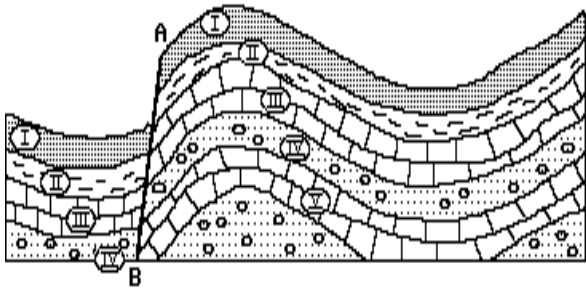


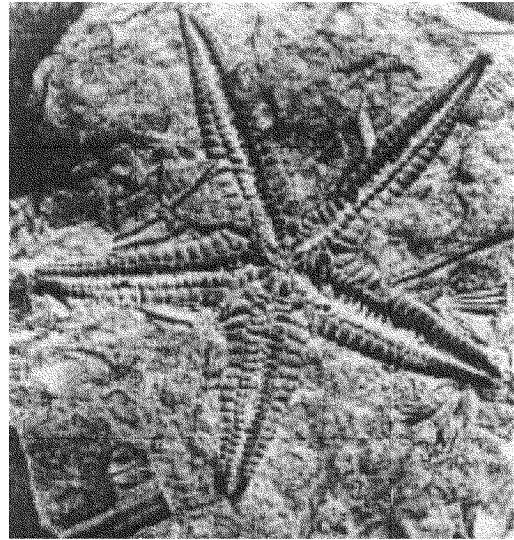
Name: _____

- 1) 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) folding of the region
 B) formation of rock layer **IV**
 C) formation of rock layer **I**
 D) faulting along line *AB*
- 2) Which statement about life on Earth is *best* supported by the information in the *Earth Science Reference Tables*?
- A) All animals without backbones became extinct at about the time that animals with backbones appeared.
 B) Birds, mammals, and dinosaurs existed during some of the same geologic periods.
 C) One species must become extinct before another can appear.
 D) Both land- and sea-dwelling organisms had their origin at the same time.

- 3) The Devonian-aged siltstone shown in the photograph below occurs as surface bedrock near Hamilton, New York.



0 2 cm

- What does the presence of the fossils suggest about the Hamilton area during the Devonian?
- A) It had a marine environment sometime between 418 and 362 million years ago.
 B) It had a terrestrial environment sometime between 418 and 362 million years ago.
 C) It had a terrestrial environment sometime between 443 and 418 million years ago.
 D) It had a marine environment sometime between 443 and 418 million years ago.
- 4) According to the *Earth Science Reference Tables*, which element is used by Earth scientists for radioactive dating of rocks?
- A) potassium-40 C) cobalt-60
 B) silicon-28 D) plutonium-244
- 5) The fossil record indicates that most of the plants and animals that lived on Earth in the past
- A) lived on land
 B) became index fossils
 C) have become extinct
 D) appeared during the Cambrian Period
- 6) What is the relative age of a fault that cuts across many rock layers?
- A) The fault is the same age as the top layer it cuts across.
 B) The fault is the same age as the bottom layer it cuts across.
 C) The fault is younger than all the layers it cuts across.
 D) The fault is older than all the layers it cuts across.

- 7) A geologist collected the fossils shown below from locations in New York State.

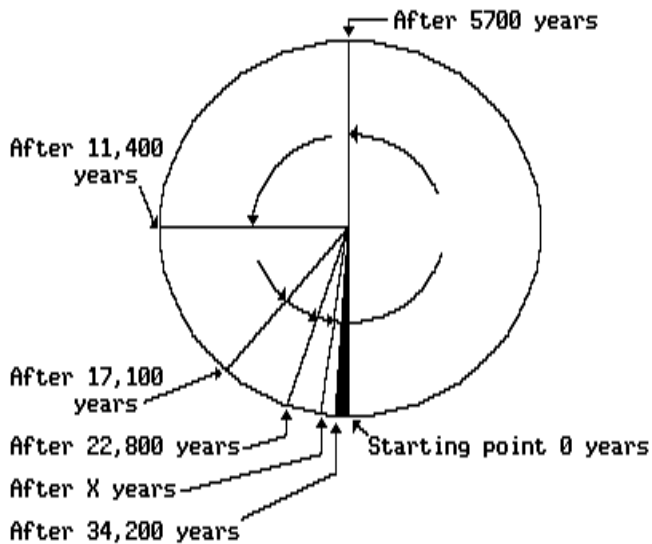


Which sequence correctly shows the fossils from *oldest* to *youngest*?

- A) OLDEST → YOUNGEST
 leaf → nautilus → bivalve → trilobite
- B) OLDEST → YOUNGEST
 nautilus → bivalve → leaf → trilobite
- C) OLDEST → YOUNGEST
 trilobite → bivalve → nautilus → leaf
- D) OLDEST → YOUNGEST
 leaf → trilobite → nautilus → bivalve

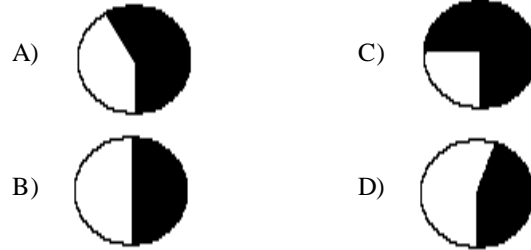
Questions 8 through 12 refer to the following:

The diagram below is a model representing a certain amount of carbon-14, having a half-life of 5.7×10^3 years, and the amount of time it takes for various percentages of the carbon-14 to radioactively decay. The shaded portion of the model represents the amount of carbon-14 remaining in a given sample after 34,200 years had passed.



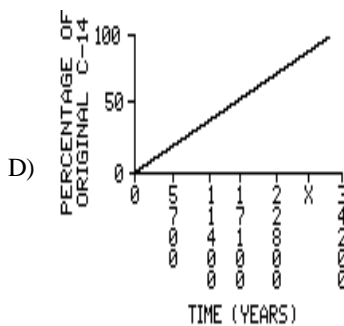
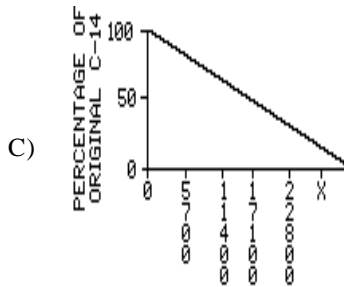
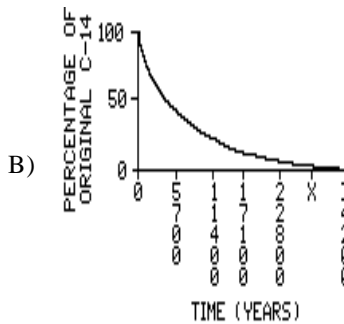
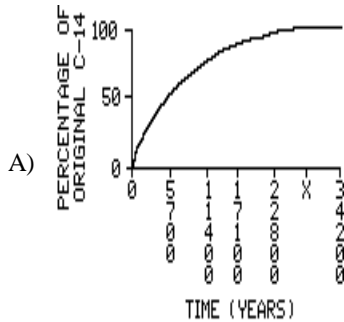
RADIOACTIVE DECAY OF C-14

- 8) Which model best represents the radioactive decay that would have occurred if this carbon-14 had been subjected to extreme heat and pressure during the first 5,700 years [The shaded area represents the amount decayed.]



- 9) Carbon-14 is useful for dating organic remains from which geologic epoch?
- A) Precambrian C) Mississippian
 B) Pleistocene D) Early Permian
- 10) If the amount of carbon-14 in the original sample had been 48 grams, about how much carbon-14 would have been left after 17,100 years?
- A) 3 grams C) 24 grams
 B) 6 grams D) 12 grams

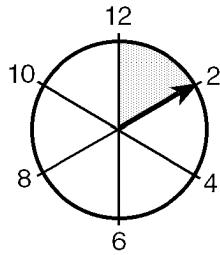
- 11) Which graph best represents the decay of carbon-14 as shown in this model?



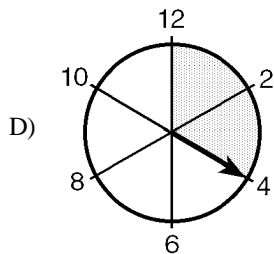
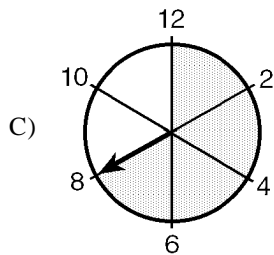
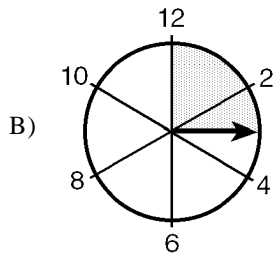
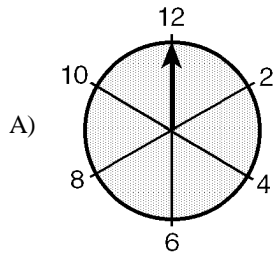
- 12) The line represented by X years indicates another half-life. How many years does X represent in the model?
- A) 25,500 years C) 39,900 years
B) 29,900 years D) 28,500 years
- 13) According to the *Earth Science Reference Tables*, between which two cities in New York State would the oldest surface bedrock be found?
- A) Plattsburgh and Watertown
B) Utica and Binghamton
C) Syracuse and Albany
D) Jamestown and Rochester

- 14) Widespread layers of volcanic ash deposits are useful to geologists because the deposits
- A) contain index fossils
B) serve as time markers
C) show a time gap in the rock record
D) are used for carbon-14 dating
- 15) Which two forms of life existed together on the Earth during the same time period? [Refer to the *Earth Science Reference Tables*.]
- A) mastodons and flowering plants
B) dinosaurs and mastodons
C) trilobites and birds
D) flowering plants and trilobites
- 16) According to the *Earth Science Reference Tables*, which of the following cities is located on the youngest bedrock?
- A) Watertown C) Binghamton
B) Albany D) Syracuse
- 17) According to the *Earth Science Reference Tables*, during which period were North America, Africa, and South America *closest*?
- A) Tertiary C) Cretaceous
B) Triassic D) Ordovician

- 18) The diagram below represents a clock used to time the half-life of a particular radioactive substance. The clock was started at 12:00. The shaded portion on the clock represents the number of hours one-half of this radioactive substance took to disintegrate.

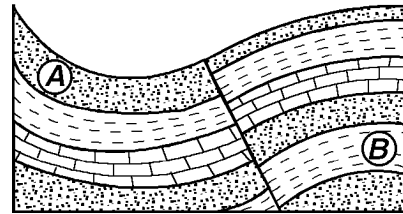


Which diagram *best* represents the clock at the end of the next half-life of this radioactive substance?



- 19) According to the *Earth Science Reference Tables*, when did armored fishes become extinct?
- after the appearance of birds
 - after the appearance of reptiles
 - before the appearance of terrestrial plants
 - before the appearance of dinosaurs

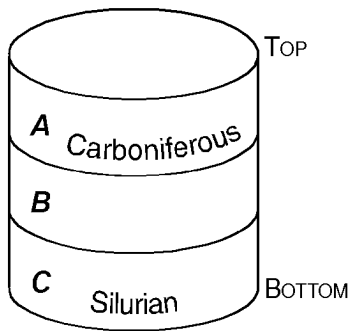
- 20) Why can layers of volcanic ash found between other rock layers often serve as good geologic time markers?
- Volcanic ash usually is rapidly deposited over a large area.
 - Volcanic ash usually occurs in narrow bands around volcanoes.
 - Volcanic ash usually contains index fossils.
 - Volcanic ash usually contains the radioactive isotope carbon-14.
- 21) Unless a series of sedimentary rock layers has been overturned, the bottom rock layer usually
- is the oldest
 - has the finest texture
 - contains the greatest variety of minerals
 - contains fossils
- 22) Which radioactive isotope is *most* useful for determining the age of mastodont bones found in late Pleistocene sediments?
- rubidium-87
 - potassium-40
 - carbon-14
 - uranium-238
- 23) 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?

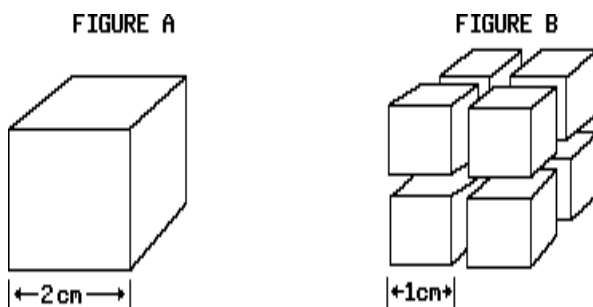
- Faulting occurred before the formation of rock layer A.
- Folding occurred before the formation of rock layer B.
- Deposition occurred before folding or faulting.
- Faulting occurred before folding of the rock layers.

- 24) 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*?

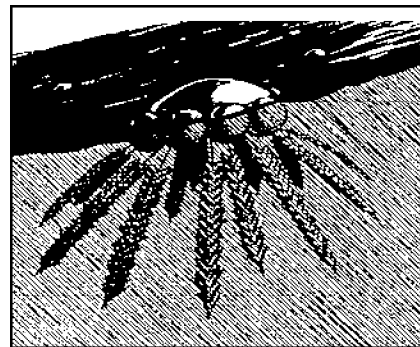
- A) Ordovician C) Devonian
B) Permian D) Cambrian
- 25) An unconformity between two sedimentary layers is most likely produced by
- A) a period of extrusive vulcanism followed by another period of extrusive vulcanism
B) uplift followed by extensive erosion, submergence, and deposition
C) continuous sedimentation in a deep basin over a long period
D) the deposition of gravel followed by the deposition of sand and silt
- 26) Pleistocene deposits of gravel are found lying directly on Precambrian bedrock near Mt. Marcy, New York. The interface between the gravel and the bedrock indicates
- A) a period of continuous deposition
B) a major time gap in the geologic record
C) a zone of contact metamorphism
D) an area of volcanic activity that resulted in extruded gravels
- 27) The diagram below represents a cube of radioactive material (Figure A) cut into eight identical cubes (Figure B).



Compared to the half-life of the material in figure A, the half-life of the material in each small cube in figure B is

- A) $\frac{1}{64}$ as long C) 8 times longer
B) $\frac{1}{8}$ as long D) the same

- 28) Earth scientists studied fossils of a certain type of plant. They noted slight differences in the plant throughout geologic time. What inference is best made from this evidence?
- A) When uplifting occurred, the fossils of this type of plant were deformed.
B) When the environment changed, this type of plant also changed, allowing it to survive.
C) The fossils have changed as a result of weathering and erosion.
D) The processes which form fossils today differ from those of the past.
- 29) According to the *Earth Science Reference Tables*, approximately how many years ago did the Palisades Sill form?
- A) 2 million C) 195 million
B) 1,650 million D) 570 million
- 30) Some marine organisms swim or float in the ocean, and others live on or in the sediment of the ocean floor. A group of floating organisms called graptolites were common in some ancient seas that covered New York State and are found in some New York State bedrock.



Floating graptolites

State *one* reason why certain species of graptolites are used as an index fossil.

- 31) In order for an organism to be used as an index fossil, the organism must have been geographically widespread and must have
- A) lived in shallow water
B) lived on land
C) existed for a geologically short time
D) been preserved by volcanic ash
- 32) According to the *Earth Science Reference Tables*, near the end of which era did the dinosaurs become extinct?
- A) Cenozoic C) Mesozoic
B) Precambrian D) Paleozoic

Questions 33 through 35 refer to the following:

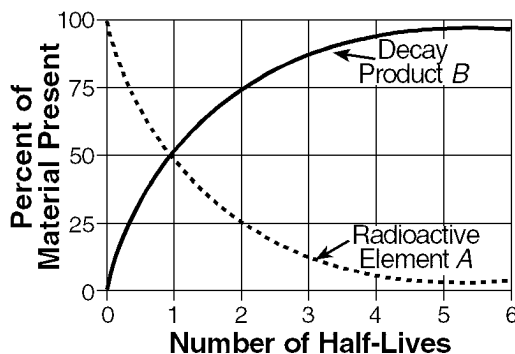
The paragraph below provides background information regarding recent fossil discoveries in Canada.

Scientific evidence indicates that the *earliest* mammals may have evolved approximately 225 million years ago from an ancient reptile group called the therapsids. For millions of years afterward, early mammals and therapsids coexisted until the therapsids apparently became extinct 165 million years ago. However, geologists have recently found a fossil they believe to be a therapsid that is only 60 million years old. They found the fossil, which they have named *Chronoperates paradoxus* (paradoxical time-wanderer), near Calgary in Canada. This find suggests that for 105 million years after the apparent extinction of the therapsids, a few of the reptiles continued to live in a narrow geographic range in Canada.

- 33) Explain briefly why *Chronoperates paradoxus* would *not* be a good index fossil.
- 34) State one method geologists could have used to determine that *Chronoperates paradoxus* lived 60 million years ago.
- 35) According to fossil evidence, during which geologic period did the *earliest* mammals appear on Earth?

Questions 36 through 39 refer to the following:

The graph below shows the rate of radioactive decay of element *A* and the rate at which decay product *B* is formed.



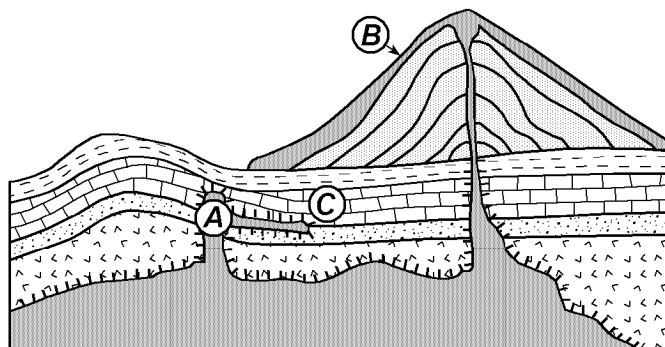
- 36) Two rocks containing radioactive element *A* were taken from a mine. One had a mass of 2 grams; the other had a mass of 4 grams. Compared to the half-life of element *A* in the 4-gram sample, the half-life of element *A* in the 2-gram sample will be
- A) longer
B) shorter
C) the same

- 37) An igneous rock contains 2 grams of radioactive element *A* and 2 grams of decay product *B*. How old is the rock sample?
- A) 3 half-lives
B) 2 half-lives
C) less than 1 half-life
D) 1 half-life
- 38) According to the *Earth Science Reference Tables*, if the half-life of radioactive element *A* is 10,000 years, for which time interval would this element be most useful in determining the age of rock?
- A) Mississippian
B) Pleistocene
C) Precambrian
D) Devonian
- 39) According to the graph, what is the total percentage of radioactive element *A* present after 3 half-lives?
- A) 25.0%
B) 87.5%
C) 75.0%
D) 12.5%
- 40) Geologic time is divided into specific periods and epochs based on
- A) uplift and erosion of New York State bedrock
B) rock types found in mountainous areas
C) inferred positions of Earth landmasses
D) fossil evidence of Earth organisms
- 41) According to the *Earth Science Reference Tables*, approximately how many years ago did the solar system originate?
- A) 10,000,000,000
B) 570,000,000
C) 4,500,000,000
D) 1,000,000,000
- 42) How would the age of sandstone fragments found in a conglomerate rock compare with the age of the conglomerate rock?
- A) The sandstone fragments are younger than the conglomerate rock.
B) The sandstone fragments and the conglomerate rock are the same age.
C) The sandstone fragments are older than the conglomerate rock.
D) The sandstone fragments may be either younger or older than the conglomerate rock.
- 43) Two rock units contain the same radioactive substance. Rock *A* is buried deep underground; rock *B* is at the Earth's surface. Which statement *best* describes the half-life of the radioactive substance?
- A) The radioactive substance has the same half-life in rock *A* and in rock *B*.
B) The radioactive substance in rock *A* has a longer half-life.
C) The radioactive substance in rock *B* has a longer half-life.
D) The radioactive substance's half-life has increased with time in rocks *A* and *B*.

- 44) A layer of volcanic ash may serve as a time marker because the ash is
- A) composed of index fossils
 - B) generally deposited only on land
 - C) often a distinct color
 - D) deposited rapidly over a large area
- 45) According to the *Earth Science Reference Tables*, when did the last dinosaurs become extinct?
- A) 230 million years ago
 - B) 97 million years ago
 - C) 66 million years ago
 - D) 187 million years ago
- 46) Carbon-14, an isotope used to date recent organic remains, would most likely be useful in determining the age of a fossil
- A) armored fish
 - B) Beluga whale
 - C) *Coelophysis*
 - D) trilobite
- 47) If a sample of a radioactive substance is crushed, the half-life of the substance will
- A) increase
 - B) decrease
 - C) remain the same
- 48) A rock contains uranium-238, which has a half-life of 4.5×10^9 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
- 49) For which segment of the Earth's geologic history are fossils rarely found?
- A) Precambrian
 - B) Cenozoic
 - C) Paleozoic
 - D) Mesozoic

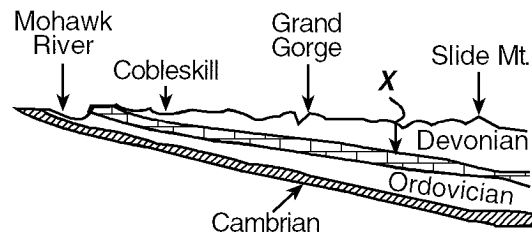
Questions 50 and 51 refer to the following:

In 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.



KEY:

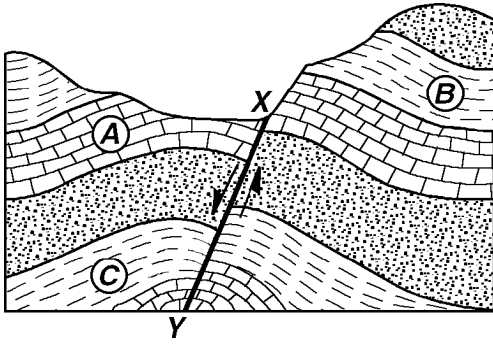
- 50) Which statement correctly describes the relative ages of rocks A and C and gives the *best* supporting evidence from the cross section?
- A) A is younger than C, because the intrusion of A metamorphosed part of rock layer C.
 - B) A is older than C, because the intrusion of A cuts across rock layer C.
 - C) A is older than C, because A has older index fossils.
 - D) A is younger than C, because A is a lower sedimentary rock layer.
- 51) Rock B is most likely which type of igneous rock?
- A) peridotite
 - B) pegmatite
 - C) basalt
 - D) granite
- 52) An ancient bone was analyzed and found to contain carbon-14 that had decayed for nearly two half-lives. According to the *Earth Science Reference Tables*, approximately how old is the bone?
- A) 2,800 years
 - B) 5,600 years
 - C) 11,000 years
 - D) 1,400 years
- 53) The diagram below shows a geologic cross section of a portion of a New York State landscape region.



What is the probable geologic age of sedimentary rock unit X?

- A) Precambrian
 - B) Permian
 - C) Silurian
 - D) Cambrian
- 54) According to the *Earth Science Reference Tables*, studies of the rock record suggest that
- A) the period during which humans have existed is very brief compared to geologic time
 - B) the earliest humans lived at the same time as the dinosaurs
 - C) humans first appeared at the time of the intrusion of the Palisades sill
 - D) evidence of the existence of humans is present over much of the geologic past
- 55) Which event would probably cause the top layer of a series of sedimentary rock layers to be older than those on the bottom?
- A) a volcanic eruption
 - B) a new sedimentary deposition
 - C) an overthrust fault
 - D) an erosion at the surface




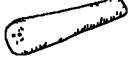
- 64) The diagram below represents a cross section of a portion of the Earth's crust.



Which geologic event is the most recent?

- A) deposition of rock layer C
 B) folding of rock layer B
 C) faulting along line XY
 D) erosion of the surface of rock layer A
- 65) A student filled a graduated cylinder with 1,000 milliliters of water to represent a radioactive substance. After 30 seconds, the student poured out one-half of the water in the cylinder to represent the decay occurring within the first half-life. The student repeated the process every 30 seconds. How much water did the student pour from the cylinder at the 2-minute mark?
- A) 125.0 mL C) 250.0 mL
 B) 62.5 mL D) 12.5 mL
- 66) Which statement about dinosaurs is supported by information provided in the *Earth Science Reference Tables*?
- A) Dinosaur fossils first appeared in rocks of the Paleozoic Era.
 B) Dinosaur fossils and trilobite fossils may be found in the same rocks.
 C) The number of dinosaurs increased before dinosaurs became extinct.
 D) Dinosaurs only lived on land.

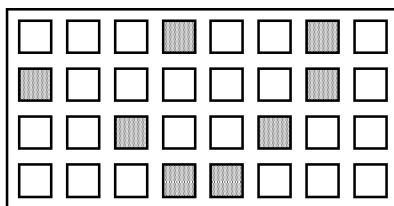
- 67) The chart below shows index fossils found in rocks of various ages.

Bedrock Age	Index Fossil
Mississippian	 Spirifer
Devonian	 Mucrospirifer
Silurian	 Eospirifer
Ordovician	 Michelinoceras

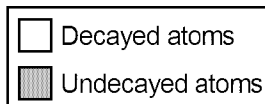
According to the *Earth Science Reference Tables*, which fossil could be found in the same rock as fossils of the first corals?

- A) Mucrospirifer C) Spirifer
 B) Eosprifer D) Michelinoceras
- 68) According to the *Earth Science Reference Tables*, when did the Jurassic Period end?
- A) 163 million years ago
 B) 190 million years ago
 C) 144 million years ago
 D) 66 million years ago

- 78) According to the *Earth Science Reference Tables*, near which community in New York State would you be *least* likely to find fossils?
- A) Watertown C) Elmira
B) Albany D) Old Forge
- 79) According to the *Earth Science Reference Tables*, how many million years ago did the surface bedrock under Watertown, New York, form?
- A) 395 to 435 C) 500 to 570
B) 345 to 395 D) 435 to 500
- 80) According to the *Earth Science Reference Tables*, if 1 meter = 1 billion years is the scale for a geologic time line, approximately how many meters would represent the Paleozoic Era?
- A) 0.450 m C) 0.570 m
B) 0.345 m D) 0.225 m
- 81) Compared to the length of time for the first half-life of a sample of a radioactive isotope, the length of time for the second half-life is
- A) the same
B) less
C) greater
- 82) The diagram below represents the present number of decayed and undecayed atoms in a sample that was originally 100% radioactive material.



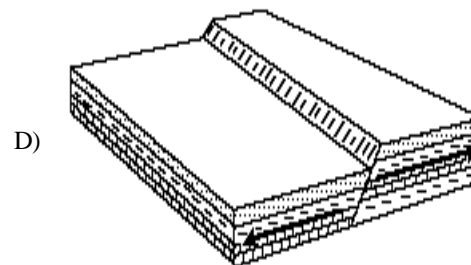
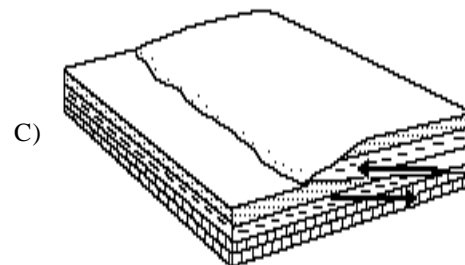
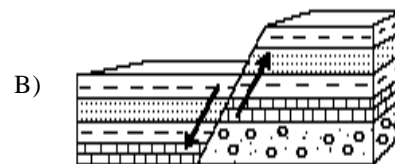
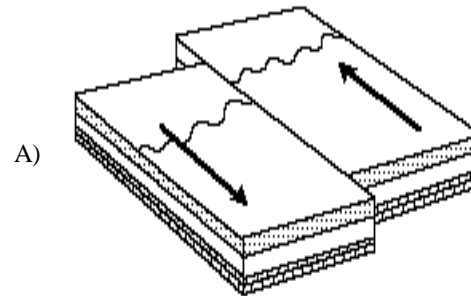
KEY:



If the half-life of the radioactive material is 1,000 years, what is the age of the sample represented by the diagram?

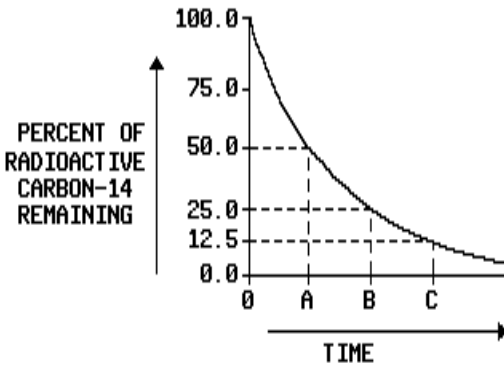
- A) 3,000 years C) 4,000 years
B) 1,000 years D) 2,000 years
- 83) Present-day corals live in warm, tropical ocean water. Which inference is *best* supported by the discovery of Ordovician-age corals in the surface bedrock of western New York State?
- A) Western New York State was covered by a warm, shallow sea during Ordovician time.
B) Ordovician-age corals were transported to western New York State by cold, freshwater streams.
C) Western New York State was covered by a continental ice sheet that created coral fossils of Ordovician time.
D) Ordovician-age corals lived in the forests of western New York State.

- 84) Which diagram of crustal movement best shows how older rock layers may be located on top of younger rock layers?



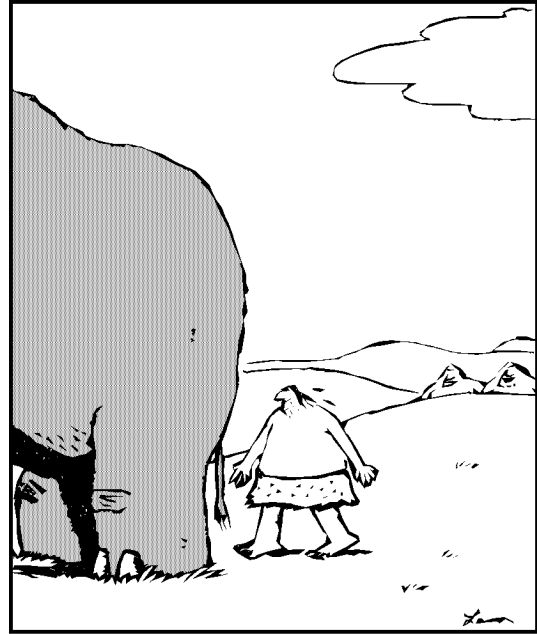
- 85) According to the *Earth Science Reference Tables*, which radioactive element would be most useful for determining the age of clothing that is thought to have been worn 2,000 years ago?
- A) rubidium-87 C) potassium-40
B) uranium-238 D) carbon-14

- 86) The graph below shows the percent remaining (not decayed) of the original amount of carbon-14 at different times (A, B, and C) during radioactive decay. How many half-lives of time are represented by point B along the time axis?



- A) 2 half-lives
B) 1 half-life
C) 4 half-lives
D) 3 half-lives
- 87) Index fossils have usually formed from organisms which had a
- A) narrow geographic distribution and existed for only a short time
B) narrow geographic distribution and existed for a long time
C) wide geographic distribution and existed for only a short time
D) wide geographic distribution and existed for a long time
- 88) According to the *Earth Science Reference Tables*, rocks containing fossils of earliest terrestrial plants could most likely be found in New York State bedrock near
- A) Syracuse
B) Oswego
C) Old Forge
D) Ithaca

- 89) The cartoon below illustrates possible interaction between humans and mammoths.

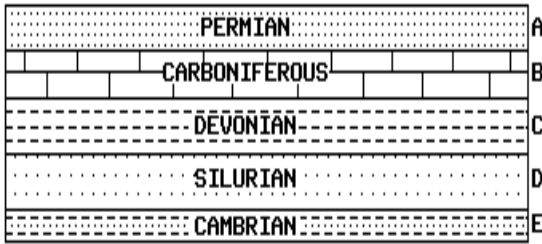


The primitive game of
"Pull the mammoth's tail and run"

- During which geologic timespan could this "game" have occurred?
- A) Precambrian Era
B) Pennsylvanian Epoch
C) Pleistocene Epoch
D) Paleozoic Era
- 90) Unconformities (buried erosional surfaces) are good evidence that
- A) the earliest life-forms lived in the sea
B) part of the geologic rock record is missing
C) many life-forms have become extinct
D) metamorphic rocks have formed from sedimentary
- 91) According to the *Earth Science Reference Tables*, which event was taking place during the Triassic Period?
- A) The Grenvillian Orogeny was raising the Adirondack Mountains.
B) The Palisades sill was intruding in the area of New York State.
C) The most recent continental glaciers were melting over much of North America.
D) Many kinds of marine animals, including trilobites, were becoming extinct.
- 92) According to the "Generalized Bedrock Geology Map of New York State" in the *Earth Science Reference Tables*, which is the youngest bedrock?

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

- 123) The diagram below represents various sedimentary rock layers and the geologic periods during which they formed. According to the *Earth Science Reference Tables*, between which rock layers does a geological time gap exist?



- A) B and C
B) C and D
C) A and B
D) D and E
- 124) Geologists have subdivided geologic time into units based on
- A) landscape development
B) fossil evidence
C) rock type
D) erosion rates
- 125) According to the *Earth Science Reference Tables*, during which geologic era did trilobites and sharks coexist?
- A) Paleozoic
B) Mesozoic
C) Cenozoic
D) Precambrian
- 126) According to the *Earth Science Reference Tables*, 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 initial opening of the Atlantic Ocean
D) the separation of South America from Africa
- 127) The diagram below represents the skull of a saber-toothed tiger that died 30,000 years ago.



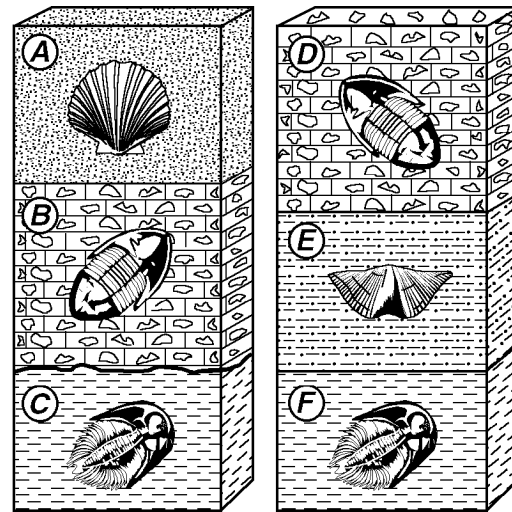
The age of the skull could be determined most accurately by using

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

- 128) According to the *Earth Science Reference Tables*, the surface bedrock of the Tug Hill Plateau is composed primarily of
- A) sedimentary rocks of Devonian age
B) intensely metamorphosed rocks of Middle Proterozoic age
C) igneous rocks of Cambrian age
D) sedimentary rocks of Ordovician age

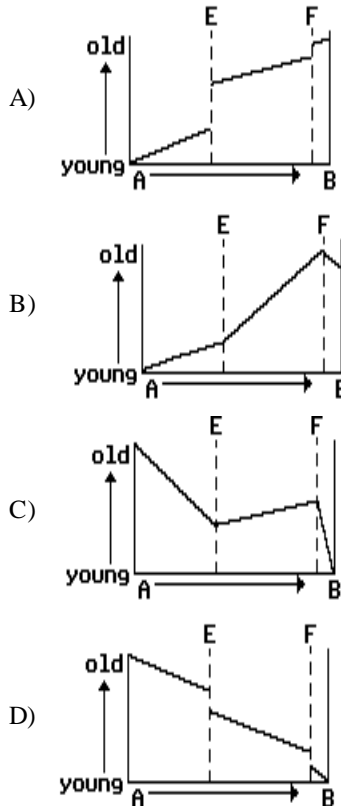
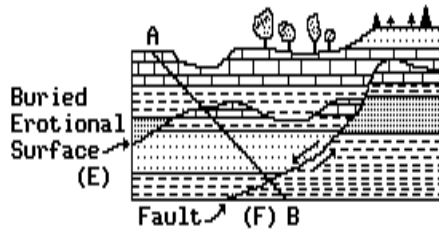
Questions 129 through 131 refer to the following:

The diagrams below represent two rock outcrops found several miles apart in New York State. Individual rock layers are lettered, and fossils and rock types are indicated.



- 129) An unconformity (buried erosional surface) is represented by the interface between which two layers?
- A) D and F
B) E and F
C) B and C
D) A and B
- 130) In which sequence are the rock layers listed in order from *oldest* to *youngest*?
- A) F, E, C, A
B) C, A, F, D
C) C, E, D, A
D) F, B, E, D
- 131) Based on the given rock and fossil evidence, which two letters most likely indicate parts of the same layer?
- A) B and D
B) A and F
C) D and A
D) C and E

- 132) Which graph most accurately indicates the relative age of the rocks along line AB in the geologic cross section below if no overturning has occurred?



- 133) According to fossil evidence in the rock record, humans have existed on Earth for approximately what percentage of geologic time?

A) 57% C) 6%
B) less than 1% D) 15%

- 134) Trilobite fossils from different time periods show small changes in appearance. These observations suggest that the changes may be the result of

A) evolutionary development
B) periods of destruction of the geological record
C) a variety of geological processes
D) the gradual disintegration of radioactive substances

- 135) According to the *Earth Science Reference Tables*, what great orogeny (mountain-building episode) occurred in New York State during the Devonian time period?

A) Allegheny Orogeny
B) Acadian Orogeny
C) Grenvillian Orogeny
D) Taconian Orogeny

- 136) Geologists have subdivided geologic time into periods that are based on

A) landscape regions
B) carbon dating
C) rock types
D) fossil evidence

- 137) The decay rates of radioactive substances remain constant when the substances are subjected to different temperature and pressure conditions. The *best* inference that can be drawn from this statement is that decay rates are

A) independent of the isotope's composition
B) affected by pressure, but not by temperature
C) affected by the mass of the isotope
D) independent of external factors

- 138) According to the *Earth Science Reference Tables*, which groups could *best* serve as index fossils for the Mesozoic Era?

A) mastodons and placental mammals
B) dinosaurs and ammonites
C) birds and armored fishes
D) trilobites and brachiopods

- 139) What characteristics of fossils are most useful in correlating sedimentary rock layers?

A) limited geographic distribution and limited to a particular rock formation
B) wide geographic distribution but limited to a particular rock formation
C) wide geographic distribution and found in many rock formations
D) limited geographic distribution but found in many rock formations

- 140) The newspaper article shown below was taken and adapted from the *Los Angeles Times*.

VOLCANIC BLAST SHAPED EARTH

Study finds eruption split an ancient continent, creating Atlantic Ocean

The largest volcanic eruption in Earth's history †† so powerful it split an ancient supercontinent and created the Atlantic Ocean †† spewed millions of square miles of searing lava that extinguished much of life on ancient Earth.

From hundreds of basalt outcrops that rim the Atlantic coasts, scientists have pieced together evidence of the titanic eruption 200 million years ago. Researchers said that the eruption set the fractured landmasses adrift and, by wedging them apart, gradually opened the gulf that created the Atlantic †† giving the map of the world the form it has today.

"This is one of the biggest things that has ever happened in Earth's history. This is a gigantic, igneous event and it all seems to have occurred in an amazingly brief amount of time."

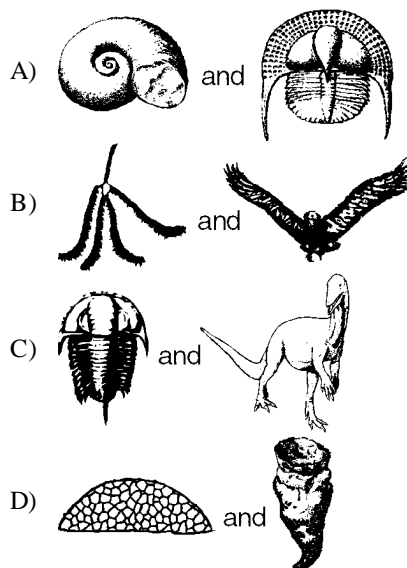
To reconstruct the ancient catastrophe, a team of scientists analyzed basalt dikes, sills, and lavas from the New Jersey Palisades, the Brazilian Amazon, Spain, and West Africa.

By studying the chemical composition and dating the residual radioisotopes in the basaltic rocks, the researchers determined that the rocks all originated from the same eruption. Once they realized the outcrops were linked, they were able to determine that, in the distant past, the rocks all had been located together at the center of an immense continent called Pangea that once stretched, unbroken, from pole to pole.

Name the geologic time period when this major volcanic eruption initially opened the Atlantic Ocean.

- 141) The best method for the correlation of sedimentary rock layers several hundred kilometers apart is by comparing the
- thickness of the rock layers
 - color of the rock layers
 - index fossils in the layers
 - layers by walking the outcrop

- 142) Which one of the following pairs of index fossils can be found in Ordovician bedrock?

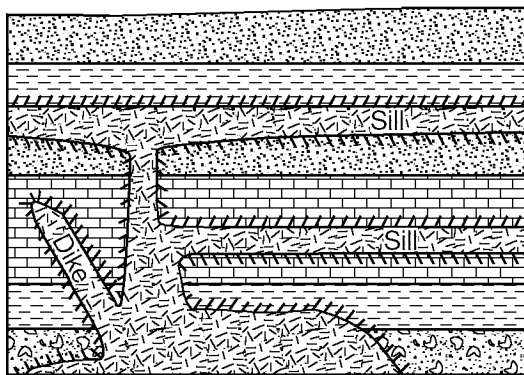


- 143) The absolute age of a rock is the approximate number of years ago that the rock formed. The absolute age of an igneous rock can *best* be determined by
- examining the rock's relative position in a rock outcrop
 - comparing the sizes of the crystals found in the upper and lower parts of the rock
 - comparing the amounts of decayed and undecayed radioactive isotopes in the rock
 - examining the environment in which the rock is found
- 144) According to the *Earth Science Reference Tables*, if the radioactive element in a rock sample is potassium-40, which resulting decay product would be present?
- N¹⁴
 - Sr⁸⁷
 - Ar⁴⁰
 - C¹²
- 145) A marine fossil was found to contain one-half of its original quantity of carbon-14. According to the *Earth Science Reference Tables*, approximately how old is this fossil?
- 17,100 years
 - 5,700 years
 - 22,800 years
 - 11,400 years
- 146) Sedimentary rock units several hundred kilometers apart could *best* be correlated by comparing the
- fossils found in each rock unit
 - color and thickness of each rock unit
 - degree of weathering and erosion of each rock unit
 - types of soil located above each rock unit
- 147) According to the *Earth Science Reference Tables*, during which period did the Acadian Orogeny occur?
- Ordovician
 - Devonian
 - Cambrian
 - Silurian

- 148) According to the *Earth Science Reference Tables*, which radioactive element has a half-life of 4.5×10^9 years?
- A) uranium-238 C) potassium-40
 B) carbon-14 D) rubidium-87
- 149) According to the *Earth Science Reference Tables*, when did the intrusion of the Palisades Sill occur?
- A) before the Appalachian Orogeny
 B) during the Paleozoic Era
 C) after the extinction of dinosaurs and ammonites
 D) during the late Triassic Period

Questions 150 and 151 refer to the following:

On the geologic cross section below, overturning has not occurred. The dike and sills shown in the cross section are igneous intrusions.



- 150) Which feature is represented by the symbol (|||||) along the edges of the dike and sills?
- A) contact metamorphic rock
 B) a glacial moraine
 C) an unconformity
 D) index fossils

151) Which rock type is the *oldest*?

A)  C) 

B)  D) 

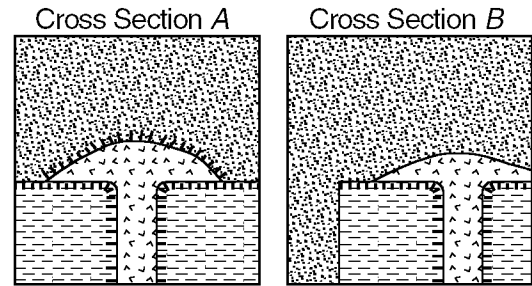
152) The table below shows the fossils found in three layers of sedimentary bedrock.

Rock Layer	Fossil
A	trilobites
B	mastodont tusk
C	dinosaur bones





According to the *Earth Science Reference Tables*, the relative age of the rock layers from *oldest* to *youngest* is

- A) A •, B •, C C) B •, A •, C
 B) A •, C •, B D) C •, A •, B

153) 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.



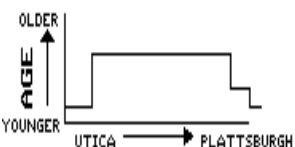
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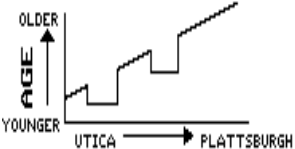
 Sandstone  Igneous rock
 Shale  Contact metamorphism

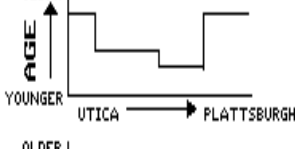
Which one of the following statements *best* describes the relative age of each igneous formation compared to the overlying sandstone bedrock?


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

154) According to the *Earth Science Reference Tables*, which graph best represents the relative age of the surface bedrock along a straight line from Utica to Plattsburgh?

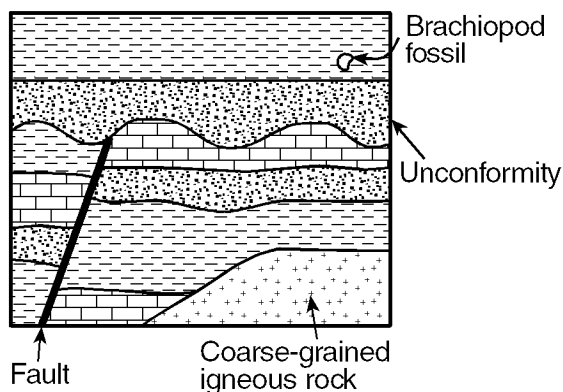
A) 

B) 

C) 

D) 

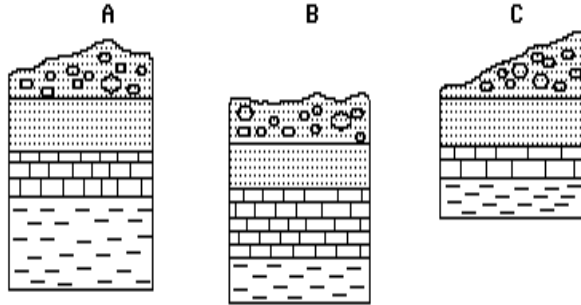
- 155) Scientists believe that Earth's early atmosphere changed in composition as a result of
- the drifting of the continents
 - the changes in Earth's magnetic field
 - the appearance of oxygen-producing organisms
 - a transfer of gases from the Sun
- 156) Living corals are found in warm shallow seas. Coral fossils have been found in the sedimentary rocks of Alaska. These findings suggest that
- Alaska once had a tropical marine environment
 - Alaska's cold climate fossilized the coral
 - coral usually develops in cold climates
 - ocean currents carried the coral to Alaska
- 157) If a radioactive material were cut into pieces, the half-life of each piece would be
- less than the original specimen's half-life
 - greater than the original specimen's half-life
 - the same as the original specimen's half-life
- 158) A skull was discovered that has human characteristics and is about 2.8 million years old. Based on this information, during which epoch could early humans have existed? [Refer to the *Earth Science Reference Tables*.]
- Oligocene
 - Pliocene
 - Eocene
 - Miocene
- 159) Trilobite fossils found in shale bedrock in the Albany, New York, area indicate that this area once
- had many land animals
 - had iron ore deposits
 - was covered by an ocean
 - was covered by a large forest
- 160) Which feature in the geologic cross section below was formed by erosion?



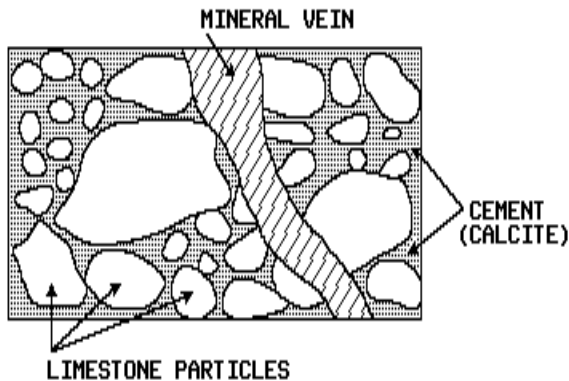
- brachiopod fossil
- fault
- unconformity
- coarse-grained igneous rock

- 161) According to the *Earth Science Reference Tables*, what are the respective decay products of uranium, potassium, and rubidium?
- hydrogen (H), lithium (Li), and helium (He)
 - carbon (C), oxygen (O), and nitrogen (N)
 - lead (Pb), argon (Ar), and strontium (Sr)
 - silicon (Si), oxygen (O), and aluminum (Al)
- 162) A well was drilled in Syracuse, New York. The first bedrock layer reached by the drill formed during which period?
- Silurian
 - Ordovician
 - Cambrian
 - Devonian
- 163) Which is the best method of determining the relative ages of a layer of sandstone in western New York State and a layer of sandstone in eastern New York State?
- Compare the size of sand particles of the two layers.
 - Compare the thickness of the two layers.
 - Compare the colors of the two layers.
 - Compare the index fossils in the two layers.
- 164) A sample of wood found in an ancient tomb contains 25% of its original carbon-14. The age of this wood sample is approximately
- 17,100 years
 - 5,700 years
 - 11,400 years
 - 2,800 years
- 165) According to the *Earth Science Reference Tables*, most of the surface bedrock found in New York State was formed during which era?
- Mesozoic
 - Precambrian
 - Cenozoic
 - Paleozoic
- 166) Which form of life existed on the Earth for the *longest* period of time?
- armored fish
 - dinosaurs
 - trilobites
 - flowering plants
- 167) The most complete fossil record of past invertebrate life in New York State can be found in rocks of which era?
- Cenozoic
 - Precambrian
 - Paleozoic
 - Mesozoic
- 168) According to the *Earth Science Reference Tables*, which inference can be made about the fossil record?
- A great variety of plants and animals existed during the Precambrian Era.
 - Very few life forms have become extinct.
 - Fossils were extremely rare for most of the geologic past.
 - Primitive humans have existed through most of the geologic past.

- 169) The diagram below represents cross sections of three rock outcrops approximately 100 kilometers apart. What would be the best method of correlating the rock layers of each outcrop?



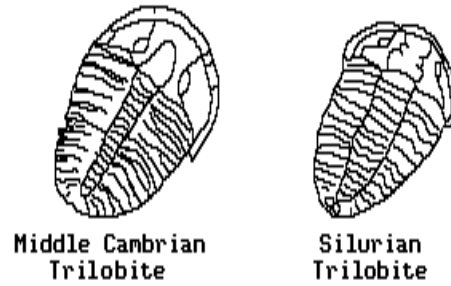
- A) comparing mineral composition
 B) comparing thickness of rock layers
 C) comparing rock types
 D) comparing index fossils
- 170) According to the *Earth Science Reference Tables*, a straight line connecting which two cities would a cross surface bedrock of only two geologic periods?
 A) Watertown and Plattsburgh
 B) Binghamton and Syracuse
 C) Jamestown and Old Forge
 D) Kingston and New York City
- 171) The diagram below shows a sample of conglomerate rock.



The oldest part of this sample is the

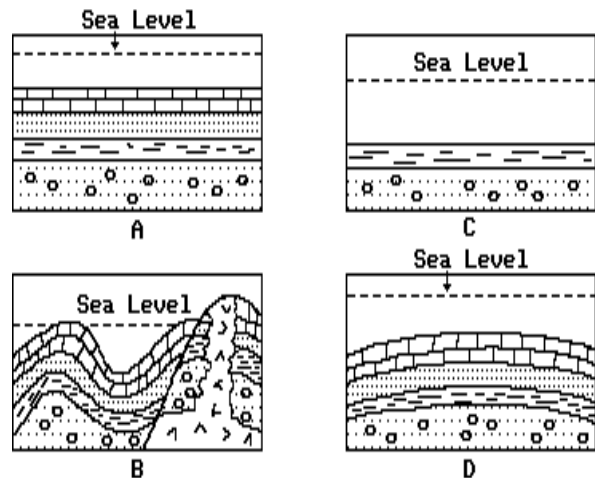
- A) conglomerate rock sample
 B) limestone particles
 C) calcite cement
 D) mineral vein

- 172) Fossils of two trilobite species from different geologic periods are illustrated below.



A comparison of these fossils provides evidence that these species may have

- A) experienced identical lifespans
 B) undergone metamorphism
 C) experienced weathering and erosion
 D) undergone evolutionary development
- 173) According to the *Earth Science Reference Tables*, which type of fossil could be found in the bedrock near Elmira, New York?
 A) early mammal
 B) flowering plant
 C) fish
 D) dinosaur
- 174) During which time period did the rocks of the Taconic Mountains begin to rise in eastern New York?
 A) Ordovician
 B) Permian
 C) Devonian
 D) Late Precambrian
- 175) The diagrams below show geologic cross sections of the same part of the Earth's crust at different times in the geologic past.



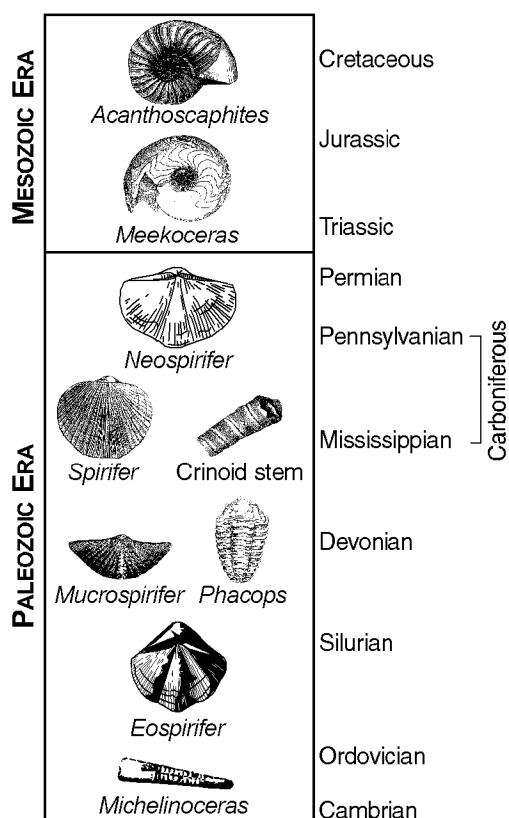
Which sequence shows the order in which this part of the crust probably formed?

- A) C •, D •, A •, B
 B) C •, A •, D •, B
 C) A •, B •, C •, D
 D) A •, C •, B •, D

- 176) Many parts of the rock record in New York State are missing. These parts are most likely missing because of
- subsidence and deposition
 - folding and faulting
 - earthquakes and volcanic activity
 - uplift and erosion
- 177) According to the *Earth Science Reference Tables*, which geologic event most likely caused the Appalachian Mountains to form?
- the massive erosion and deposition of Mesozoic rocks
 - the melting of a subducted oceanic plate
 - the collision of North America and Africa
 - the eruption of an ancient volcanic mountain chain

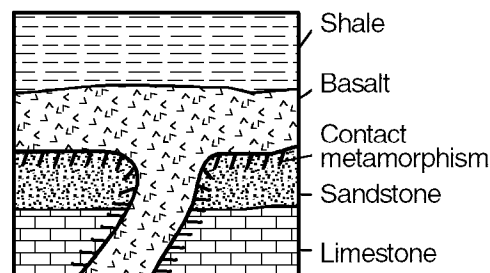
Questions 178 and 179 refer to the following:

The chart below shows the geologic ages of some well-known fossils.



- 178) The *Spirifer*, Crinoid stem, and *Neospirifer* fossils might be found in some of the surface bedrock of which New York State landscape region?
- the Allegheny Plateau southeast of Jamestown
 - the Adirondack Mountains near Mt. Marcy
 - the Catskills near Slide Mountain
 - the Erie-Ontario Lowlands northeast of Niagara Falls
- 179) Which New York State fossil is found in rocks of the same period of geologic history as *Meekoceras*?
- Condor
 - Eurypterus*
 - Coelophysis*
 - Placoderm fish

- 180) According to the *Earth Science Reference Tables*, which event occurred most recently in New York State?
- formation of the ancestral Adirondacks
 - extinction of dinosaurs
 - intrusion of the Palisades Sill
 - Taconian orogeny
- 181) Which statement correctly describes an age relationship in the geologic cross section below?

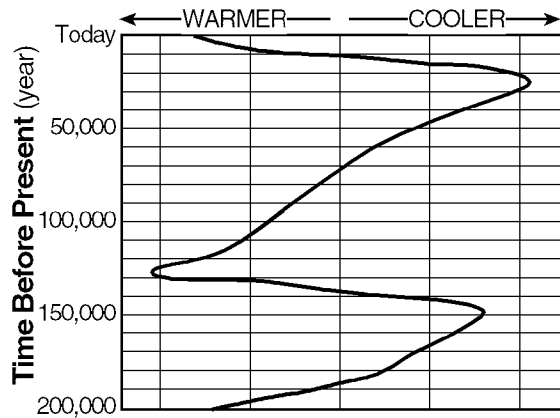


- The sandstone is younger than the basalt.
 - The limestone is younger than the sandstone.
 - The shale is younger than the basalt.
 - The limestone is younger than the shale.
- 182) The age of a Moon rock can be found by analyzing a sample to compare the relative amounts of
- C¹⁴ and Pb²⁰⁶
 - U²³⁸ and Sr⁸⁷
 - U²³⁸ and C¹⁴
 - U²³⁸ and Pb²⁰⁶
- 183) Which feature in a rock layer is older than the rock layer?
- faults
 - igneous intrusions
 - mineral veins
 - rock fragments
- 184) Theories of evolution suggest that variations between members of the same species give the species *greater* probability of
- surviving environmental changes
 - remaining unchanged
 - becoming extinct
 - becoming fossilized
- 185) Specific mass extinction of living organisms and global climatic changes in geologic history are inferred by most scientists to have been caused by
- large energy surges from the surface of the Sun
 - the impact of asteroids or large meteors on Earth's surface
 - earthquakes occurring along crustal plate boundaries
 - the gravitational pull of the Sun on Earth's surface

186) A sample of rock contained 100 grams of potassium-40 (^{40}K) when it was formed. Today the rock contains 50 grams of potassium-40 (^{40}K). According to the *Earth Science Reference Tables*, what is the age of the rock?

- A) 5.6×10^9 years
- B) 4.5×10^9 years
- C) 2.8×10^9 years
- D) 1.3×10^9 years

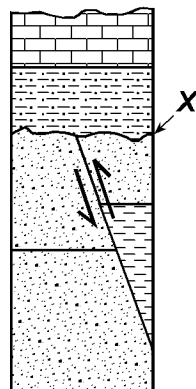
187) The diagram below shows trends in the temperature of North America during the last 200,000 years, as estimated by scientists.



What is the total number of major glacial periods that have occurred in North America in the last 200,000 years?

- A) 3
- B) 2
- C) 4
- D) 5

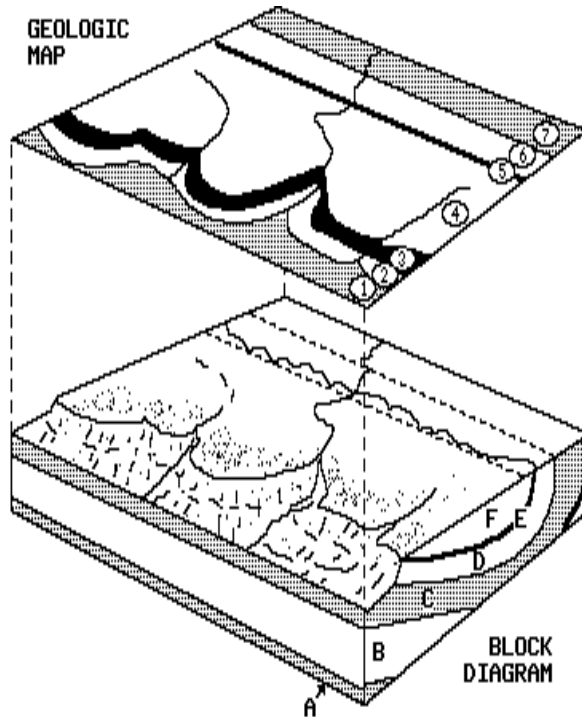
188) The diagram below shows a cross section of New York State bedrock that has not been overturned. Line X represents an unconformity.



The index fossil *Eurypteris* is found in the limestone layer. What trilobite index fossil could be found in the shale layer?

Questions 189 and 190 refer to the following:

The block diagram below shows the underlying rock structure and surface land forms of an area and the geologic map shows the outcrop pattern of the same area. Assume that the rock layers have not been overturned.



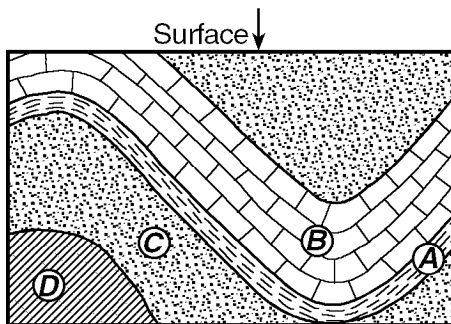
189) The region represented by the diagram shows evidence of having been subjected to which type of mountain-building process?

- A) glaciation
- B) folding
- C) vulcanism
- D) faulting

190) Compared to the age of rock layer 6, the age of rock layer 2 is probably

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

- 203) Why are ancient volcanic ash deposits important to geologists?
- They serve as good geological time makers.
 - They indicate major areas where earthquakes occurred.
 - They form resistant rock layers containing fossils.
 - They are easily dated using carbon-14.
- 204) The *best* indicator of an area's ancient environmental conditions and climates would be the
- amount of carbon-14 found in sedimentary layers
 - banding patterns of metamorphosed rocks
 - type and distribution of fossils
 - present plant and animal life
- 205) According to the *Earth Science Reference Tables*, which rock is most likely the oldest?
- sandstone containing fossils of flowering plants
 - siltstone containing dinosaur footprints
 - conglomerate containing the tusk of a mastodon
 - shale containing trilobite fossils
- 206) Sedimentary rock layers *A* through *D* in the cross section below have not been overturned.



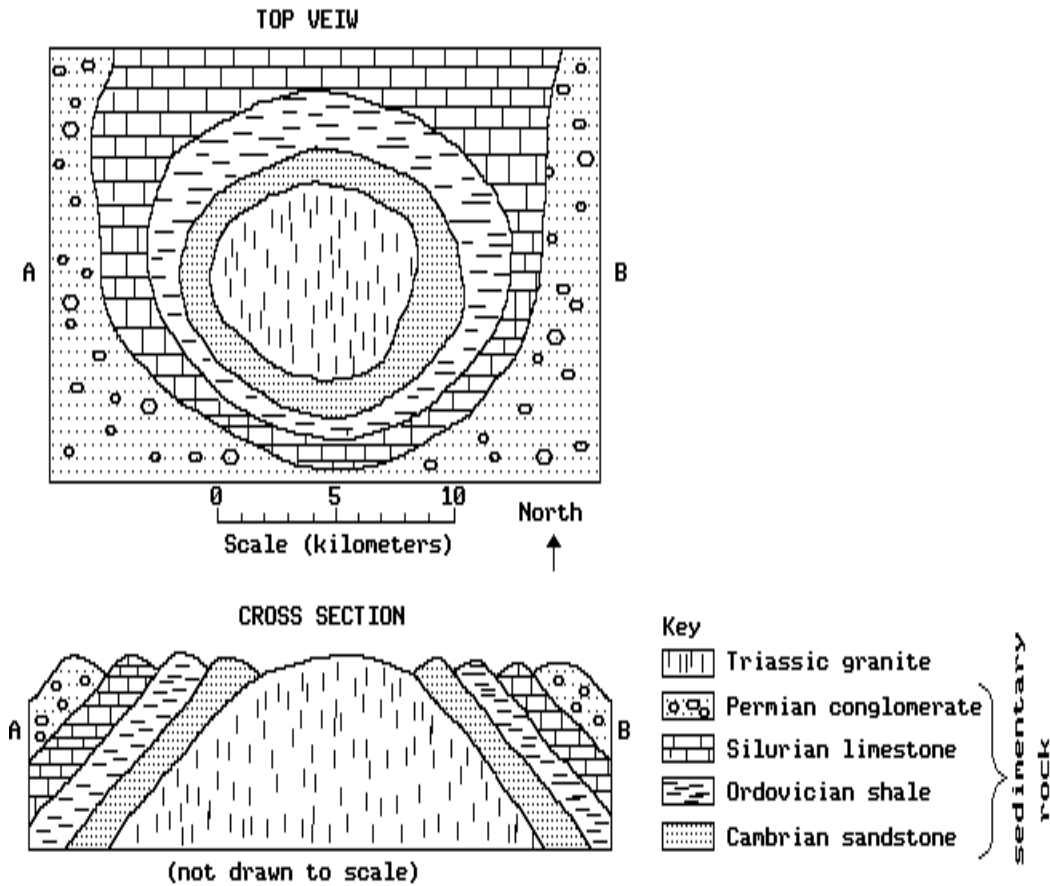
Which rock layer is the *oldest*?

- A*
 - B*
 - C*
 - D*
- 207) The fossils record provides evidence that primitive humans were alive on Earth at the same time as the
- dinosaurs
 - earliest birds
 - mammoths
 - armored fish

- 208) Which radioactive substance would probably be used in dating the recent remains of a plant found in sedimentary deposits?
- carbon-14
 - rubidium-87
 - uranium-238
 - potassium-40
- 209) According to the *Earth Science Reference Tables*, which area of New York State has the youngest bedrock?
- the area between Syracuse and Rochester
 - the area east of Albany
 - the area south of the Finger Lakes
 - the area around Mt. Marcy
- 210) According to the *Earth Science Reference Tables*, the rock record preserved in New York State indicates that
- early Paleozoic rock is very abundant
 - Jurassic rock is very abundant
 - the palisades Sill formed before the extinction of the trilobites
 - dinosaurs existed at the time of the Taconian Orogeny
- 211) According to the *Earth Science Reference Tables*, at which location could a geologist find shale containing eurypterid fossils?
- Old Forge
 - Syracuse
 - New York City
 - Long Island
- 212) Why is carbon-14 not usually used to accurately date objects more than 50,000 years old?
- Carbon-14 has been introduced as an impurity in most materials older than 50,000 years.
 - Carbon-14 has a relatively short half-life and too little carbon-14 is left after 50,000 years.
 - Carbon-14 has a relatively long half-life and not enough carbon-14 has decayed after 50,000 years.
 - Carbon-14 has only existed on Earth during the last 50,000 years.
- 213) According to the *Earth Science Reference Tables*, the bedrock underlying the St. Lawrence Lowlands landscape region would most likely contain fossils of the *earliest*
- flowering plants
 - mollusks
 - dinosaurs
 - reptiles

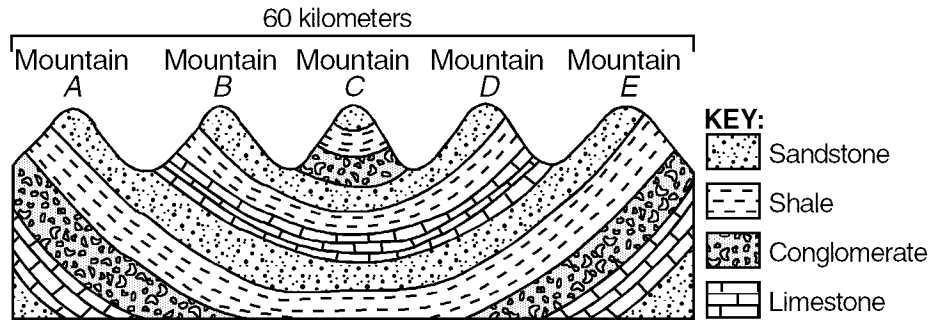
Questions 214 through 217 refer to the following:

The diagrams below represent the bedrock geology of an area outside New York State. [Refer to the *Earth Science Reference Tables*.]



- 214) In which bedrock unit are fossils *least* likely to be found?
- A) Permian conglomerate
B) Cambrian sandstone
C) Triassic granite
D) Ordovician shale
- 215) Which fossils could be found in the Silurian limestone?
- A) mammals
B) flowering plants
C) eurypterids
D) reptiles
- 216) Which type of bedrock shown in the diagrams is *not* found in New York State?
- A) Cambrian sandstone
B) Permian conglomerate
C) Ordovician shale
D) Silurian limestone
- 217) Which bedrock could be 530 million years old?
- A) Ordovician shale
B) Silurian limestone
C) Cambrian sandstone
D) Triassic granite

218) The diagram below represents a geologic cross section of a portion of the Earth's crust. The rock layers have not been overturned.

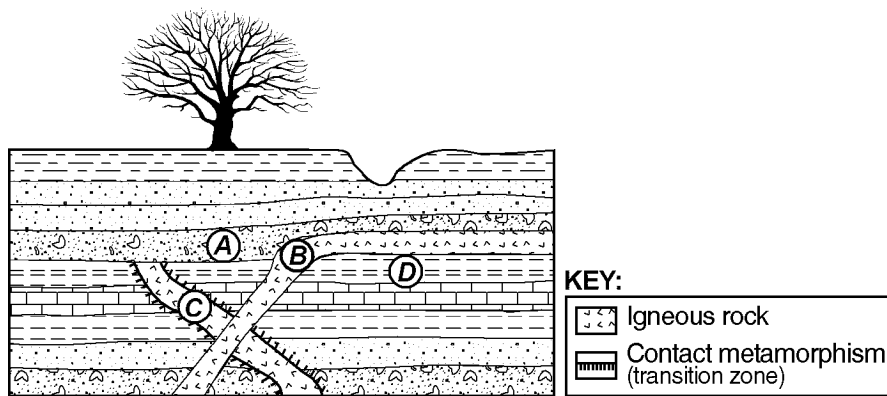


The top of which mountain is composed of the *youngest* bedrock?

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

Questions 219 through 221 refer to the following:

The cross section below represents a portion of Earth's crust. Letters A, B, C, and D are rock units.

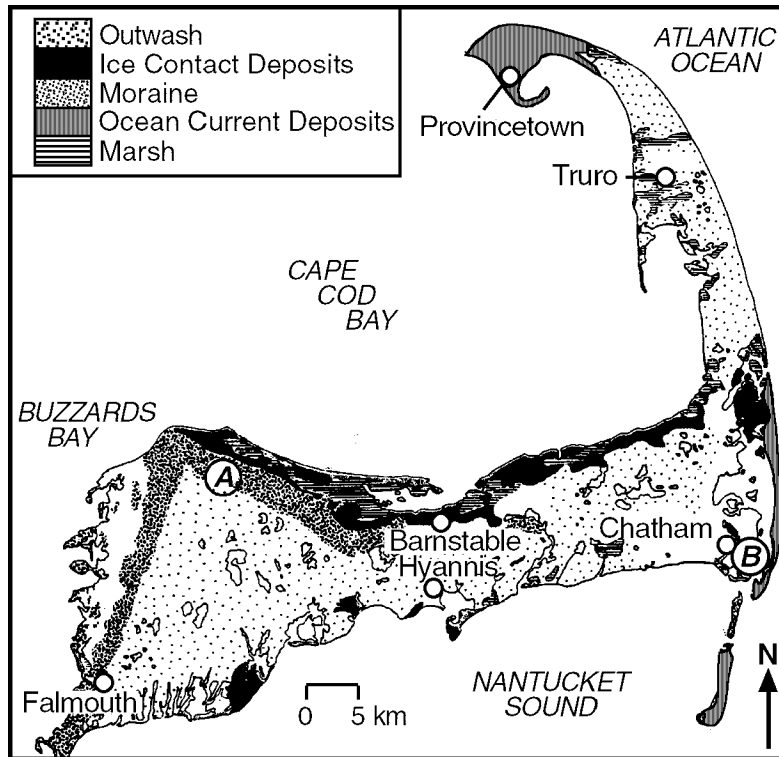


219) Igneous rock B was formed after rock layer D was deposited but before rock layer A was deposited. Using the contact metamorphism symbol shown in the key, draw that symbol in the proper locations on the cross section provided to indicate those rocks that underwent contact metamorphism when igneous rock B was molten.

220) In relation to rock units A and B in the cross section, when was igneous rock C formed?

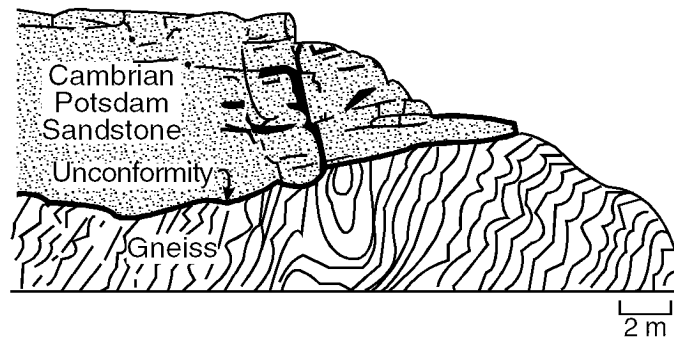
221) Describe *one* observable characteristic of rock A that indicates that rock A is sedimentary.

- 222) The map below shows geologic features of Cape Cod, Massachusetts. The locations of several towns are shown as small circles.



The unsorted sediments at location A were deposited during the advance and retreat of the last continental ice sheet. During which geologic epoch were these sediments deposited?

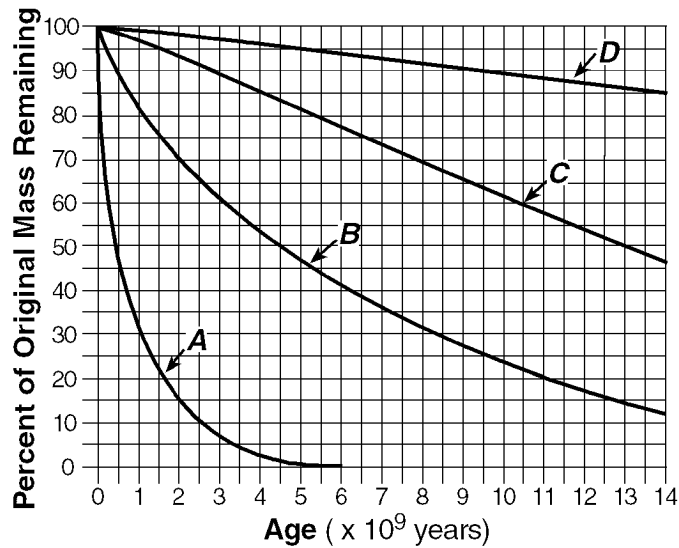
- A) Miocene B) Pliocene C) Pleistocene D) Oligocene
- 223) The geologic cross section below shows an unconformity between gneiss and the Cambrian-age Potsdam sandstone in northern New York State.



According to the *Earth Science Reference Tables*, what is the most probable age of the gneiss at this location?

- A) Precambrian B) Cretaceous C) Ordovician D) Silurian

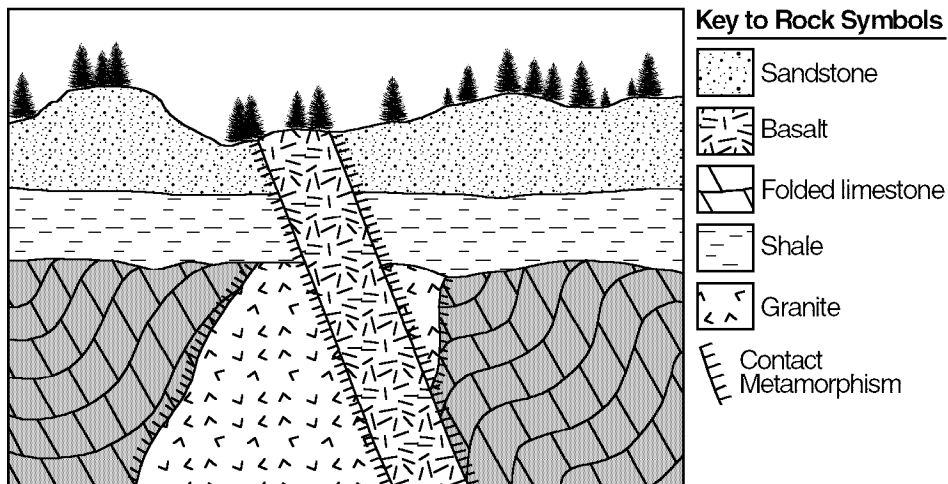
224) The graph below shows the decay rates of four radioactive substances, A, B, C, and D.



When 90 percent of the original mass of isotope D remains, what total percent of the original mass of isotope B remains?

- A) 22% B) 10% C) 63% D) 90%

225) The diagram below represents a cliff of exposed bedrock that was investigated by an Earth science class.

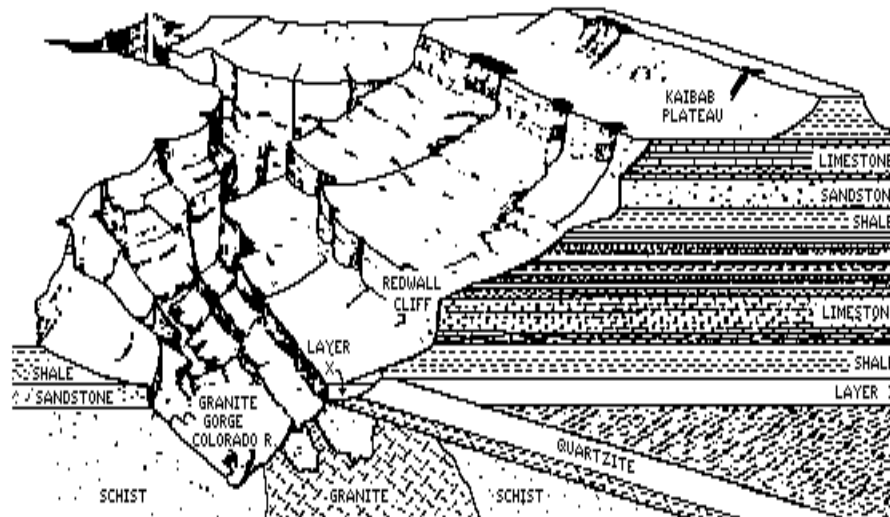


After the students examined the cliff, they made three correct inferences about the geologic history of the bedrock.

- Inference 1:* The shale layer is older than the basaltic intrusion.
Inference 2: The shale layer is older than the sandstone layer.
Inference 3: An unconformity exists directly under the shale layer.

Explain how each inference is supported by evidence shown in the diagram.

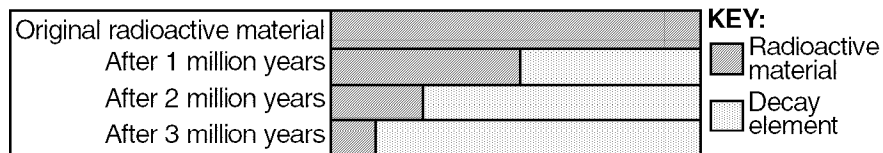
226) The diagram below shows a cross section of the Grand Canyon. The rock type of layer X has been purposely left blank.



Correlation of rock layers on *both* sides of the canyon would show that layer X is composed of

- A) limestone B) sandstone C) quartzite D) granite

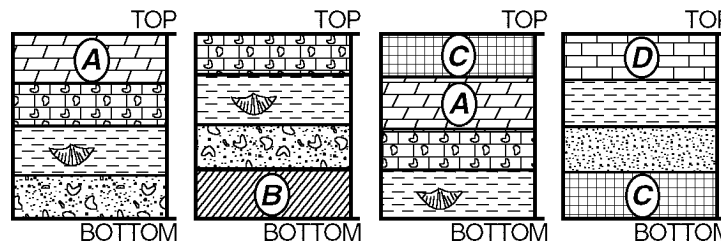
227) The graph below represents the decay rate of a radioactive material.



What is the total amount of the original radioactive material that remains after 3 million years?

- A) $\frac{1}{2}$ B) $\frac{1}{4}$ C) $\frac{1}{8}$ D) $\frac{1}{16}$

228) The diagrams below represent layers of sedimentary rocks from four different locations. Four of the layers are identified as A, B, C, and D. No layers have been overturned.

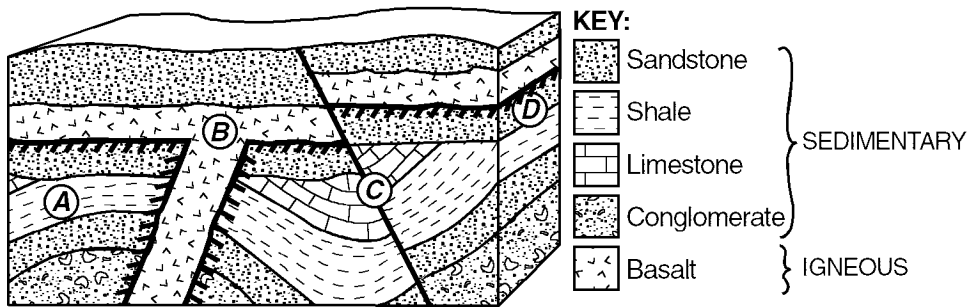


Which rock layer is *youngest*?

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

Questions 229 and 230 refer to the following:

The diagram below represents a geologic cross section.



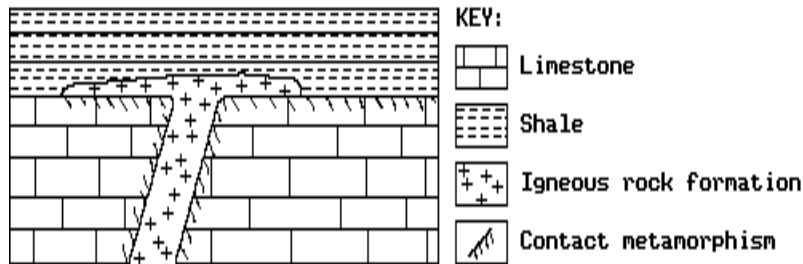
229) Which geologic event occurred most recently?

- A) the intrusion at *B*
- B) faulting at *C*
- C) the unconformity at *D*
- D) folding at *A*

230) The symbol in the diagram most likely represents a

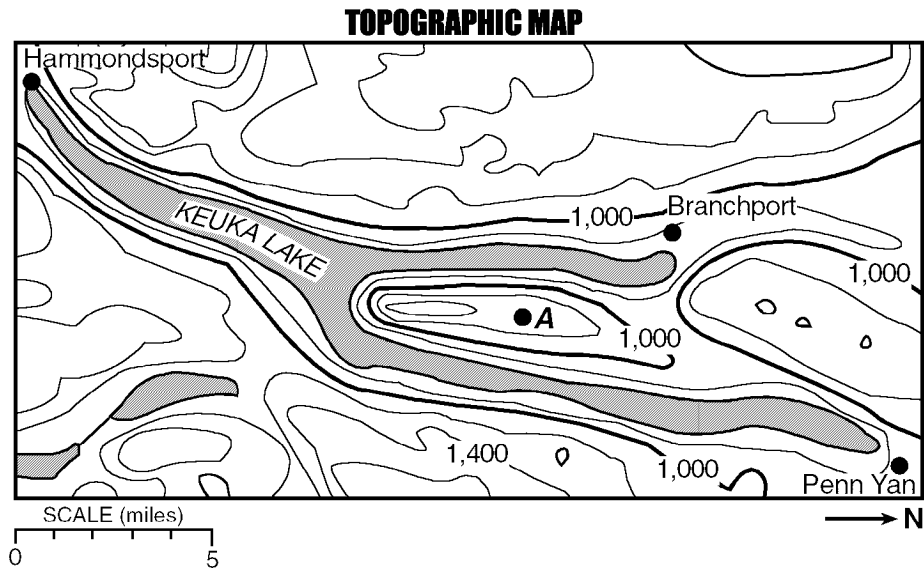
- A) convection cell caused by unequal heating
- B) large fault from an earthquake or crustal movement
- C) metamorphic rock in contact with an igneous rock
- D) depression caused by underground erosion

231) In the diagram below which shows a portion of the Earth's crust, what is the relative age of the igneous rock?



- A) It is younger than both the limestone and the shale.
- B) It is older than the limestone but younger than the shale.
- C) It is younger than the limestone but older than the shale.
- D) It is older than both the limestone and the shale.

- 232) The topographic map below represents Keuka Lake, one of the Finger Lakes in New York State. Branchport, Hammondsport, and Penn Yan are towns near the lake.



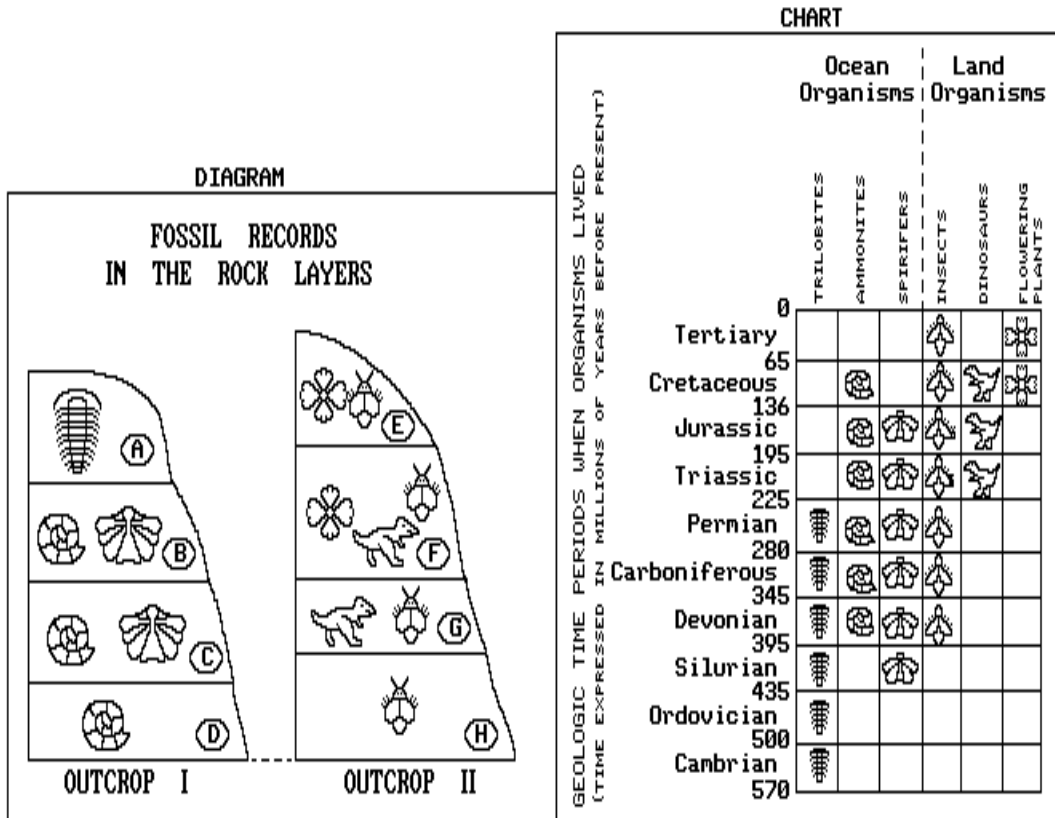
During which geologic period did the surface bedrock surrounding all of the Finger Lakes form?

- | | |
|-------------|---------------------|
| A) Devonian | C) Cretaceous |
| B) Cambrian | D) Early Ordovician |

Questions 233 through 237 refer to the following:

The chart below shows the time periods when several species of organisms lived on the Earth and the type of environment, either ocean or land, in which the species lived.

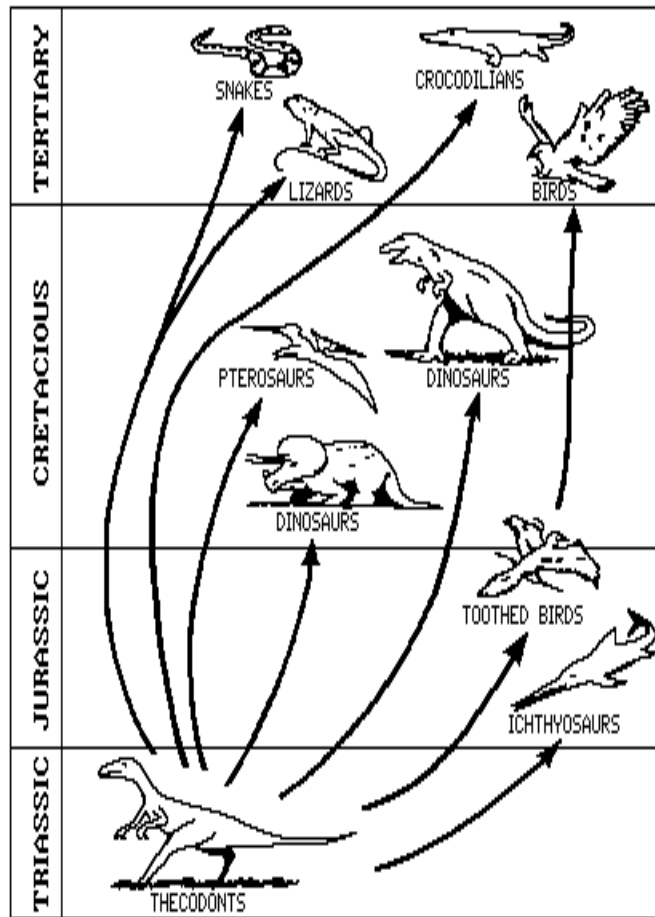
The diagram below shows the fossils of these organisms that are found in the rock layers (A through H) of two separate outcrops that are 25 kilometers apart. Each rock layer contains a complete fossil record of the organisms that existed in the depositional environment during the time of deposition. If a fossil symbol is not shown in a rock layer, the species either lived in the other environment or did not exist at the time that the rock formed.



- 233) The extinction of spirifers occurred at most nearly the same time as the
- A) extinction of dinosaurs
 - B) beginning of flowering plants
 - C) beginning of trilobites
 - D) extinction of the insects
- 234) According to the chart, when did dinosaurs live on the Earth?
- A) between 395 and 280 million years ago
 - B) between 225 and 65 million years ago
 - C) between 65 and 2 million years ago
 - D) between 570 and 435 million years ago

- 235) Which statement best explains the differences between the types of fossils found in outcrop I and those found in outcrop II?
- A) Erosion has removed from outcrop II those fossils found in outcrop I.
 - B) Faulting has removed from outcrop I those fossils found in outcrop II.
 - C) Different types of rocks are found at outcrop I than at outcrop II.
 - D) The rocks in each outcrop were deposited in different types of environments.
- 236) Which rock layer in outcrop I could be the same age as layer F in outcrop II?
- A) B
 - B) D
 - C) A
 - D) C
- 237) Based on fossil evidence, during which time period was rock layer E most likely deposited?
- A) Ordovician
 - B) Permian
 - C) Tertiary
 - D) Triassic

238) The diagram below shows a possible sequence of evolutionary development of some vertebrates.

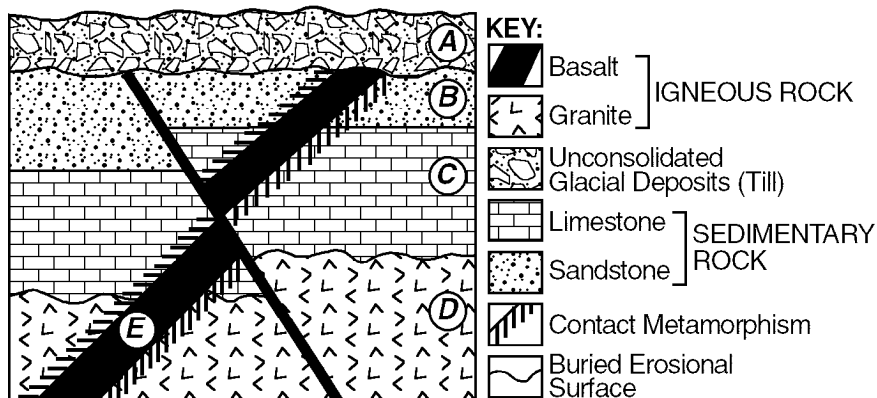


Which statement can best be inferred from the diagram?

- A) The lizard and the bird are both reptiles.
- B) The pterosaurs and the ichthyosaurs became extinct at the same time.
- C) The pterosaurs evolved into modern birds.
- D) The thecodont is the ancestor of several different types of animals.

Questions 239 and 240 refer to the following:

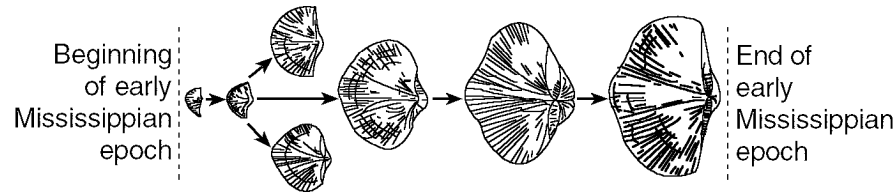
The diagram below represents a geologic cross section of a portion of the Earth's crust in New York State. Letters A through E identify specific rock units. The layers have not been overturned.



- 239) Which of these events occurred most recently at this location?
- A) faulting of rock units *B*, *C*, *D*, and *E*
 - B) intrusion of the basalt
 - C) metamorphism of the granite
 - D) formation of limestone layer *C*

- 240) Which evidence indicates that there is a gap in the geologic record represented by this cross section?
- A) Rock unit *D* is an igneous rock.
 - B) Faulting occurred after rock unit *D* was formed.
 - C) A buried erosional surface exists between rock units *C* and *D*.
 - D) Rock units *D* and *E* are made of different minerals.

- 241) The diagram below represents a series of brachiopod fossils showing progressive changes during the Early Mississippian Epoch. The fossils are drawn to scale.

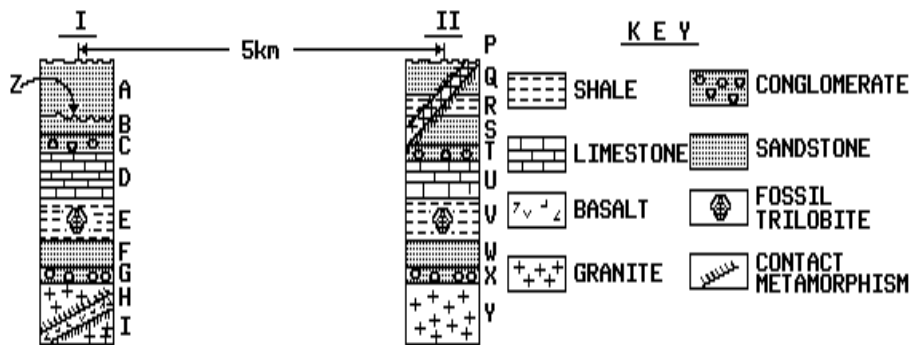


One explanation for this process of change is the theory of

- A) dynamic equilibrium
- B) fossilization
- C) evolution
- D) superposition

Questions 242 through 246 refer to the following:

The diagrams below represent two geologic cross sections of rock layers which have not been overturned.

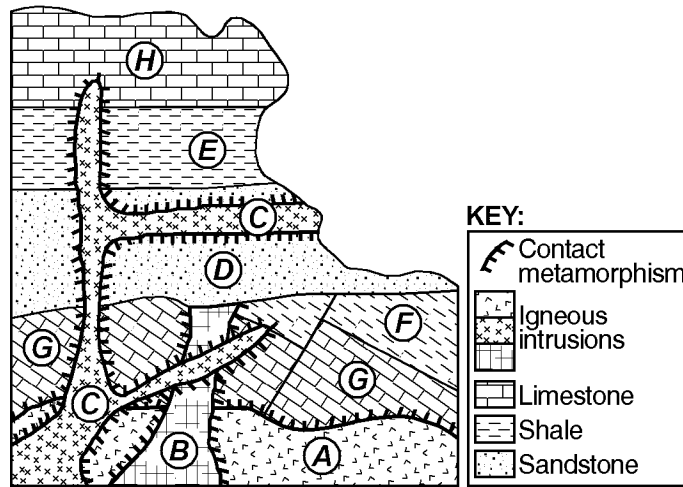


- 242) Which is probably the youngest rock in cross section **II**?
- A) *P*
 - B) *W*
 - C) *Q*
 - D) *V*
- 243) The feature at *Z* is a buried erosional surface. Based on this, what inference can best be supported?
- A) No other rock layers could have been present between rock layer *A* and rock layer *B*.
 - B) The fossils eroded from rock layer *B* were formed again in rock layer *A*.
 - C) Rock layers *A* and *B* do not provide a continuous geologic record.
 - D) Rock layers *A* and *B* were formed by the same deposition of sand.

- 244) Rock layer *F* is probably the same as rock layer
- A) *W*
 - B) *P*
 - C) *T*
 - D) *S*
- 245) Which rock layer is most likely sedimentary in origin?
- A) *Y*
 - B) *G*
 - C) *H*
 - D) *P*
- 246) According to the *Earth Science Reference Tables*, approximately how many years ago might layer *E* have formed?
- A) 150 million years
 - B) 540 million years
 - C) 950 million years
 - D) 50 million years

Questions 247 and 248 refer to the following:

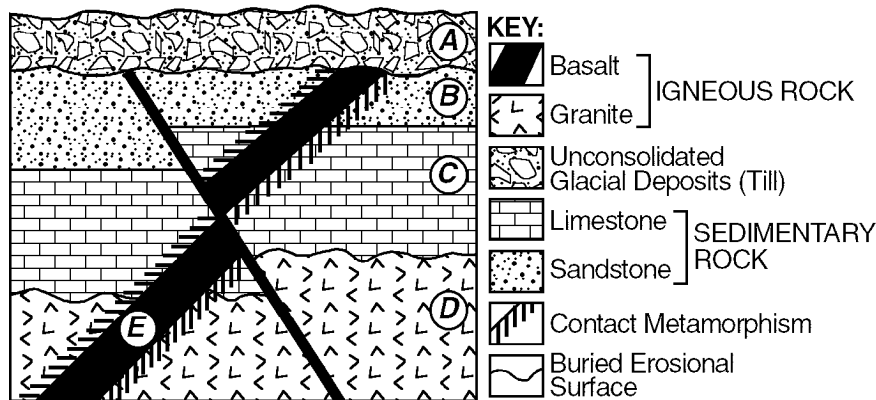
The diagram below shows a cross section of Earth's crust.



- 247) 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.

- 248) The *most* apparent buried erosional surface is found between which two rock units?
- A) E and H
 - B) A and B
 - C) D and F
 - D) C and D

249) The diagram below represents a geologic cross section of a portion of the Earth's crust in New York State. Letters A through E identify specific rock units. The layers have not been overturned.

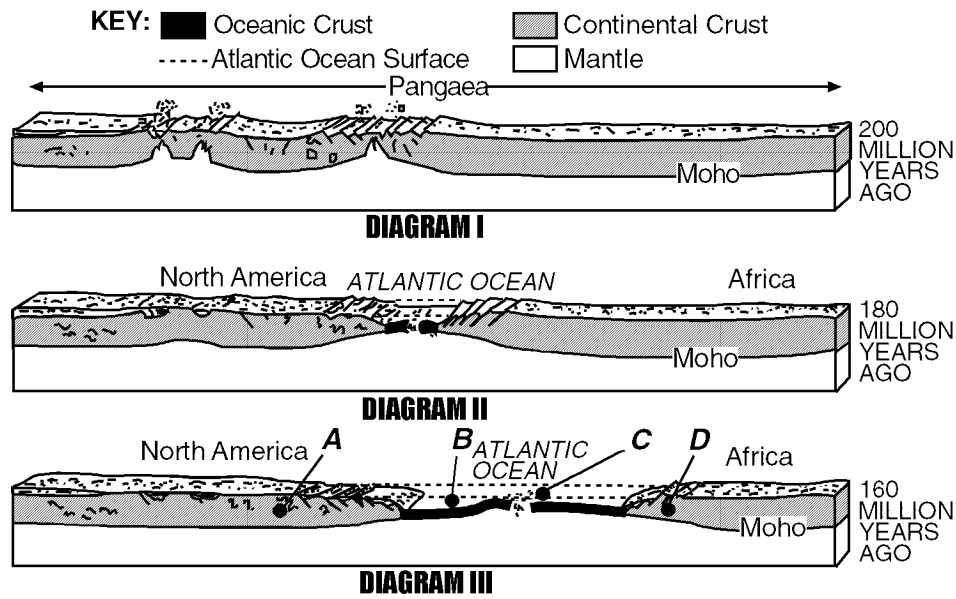


In which epoch was the glacial till in layer A most likely deposited?

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

Questions 256 and 257 refer to the following:

The three cross-sectional diagrams below represent the splitting apart of the former supercontinent Pangaea.

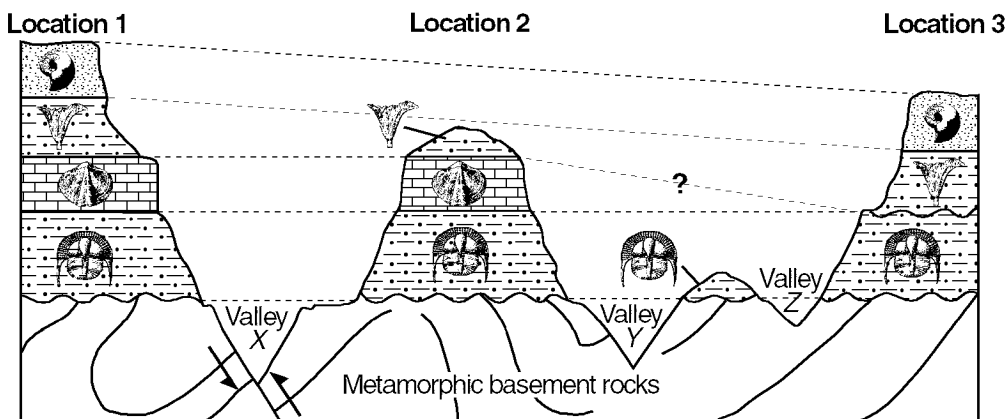


- 256) Which event occurred after the time represented by diagram III?
- A) Pangaea formed again.
 - B) North America and Africa collided.
 - C) The Atlantic Ocean became narrower.
 - D) South America separated from Africa.

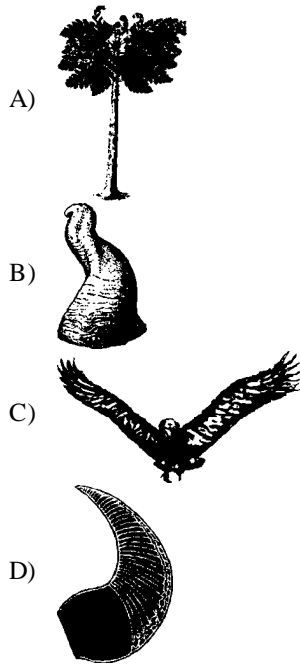
- 257) During which time interval did Pangaea split apart to form the Atlantic Ocean?
- A) Late Devonian to Early Permian
 - B) Late Archean to Late Proterozoic
 - C) Late Cambrian to Middle Devonian
 - D) Late Triassic to Early Jurassic

Questions 258 through 260 refer to the following:

The geologic cross section below 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.



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




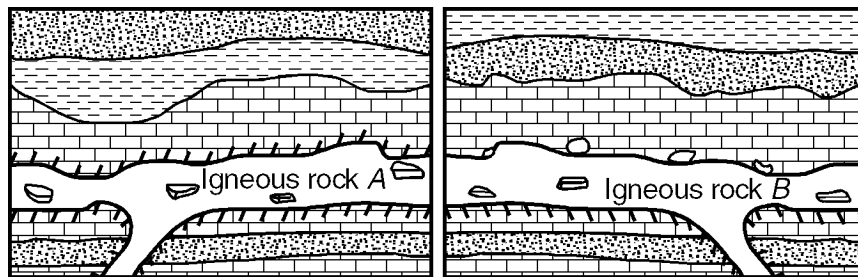
259) In which type of environment were the sediments that formed these sedimentary rock layers most likely deposited?

- A) terrestrial plateau
- B) mountainous
- C) marine
- D) glacial

260) The sedimentary rock layers at the three locations can be most accurately correlated by comparing the

- A) minerals in the igneous rocks
- B) fossils in the sedimentary rocks
- C) foliation bands in the metamorphic basement rocks
- D) thickness of the sedimentary rock layers

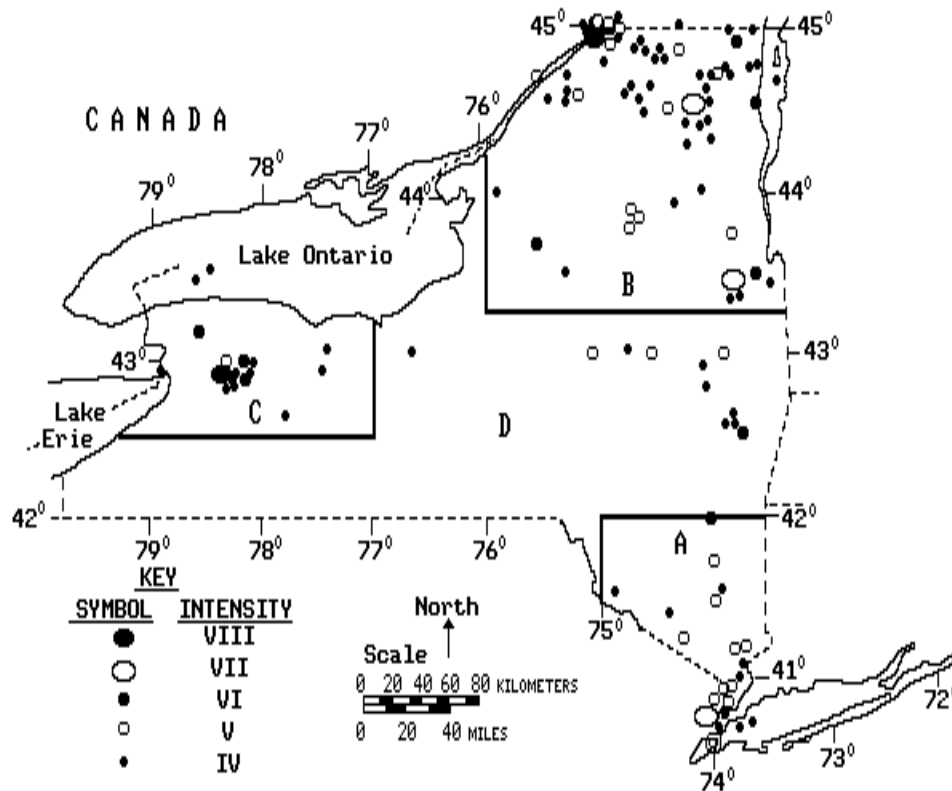
261) The diagrams below represent two geologic cross sections. ( represents contact metamorphism.)



Which statement *best* describes a difference between igneous rock *A* and igneous rock *B*?

- A) *A* was extrusive; *B* was intrusive.
- B) *A* cooled quickly; *B* cooled slowly.
- C) *A* formed after the limestone layer directly above it; *B* formed before the limestone layer directly above it.
- D) *A* has been exposed to weathering and erosion; *B* has not been exposed.

- 262) The map below shows the epicenters and intensities of earthquakes within New York State. The State has been subdivided into four regions (A, B, C, D). In the key, **VIII** represents the most intense earthquakes and IV represents the least intense.

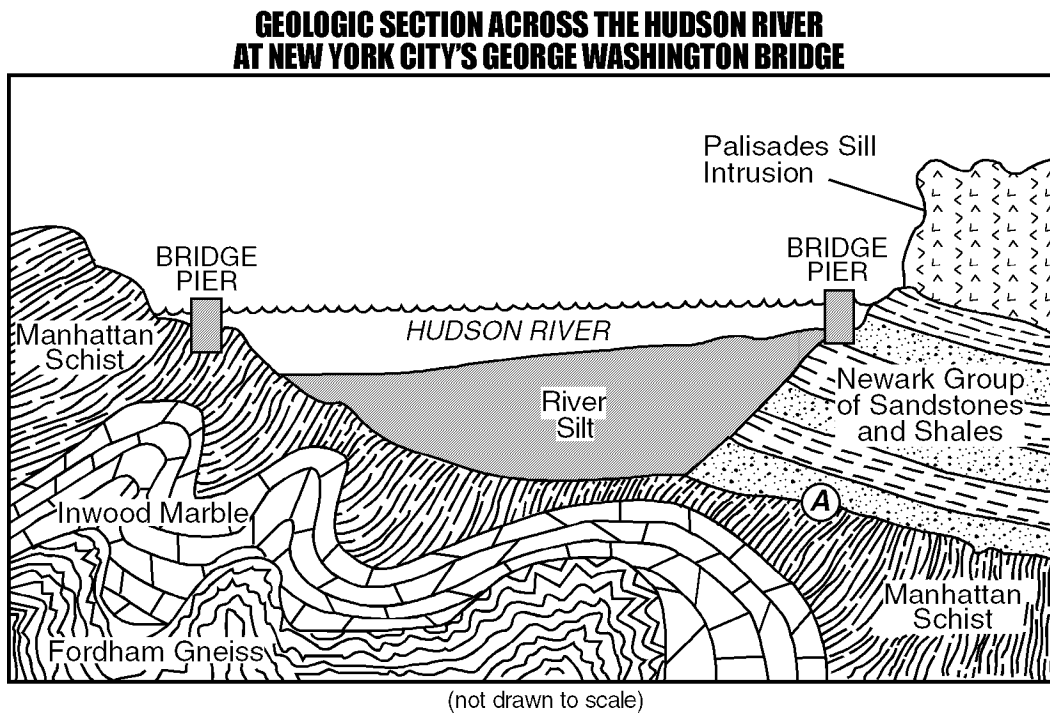


According to the *Earth Science Reference Tables*, what type of rocks are found surrounding the epicenters of region C?

- A) sedimentary
 B) intensely metamorphosed
 C) igneous
 D) slightly metamorphosed

Questions 263 through 265 refer to the following:

Letter A represents a location in the area of the geologic cross section below.



263) Which rock appears to be the *oldest*?

- A) Newark sandstone
- B) Inwood marble
- C) Palisades intrusion
- D) Fordham gneiss

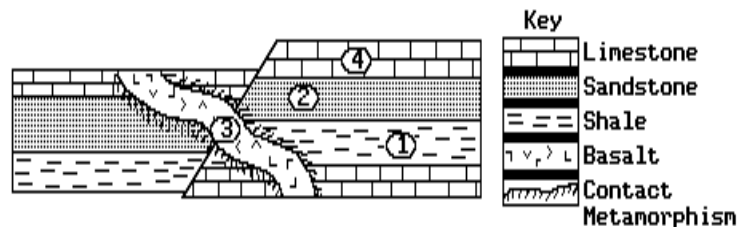
264) Point A is located on an unconformity (buried erosional surface). This unconformity represents an interface at which

- A) magma has intruded between the layers
- B) a gap exists in the geologic record
- C) gravity has caused the rock layers to slip
- D) the rock layers are reacting chemically with each other

265) During which geologic time period did the intrusion of the Palisades Sill occur?

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










266) Which is the youngest rock shown in the diagram below?



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

Questions 267 and 268 refer to the following:





The table below shows the geologic ages of some index fossils.

Geologic Time	Index Fossils
Mississippian	 Spirifer  Muensteroceras  Crinoid Stem  Pentremites
Devonian	 Mucrospirifer  Phacops
Silurian	 Eospirifer
Ordovician	 Michelinoceras  Flexicalymene

267) Which type of past environment is indicated by these index fossils?

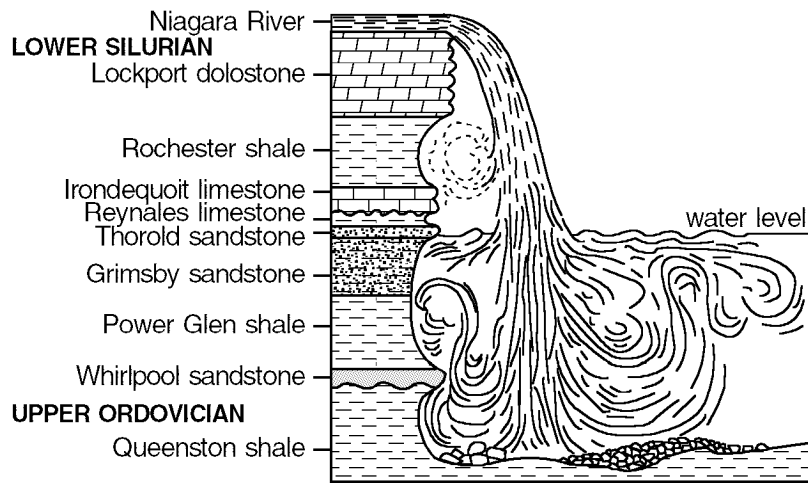
- A) ocean
- B) sandy desert
- C) equatorial rain forest
- D) arctic tundra

268) According to the *Earth Science Reference Tables*, which index fossil might be found in rock layers that are approximately 387 million years old?

- A)  Eospirifer
- B)  Flexicalymene
- C)  Muensteroceras
- D)  Phacops

Questions 269 and 270 refer to the following:

The diagram below shows a cross section of bedrock where the Niagara River flows over Niagara Falls.

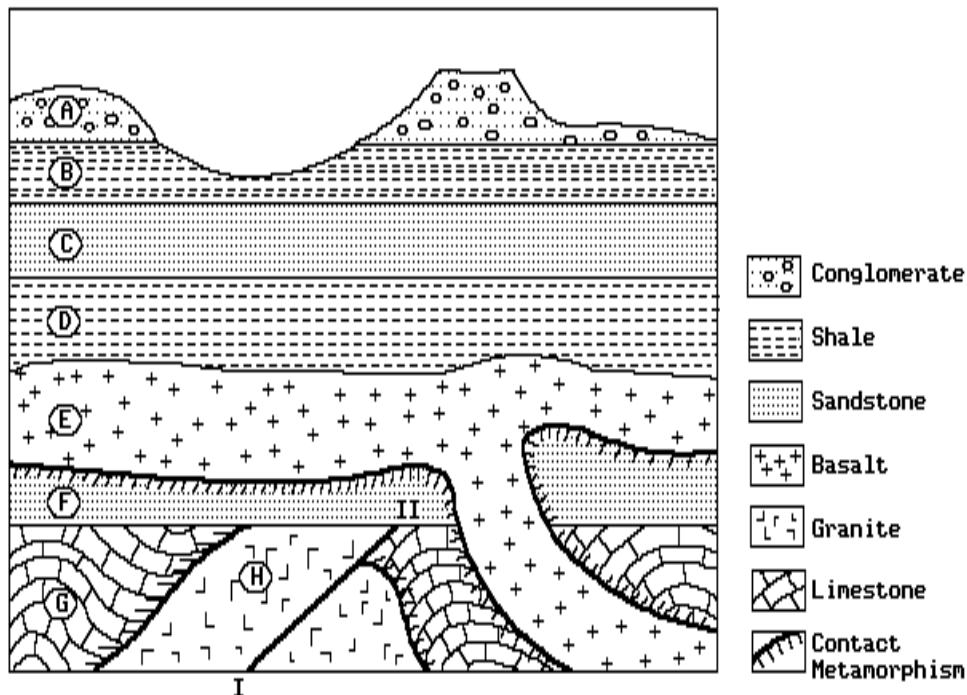


- 269) Which is the *youngest* rock unit?
- A) Queenston shale
 - B) Lockport dolostone
 - C) Whirlpool sandstone
 - D) Rochester shale

- 270) A sedimentary layer resembling the Rochester shale is located in another section of New York State. The *best* way to correlate these two rock units would be to compare the
- A) minerals cementing the sediments
 - B) index fossils contained in the layers
 - C) thickness of the layers
 - D) color of the layers

Questions 271 through 274 refer to the following:

The diagram below represents a geologic cross section of a portion of the Earth's crust consisting of various sedimentary and nonsedimentary rock units, indicated by letters *A* through *H*, which have not been overturned. Line **I-II** represents a fault.

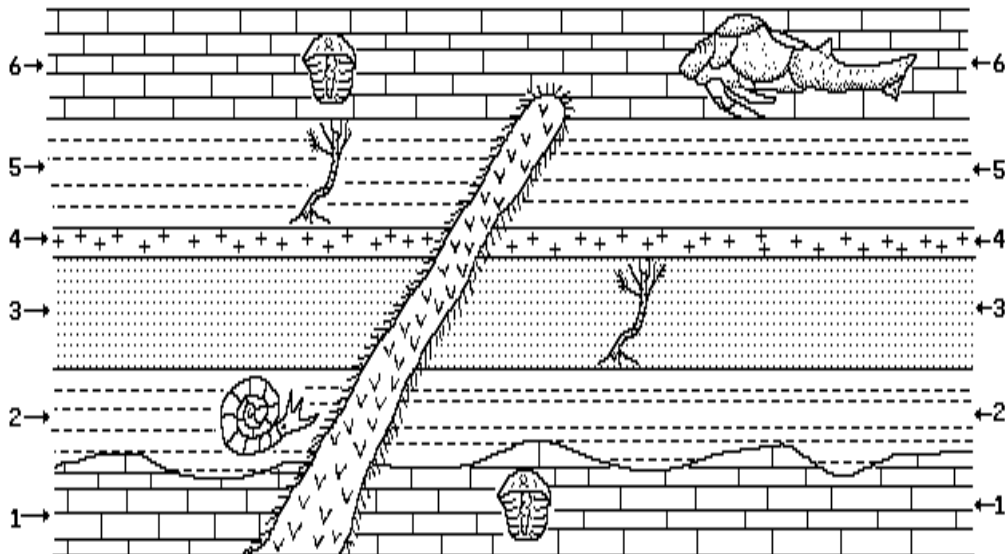


- 271) What is the age sequence of the rock units, from oldest to youngest?
- A) *E, F, G, H* C) *H, G, E, F*
 B) *F, E, G, H* D) *G, H, F, E*
- 272) Evidence of a buried erosional surface (unconformity) is found at the top of unit
- A) *C* C) *A*
 B) *D* D) *G*
- 273) In which rock unit would unsorted rock fragments of greatly varying size most likely be found?
- A) *E* C) *H*
 B) *G* D) *A*

- 274) What is the relative age of the fault (line I-II)?
- A) younger than rock unit *F* but older than rock unit *G*
 B) younger than rock unit *F* but older than rock unit *H*
 C) younger than rock unit *G* but older than rock unit *H*
 D) younger than rock unit *H* but older than rock unit *F*

Questions 275 through 278 refer to the following:

The diagram below represents a cross section on the Earth's crust showing several rock layers containing marine fossils. Overturning has not occurred. The diagram is not to scale.



Key:

LIMESTONE	SHALE	VOLCANIC ASH	SANDSTONE	BASALT	CONTACT METAMORPHISM

Models of Fossils:

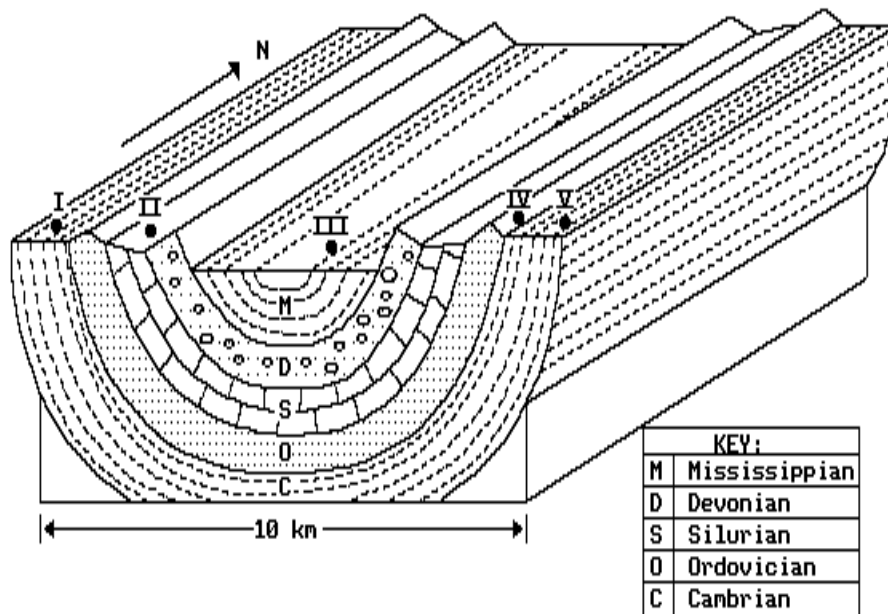
ARMORED FISH	ECHINODERMS (CRINOIDS)	MOLLUSKS	TRILOBITES

- 275) Which best describes the order of events for the formation of this section of the Earth's crust?
- intrusion of basalt; deposition of rock layers 1, 2, 3, 4, 5, and 6
 - deposition of rock layers 1, 2, 3, 4, and 5; intrusion of basalt; deposition of rock layer 6
 - deposition of rock layers 1, 2, 3, 4, 5, and 6; intrusion of basalt
 - deposition of rock layers 1, 2, 3; intrusion of basalt; deposition of rock layers 4, 5, and 6
- 276) Why is layer 4 likely to be a good time marker?
- Volcanic ash is usually a unique gray color.
 - Volcanic ash is usually rapidly deposited over a large area.
 - Volcanic ash usually contains index fossils.
 - Volcanic ash can usually be dated with carbon-14.

- 277) What could be an approximate age of rock layer 1? [Refer to the *Earth Science Reference Tables*.]
- 810 million years old
 - 510 million years old
 - 210 million years old
 - 110 million years old
- 278) Which is the best explanation for the irregular surface between layers 1 and 2?
- Pressure from the layers above pushed layer 2 into layer 1.
 - Layer 1 was partially eroded before 2 was deposited.
 - Layer 1 was folded after 2 was deposited.
 - Volcanic actions pushed layer 1 up before 2 was deposited.

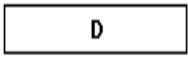
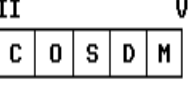
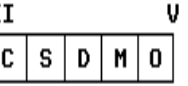
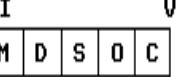
Questions 279 through 281 refer to the following:

The block diagram below shows a section of the Earth's crust. The rock layers have not been overturned. **I**, **II**, **III**, **IV**, and **V** are locations on the Earth's surface.



- 279) According to the *Earth Science Reference Tables*, fossils of the earliest fishes could be found in the bedrock at location
- I**
 - IV**
 - II**
 - III**

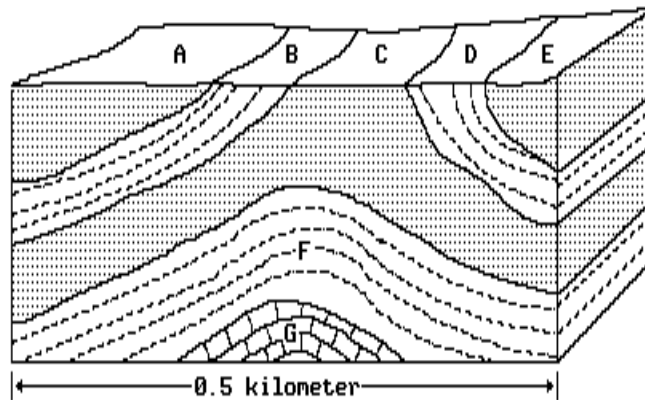
280) Which diagram best represents the rocks crossed when traveling across the surface from location **III** to location **V**?

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

281) According to the *Earth Science Reference Tables*, near which location in New York State would rocks similar in age to those at location **III** in the diagram be found?

- A) 41D N. lat., 72D W. long.
- B) 44D N. lat., 75D W. long.
- C) 44D N. lat., 74D W. long.
- D) 42D N. lat., 79D W. long.

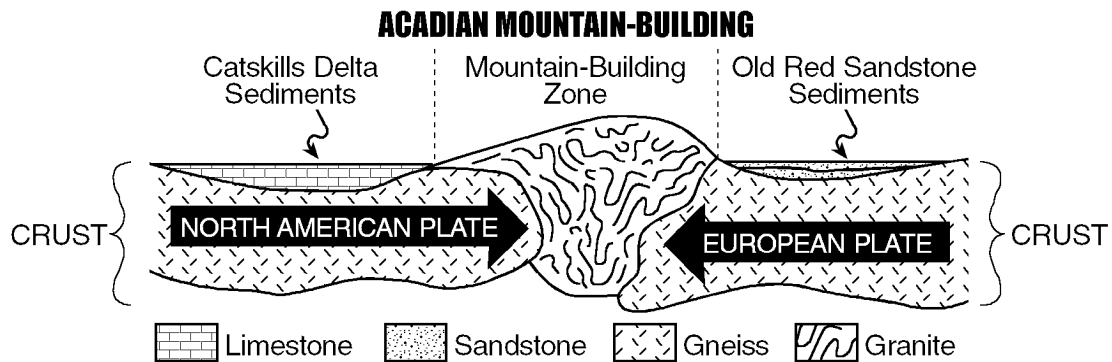
282) The diagram below represents a portion of the Earth where the rock layers have not been overturned.



The evidence present in the diagram supports the inference that

- A) rock C is older than rock G
- B) rock B is the same age as rock F
- C) rock D is younger than rock A
- D) rock B is the same age as rock D

283) The diagram below represents the Acadian Orogeny (mountain-building) that resulted from a collision between the North American Plate and the European Plate.

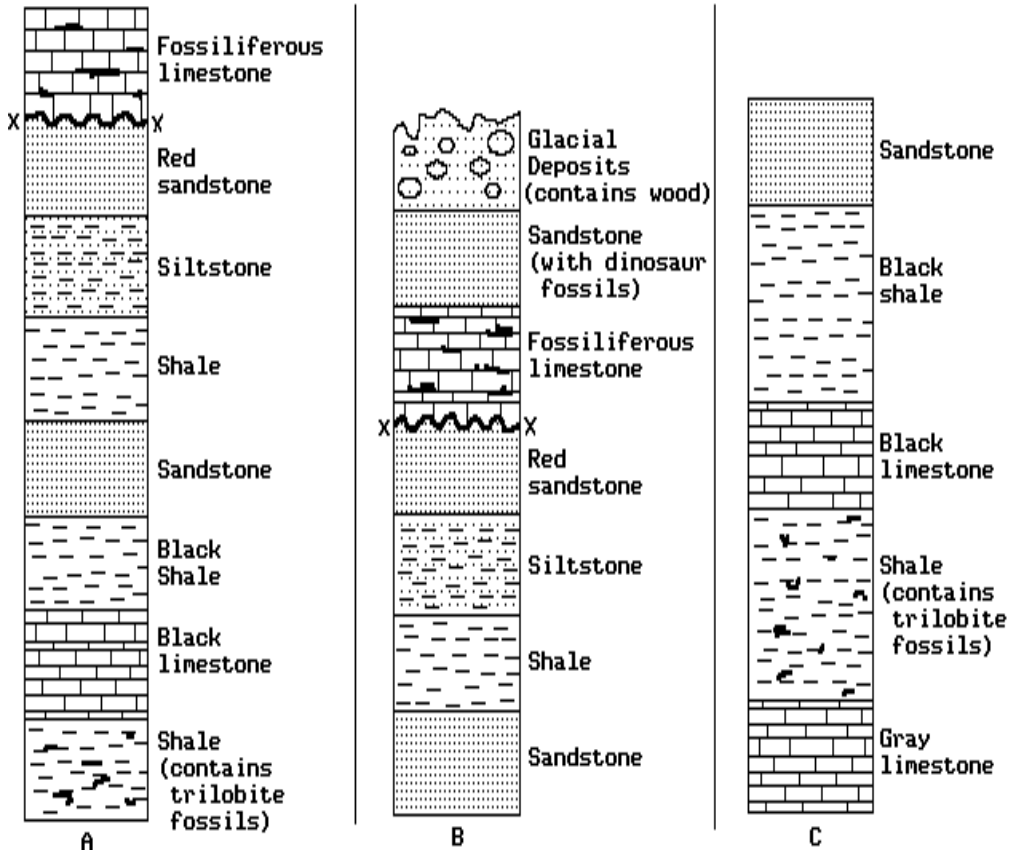


Approximately how many million years ago did the Acadian Orogeny occur?

- A) 1,030-900
- B) 400-380
- C) 4,000-3,600
- D) 480-425

Questions 284 through 287 refer to the following:

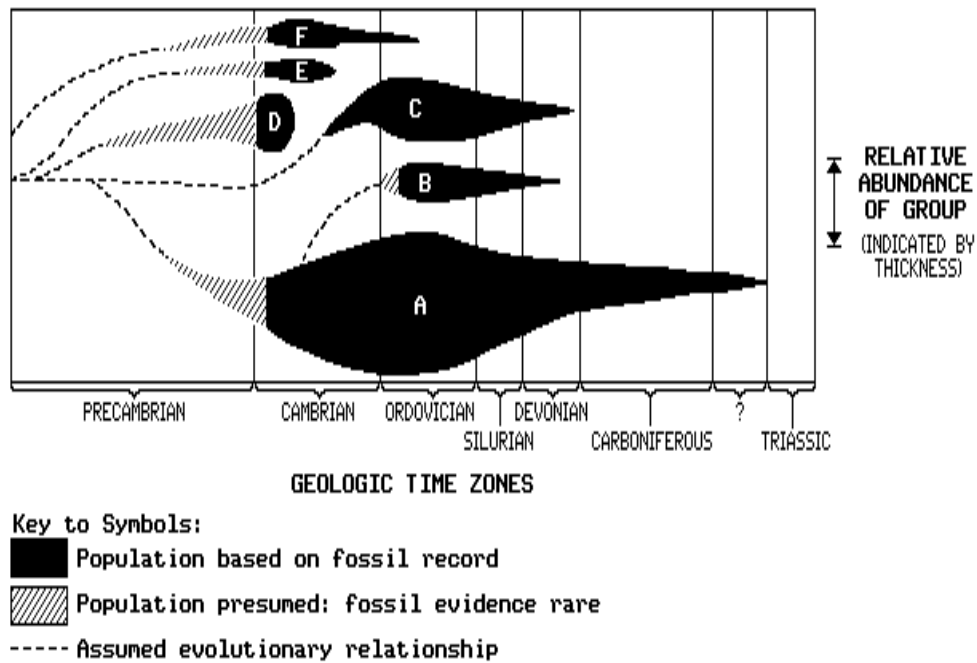
The diagram below shows matching geologic columns from three different locations, A, B, and C. The locations are about 5 kilometers apart and the layers have not been overturned.



- 284) Radioactive carbon-14 would be most useful in determining the age of the
- trilobite fossils in the shale
 - calcite in the black limestone
 - iron oxide in the red sandstone
 - wood in the glacial till
- 285) The shale which contains the trilobite fossils was most likely deposited during which geologic period? [Refer to the *Earth Science Reference Tables*.]
- Triassic
 - Tertiary
 - Cretaceous
 - Ordovician
- 286) The feature at X is a buried erosional surface. Based on this, what inference can best be supported?
- An igneous intrusion has destroyed part of the fossiliferous limestone layer.
 - No rock layers ever formed between the red sandstone and the fossiliferous limestone.
 - The red sandstone and the fossiliferous limestone do not provide a continuous geologic record.
 - Faulting has occurred along the boundary between the red sandstone and the fossiliferous limestone.
- 287) Which is the oldest layer shown?
- shale containing trilobite fossils
 - gray limestone
 - glacial till containing wood
 - sandstone

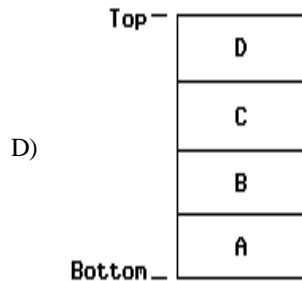
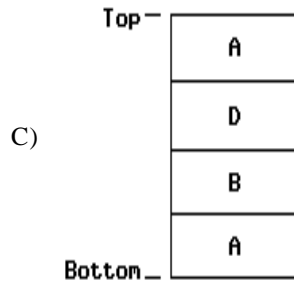
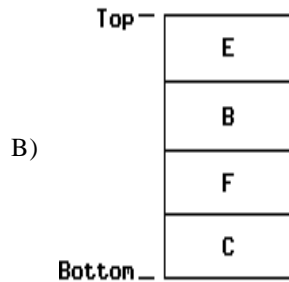
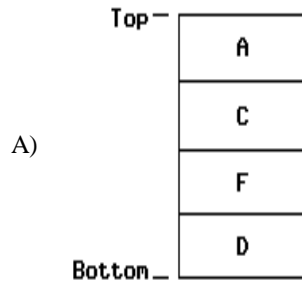
Questions 288 through 292 refer to the following:

The graph below shows the development, growth in population, and extinction of the six major groups of trilobites, labeled A through F.



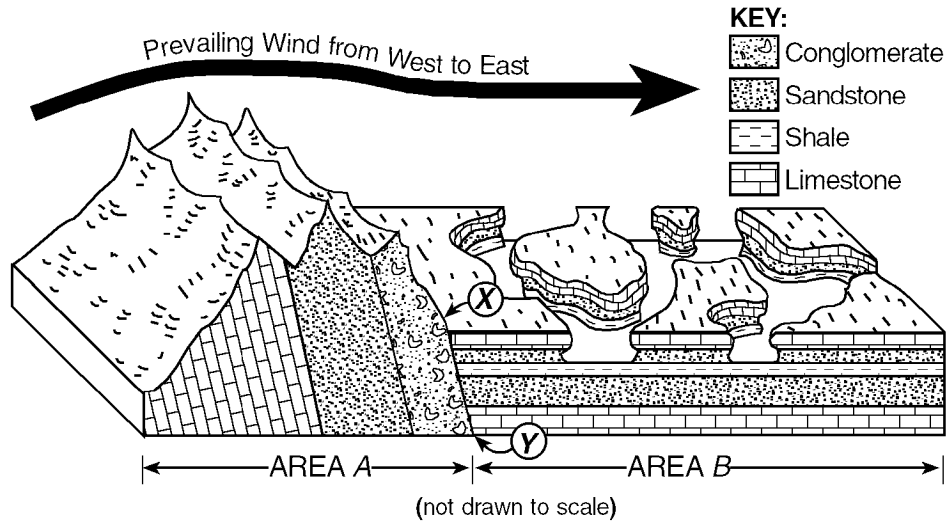
- 288) The fossil evidence that forms the basis for this graph was most likely found in
- A) metamorphic rock that formed from volcanic rocks
 - B) granite rock that formed from former sedimentary rocks
 - C) lava flows of ancient volcanoes
 - D) sedimentary rock that formed from ocean sediment
- 289) Which group of trilobites became the most abundant?
- A) *D*
 - B) *C*
 - C) *B*
 - D) *A*

- 290) The diagrams below represent rock outcrops in which the rock layers have not been overturned. Which rock outcrop shows a possible sequence of the trilobite fossils?



- 291) Which inference is best supported by the graph?
- A) Trilobites could exist in present-day marine climates.
 - B) The trilobite groups became most abundant during the Devonian Period.
 - C) Precambrian trilobite fossils are very rare.
 - D) All trilobites evolved from group A trilobites.
- 292) During which period did the last of these trilobite groups become extinct? [Refer to the *Earth Science Reference Tables*.]
- A) Permian
 - B) Carboniferous
 - C) Triassic
 - D) Cretaceous

293) The diagram below represents a geologic cross section of a portion of the Earth's crust. Line *XY* represents a fault. The rock layers in area *B* have not been overturned.



A comparison of the lower layer of sandstone in area *B* with the upper layer of sandstone in area *B* would most likely show that the upper layer

- A) contains more fossils
- B) took more time to form
- C) is better sorted
- D) is younger

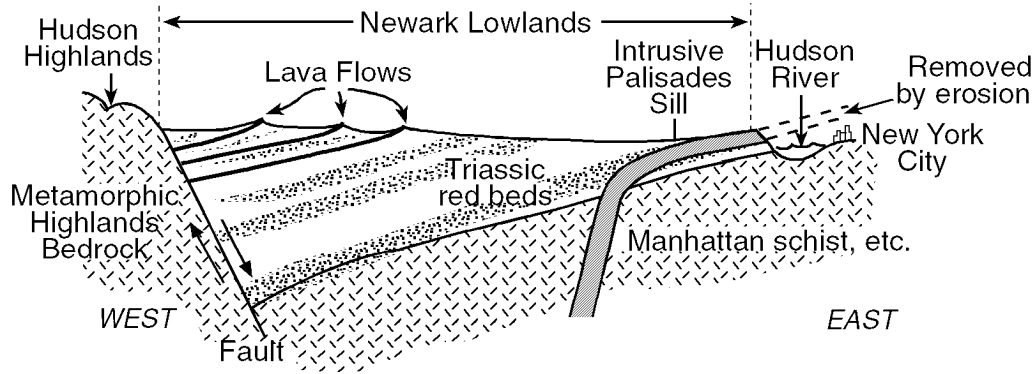
294) The table below shows the types of fossils found in some rock layers. A checkmark indicates that the fossil is present.

ROCK LAYER	FOSSILS													
	Graptolites	Crinoids	Starfish	Brachiopods	Worms and/or Worm Trails	Pelecypods	Gastropods	Cephalopods	Trilobites	Ostracods	Eurypterids	Bryozoans	Corals	Sponges
Hamilton				✓	✓	✓	✓							
Marcellus				✓				✓						
Onondaga				✓		✓	✓	✓	✓			✓	✓	
Schoharie				✓		✓	✓	✓	✓			✓	✓	
Escopus					✓									
Oriskany				✓			✓							
Becraft		✓		✓										✓
New Scotland		✓		✓			✓	✓	✓	✓		✓	✓	✓
Coeymans		✓		✓										
Manlius		✓		✓		✓				✓		✓	✓	
Indian Ladder	✓	✓		✓					✓			✓		
Schenectady	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			

Which fossil type could be used as an index fossil for the Schenectady layers?

- A) eurypterids
- B) sponges
- C) brachiopods
- D) crinoids

- 295) The diagram below represents a cross section of the Newark Lowlands and the Palisades Sill in southern New York and northern New Jersey.

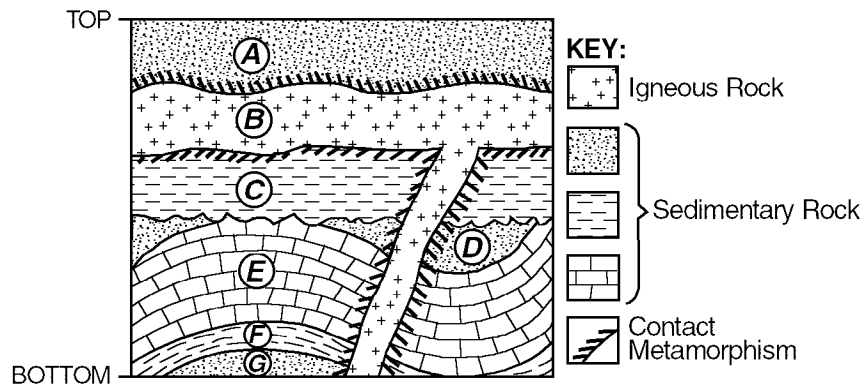


Based on this geologic information, the intrusion of the Palisades Sill must have occurred

- after the formation of the Hudson River
- before the formation of any of the Triassic red beds
- after the formation of the Manhattan schist
- before the formation of the Hudson Highlands bedrock

Questions 296 through 298 refer to the following:

The diagram below represents a geologic cross section of a portion of the Earth's crust. Letters identify individual rock units.



- 296) When did folding of rock units occur?

- after layer E formed
- after layer A formed
- before layer F formed
- after layer C formed

- 297) Between which layers is an unconformity (buried erosional surface) located?

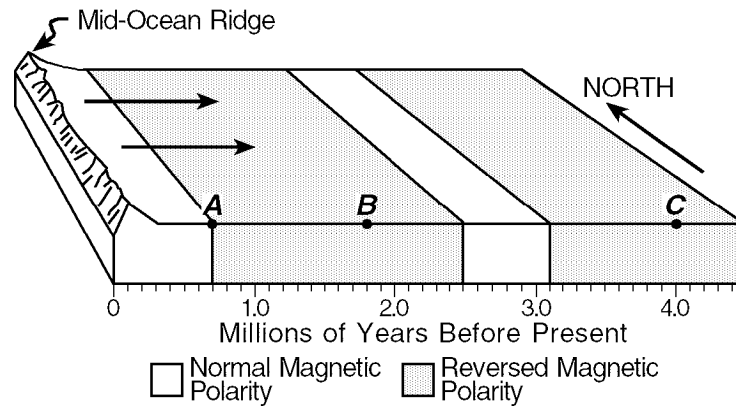
- F and C
- E and F
- C and D
- D and E

- 298) Which geologic event is most recent?

- intrusion of igneous rock B
- formation of layer A
- folding of layer F
- formation of layer C

299) At intervals in the past, the Earth's magnetic field has reversed. The present North magnetic pole was once the South magnetic pole, and the present South magnetic pole was once the North magnetic pole. A record of these changes is preserved in the igneous rocks that formed at mid-ocean ridges and moved away from the ridges.

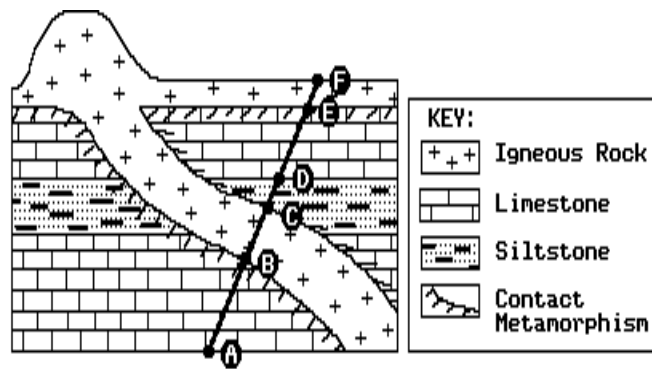
The diagram below represents the pattern of normal and reversed magnetic polarity in the igneous rocks composing the ocean crust on the east side of a mid-ocean ridge.



According to the *Earth Science Reference Tables*, during which geological epoch were the rocks at letter C formed?

- A) Oligocene B) Paleocene C) Pliocene D) Eocene

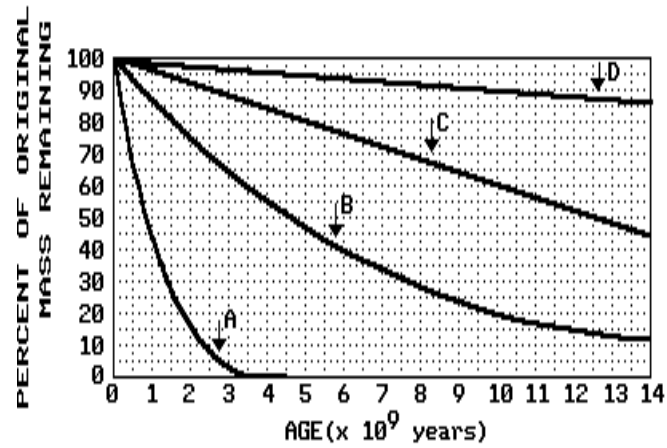
300) The diagram below represents a cross section of a portion of the Earth's crust.



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

- A) C)
- B) D)

301) Which radioactive substance shown on the graph below has the longest half-life?



A) B

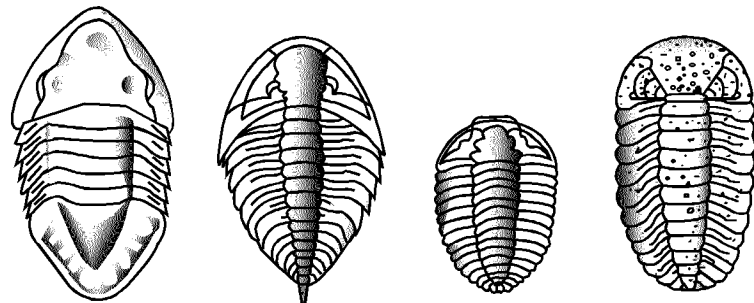
B) A

C) D

D) C

Questions 302 and 303 refer to the following:

The diagrams below represent fossil trilobites. The geologic period in which each trilobite form existed is given.



Isotelus (Ordovician Period) Dalmanites (Silurian Period) Calymene (Silurian Period) Phacops (Devonian Period)

302) A geologist collected samples of some of these trilobites from bedrock in New York State. According to the *Earth Science Reference Tables*, near which location were the samples most likely collected?

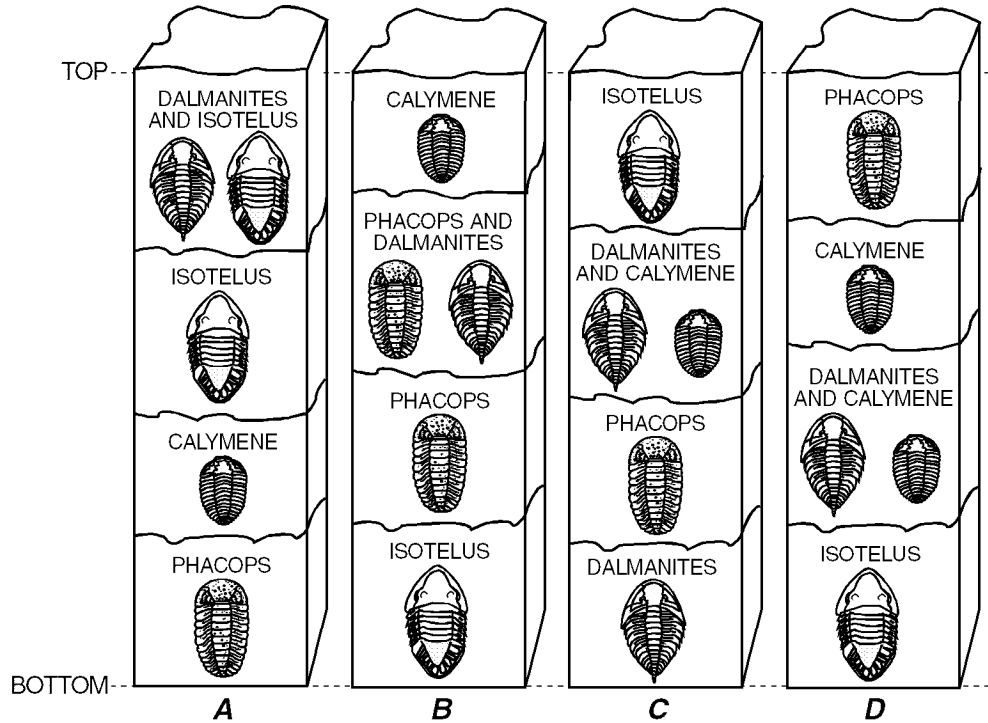
A) Long Island

B) Mt. Marcy

C) Buffalo

D) Old Forge

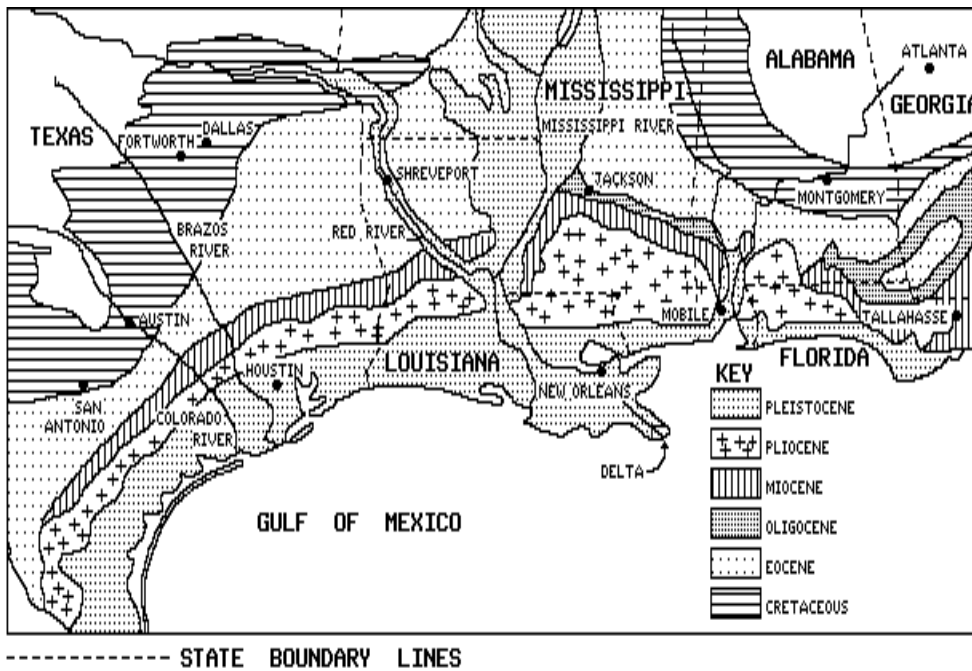
303) The diagrams below show different geologic cross sections of rock layers in the Earth's crust. Which cross section *best* shows the relative location of these four types of trilobites if overturning of the rock layers has *not* occurred? [Refer to the *Earth Science Reference Tables*.]



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

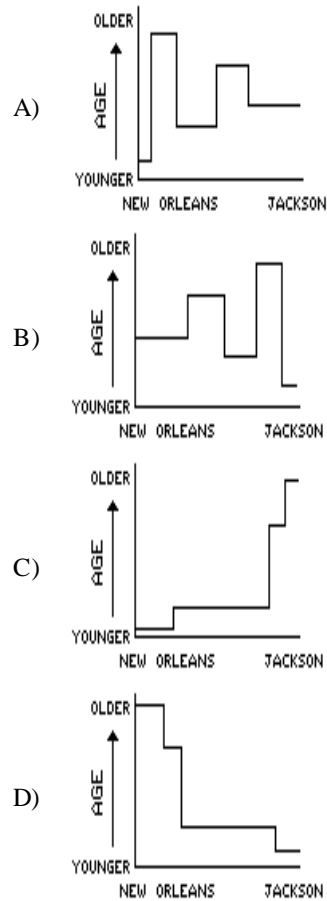
Questions 304 through 308 refer to the following:

The map below represents the generalized bedrock geology of a section of the southern United States.



- 304) Which of the following cities is built on the youngest rock material?
- Houston, Texas
 - Montgomery, Alabama
 - Tallahassee, Florida
 - Dallas, Texas
- 305) Why do some of the Pleistocene layers extend far upstream along the Red and the Mississippi Rivers?
- Waters from the Gulf of Mexico have washed the Pleistocene layers inland.
 - Downcutting by the rivers has exposed the Pleistocene layers which are below the Eocene layers.
 - Pleistocene layers were deposited along the rivers on top of older sedimentary layers.
 - Pleistocene layers are generally very resistant to erosion.
- 306) Which areas in New York State was forming at the time the sediment was being deposited in Louisiana? [Refer to the *Earth Science Reference Tables*.]
- Palisades Sill
 - Taconic Mountains
 - Adirondack Mountains
 - Long Island

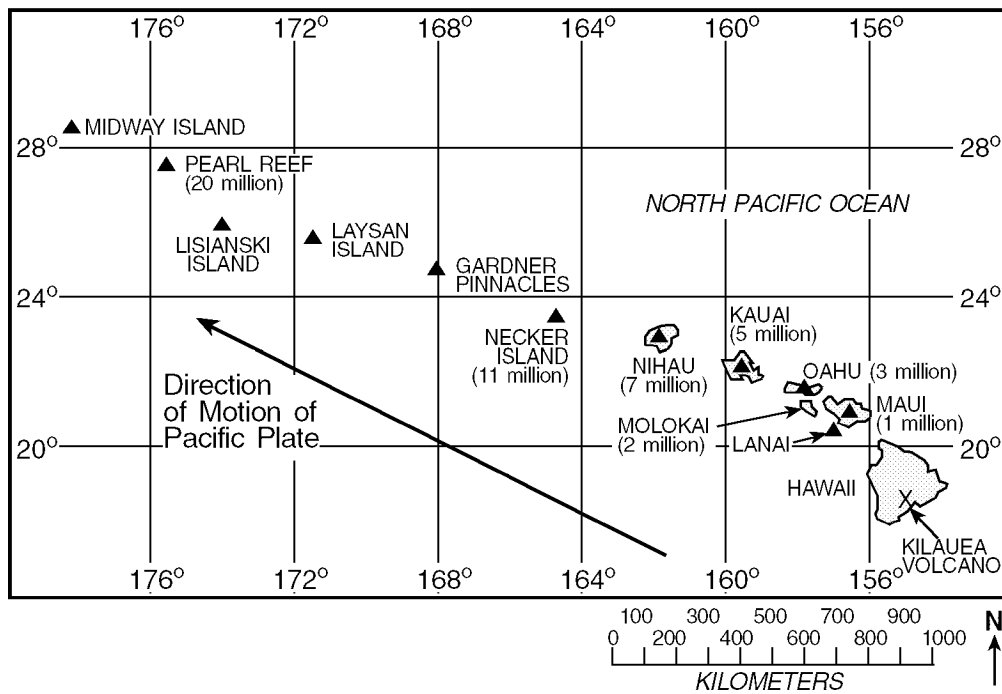
- 307) Which graph best represents the age of the bedrock along a straight line from New Orleans, Louisiana to Jackson, Mississippi?



- 308) During which geologic epoch was the bedrock around Tallahassee, Florida, formed?
- Pliocene
 - Miocene
 - Pleistocene
 - Eocene

309) The map below shows the location of major islands and coral reefs in the Hawaiian Island chain. Their ages are given in millions of years.

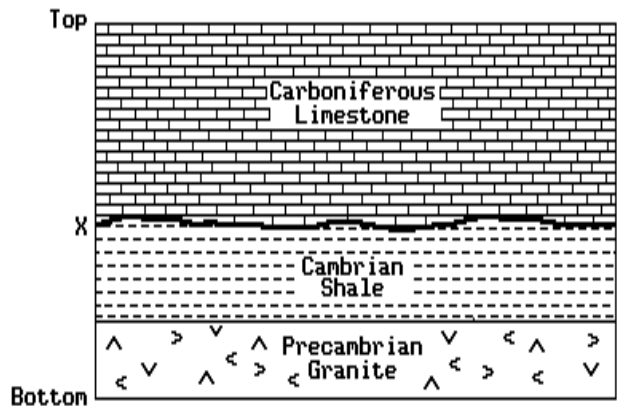
The islands of the Hawaiian chain formed from the same source of molten rock, called a hot plume. The movement of the Pacific Plate over the Hawaiian hot plume created a trail of extinct volcanoes that make up the Hawaiian Islands. The island of Hawaii (lower right) is the most recent island formed. Kilauea is an active volcano located over the plume on the island of Hawaii.



According to the *Earth Science Reference Tables*, what kinds of animals were common in New York State 20 million years ago, when Pearl Reef was forming?

- A) grazing mammals
- B) primitive humans
- C) dinosaurs and ammonites
- D) early reptiles

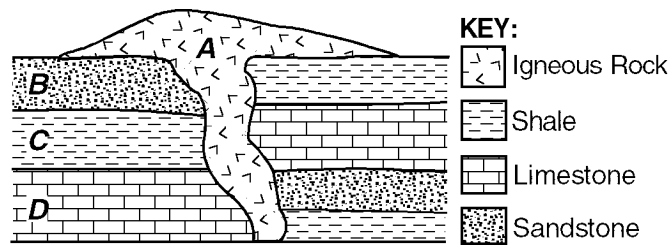
310) The diagram below shows a cross-sectional view of part of the Earth's crust.



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

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

311) The diagram below represents a cross section of a portion of the Earth's crust in which overturning has not occurred.

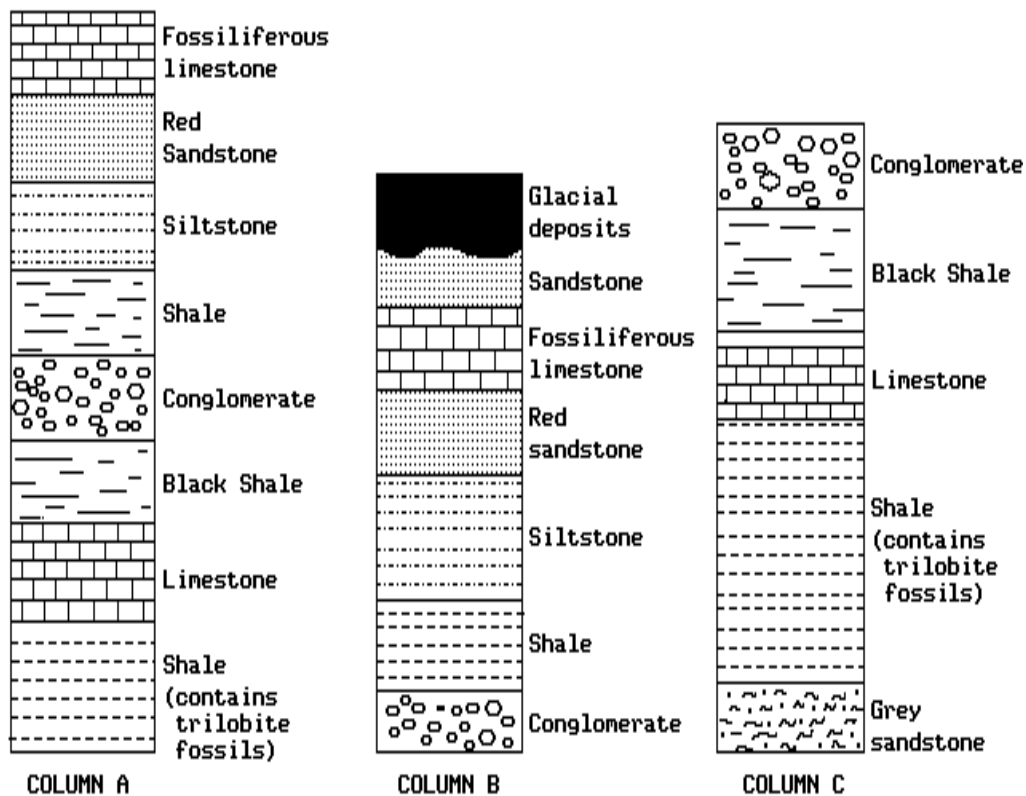


Which rock unit is the *youngest*?

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

Questions 312 through 315 refer to the following:

The diagram below shows three geologic columns representing widely separated rock outcrops that had a common origin. Descriptions of each sedimentary rock are indicated beside the layers. The rock layers have not been overturned.



312) Which sequence of layers is present in column A, but is *not* shown in column B?

- A) siltstone, red sandstone, and fossiliferous limestone
 B) shale containing trilobite fossils, sandstone, and shale
 C) shale containing trilobite fossils, limestone, and black shale
 D) sandstone, shale, and siltstone

313) According to the *Earth Science Reference Tables*, which fossil might be found in a red sandstone layer if the layer was deposited during the Triassic Period?

- A) mammal bones
 B) remains of flowering plants
 C) impressions of armoured fish
 D) dinosaur footprints

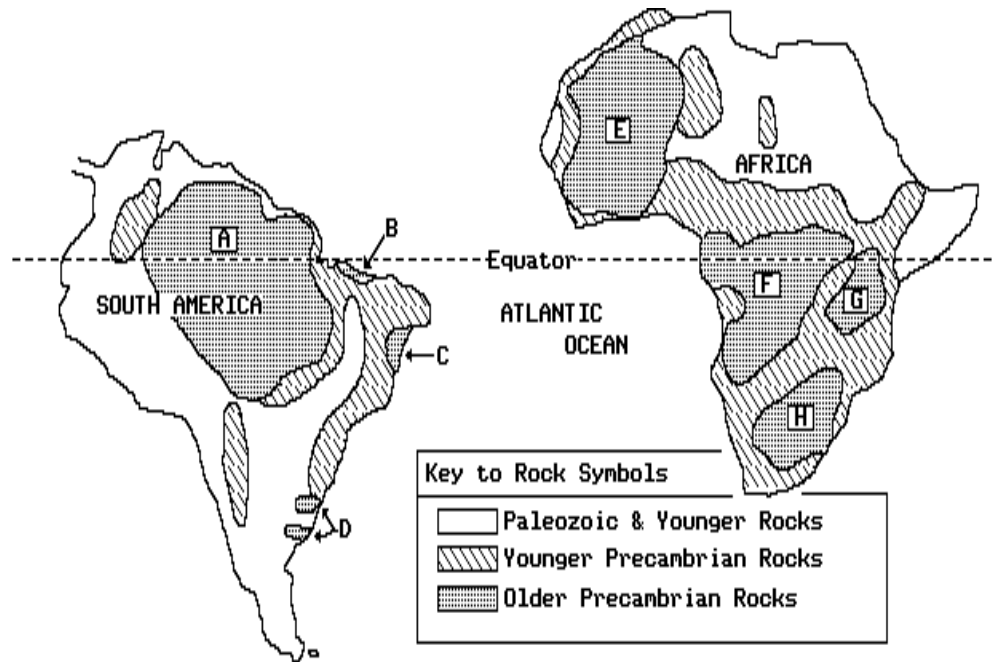
314) Which column contains the youngest rock formations?

- A) C B) A C) B

315) According to the *Earth Science Reference Tables*, the shale layer containing trilobite fossils probably was deposited during which geologic time period?

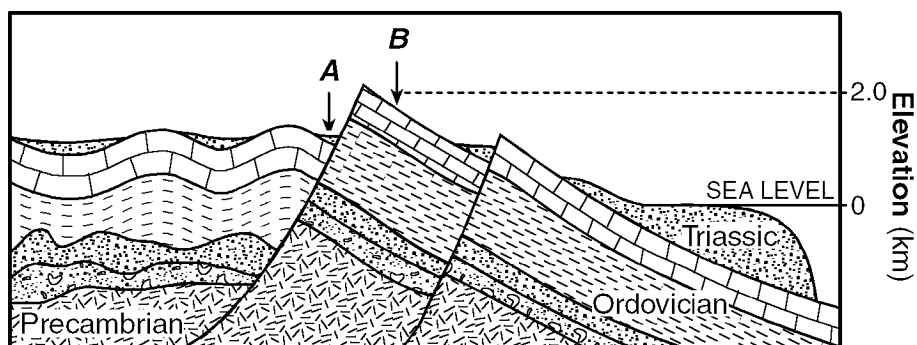
- A) Jurassic
 B) Cretaceous
 C) Tertiary
 D) Cambrian

316) The map below shows the present-day relative positions of South America and Africa and the age of the rocks composing the two continents. Letters A-H indicate specific rock units. The apparent close correlation between rocks on the two continents provided early evidence for the theory of continental drift.



According to the *Earth Science Reference Tables*, when did Africa and South America completely separate and move away from each other into two distinct landmasses as shown above?

- A) during the Triassic Period
 B) during the Carboniferous Period
 C) before the Cambrian Period
 D) after the Cretaceous Period
- 317) The diagram below shows a cross section of a landscape and a nearby sea. Letters A and B indicate locations on the landscape surface. The geologic age of three of the rock types is shown.

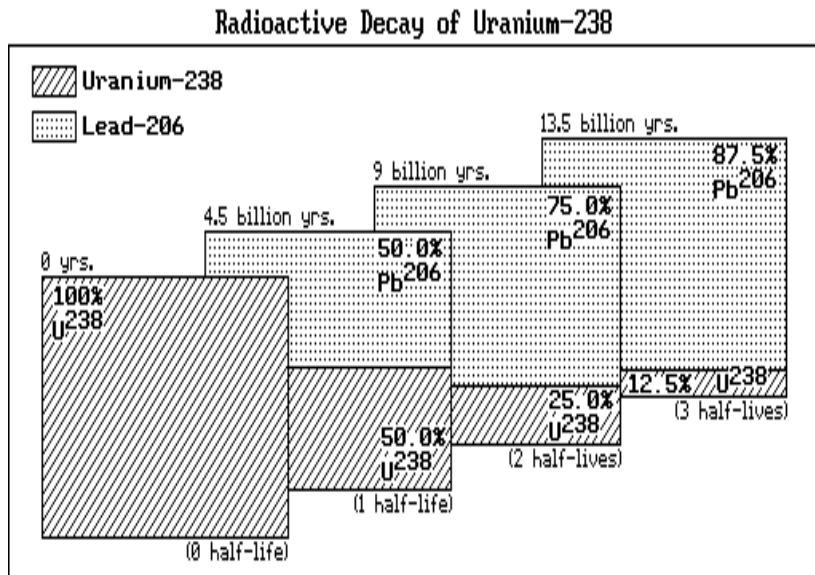


Which activity caused the limestone bedrock layer to become folded?

- A) slow movement of volcanic rock as it was deposited
 B) deposition of loose fragments in angular beds
 C) deposition of sediments with different densities
 D) crustal movement that occurred after deposition

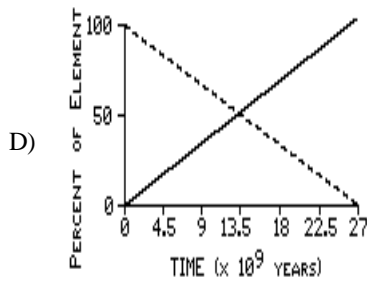
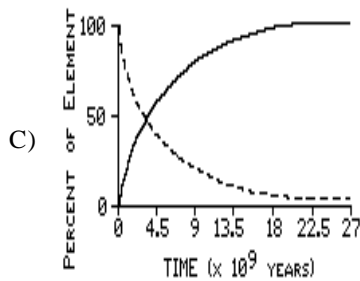
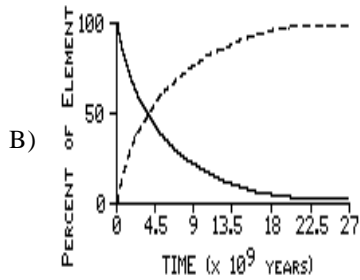
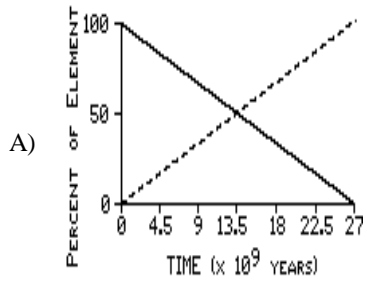
Questions 318 through 322 refer to the following:

The diagram below represents the radioactive decay of uranium-238 and shows the percentages of uranium-238 (^{238}U) and the stable element lead-206 (^{206}Pb) after three half-lives.



- 318) If an original sample of radioactive ^{238}U had a mass of 400. grams, what is the total amount of the ^{238}U sample that would be left after 9 billion years?
- A) 100. g C) 200. g
 B) 75.0 g. D) 50.0 g

319) Which graph best shows the changing amounts of ^{238}U and ^{206}Pb in a radioactive rock sample?



320) Which radioactive element is best suited for determining the age of wooden tools used by prehistoric humans during the last ice age?

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

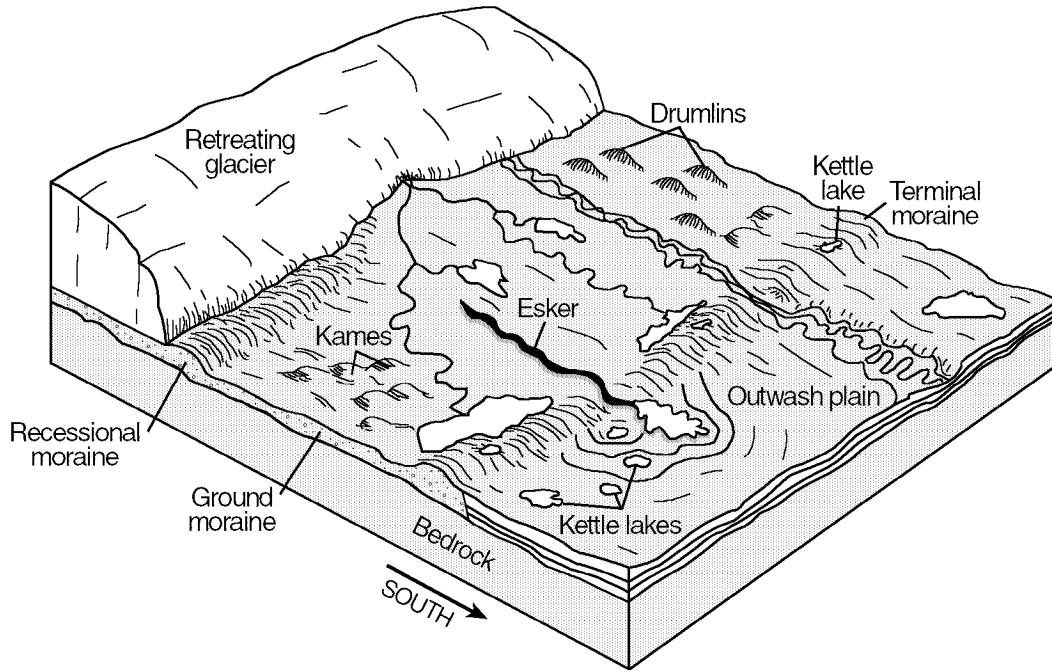
321) After three half-lives, how much of the original sample of ^{238}U remains?

- A) 87.5% C) 12.5%
B) 25.0% D) 50.0%

322) A rock sample containing uranium-238 was crushed into fragments. The half-life of the uranium-238 in each rock fragment is best described as

- A) shorter than that of the original sample
B) the same as that of the original sample
C) longer than that of the original sample
D) impossible to measure

323) The block diagram below shows some of the landscape features formed as the *most* recent continental glacier melted and retreated across western New York State.



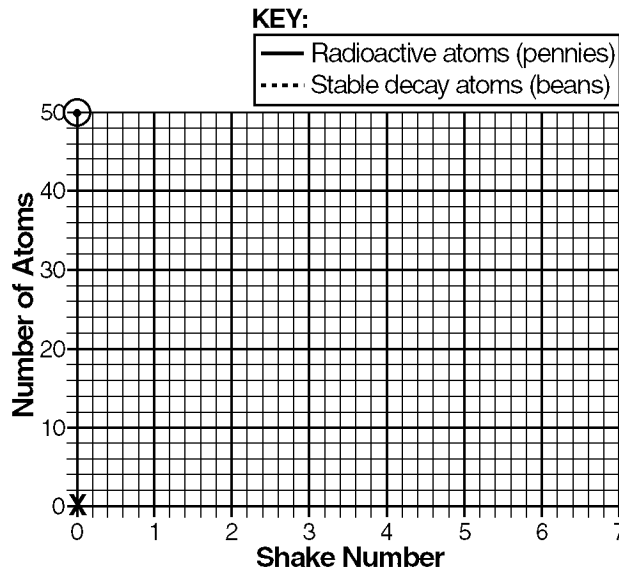
During which geologic epoch did this glacier retreat from New York State?

- A) Eocene
- B) Early Mississippian
- C) Late Pennsylvanian
- D) Pleistocene

Questions 324 and 325 refer to the following:

The table below shows the results of a student's demonstration modeling radioactive decay. To begin, the student put 50 pennies heads up in a container. Each penny represented one radioactive atom. The student placed a top on the box and shook the box. Each penny that had flipped over to the tails up side was replaced with a bean that represented the stable decay product. The student continued the process until all of the pennies had been replaced by beans.

Shake Number	Number of Radioactive Atoms (pennies)	Number of Stable Decay Atoms (beans)
0	50	0
1	25	25
2	14	36
3	7	43
4	5	45
5	2	48
6	1	49
7	0	50



324) On the given grid, graph the data shown on the table by following the steps below.

- (a) Mark with a dot each number of radioactive atoms (pennies) after each shake. Surround each dot with a small circle (⊙). The zero shake has been plotted for you.
- (b) Connect *all* the dots with a solid line.

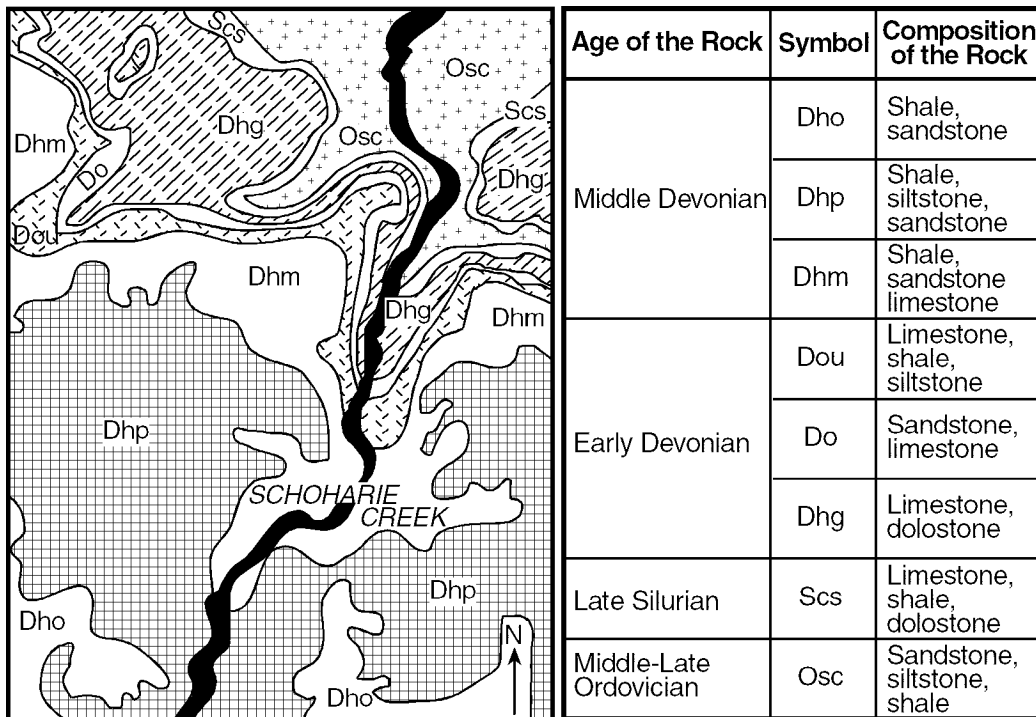
EXAMPLE:



- (c) Mark with an **X** the number of stable decay atoms (beans) after each shake. The zero shake has been plotted for you.
- (d) Connect all the **X**'s with a dashed line.

325) Assume that each shake number represents an additional 100 years. State the half-life of the radioactive material in this model.

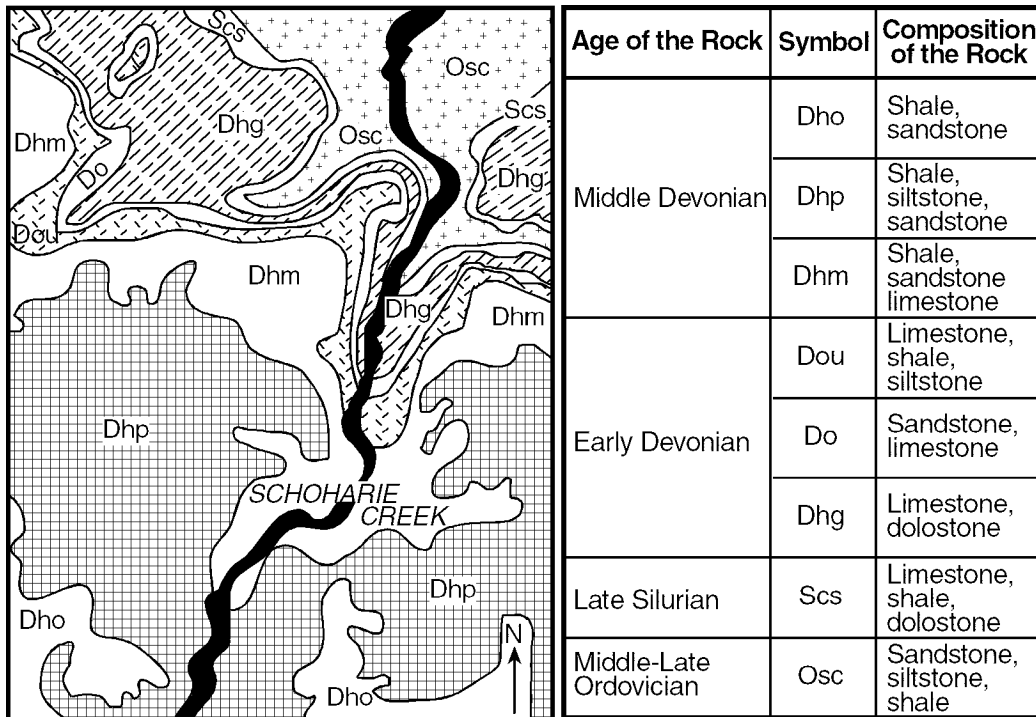
326) The map below shows surface geology of a portion of the Schoharie Valley in New York State. Patterns and letters are used to indicate bedrock of different ages. The Schoharie Valley contains mostly horizontal rock structure in which overturning has not occurred. The table provides information about the rocks shown on the map.



Which cross section represents a possible arrangement of rock units in a cliff along this portion of Schoharie Creek?

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

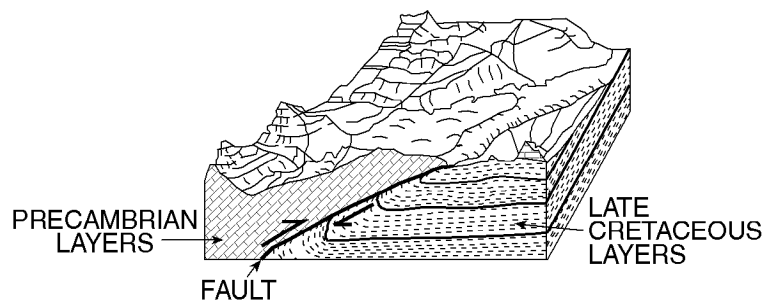
327) The map below shows surface geology of a portion of the Schoharie Valley in New York State. Patterns and letters are used to indicate bedrock of different ages. The Schoharie Valley contains mostly horizontal rock structure in which overturning has not occurred. The table provides information about the rocks shown on the map.



Which fossil could be found in the surface bedrock of this portion of the Schoharie Valley?

- A) figlike leaf B) brachiopod C) coelophysis D) mastodont

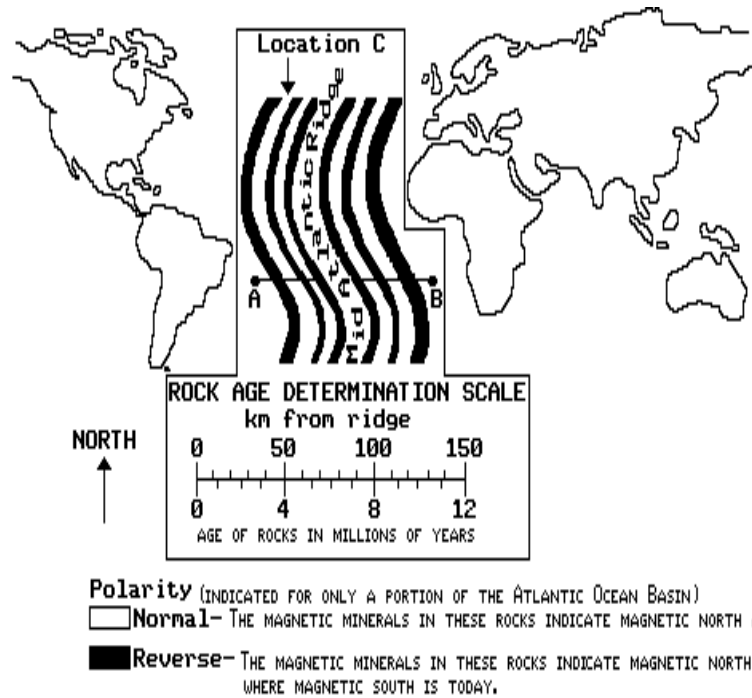
328) The geologic block diagram below shows surface features and subsurface structures of a section of Montana.



The faulting shown in the diagram could have occurred

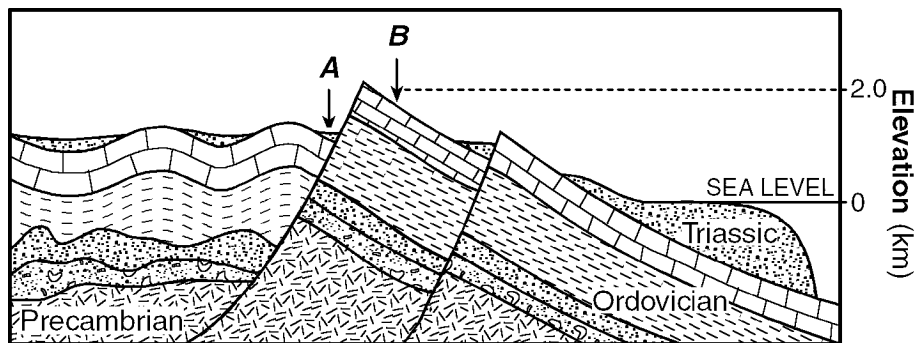
- A) 250 million years ago C) 520 million years ago
 B) 50 million years ago D) 2,100 million years ago

- 329) The diagram below shows an enlargement of the mid-Atlantic ridge and surrounding in its position with respect to the continents. Magnetic polarity bands of igneous rock parallel to the ridge are illustrated according to the key.



What is the most accurate method used by geologists to determine the age of igneous rocks on the ocean floor near the mid-Atlantic ridge?

- A) chemical weathering rate
 B) walking the outcrop
 C) erosional rate
 D) radioactive dating
- 330) The diagram below shows a cross section of a landscape and a nearby sea. Letters A and B indicate locations on the landscape surface. The geologic age of three of the rock types is shown.

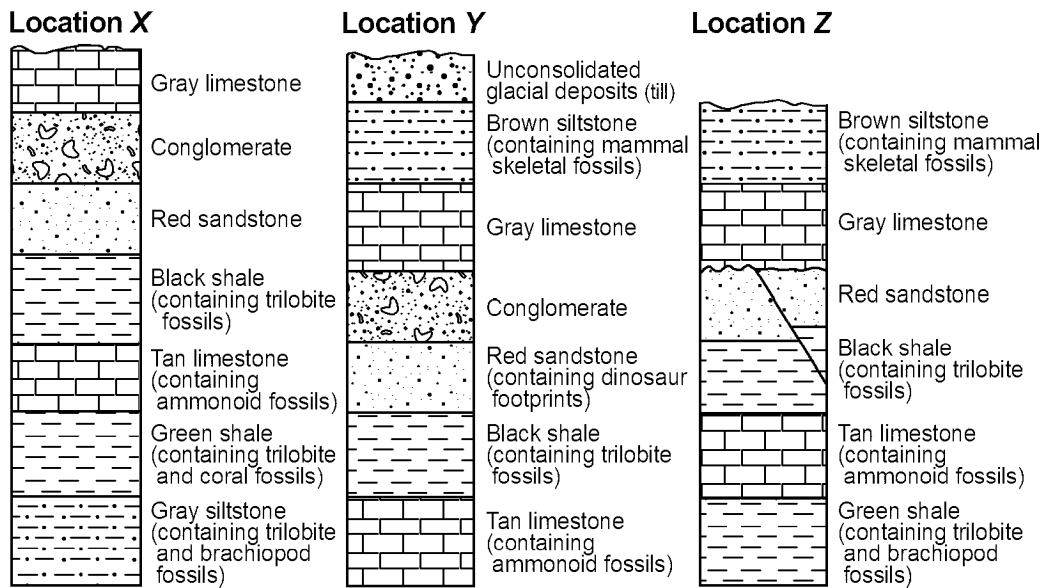


Which particle size and type of fossil would be characteristic of the Ordovician rock layer?

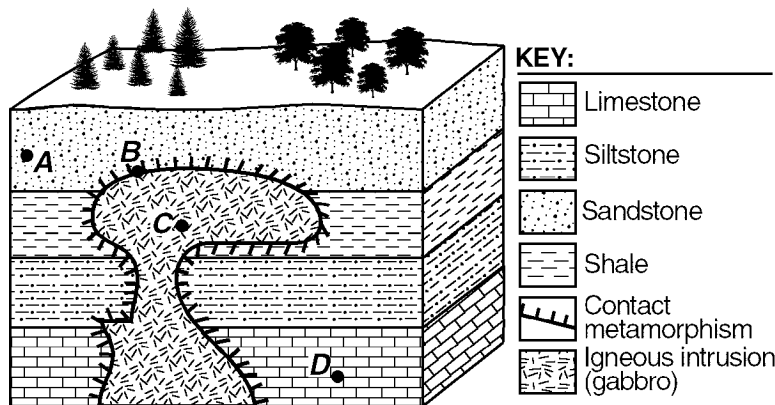
- A) clay-sized particles and shark fossils
 B) silt-sized particles and coral fossils
 C) clay-sized particles and coral fossils
 D) silt-sized particles and shark fossils

Questions 331 through 334 refer to the following:

The cross sections below show widely separated outcrops at locations X, Y, and Z.



- 331) Which rock layer is *oldest*?
- A) brown siltstone C) gray siltstone
 B) green shale D) tan limestone
- 332) The fossils in the rock formations at location X indicate that this area was often covered by
- A) desert sand
 B) tropical rain forests
 C) seawater
 D) glacial ice
- 333) At location Y, the boundary between the red sandstone and the black shale marks the
- A) end of the Mesozoic Era
 B) beginning of the Mesozoic Era
 C) beginning of the Cenozoic Era
 D) end of the Cenozoic Era
- 334) An unconformity can be observed at location Z. Which rock layer was most probably removed by erosion during the time represented by the unconformity?
- A) gray siltstone C) brown siltstone
 B) black shale D) conglomerate
- 335) The diagram below represents a cross section of a portion of the Earth's crust. Points A through D represent locations in the bedrock. The rock layers have not been overturned.

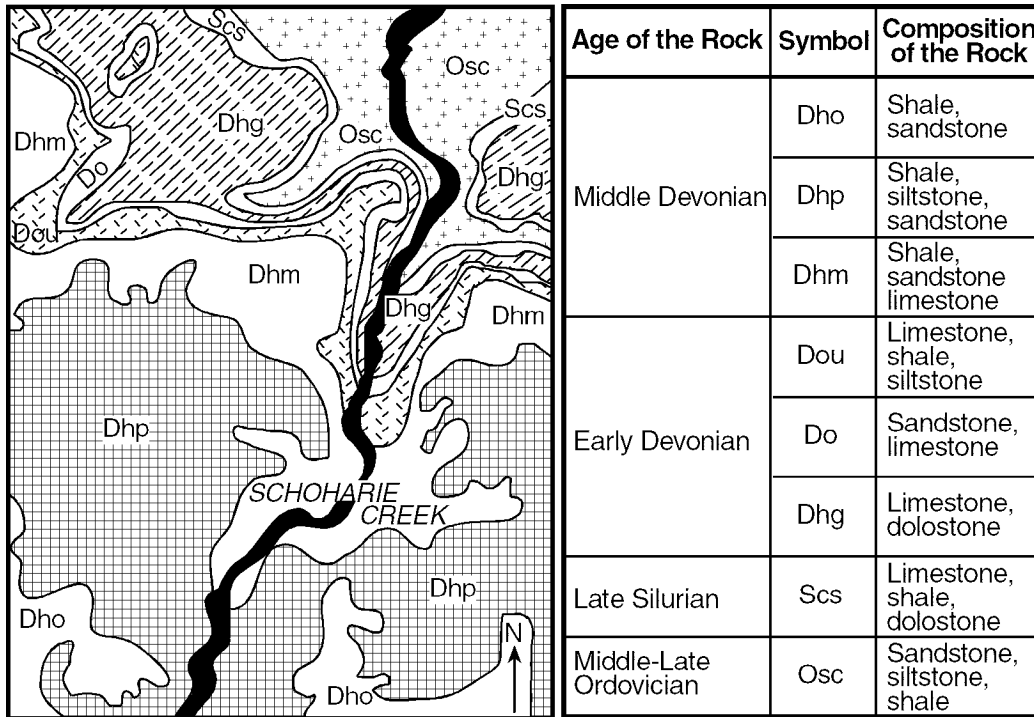


Which rock formed most recently?

- A) shale B) limestone C) siltstone D) gabbro

Questions 336 and 337 refer to the following:

The map below shows surface geology of a portion of the Schoharie Valley in New York State. Patterns and letters are used to indicate bedrock of different ages. The Schoharie Valley contains mostly horizontal rock structure in which overturning has not occurred. The table provides information about the rocks shown on the map.



336) What is the age of the surface bedrock in this portion of the Schoharie Valley?

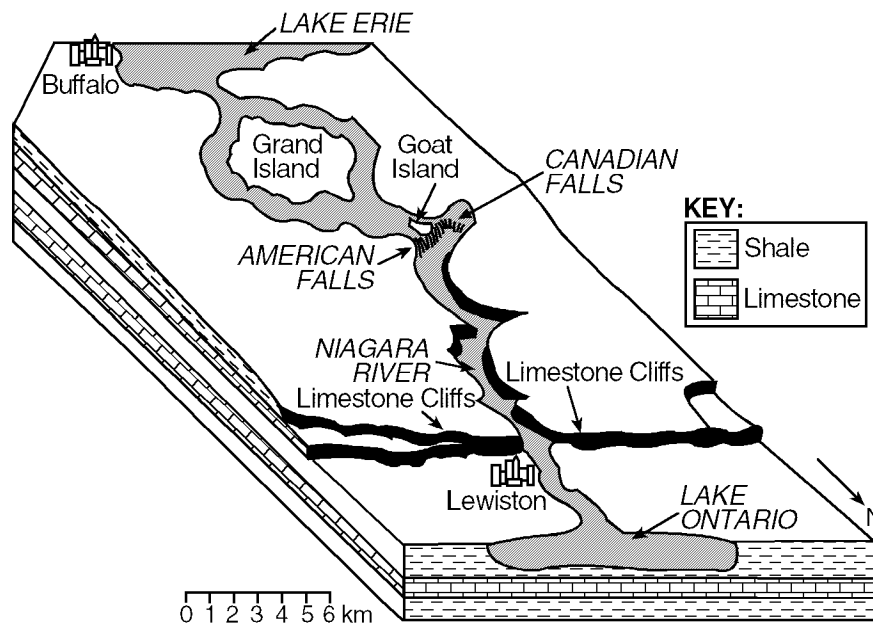
- A) 478-505 million years
- B) 374-478 million years
- C) 505-540 million years
- D) 320-374 million years

337) Based on the age of the bedrock, between which two rock units is an unconformity representing the *longest* period of time located?

- A) Dhm and Dou
- B) Dhg and Scs
- C) Do and Dhg
- D) Scs and Osc

Questions 338 and 339 refer to the following:

The block diagram below shows the generalized underlying geology of an area in western New York State and Canada.



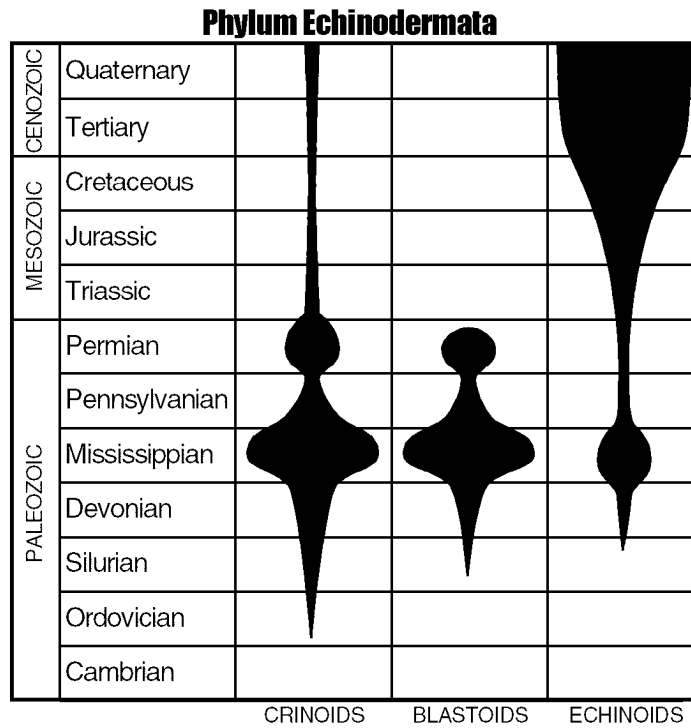
338) Compared to the surface bedrock in Lewiston, the surface bedrock in Buffalo is

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

339) The Niagara River first started flowing over the cliffs near Lewiston approximately 10,000 years ago. Which other geologic event occurred about the same time?

- A) the Acadian Orogeny
- B) the formation of the ancestral Adirondack Mountains
- C) the retreat of the last continental ice sheet
- D) the initial opening of the Atlantic Ocean

340) 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.

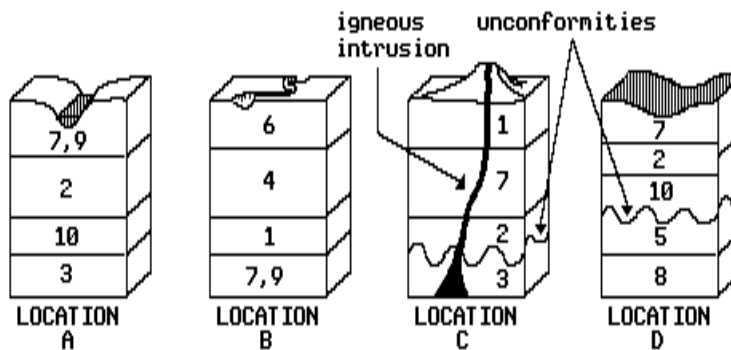


Which statement about crinoids, blastoids, and echinoids is *best* supported by the diagram?

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

Questions 341 through 345 refer to the following:

The diagrams below show cross sections of the Earth's crust at four widely scattered locations, A through D, Numbers 1 through 10 represent fossils located in the rock layers. (The numbers do not represent the relative ages of the fossils.) The rock layers have not been overturned.



341) Which location most likely contains the youngest fossil?

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

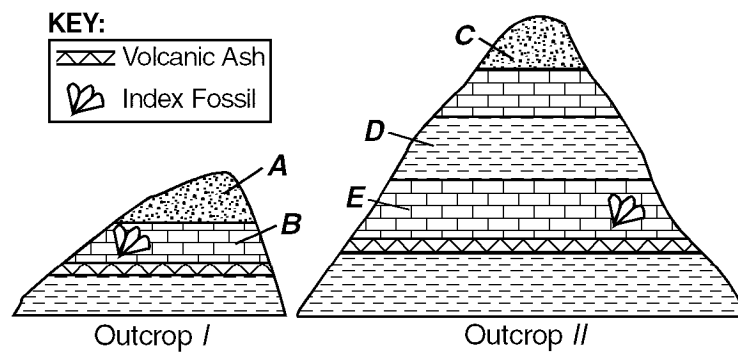
342) What is the relative age of the igneous intrusion at location C?

- A) older than the layer containing fossil 7
- B) the same age as the layer containing fossil 1
- C) the same age as the layer containing fossil 9
- D) younger than the layer containing fossil 10

- 343) What is the most likely cause of the unconformities at location *C* and *D*?
- A) volcanic activity
 - B) faulting
 - C) human activity
 - D) uplift and erosion
- 344) Fossil 8 represents the earliest fish. How many millions of years ago was the rock layer containing this fossil probably formed? [Refer to the *Earth Science Reference Tables*.]
- A) 580
 - B) 275
 - C) 510
 - D) 300

- 345) Index fossils such as 7 are useful for correlating rocks because the fossils
- A) represent organisms that lived for a relatively short period of geological time in widespread areas
 - B) are found only in sedimentary rocks
 - C) contain radioactive carbon-14, which is used for relative dating
 - D) represents organisms that lived close to the Earth's surface for a relatively long period of time

346) The diagrams below represent two outcrops of bedrock located several kilometers apart. The rocks have not been overturned.

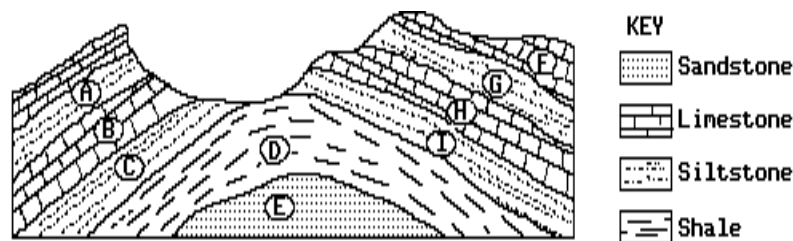


Which statement about the geologic history of the outcrops is *best* supported by the diagram?

- A) The rocks at *B* formed after the rocks at *D*.
- B) The rocks at *C* and *B* are the same age.
- C) The rocks at *B* and *E* are the same age.
- D) The rocks at *B* formed after the rocks at *A*.

Questions 347 and 348 refer to the following:

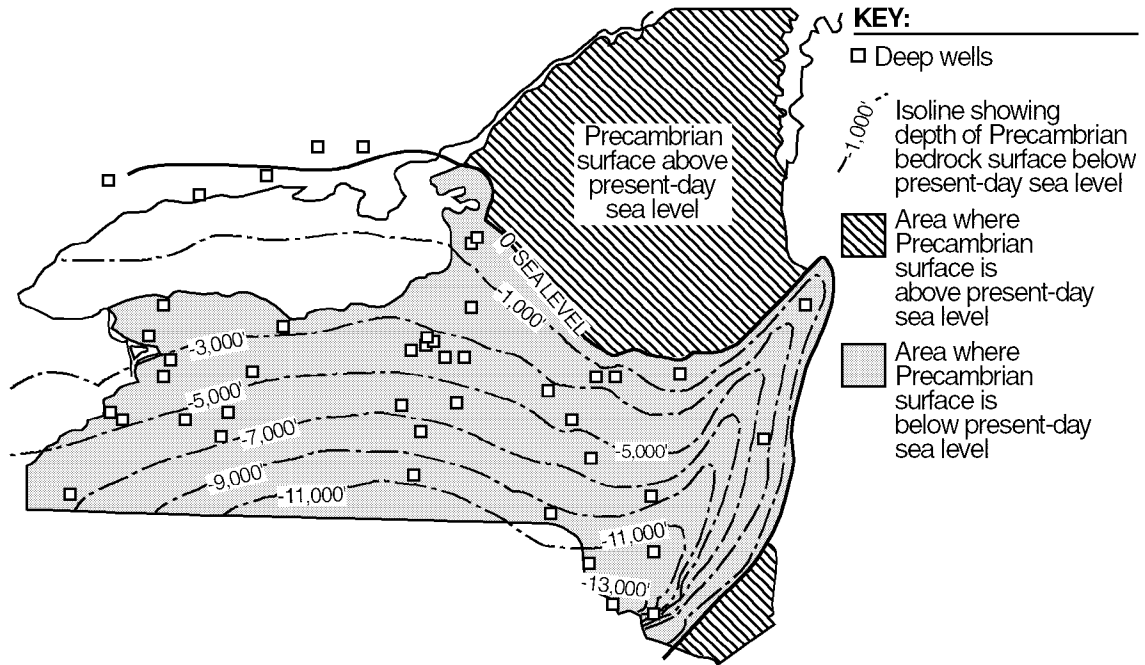
The diagram below represents a cross section of an eroded fold that has not been overturned.



- 347) The fossils found in rock layer *G* will most closely resemble those found in rock layer
- A) *I*
 - B) *C*
 - C) *E*
 - D) *A*

- 348) If rock layer *A* is of Devonian Age, rock layer *E* could be of
- A) Carboniferous Age
 - B) Cambrian Age
 - C) Triassic Age
 - D) Tertiary Age

- 349) The map below shows most of New York State. Isolines indicate the depth of the Precambrian bedrock surface below present-day sea level. Depths are in feet.

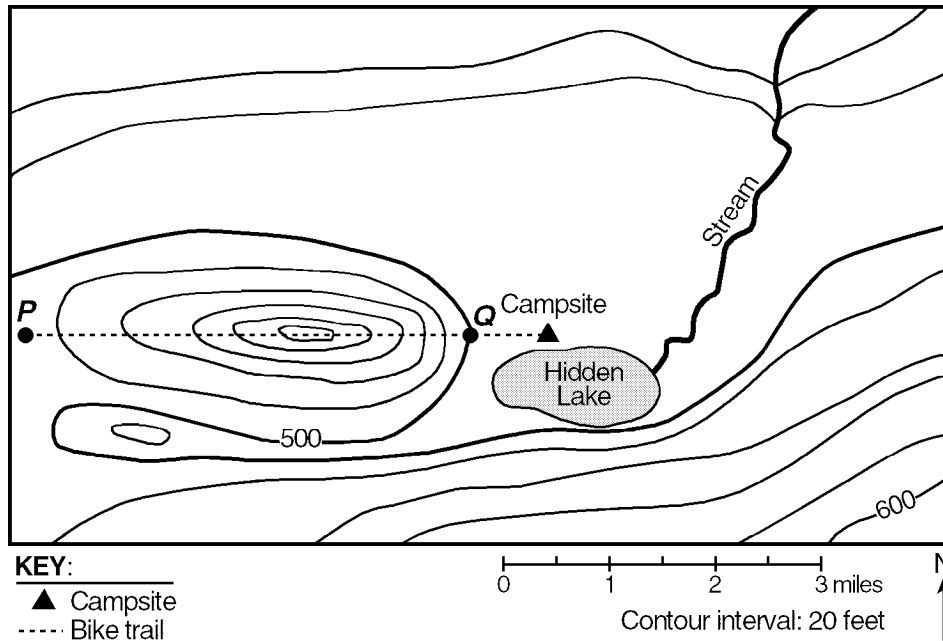


What is the geologic age of *most* of the bedrock covering the Precambrian rock in present-day New York State?

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

350) A group of Earth Science students decided to take an adventurous camping trip, so they rode bicycles to a New York State park that was located in an isolated area. They traveled up a steep hill. When they reached the top, they looked at the landscape and noticed a lake at the bottom of the hill. They named it Hidden Lake. To the left of Hidden Lake was a large field with a small stream. They decided to set up their campsite in the field near Hidden Lake. To get to the field, they cycled down a very steep slope.

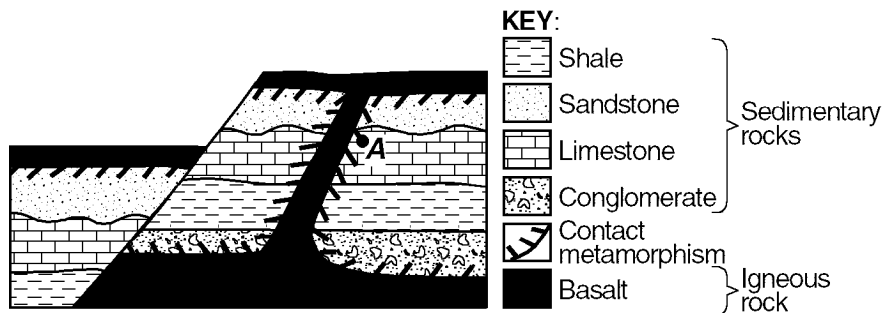
The map below shows the location of the bicycle trail and the students' campsite. Points *P* and *Q* are reference points on the map.



- (a) While exploring the stream, a student found a rock containing a trilobite fossil. Name the most likely type of rock this student found.
- (b) State the geologic era during which the rock containing the trilobite most likely formed.

Questions 351 and 352 refer to the following:

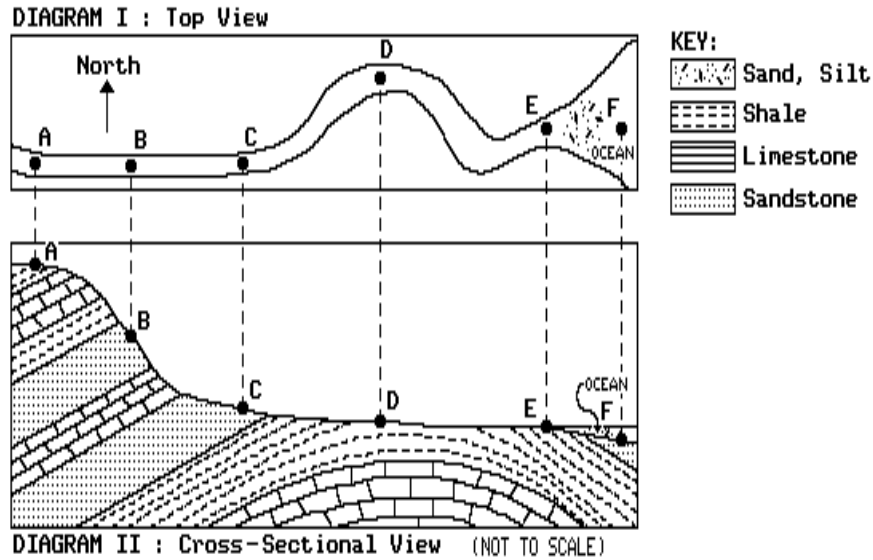
The diagram below shows a cross section of a portion of Earth's crust that has undergone geological processes. Overturning of rock layers has not occurred. Point *A* represents one location of metamorphic rock.



351) State *one* piece of evidence that indicates basalt is the *youngest* rock unit in the cross section.

352) State *one* piece of evidence that shows that crustal uplift has occurred in this region.

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

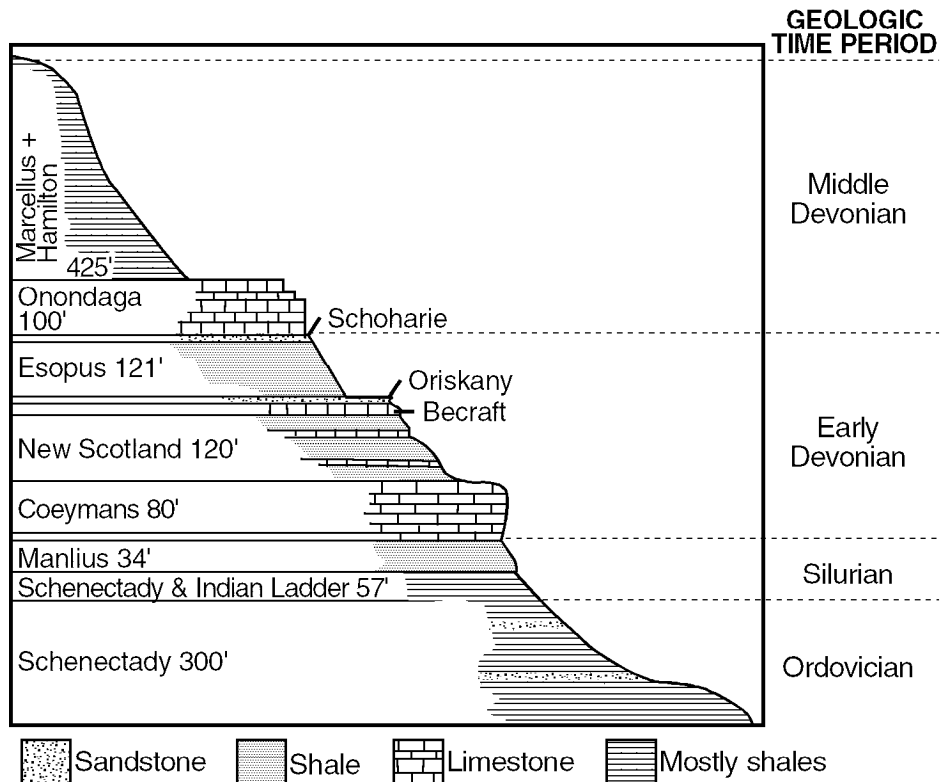


If overturning has not occurred, at which point is the stream flowing over the oldest bedrock?

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

Questions 359 and 360 refer to the following:

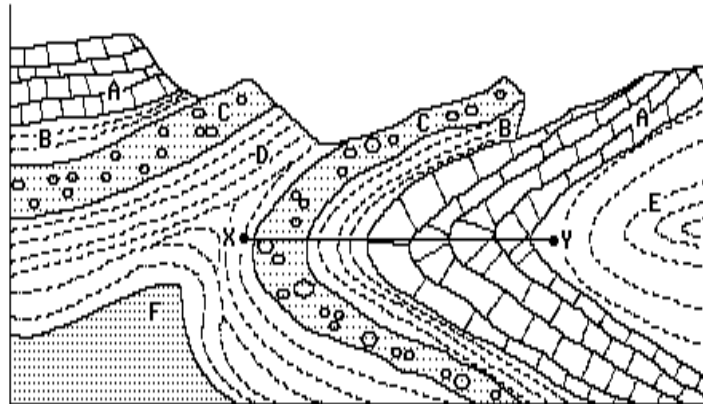
The diagram below represents a cross section of a hillside in eastern New York State. The names of the rock layers and the geologic time periods in which they were formed are given. Layer thicknesses are shown in feet.



- 359) Which rock layers are the *youngest*?
- A) Marcellus and Hamilton
 - B) Esopus and Schoharie
 - C) Schenectady and Indian Ladder
 - D) Manlius and Coeymans

- 360) What do the Marcellus and Hamilton layers have in common with the Schenectady and Indian Ladder layers?
- A) They are composed mostly of shales.
 - B) They have the same thickness.
 - C) They formed directly over limestone.
 - D) They developed during the same time period.

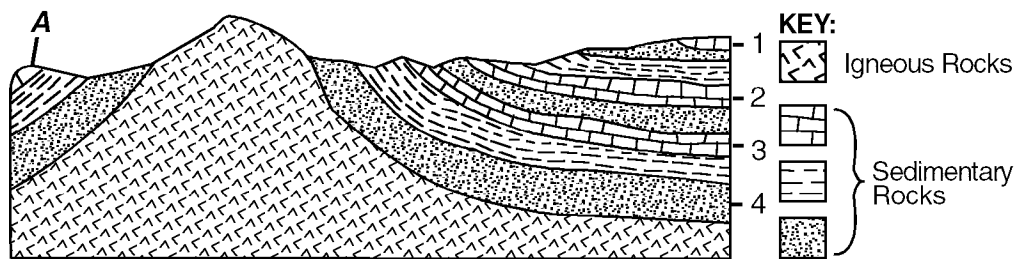
361) The diagram below shows a geologic cross section and landscape profile of a section of the Earth's crust.



Which graph best represents the age of the rocks along line XY?



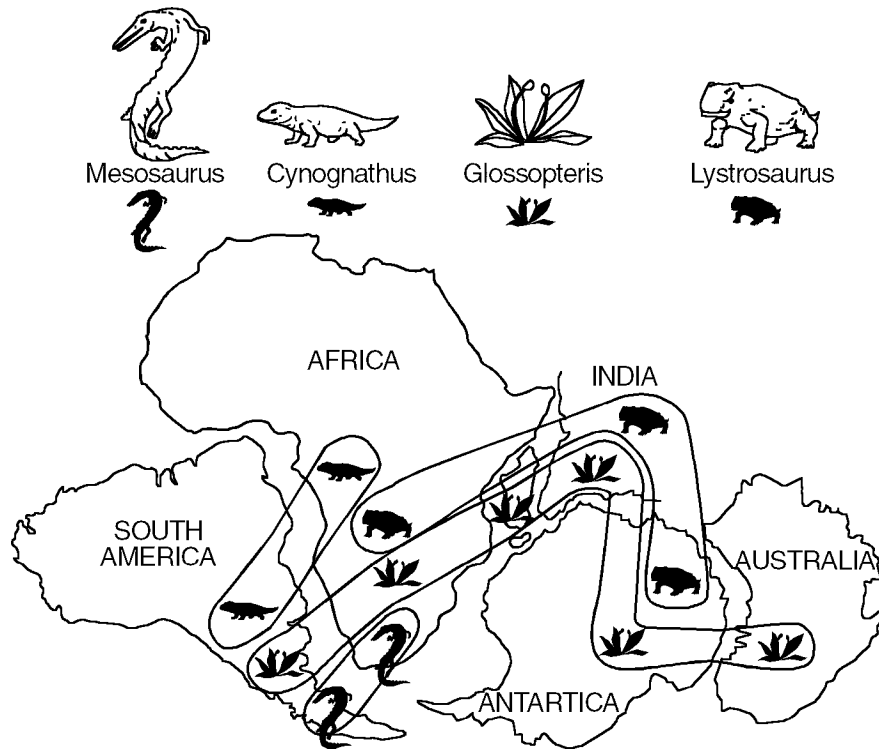
362) The diagram below represents a cross section of the Earth's crust in which no overturning has occurred.



Which numbered rock layer on the right is most likely the same age as layer A on the left?

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

- 363) The diagram below shows the probable arrangement of some Earth continents during the Mesozoic Era and the present distribution of four fossils.



Which fossil shown in the diagram would be most useful for correlating rocks among all the landmasses shown?

- A) *Cynognathus* B) *Mesosaurus* C) *Lystrosaurus* D) *Glossopteris*