rock F?
- A) obsidian
  - C) metaconglomerate**
  - B) slate
  - D) sandstone

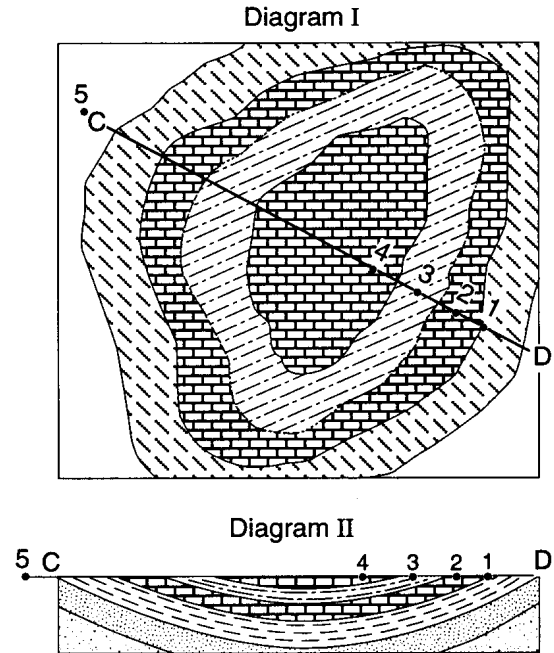
71. The cross section below shows rock layers *A*, *B*, *C*, *D*, and fault *F*. The rock layers have not been overturned.



Which sequence places the rock layers and fault in order from oldest to youngest?

- A)  $D \rightarrow C \rightarrow B \rightarrow A \rightarrow F$
- B)  $A \rightarrow B \rightarrow C \rightarrow D \rightarrow F$
- C)  $F \rightarrow D \rightarrow C \rightarrow B \rightarrow A$
- D)  $F \rightarrow A \rightarrow B \rightarrow C \rightarrow D$

Base your answers to questions 72 and 73 on the diagrams below. Diagram I shows part of a geologic map. Diagram II shows a geologic cross section taken along line *CD*. The rock layers shown have not been overturned. Numbers 1 through 5 represent locations on the surface bedrock.



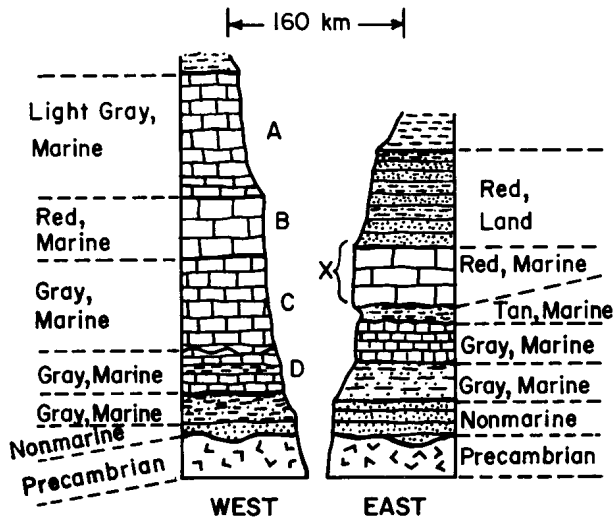
72. Which type of surface bedrock would most likely be found at location 5?

- A) shale
- B) sandstone**
- C) chemical limestone
- D) siltstone

73. Which graph best represents the age of the surface bedrock along line *CD*?

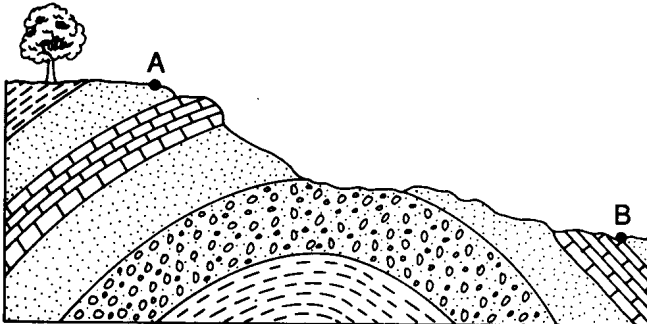
- A)
- B)
- C)
- D)

74. The diagram below represents two geologic rock columns. The color and environment of deposition of each sedimentary rock are indicated beside the rock layers. Which rock layer in the West geologic column is most likely the same as rock layer X in the East column?



A) A    B) B    C) C    D) D

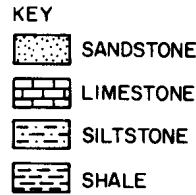
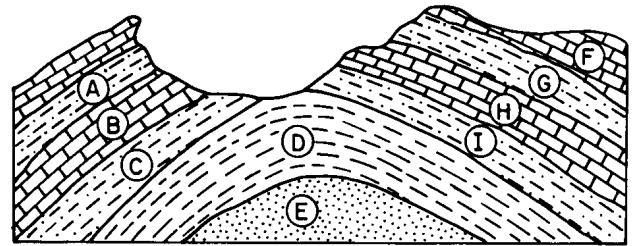
75. The diagram below shows a geologic cross section of a portion of the Earth's crust that has not been overturned.



An observer travels across the surface from point A to point B, measuring the age of the surface bedrock. The observer finds the age of the surface bedrock to

- A) decrease, only
- B) increase, only
- C) decrease, then increase
- D) increase, then decrease

Base your answers to questions 76 and 77 on the diagram below which represents a cross section of an eroded fold that has *not* been overturned.



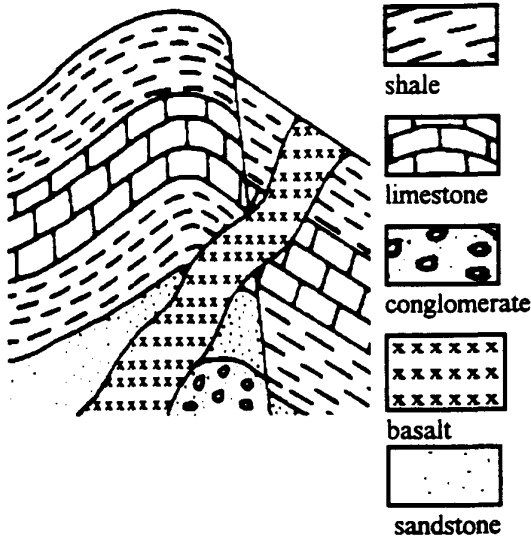
76. The fossils found in rock layer G will most closely resemble those found in rock layer

- A) A    B) I    C) C    D) E

77. If rock layer A is of Devonian Age, rock layer E could be of

- A) Triassic Age
- B) Carboniferous Age
- C) **Cambrian Age**
- D) Tertiary Age

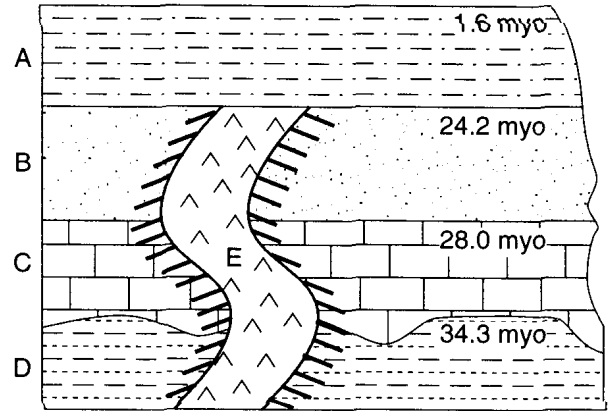
78. The diagram below represents a geologic cross section.



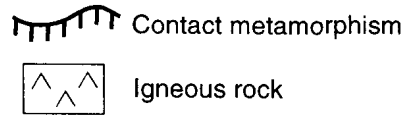
In the cross section, the basalt is known to be younger than the sandstone because

- A) in places, the sandstone is above the basalt
- B) rocks are older than the igneous intrusions that cut through them**
- C) the sandstone is made of weathered basalt
- D) igneous rocks are usually younger than sedimentary rocks

79. The geologic cross section below represents a cliff outcrop. Some bedrock layers are labeled as millions of years old (myo). Letters *A* through *E* represent different rock types.



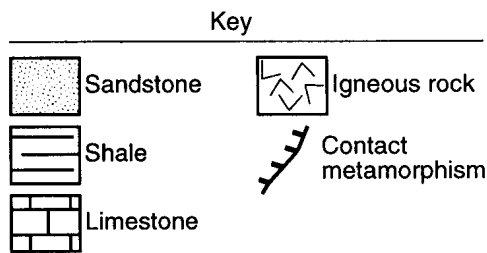
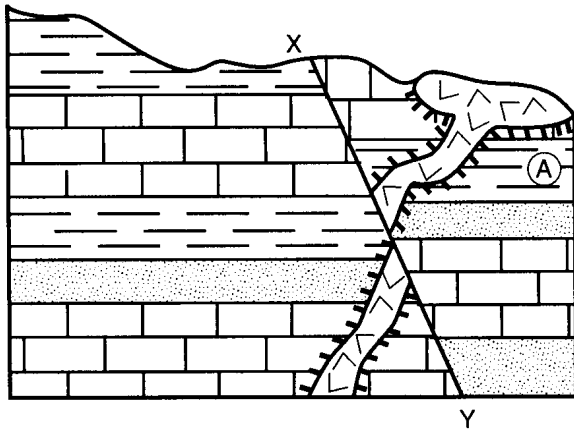
Key:



What is a possible age of igneous rock *E*?

- A) 1.5 million years old
- B) 12 million years old**
- C) 28 million years old
- D) 40 million years old

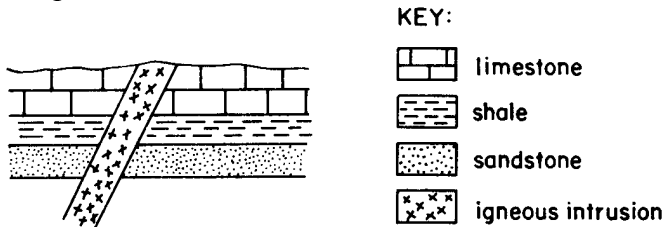
80. A geologic cross section for a portion of Earth's crust is shown below. Letter *A* is a location in a rock layer, and line *XY* represents a fault.



Which of these events occurred most recently at this location?

- A) deposition of the layer at *A*
- B) igneous intrusion
- C) contact metamorphism
- D) faulting along line *XY***

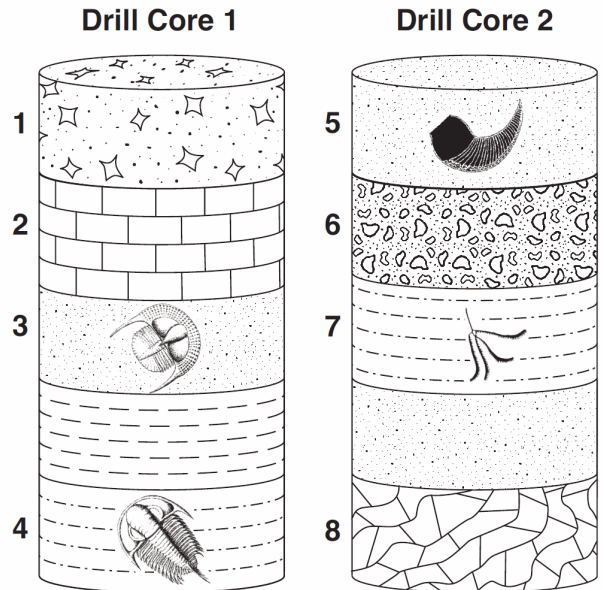
81. The diagram below represents a cross-sectional view of a portion of the Earth's crust.



Compared to the age of the sedimentary rock layers, the age of the igneous intrusion is

- A) younger**
- B) older
- C) the same

82. 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.

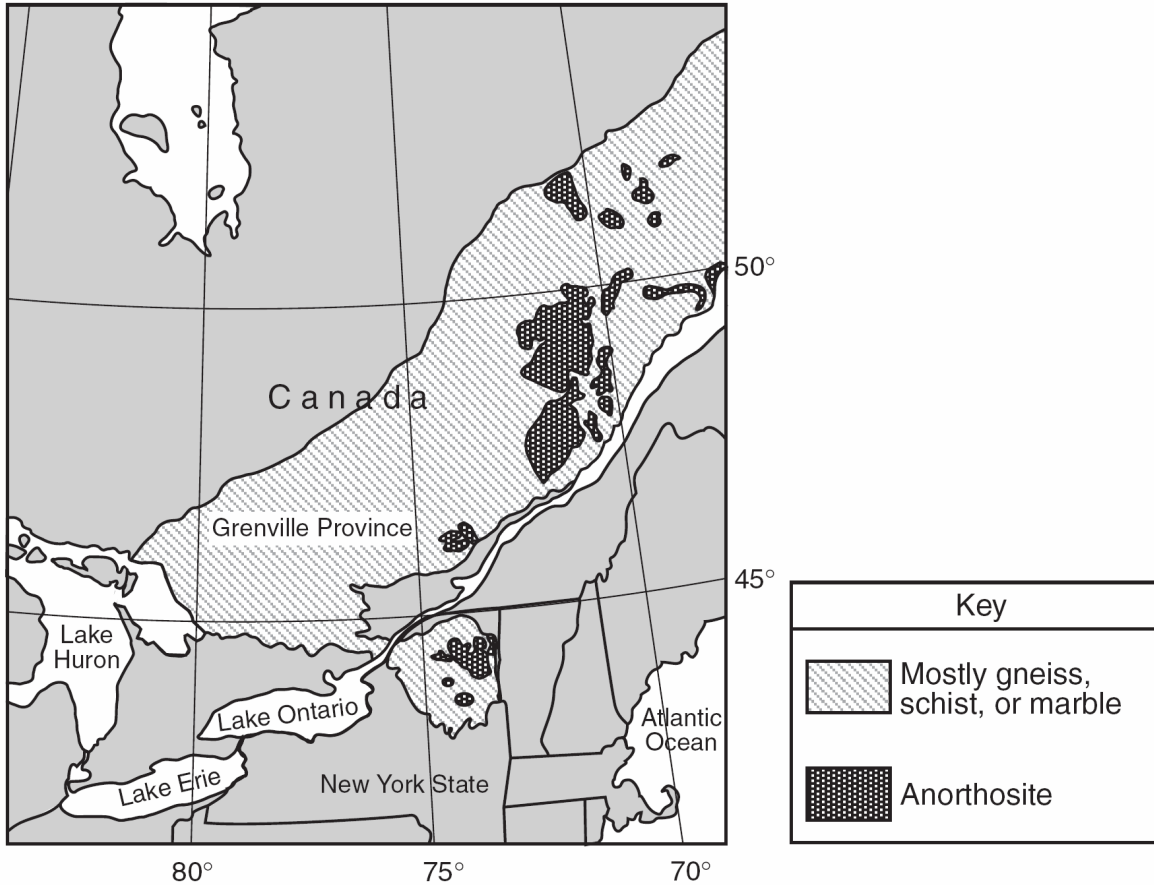


Which numbered layers most likely formed at the same time?

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



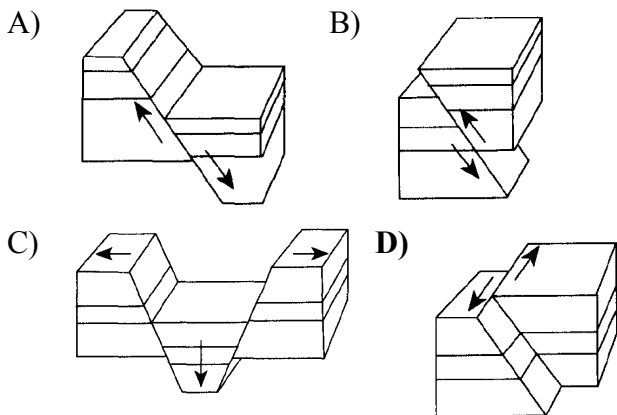
83. Base your answer to the following question on the map below. The map shows some regions where metamorphic bedrock of the Grenville Province in northeastern North America is exposed at Earth's surface.



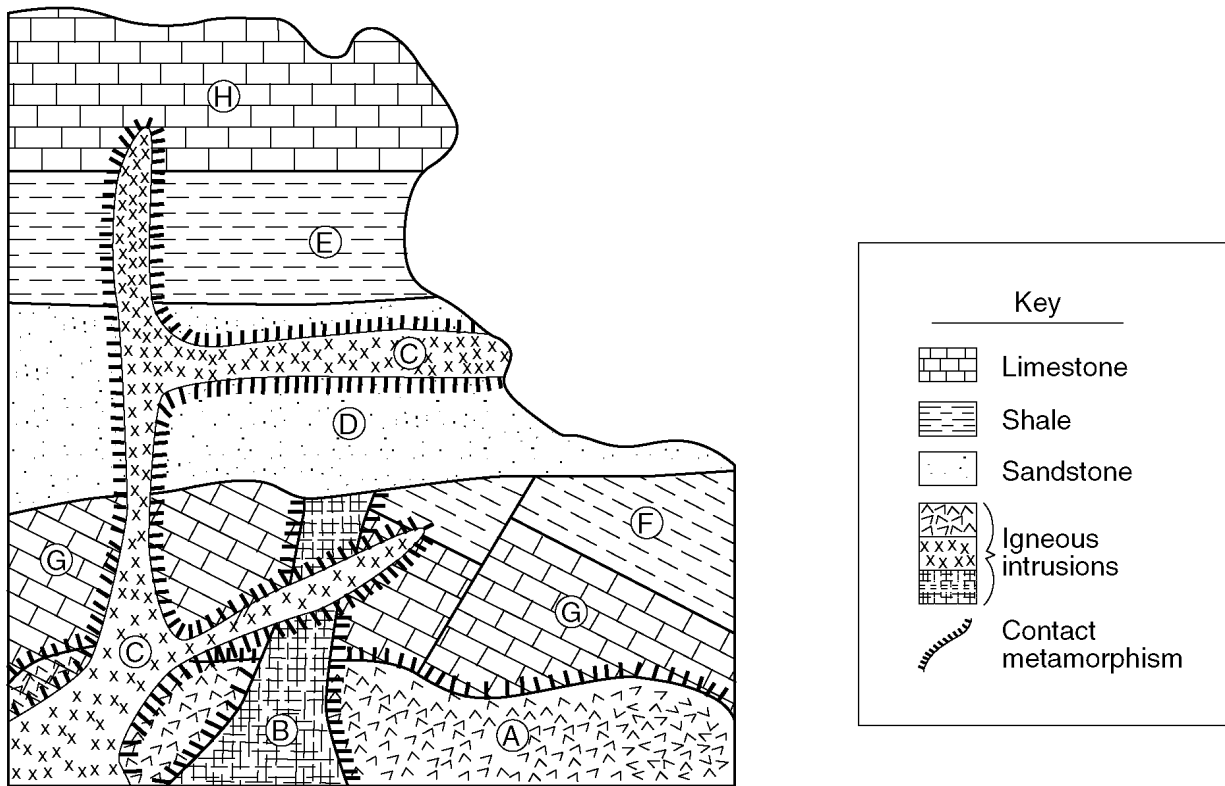
The bedrock of the Grenville Province is generally thought to have formed approximately

- A) 250 million years ago
- B) 400 million years ago
- C) 560 million years ago
- D) 1100 million years ago**

84. Which block diagram best shows a transform fault?



Base your answers to questions 85 and 86 on the diagram below, which shows a cross section of Earth's crust.



85. Which statement gives an accurate age relationship for the bedrock in the cross section?

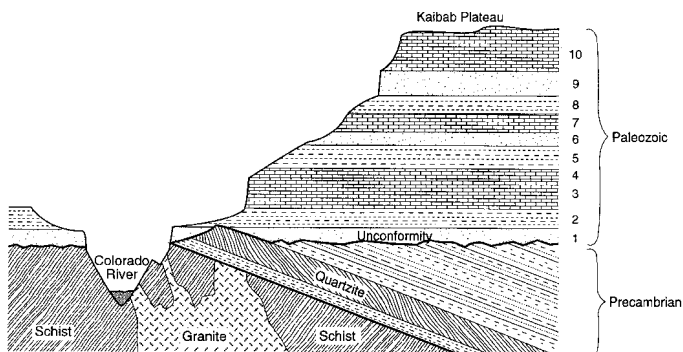
- A) Intrusion *A* is younger than intrusion *C*.
- B) Intrusion *C* is younger than intrusion *B*.**
- C) Intrusion *B* is older than intrusion *A*.
- D) Intrusion *C* is older than layer *E*.

86. 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*

87. Base your answer to the following question on the geologic cross section below of the Grand Canyon.

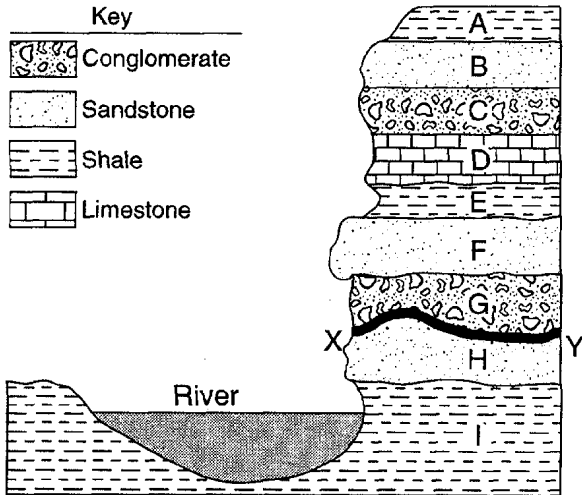
The numbers 1 through 10 represent Paleozoic sedimentary rock layers.



Which Paleozoic rock layer is the oldest?

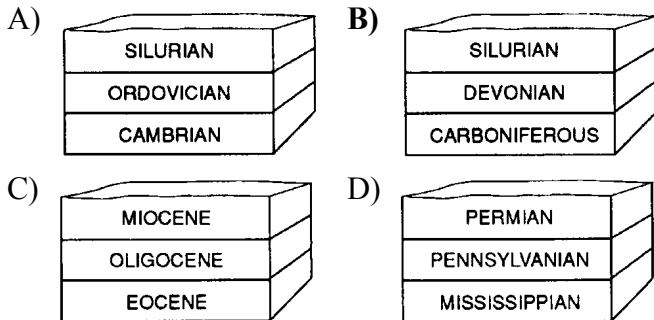
- A) 1**
- B) 10
- C) 5
- D) 4

88. Base your answer to the following question on the diagram below, which is a geologic cross section of an area where a river has exposed a 300-meter cliff of sedimentary rock layers. The rock layers are labeled *A* through *I*. Line *XY* represents a gap in the geologic record (an unconformity).

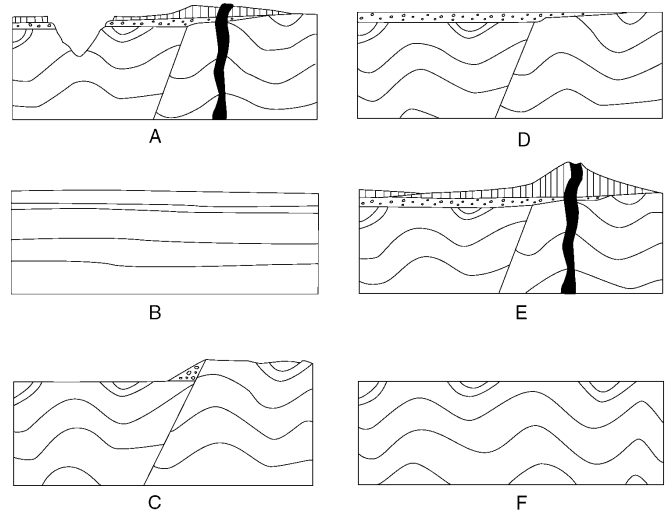


Which layer is oldest? [Assume that the rock layers have not been overturned.]

- A) *A*    B) *B*    C) *H*    D) *I*
89. Which block diagram shows rock layers that have been overturned?



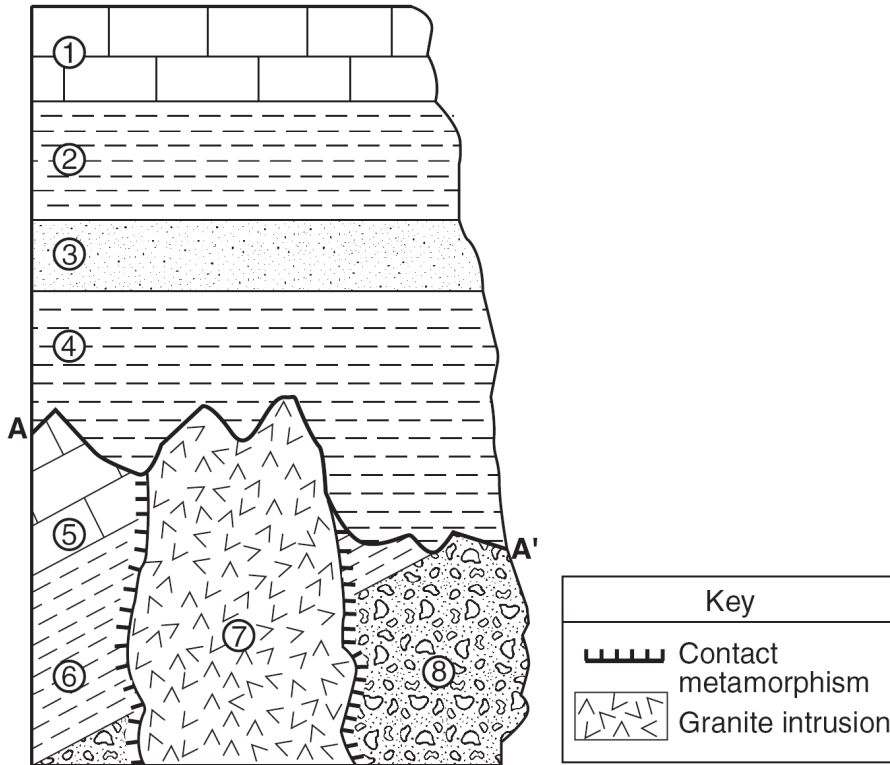
90. Geologic cross sections *A* through *F* shown below represent different stages in the development of one part of Earth's crust over a long period of geologic time.



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*

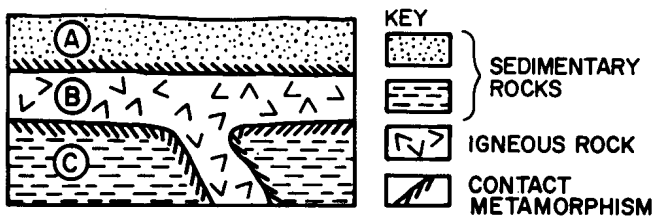
91. Base your answer to the following question on the cross section below. Rock units are labeled 1 through 8. The line between *A* and *A'* indicates an unconformity.



Which event occurred sometime after the formation of the unconformity?

- A) formation of rock unit 3
- B) tilting of rock unit 5
- C) deposition of the sediments that formed rock unit 8
- D) intrusion of rock unit 7

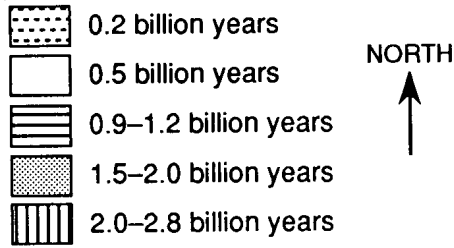
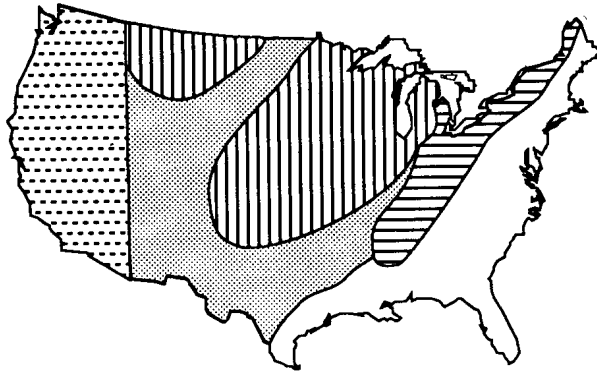
92. The diagram below represents layers of rock.



Rock layer *A* is inferred to be older than intrusion *B* because

- A) layer *A* is composed of sedimentary rocks
- B) parts of layer *A* were altered by intrusion *B*
- C) layer *B* is located between layer *A* and layer *C*
- D) parts of layer *C* were altered by intrusion *B*

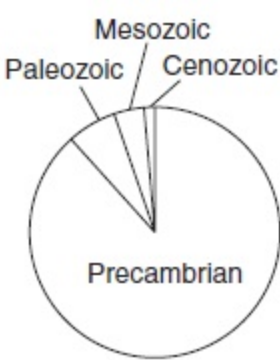
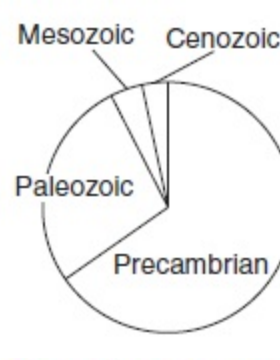
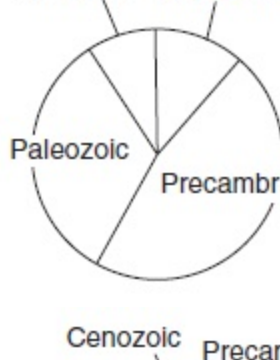
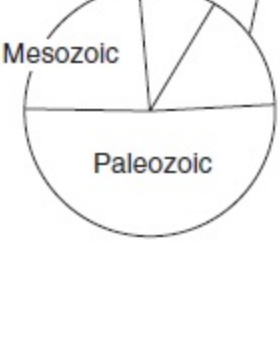
93. The map below shows the relative age of the bedrock in the continental United States.



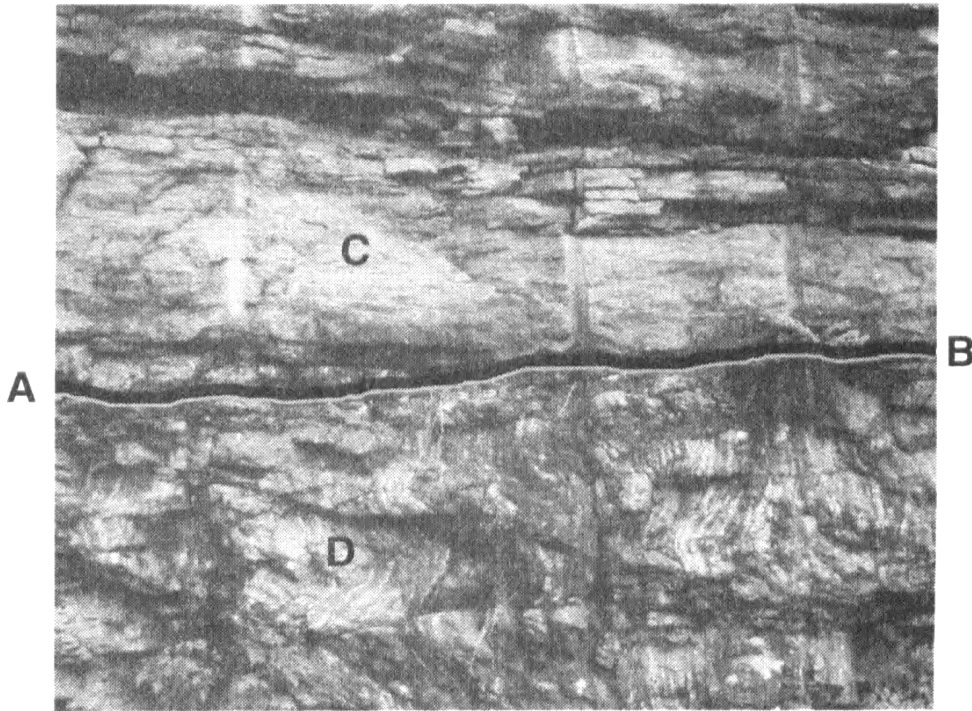
The general age of the bedrock is found to be progressively

- A) older as an observer moves from the east and west coasts toward the center of the United States
- B) younger as an observer moves from the east and west coasts toward the center of the United States
- C) older as an observer moves across the United States from the east coast to the west coast
- D) younger as an observer moves across the United States from the east coast to the west coast

94. Which pie graph best shows the relative length of time of the major intervals of Earth's geologic history?

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

- 
95. 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

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96. Base your answer to the following question on the newspaper article shown below.

### **Fossilized Jellyfish Found in Wisconsin**

Fossil hunters have unearthed the largest collection of fossilized jellyfish ever discovered, including the largest fossilized jellyfish ever found.

The remains of soft-bodied animals such as jellyfish are relatively rare because they don't have bones, fossil dealer Dan Damrow, James W. Hagadorn of the California Institute of Technology and Robert H. Dott Jr. of the University of Wisconsin at Madison noted in describing the find in the journal *Geology*.

About a half-billion years ago, during the Cambrian period, the quarry in Mosinee, Wis., where the deposits were found was a small lagoon. The jellyfish apparently died when they were washed up by a freak tide or storm, the researchers said. The jellyfish remains were probably preserved because of a lack of erosion from sea water and wind, and a lack of scavengers, the researchers concluded.

"It is very rare to discover a deposit which contains an entire stranding event of jellyfish," Hagadorn said. "These jellyfish are not just large for the Cambrian, but are the largest jellyfish in the entire fossil record."

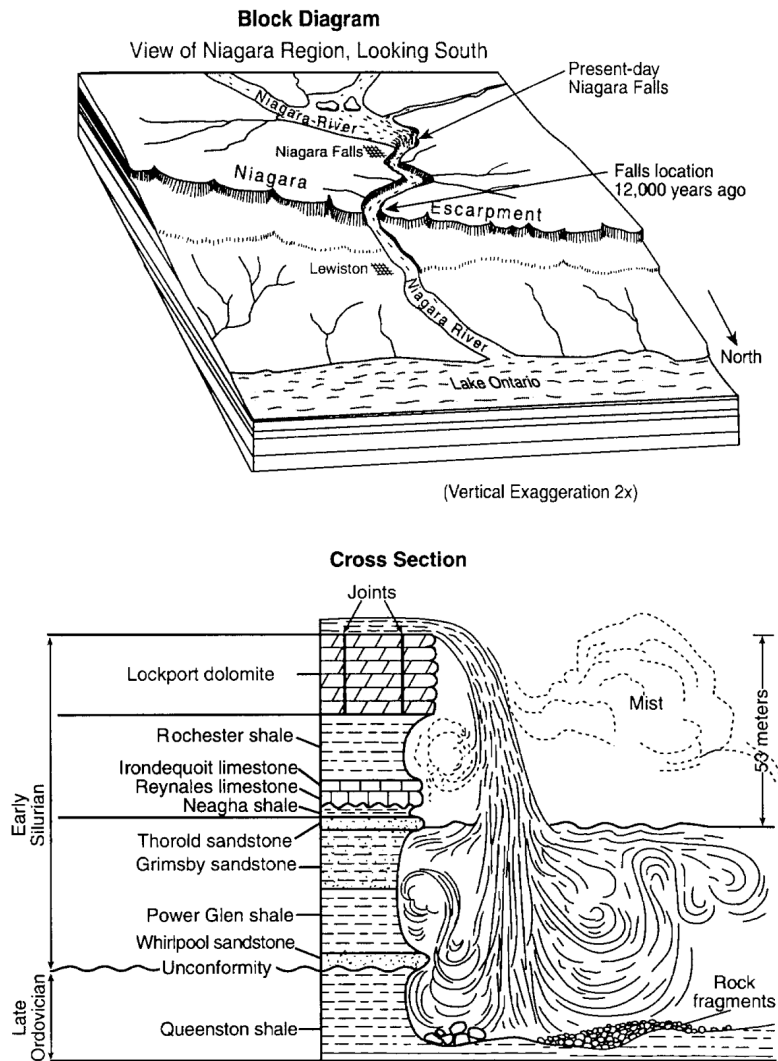
*Washington Post,*

January 2002

Which two marine organisms most likely lived at the same time as these jellyfish?

- A) crinoids and dinosaurs
- B) ammonoids and placoderm fish
- C) **brachiopods and gastropods**
- D) amphibians and eurypterids

97. Base your answer to the following question on the block diagram and the cross section below. The block diagram shows the present position of Niagara Falls in relation to the Niagara Escarpment. The cross section shows the general bedrock structure of present-day Niagara Falls.

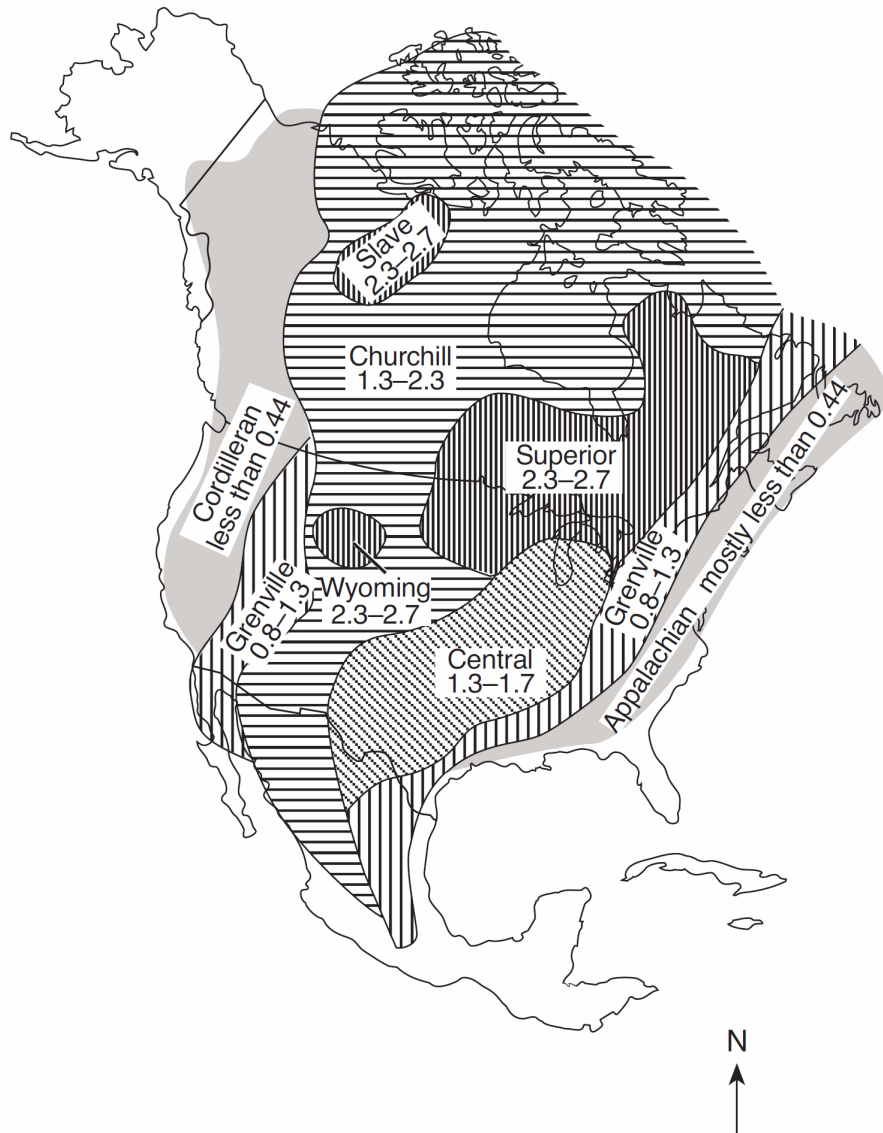


At the end of the glacial period, the Niagara River began flowing over the Niagara Escarpment. At the end of which epoch of geologic time did this situation occur?

- A) Pleistocene    B) Pliocene    C) Miocene    D) Oligocene



98. The map below shows the names and ages of different bedrock formations in North America. The bedrock ages are shown in billions of years.



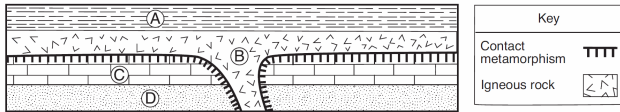
The ages shown on the map suggest that the

- A) oldest bedrock is located in the Churchill formation
- B) youngest bedrock is located in the Wyoming formation
- C) younger bedrock has been added to the east and west coasts of the continent**
- D) age of bedrock increases from west to east across the continent

99. Which event is inferred to have contributed to the significant global climate change that may have caused the mass extinctions of organisms at the end of the Late Cretaceous Epoch?

- A) the Big Bang
- B) an asteroid impact**
- C) formation of Pangaea
- D) shifting of Earth's magnetic poles

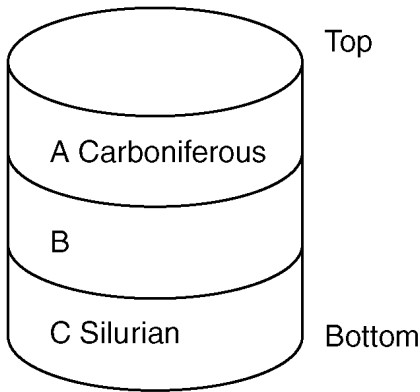
100. The cross section below shows four rock units, *A*, *B*, *C*, and *D*.



Which rock unit is youngest in age?

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

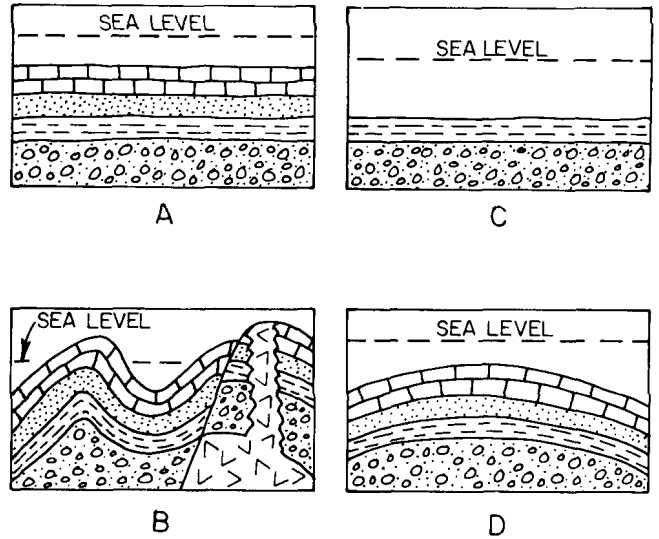
101. The geologic drill core below shows bedrock layers *A*, *B*, and *C* that have not been overturned. The geological ages of layers *A* and *C* are shown.



What is the geologic age of layer *B*?

- A) Cambrian                      B) Ordovician  
 C) **Devonian**                    D) Permian

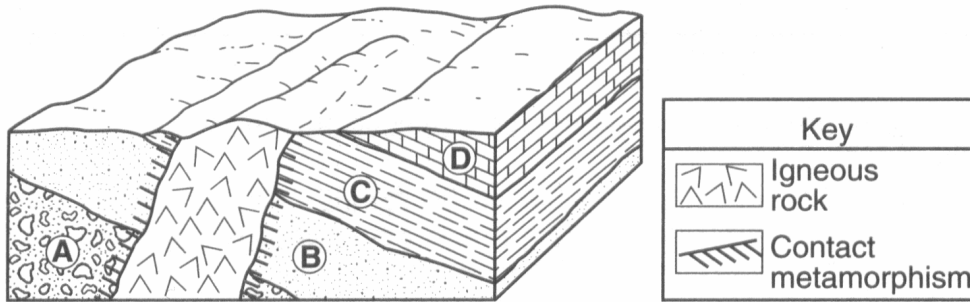
102. The diagrams below show geologic cross sections of the same part of the Earth's crust at different times in the geologic past.



Which sequence shows the order in which this part of the crust probably formed?

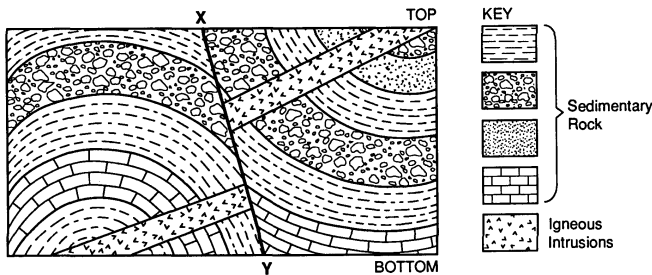
- A) *A* → *B* → *C* → *D*  
 B) *C* → *D* → *A* → *B*  
 C) *C* → *A* → *D* → *B*  
 D) *A* → *C* → *B* → *D*

103. Base your answer to the following question on the block diagram below, which shows a portion of Earth's crust. Letters *A*, *B*, *C*, and *D* indicate sedimentary layers.



Which event occurred most recently?

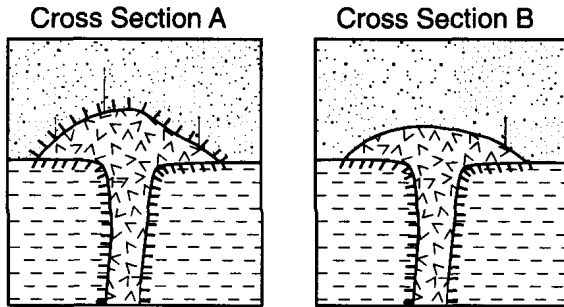
- A) formation of layer *A*  
 B) formation of layer *D*  
 C) tilting of all four sedimentary rock layers  
**D) erosion of the igneous rock exposed at the surface**
- 
104. Which geologic event is inferred to have occurred most recently?
- A) collision between North America and Africa  
 B) metamorphism of the bedrock of the Hudson Highlands  
 C) formation of the Queenston delta  
**D) initial opening of the Atlantic Ocean**
105. The diagram below shows a cross section of the Earth's crust. Line *XY* is a fault.
107. Which event is inferred by most scientists to be responsible for a climate change that has recently led to a *decrease* in the size of most glaciers?
- A) a decrease in the rate of divergence of lithospheric plates along a mid-ocean ridge  
 B) a decrease in the amount of insolation reaching Earth's surface  
**C) an increase in the amount of greenhouse gases in Earth's atmosphere**  
 D) an increase in the amount of vegetative cover in the tropics



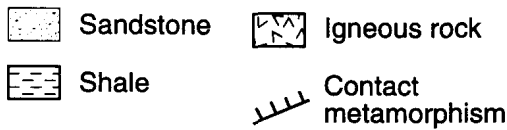
Which sequence of events, from oldest to youngest, has occurred in this outcrop?

- 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**
106. Which geologic event occurred most recently?
- A) initial opening of the Atlantic Ocean**  
 B) formation of the Hudson Highlands  
 C) formation of the Catskill delta  
 D) collision of North America and Africa

108. The diagrams below represent two different geologic cross sections in which an igneous formation is found in sedimentary bedrock layers. The layers have not been overturned.



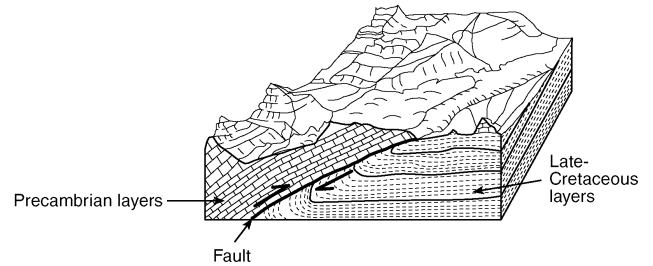
Key



Which statement best describes the relative age of each igneous formation compared to the overlying sandstone bedrock?

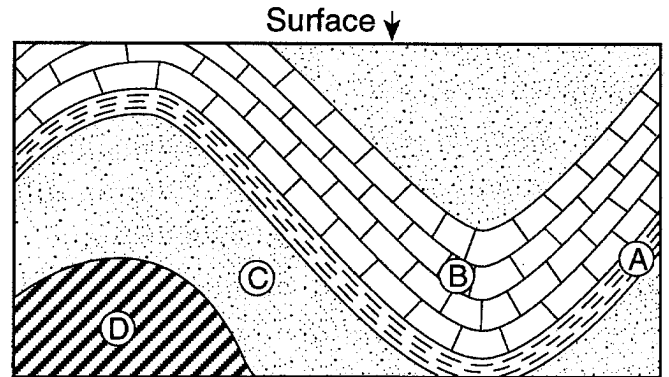
- A) In *A*, the igneous rock is younger than the sandstone and in *B*, the igneous rock is older than the sandstone.
- B) In *A*, the igneous rock is older than the sandstone and in *B*, the igneous rock is younger than the sandstone.
- C) In both *A* and *B*, the igneous rock is younger than the sandstone.
- D) In both *A* and *B*, the igneous rock is older than the sandstone.

109. The geologic block diagram below shows surface features and subsurface structures of a section of Montana.



The faulting shown in the diagram could have occurred

- A) 2,100 million years ago
  - B) 520 million years ago
  - C) 250 million years ago
  - D) 50 million years ago**
110. Sedimentary rock layers *A* through *D* in the cross section below have not been overturned.



Which rock layer is the oldest?

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