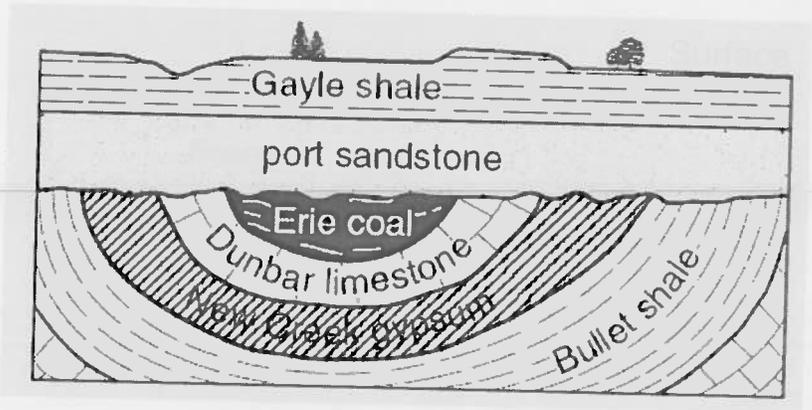


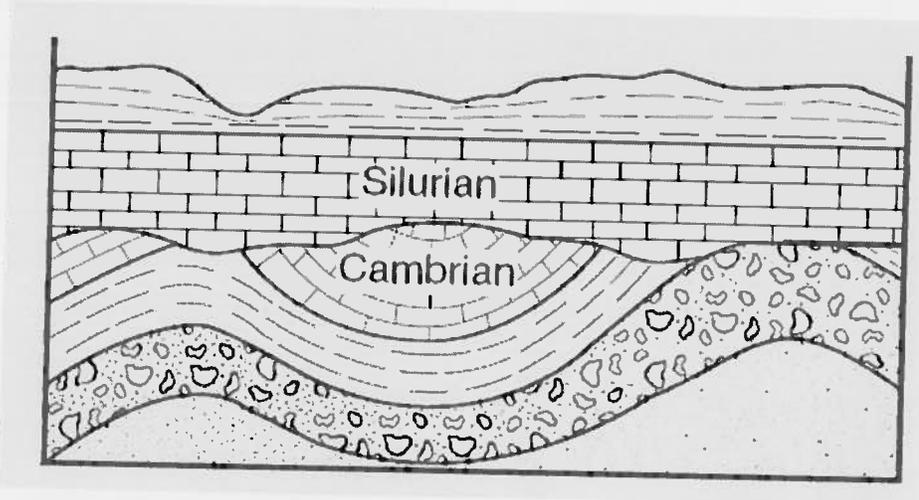
Geologic History Review

Use the picture below to answer questions 1-3.

1. Label the unconformity.
2. Where did the Erie coal come from?
3. What is the grain size of the Bullet and the Gayle shale?



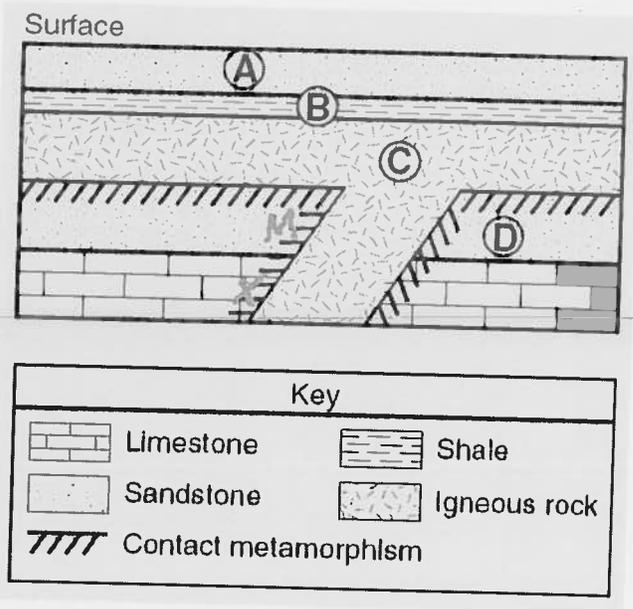
Use the diagram below to answer questions 4-9.



4. Approximately how many million years ago did the unconformity form?
5. Name the nautiloid fossil that could be found in the limestone layer directly above the unconformity.
6. How can you tell from the picture that the conglomerate layer could be from the Precambrian?
7. Label the sandstone layer with an S.
8. What could have caused the bottom four layers to be folded?
9. Label the layer with the largest range in particle size with a C.

Use the diagram below to answer questions 10-15.

10. How can you tell layer C is an extrusion?
11. What is the crystal size of layer C?
12. What is the grain size of layer A?
13. What is the composition of the limestone layer?
14. Name the metamorphic rock at location X.
15. Name the metamorphic rock at location M.



Use the reading passage below to answer questions 16-18.

Fossil With Signs of Feathers Is Cited as Bird-Dinosaur Link

Paleontologists have discovered in China a fossil dinosaur with what are reported to be clear traces of feathers from head to tail, the most persuasive evidence so far, scientists say, that feathers predated the origin of birds and that modern birds are descendants of dinosaurs.

Entombed in fine-grained rock, the unusually well-preserved skeleton resembles that of a duck with a reptilian tail, altogether about three feet in length. Its head and tail are edged with the imprint of downy fibers. The rest of the body, except for bare lower legs, shows distinct traces of tufts and filaments that appear to have been primitive feathers. On the backs of its short forelimbs are patterns of what look like modern bird feathers.

Other dinosaur remains with what appear to be featherlike traces have been unearthed in recent years, but nothing as complete as this specimen, paleontologists said. Etched in the rock like a filigree decoration surrounding the skeleton are imprints of where the down and feathers appear to have been.

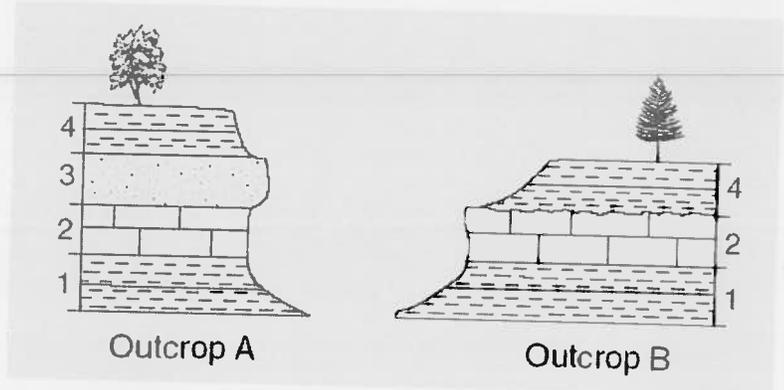
The 130-million-year-old fossils were found a year ago by farmers in Liaoning Province in northeastern China. After an analysis by Chinese and American researchers, the fossil animal was identified as a dromaeosaur, a small fast-running dinosaur related to velociraptor. The dinosaurs belonged to a group of two-legged predators known as advanced theropods . . .

excerpted from "Fossil With Signs of Feathers Is Cited as Bird-Dinosaur Link"
 John Noble Wilford
 New York Times, April 26, 2001

Review

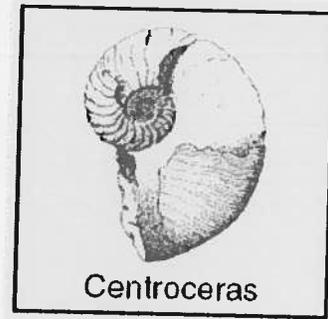
16. What period is the fossil the farmers found from?
17. What type of rocks were these fossils probable found in?
18. Why is the feathered dinosaur NOT considered an index fossil?

19. Explain why layer three is missing from outcrop 2.



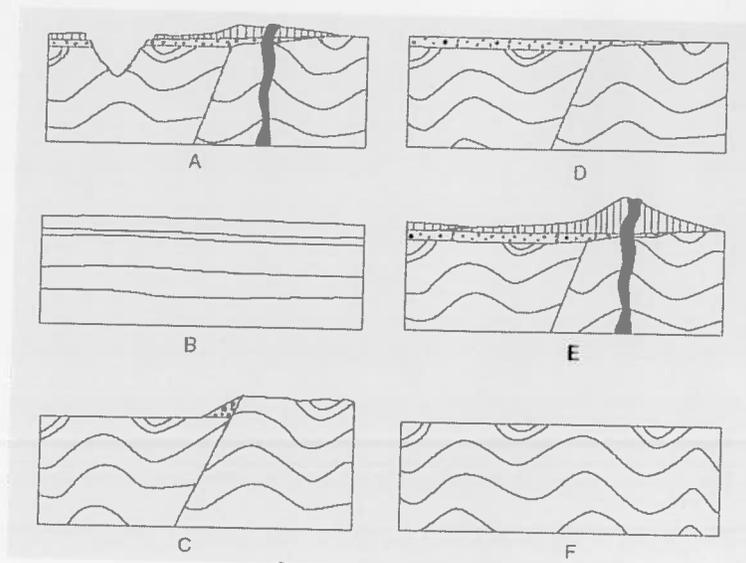
Use the picture of the fossil to answer questions 20-22.

20. What geologic period is this fossil from?
21. Name another fossil found in the same bedrock.
22. Where do you think this animal lived when it was alive?



23. Put the following pictures in the correct order.

First _____

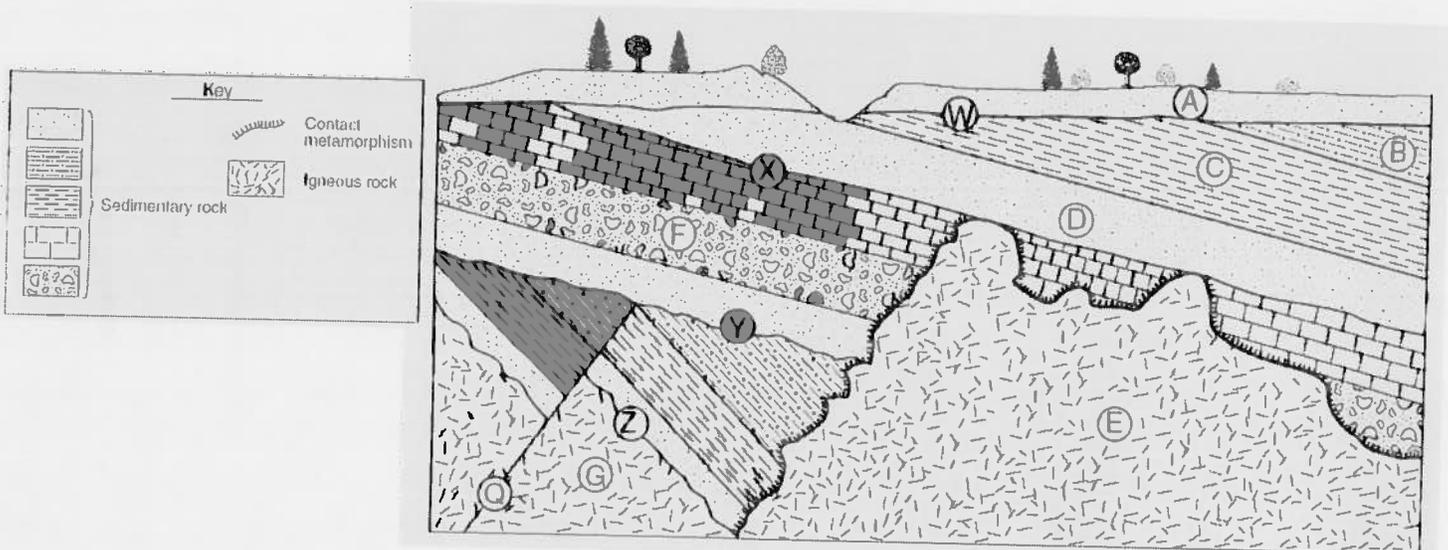


Review

24. Fill in the following chart.

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

Use the following picture to answer questions 25-30.



25. What caused Q to occur?

26. What caused Y, Z and W?

27. Describe rock E.

28. Which letter has the greatest range in particle size?

29. Label with a star the layer of rock that is composed of shells?

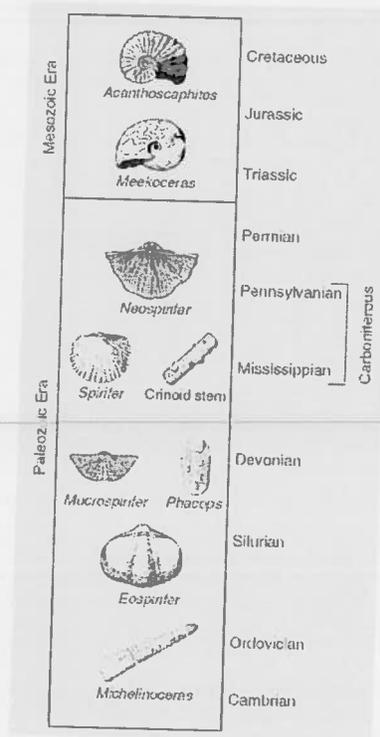
30. Describe another way you can determine this layer is limestone.

Review

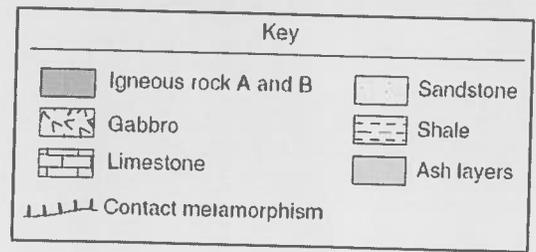
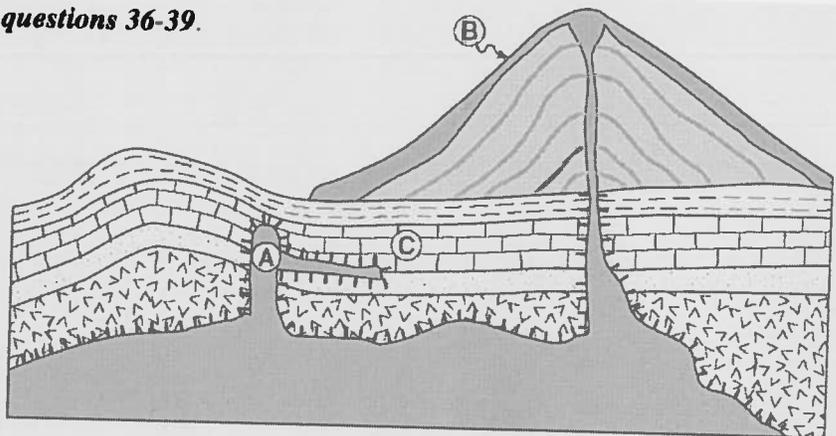
49

Use the picture to the right to answer questions 31-35.

31. Put a ▲ on the right side of the diagram to show when the dinosaurs were abundant.
32. Put a ■ on the right side of the diagram to show when *Platyceras* lived.
33. Put a ● on the right side of the diagram to show when PANGEA broke up.
34. Label where the PRECAMBRIAN would be.
35. Circle the period when you would have seen *Elliptocephala*.

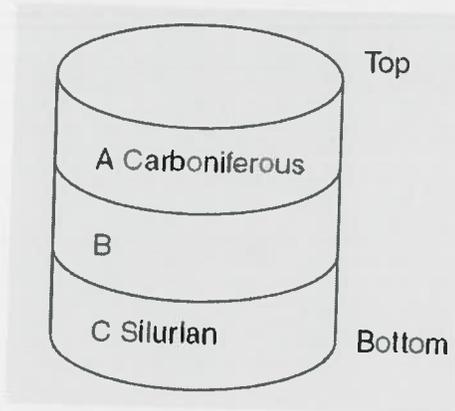


Use the picture below to answer questions 36-39.

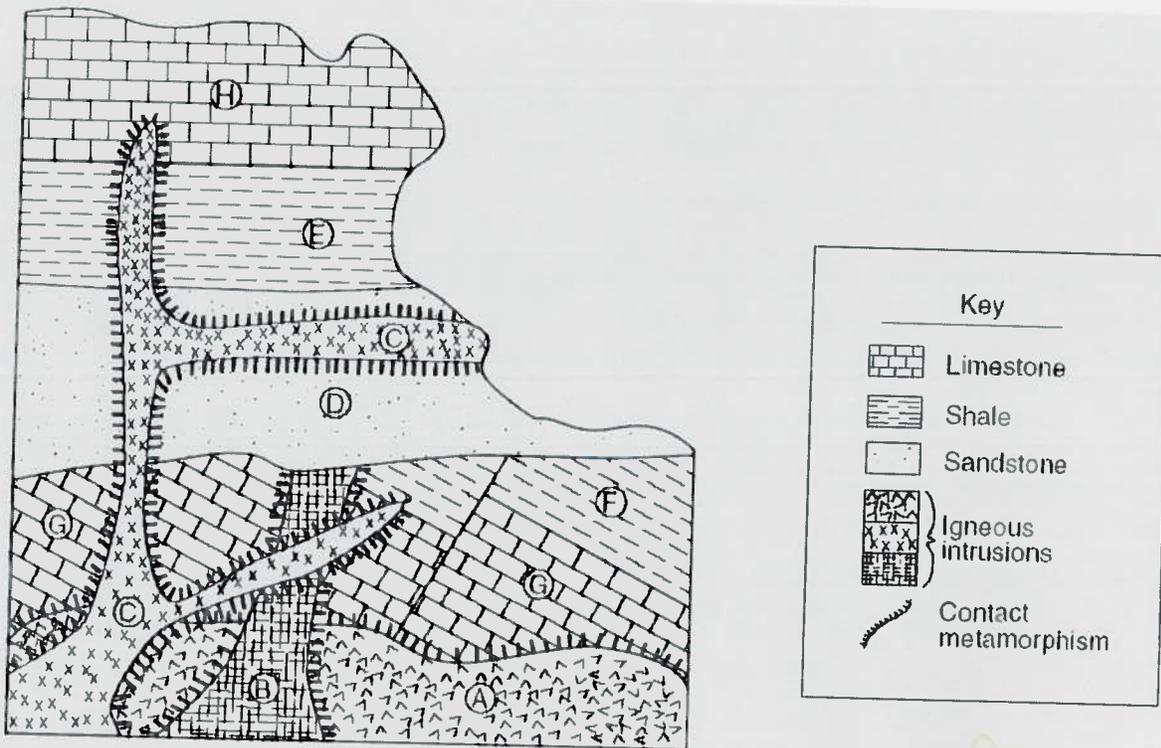


36. How does the crystal size of rock B compare to the size of rock A?
37. Which igneous rock will B probably be?
38. How can you tell this volcano erupted more than once?
39. How can tell igneous rocks A and B are younger than the gabbro?

40. Label the following diagram.



Use the picture below to answer questions 41-45.



I will give you two letters and you need to tell me which occurred first and why.

- 41. B and C...
- 42. A and G...
- 43. F and D...
- 44. C and E...
- 45. C and A...

Review

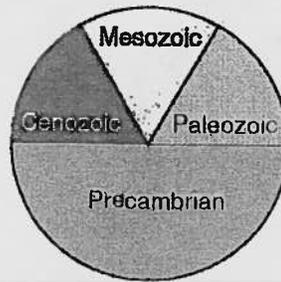
51

1. Which graph shows the relative duration of geologic time for the Precambrian, Paleozoic, Mesozoic, and Cenozoic time intervals?

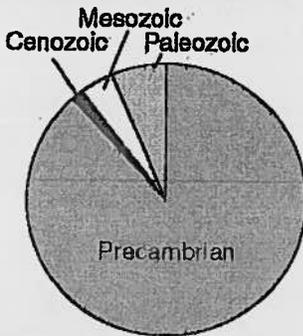
1)



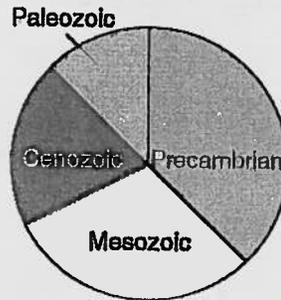
3)



2)



4)



2. Which rock is most likely the oldest?

- 1) conglomerate containing the tusk of a mastodont
 - 2) shale containing trilobite fossils
 - 3) sandstone containing fossils of flowering plants
 - 4) siltstone containing dinosaur footprints
3. 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?
- 1) Pliocene
 - 2) Miocene
 - 3) Oligocene
 - 4) Eocene
4. Near which location in New York State would a geologist have the greatest chance of finding dinosaur footprints in the surface bedrock?
- 1) 41°10' N latitude, 74° W longitude
 - 2) 42°10' N latitude, 74°30' W longitude
 - 3) 43°30' N latitude, 76° W longitude
 - 4) 44°30' N latitude, 75°30' W longitude

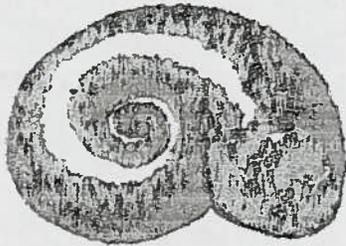
5. The chart below shows index fossils found in rocks of various ages.

BEDROCK AGE	INDEX FOSSIL
MISSISSIPPIAN	 SPIRIFER
DEVONIAN	 MUCROSPIRIFER
SILURIAN	 EOSPIRIFER
ORDOVICIAN	 MICHELINOCERAS

Which fossil could be found in the same rock as fossils of the first corals?

- 1) *Spirifer*
- 2) *Mucrospirifer*
- 3) *Eospirifer*
- 4) *Michelinoceras*

6. The diagram below shows an index fossil found in surface bedrock in some parts of New York State.



Maclurites

In which New York State landscape region is this gastropod fossil most likely found in the surface bedrock?

- 1) Tug Hill Plateau
- 2) Allegheny Plateau
- 3) Adirondack Mountains
- 4) Newark Lowlands

7. Trilobite fossil remains are most likely to be found in bedrock of

- 1) Precambrian age near Mt. Marcy
- 2) Cretaceous age on Long Island
- 3) Triassic age northwest of New York City
- 4) Ordovician age near Plattsburgh

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

- 1) A continental glacier covered most of the State.
- 2) The entire State was uplifted from below sea level.
- 3) The Palisades Sill intruded.
- 4) The Taconic Mountains formed.

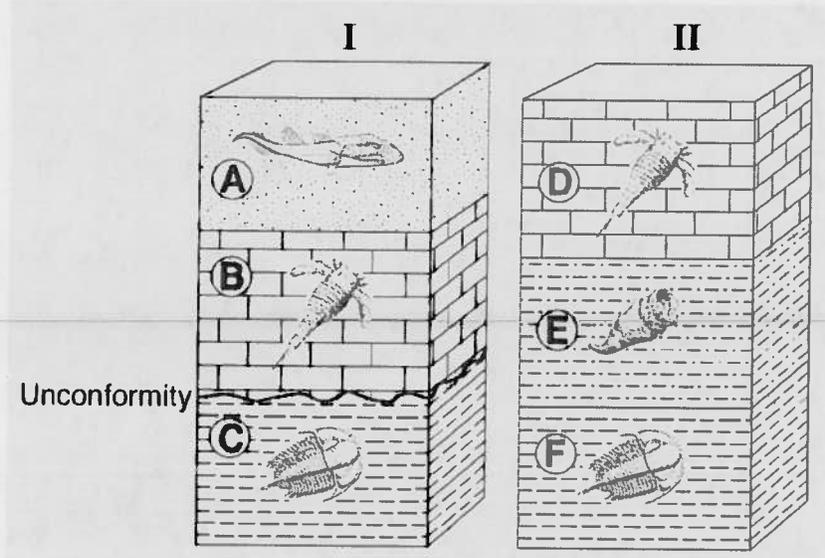
9. Most of the surface bedrock found in New York State was formed during which era?

- | | |
|----------------|-------------|
| 1) Precambrian | 3) Mesozoic |
| 2) Paleozoic | 4) Cenozoic |

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

- | | |
|--------|--------|
| 1) 37% | 3) 67% |
| 2) 50% | 4) 87% |

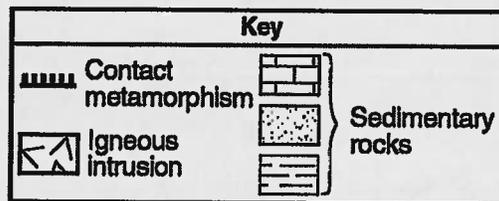
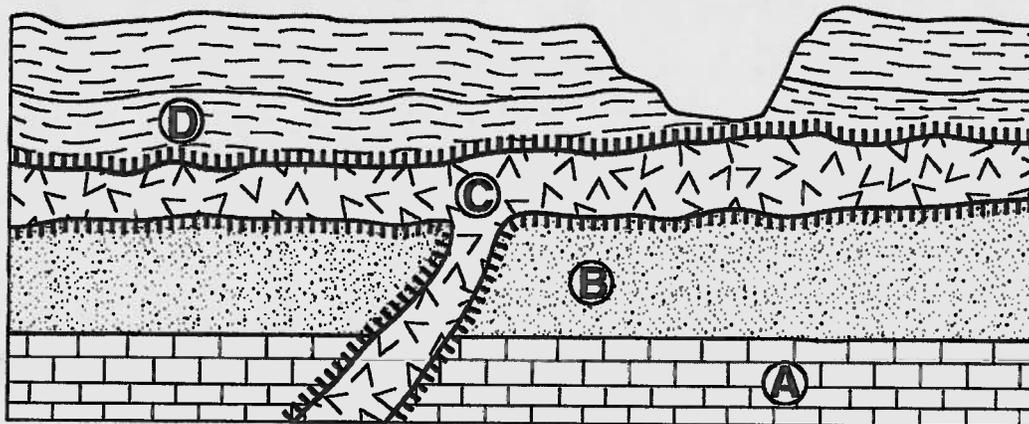
Base your answers to questions 1 through 4 on the diagrams below, which represent two bedrock outcrops, I and II, found several kilometers apart in New York State. Rock layers are lettered *A* through *F*. Drawings represent specific index fossils.



1. Explain why carbon-14 can *not* be used to find the geologic age of these index fossils.
2. Describe *one* characteristic a fossil must have in order to be considered a good index fossil.
3. Identify *two* processes that produced the unconformity in outcrop I.
4. During which geologic time period was rock layer *C* deposited?

Date

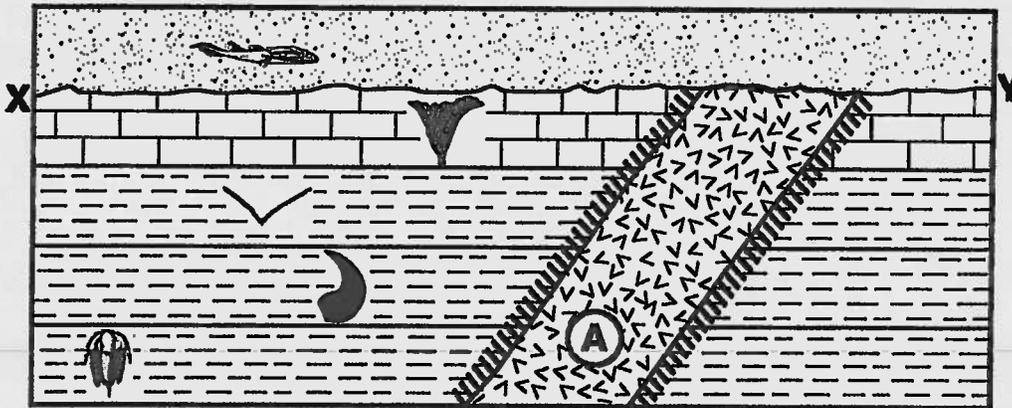
Base your answers to questions 5 through 7 on the cross section below. The cross section shows a portion of Earth's crust. Letters *A*, *B*, *C*, and *D* represent rock units that have not been overturned.



5. State *one* piece of evidence shown in the cross section that indicates that rock unit *D* is older than igneous intrusion *C*.
6. Identify by name the most abundant mineral in rock unit *A*.
7. On the cross section above, place an **X** where the metamorphic rock quartzite may be found.

Date

Base your answers to questions 8 through 10 on the geologic cross section below. The cross section shows Vermont index fossils in rock layers that have not been overturned. Rock unit *A* is an igneous intrusion and line *XY* represents an unconformity.



Key	
Index Fossils	
	<i>Bothriolepis</i>
	<i>Ctenocrinus</i>
	<i>Dicellograptus</i>
	<i>Valcouroceras</i>
	<i>Elliptocephala</i>

Key	
Rock Units	
	} Sedimentary rocks
	
	
	} Igneous rock
	} Contact metamorphic rock

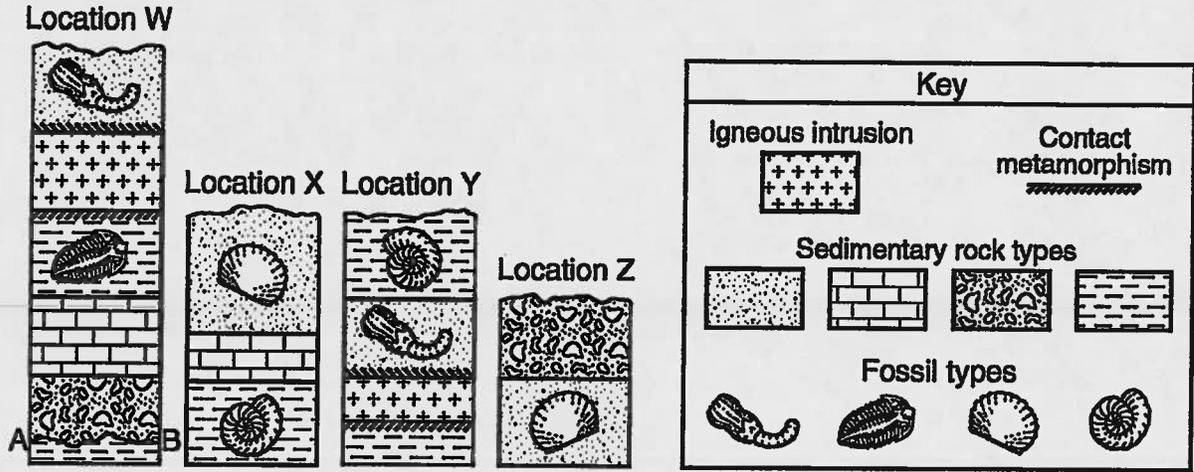
8. Identify one piece of evidence shown in this cross section that indicates that the igneous intrusion, *A*, is older than the sandstone layer.

9. Identify the coral index fossil that would most likely be found in the same layer as the index fossil *Ctenocrinus*.

10. Based on fossil evidence, determine the geologic period during which the unconformity formed.

Date

11. Base your answer to the following question on the cross sections below, which show widely separated outcrops at locations *W*, *X*, *Y*, and *Z*. The rock layers have not been overturned. Line *AB* in the cross section at location *W* represents an unconformity. Fossils are shown in some of the layers.



(Not drawn to scale)



Determine the relative geologic age of the four fossils by correlating the rock layers between these outcrops. Number the fossils from 1 to 4 in order of relative age, with 1 as the oldest and 4 as the youngest.

Date

Base your answers to questions 12 and 13 on the table of index fossils shown below and on your knowledge of Earth science.

Table of Index Fossils		
		
Eospirifer	Manticoceras	Phacops

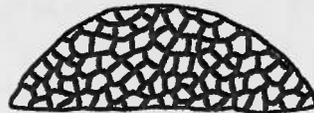
Fossil Classification

Index Fossil	<i>Eospirifer</i>	<i>Manticoceras</i>	<i>Phacops</i>
General Fossil Group			

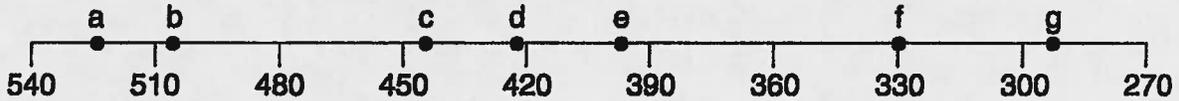
12. Complete the classification table above by filling in the general fossil group name for *each* index fossil.

13. During what geologic time period did the oldest index fossil shown in this table exist?

Base your answers to questions 14 through 17 on the geologic time line shown in your answer booklet. Letters *a* through *g* on the time line indicate specific reference points in geologic time.



Geologic Time Line (millions of years ago)



14. Identify *one* letter that indicates a time for which there is no rock record in New York State.

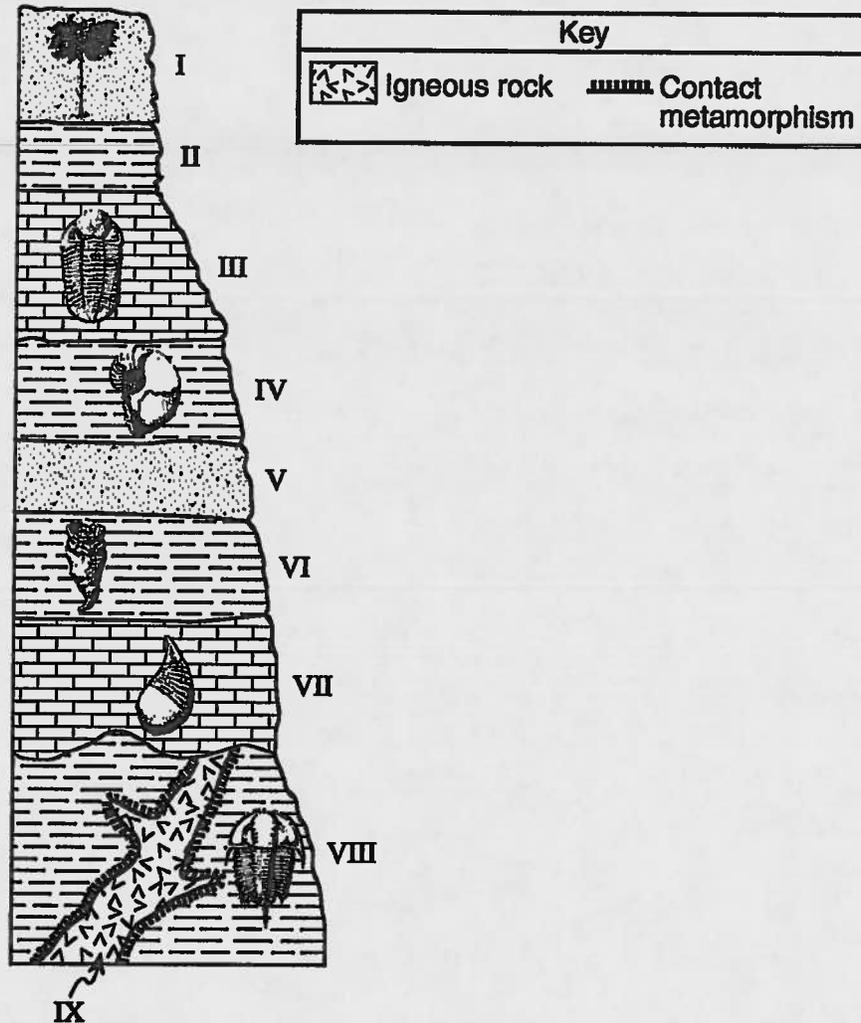
15. Identify the mountain building event (orogeny) that was occurring in eastern North America at the time represented by letter *g*.

16. Letter *a* indicates a specific time during which geologic period?

Date

17. Place an X on the geologic time line above, so that the center of the X shows the time that the coral index fossil *Lichenaria* shown above existed on Earth.

Base your answers to questions 18 through 20 on the cross section of the bedrock outcrop shown below and on your knowledge of Earth science. Index fossils found in some of the rock units are shown. The rock units are labeled I through IX.



18. Based on the fossils shown in the limestone and shale layers, state the type of environment in which these sedimentary rocks were deposited.
19. The fossil shown in rock unit VIII is a member of an extinct group of fossils. State *two* other index fossils that are also members of the same group of extinct fossils.

Date

20. In the space provided, number the relative age of rock units VII, VIII, and IX from 1 to 3, with number 1 indicating the oldest rock and number 3 indicating the youngest rock.

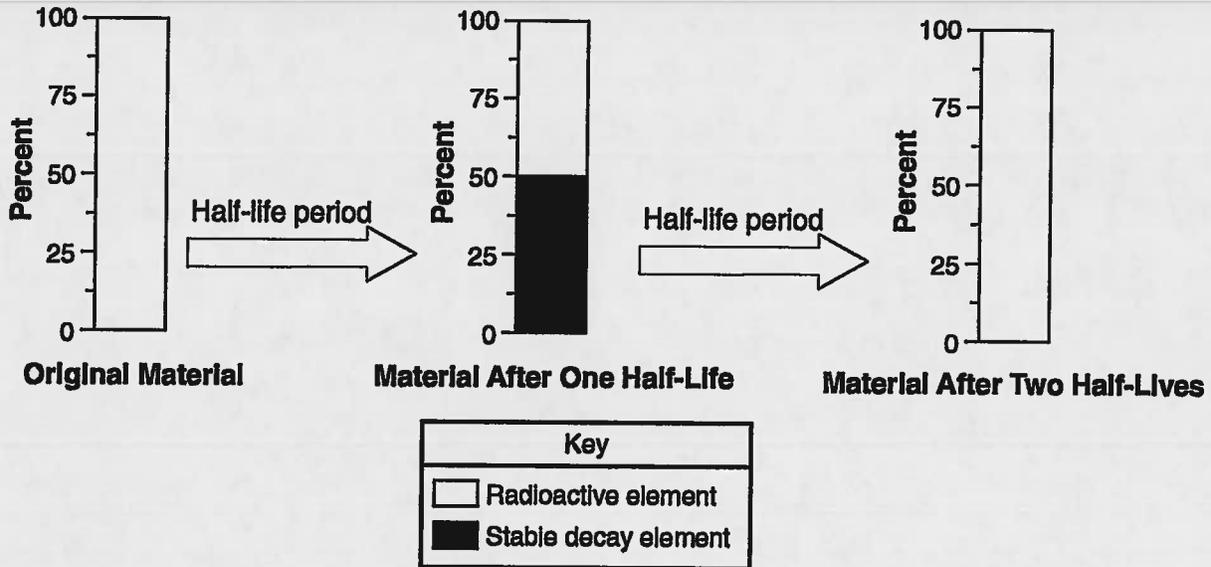
Rock Unit VII: _____

Rock Unit VIII: _____

Rock Unit IX: _____

Base your answers to questions 21 and 22 on the diagram below, which represents a model of the radioactive decay of a particular element. The diagram shows the decay of a radioactive element into the stable decay element after one half-life period.

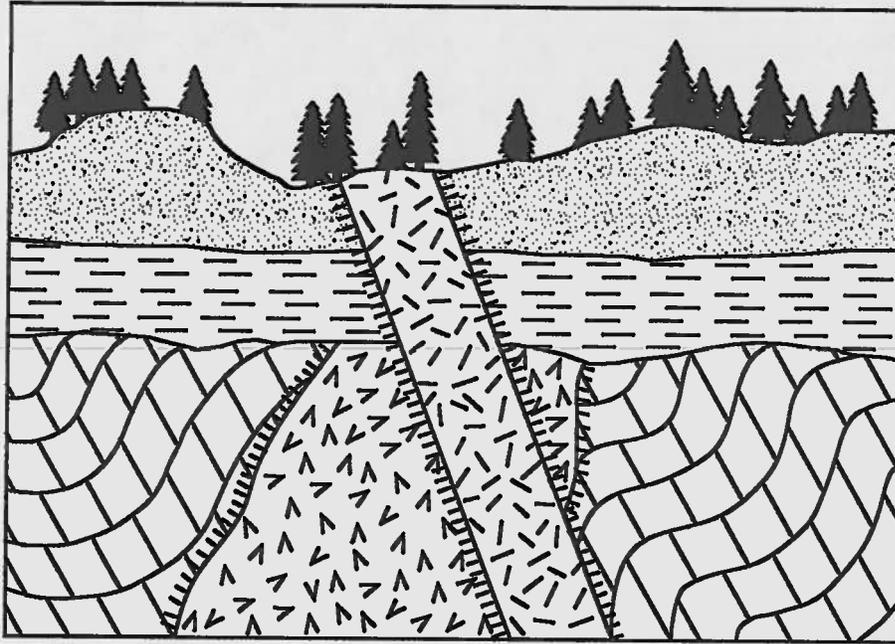
Radioactive Decay Model



21. If the radioactive element in this model is carbon-14, how much time will have passed after one half-life?
22. On the diagram above labeled *Material After Two Half-lives*, shade in the amount of stable decay element present after the second half-life period.

Date

23. Base your answer to the following question on the information and diagram below. The diagram represents a cliff of exposed bedrock that was investigated by an Earth science class.



Key to Rock Symbols

 Sandstone	 Folded limestone	 Granite
 Basalt	 Shale	 Contact metamorphism

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.

Inference 1:

Inference 2:

Inference 3:

Date

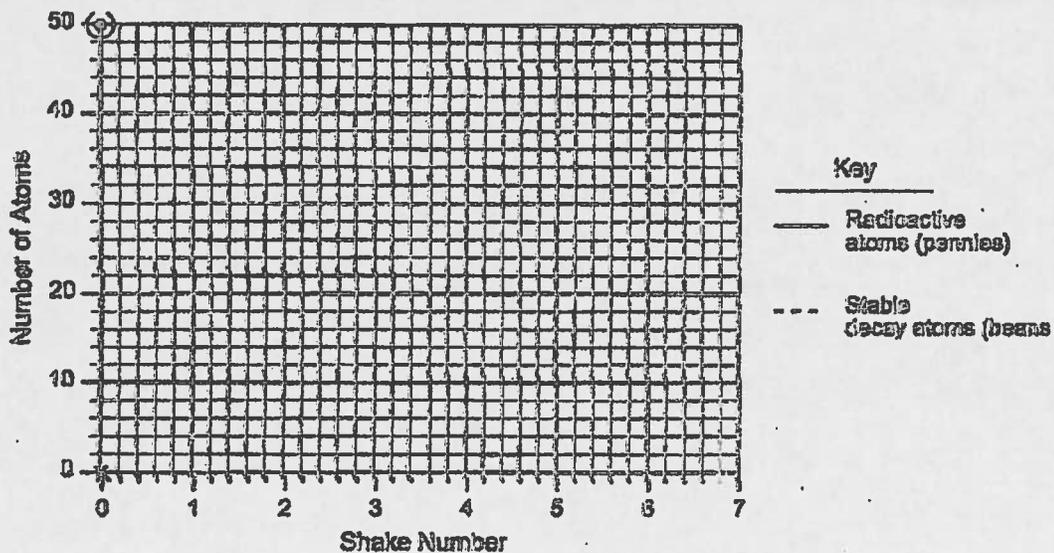
24. Base your answer to the following question on the paragraph below, which provides background information regarding recent fossil discoveries in Canada.

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.

Explain briefly why *Chronoperates paradoxus* would not be a good index fossil.

Base your answers to questions 25 and 26 on the table below, which 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	3	47
5	2	48
6	1	49
7	0	50



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

26. On the grid provided on your answer paper, graph the data shown on the table by following the steps below.

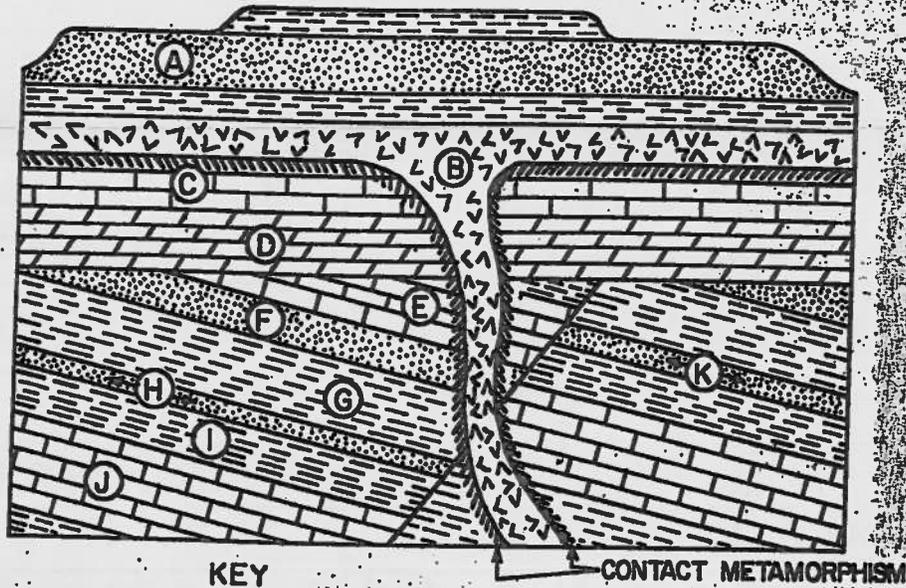
- Mark with a dot each number of radioactive atoms (pennies) after each shake. Surround each dot with a small circle. The zero shake has been plotted for you.
- Connect all the dots with a solid line.
- Mark with an X the number of stable decay atoms (beans) after each shake. The zero shake has been plotted for you.
- Connect all the X's with a dashed line.

Practice Test

62

NAME _____

Base your answers to questions 1 through 5 on your knowledge of earth science, the *Earth Science Reference Tables*, and the diagram below. The diagram represents a geologic cross section in which overturning has not occurred.



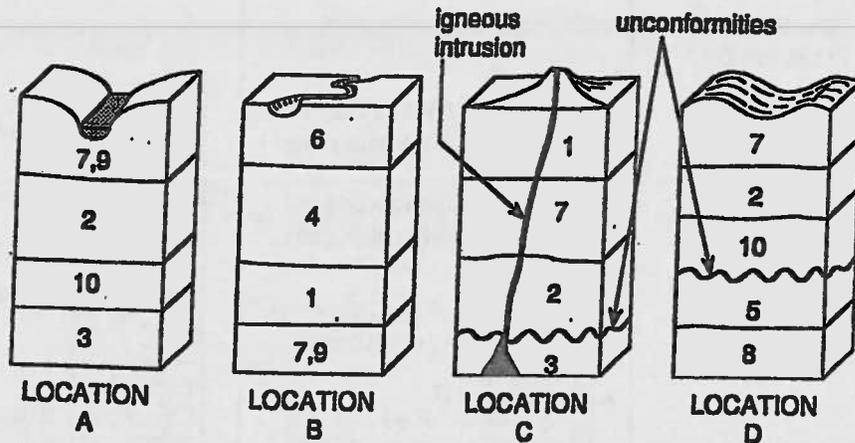
- 1 Which rock is the same age as rock K?

- 2 Which rock is *least* likely to contain fossils?

- 3 What is the relative age of the fault?
 - 1 older than rock D
 - 2 older than rock G
 - 3 younger than rock B
 - 4 younger than rock C

- 4 Dinosaur bones and ammonite shells have been found in several of the rocks shown. What is the probable age of these rocks?
 - 1 Devonian
 - 2 Jurassic
 - 3 Oligocene
 - 4 Permian
- 5 A buried erosion surface (unconformity) most likely exists between rocks
 - (1) G and K
 - (2) H and I
 - (3) C and D
 - (4) D and E

Base your answers to questions 1 through 5 on your knowledge of earth science, the *Earth Science Reference Tables*, and the diagrams below. The diagrams 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.



1. What is the most likely cause of the unconformities at locations C and D?

2. Which location most likely contains the youngest fossil?

3. What is the relative age of the igneous intrusion at location C?

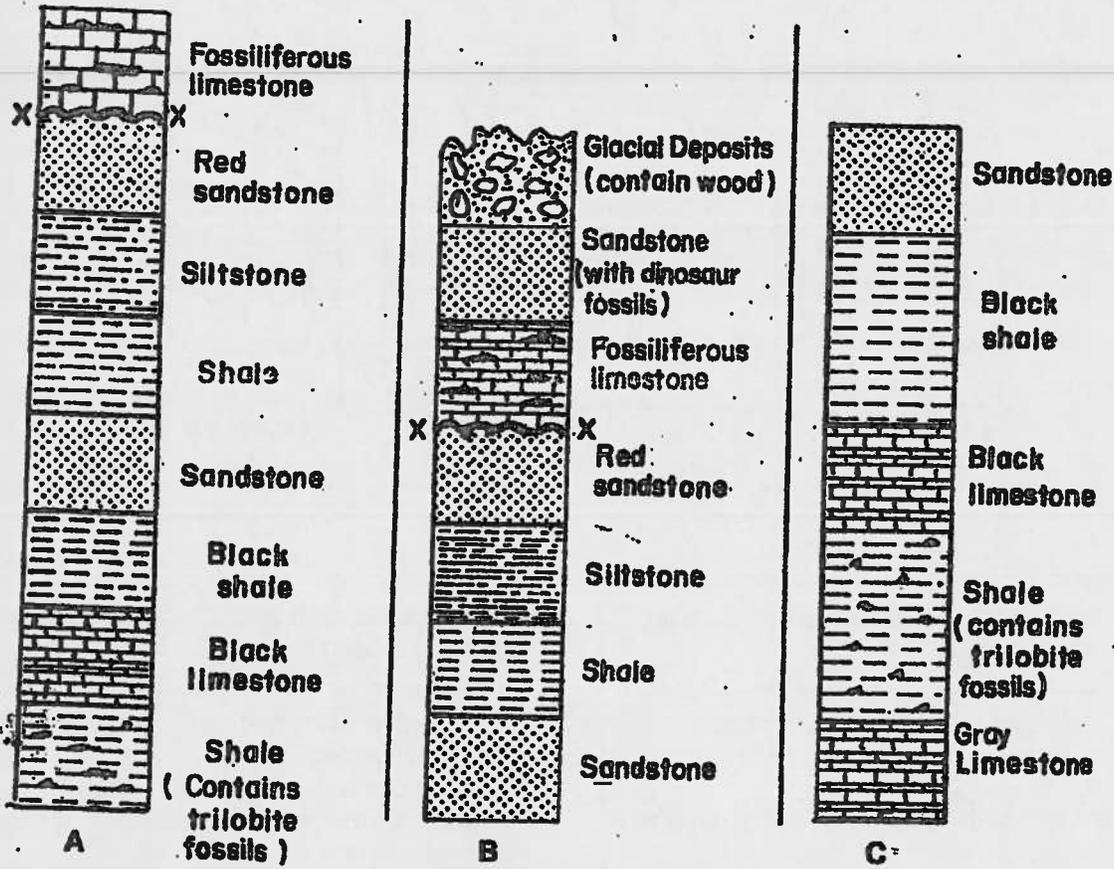
- 1 younger than the layer containing fossil 10
- 2 older than the layer containing fossil 7
- 3 the same age as the layer containing fossil 1
- 4 the same age as the layer containing fossil 9

4. Index fossils such as 7 are useful for correlating rocks because the fossils

- 1 are found only in sedimentary rocks
- 2 contain radioactive carbon-14, which is used for relative dating
- 3 represent organisms that lived for a relatively short period of geologic time in widespread areas
- 4 represent organisms that lived close to the Earth's surface for a relatively long period of time

5. Fossil 8 represents the earliest fish. How many millions of years ago was the rock layer containing this fossil probably formed?

Base your answers to questions 1 through 3 on the diagram below, your knowledge of Earth Science and the Earth Science Reference Tables. The diagram 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. Please answer questions 1 through 3 in complete sentences.



1. Which is the oldest rock layer? Describe how the oldest rock layer shown was determined.

2. Describe the evidence that indicates that the glacial deposits are the youngest shown.

3. Explain why the buried erosional surface at X is not shown in column C. What is another name for a buried erosional surface?

Name: _____ Date _____

Period: _____

Poisonous Dinosaurs

There is no conclusive evidence that any dinosaur possessed poisonous saliva. The poison-spitting dinosaur reconstructed in *Jurassic Park* is *Dilophosaurus*. At the time the movie was produced, there was no evidence that this or any other dinosaur spat poison or had poisonous saliva of any kind. Just last year, however, Mexican paleontologist Rubén A. Rodríguez de la Rosa of the Museum of the Desert in Saltillo presented suggestive evidence at the annual meeting of the Society of Vertebrate Paleontology. He has recovered a single odd tooth from an unknown carnivorous dinosaur that possesses a groove reminiscent of those seen in snakes for transmitting poison. "I have examined this tooth firsthand and, at this point, remain unconvinced". More examples need to be recovered before this hypothesis can be evaluated.

That said, it is well known that the largest lizard predator today, the Komodo dragon, does carry a potentially lethal bacterial load in its saliva that is used to poison prey. Not surprisingly, several people have suggested that some theropod (carnivorous) dinosaurs may have exhibited similar and equally unsavory behaviors, biting prey and letting the poison do the rest of the work. This might have proved an especially useful tactic for Jurassic predators such as *Allosaurus*, which most likely tackled prey animals many times its body size: the gargantuan, long-necked sauropods. Nevertheless, it is important to note that all of the above remains firmly embedded in speculation.

HW

66

1. What was so special about *Dilophosaurus* in the movie Jurassic Park?
2. What lead the paleontologist to believe that dinosaurs might have had poison glands?
3. A Komodo dragon does not have poison glands. How is it able to poison a victim?
4. In a Komodo dragon, and possibly the dinosaur whose tooth was discovered, how does the poison help the predator?
5. Why would poison be a useful tactic for an Allosaurus?
6. What further evidence might paleontologists look for to prove the existence of poisonous glands?
7. The term "(understanding) the present is the key to (understanding) the past" is an important concept in geology. How does it apply in this case?

Name: _____ Date: _____ Per: _____

Interpreting the Geologic Time Scale (ESRT pgs. 8 & 9)

1. During what periods did dinosaurs live on earth? _____
2. When did Pangaea begin to break up? _____
3. When did modern man first appear (epoch) on Earth? _____
4. Explain why man could not have hunted dinosaurs. _____
5. Using the numbers 1 through 3, place the following eras in order from oldest (1) to the most recent (3).
Cenozoic Mesozoic Paleozoic
6. When did trilobites become extinct? _____
7. Near the end of which era did dinosaurs become extinct? _____
8. For which geologic periods are no fossils (no rock record) found in New York State?

9. For which segment of the Earth's geologic history are fossils rarely found? _____
10. During which time period were trilobites common? _____
11. During which orogeny was Pangaea formed? _____
12. Which span of geologic time is the longest? _____
13. For how long did dinosaurs roam the earth? _____
14. How long ago did dinosaurs become extinct? _____
15. Which is the most recent time period where North America and Africa are believed to be separated?

16. Describe the motions of North America from the Ordovician to the Paleogene. _____
17. When was the Taconic Orogeny? _____
18. When did the Atlantic Ocean start to open? _____
19. What is the official fossil of NYS (see front page of ESRT)? _____
20. What era, period and epoch are we now in? _____

HW

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Name _____ Per _____

Learning to Love Your Earth Science Reference Tables
Geologic History of New York State

Pre-Cambrian

1. How long ago did the Pre-Cambrian Eon begin? _____
 2. Name the two main divisions of the Pre-Cambrian Eon.

 3. About how long did the Archean last? _____
 4. About how long did the Proterozoic last? _____
 5. How are the Archean and Proterozoic divided?

 6. When did Earth and the solar system originate? _____
 7. About how old are the oldest known rocks? _____
 8. During which era did sexually reproducing organisms appear? _____
 9. How many millions of years ago did our atmosphere begin to contain oxygen? _____
 10. In which era are the oldest microfossils found? _____
 11. In which era are stromatolites first found? _____
 12. How old is the Ediacaran fauna? _____
 13. Which ocean formed during the Pre-Cambrian? _____
- ** An orogeny is a mountain-building event.**
14. Which mountains and NYS landscape region formed during the Pre-Cambrian?

 15. a. What happened to the Grenville Mountains during the Precambrian? _____
b. What type of plate tectonic activity caused the Grenville Orogeny? _____

HW

(69)

Name: _____ Class: _____ Per. _____

Directions: Answer the following questions as you navigate through *Understanding Geologic Time*. Use website <http://www.ucmp.berkeley.edu/education/explorations/tours/geotime/geotime.html> Click "Student Start"

1. How is relative age different from the actual date of an event?
2. What can radiometric dating tell us about the age of rocks that the Law of Superposition cannot?
3. How can you find the age of a layer of rock that is surrounded by layers of volcanic ash?
4. What do the periods in the geologic time scale represent?
5. What do the terms Paleozoic, Mesozoic and Cenozoic mean?

6. The diagram to the right below shows a portion of the Geologic Time Scale. What do the divisions of time represent?

- a) the names of famous scientists
- b) major changes in flora (plants) and fauna (animals)
- c) Latin terms for lengths of time

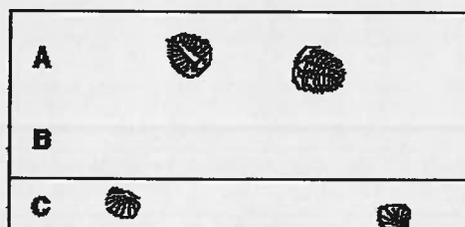
PHANEROZOIC	PALEOZOIC	PERMIAN
		CARBONIFEROUS
		DEVONIAN
		SILURIAN
		ORDOVICIAN
		CAMBRIAN

7. Current scientific evidence shows that the Earth is:

- a) less than 1 million years old
- b) between 3 and 4 billion years old
- c) more than 4 billion years old

8. Look at the diagram below representing layers of rocks and the fossils buried in them.

- a) Which is Circle the oldest layer? _____
- b) Explain how you can tell which layer is the oldest. (Hint: The Law of Superposition might help you.) _____



Name: _____ HW due by _____ Per. _____

~ Use your notes, Review Book, Textbook and ESRT. If you use the Internet, make sure you are defining an Earth Science term!

Definition:	Definition:
Carbon-14	Correlation
Drawing or Example:	Drawing or Example:

Definition:	Definition:
Half-life	Orogeny
Drawing or Example:	Drawing or Example:

Definition:
radioactive
Drawing or Example:

Definition:
Decay Product
Drawing or Example:

Name: _____

HW due by _____

Per. _____

Definition:

Evolution

Drawing or Example:

Definition:

Isotope

Drawing or Example:

Definition:

Mass Extinction

Drawing or Example:

Definition:

Outgassing

Drawing or Example:

Definition:

Unconformity

Drawing or Example:

Definition:

Submergence

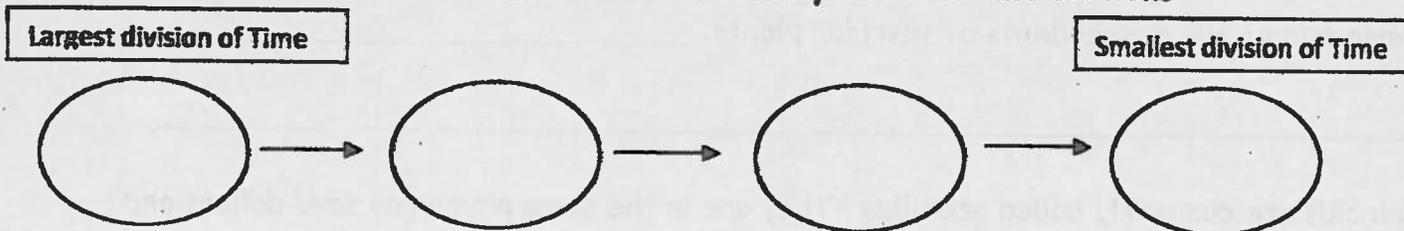
Drawing or Example:

Textbook Worksheet

> Read pgs. 347-355

1. About how old is the Earth? _____
2. What is another name for the unstable, radioactive isotope? _____
3. What is another name for the stable decay product? _____
4. What is radiometric dating useful for?
5. What is Carbon-14 useful for?
6. What is compared when dating with carbon-14?
7. What have geologists used to break up Earth's history into sections?

8. Fill in the Flow Chart to show how Earth's History is broken into sections:



9. Why is it sometimes difficult to assign absolute dates to the divisions of the geologic time scale?

Name: _____ HW due by _____ Per. _____

**Learning to Love Your Earth Science Reference Tables
Geologic History of New York State- ESRT pgs. 8 & 9**

> Time Distribution of Fossils

1. What are the three descendants of trilobites? _____

2. When did trilobites go extinct? _____
3. During which period did Earth have its first forest? _____
4. What is the name of the oldest coral index fossil? _____
5. During which era did graptolites exist? _____
6. Which two organisms have lived for the longest amount of time?

7. For how long did dinosaurs live on Earth? _____
8. What type of organism is a Manticoceras and when did it live? _____

9. Name two of the descendants of vascular plants. _____

10. Crinoids are commonly called sea lilies. They are in the same phylum as sand dollars and starfish. Name two early crinoids. _____

Name: _____

HW due by _____

Per. _____

Definition:

intrusion

Drawing or Example:

Definition:

Crosscutting relationships

Drawing or Example:

Definition:

Geologic time scale

Drawing or Example:

Definition:

Geologic era

Drawing or Example:

Definition:

Geologic period

Drawing or Example:

Definition:

Index fossil

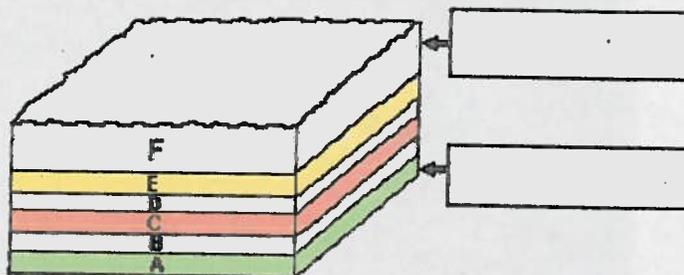
Drawing or Example:

Textbook Worksheet

> Read pgs. 336-342

1. Why are rocks so important?
2. How is relative dating different than absolute dating?

3. Using the Law of Superposition, label the youngest rock layer and the oldest rock layer in the diagram.

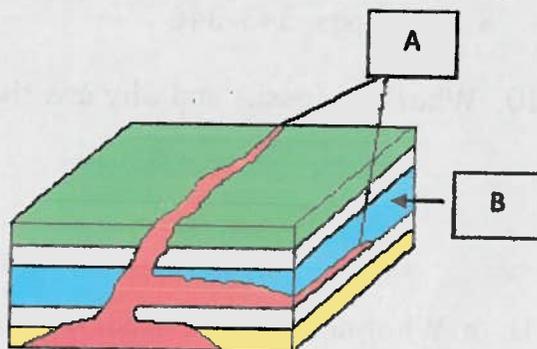


4. What type of rocks is originally deposited in horizontal layers?

5. Where do sedimentary rocks usually form? _____

6. a. Which rock layer is older, A or B? _____

b. Use the Principle of Cross-Cutting Relationships to explain your answer.



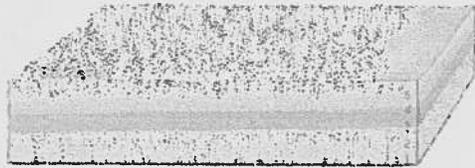
7. What does an unconformity represent?

Name: _____

HW due by _____

Per. _____

8.



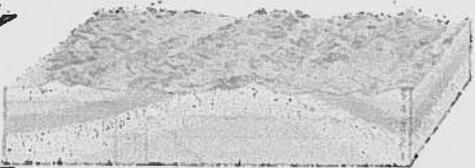
A

a. Describe the processes, as shown in this diagram, that lead to the formation of an unconformity, or GAP, in the rock record.



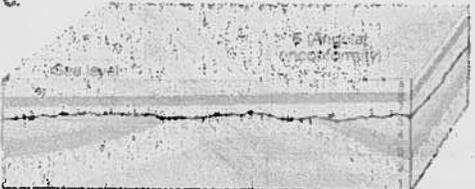
B

> A.



C

> B.



D

> C.

> D.

9. What is the purpose of correlating rocks?

- Read pgs. 343-346

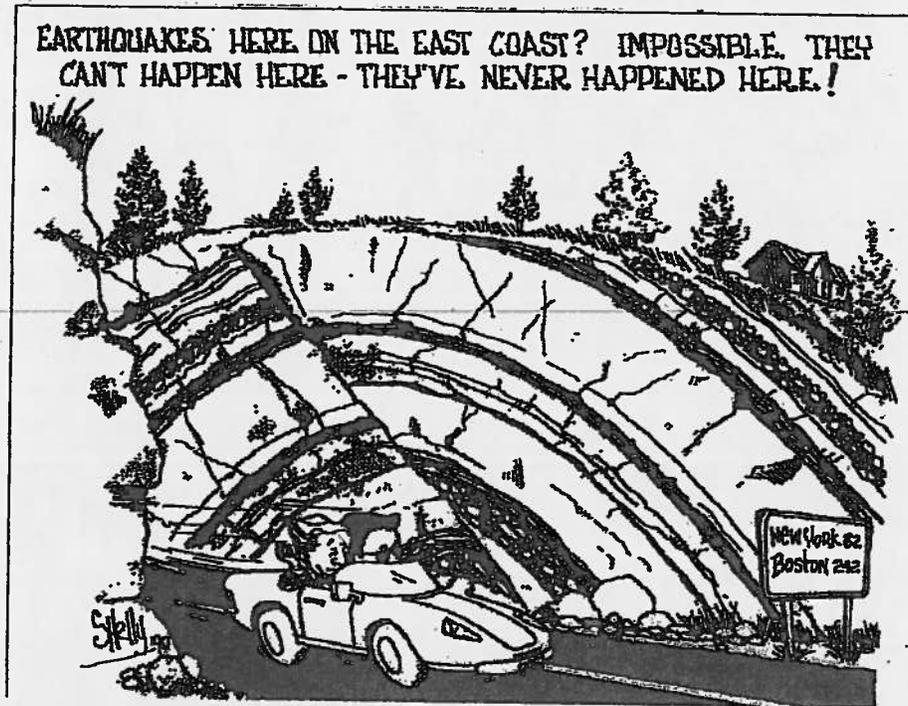
10. What are fossils and why are they important components of geologic history?

11. a. What are the two important conditions for preserving fossils?

- R _____ B _____
- H _____ P _____

b. How do these two conditions help preserve a fossil?

12. What are index fossils and why are they so important for correlation?



1. What is the cartoon implying?
2. What evidence does the diagram show to support this?
3. Use ESRT pgs. 2 & 3 to complete the following chart:

NYS Landscape Region	Geologic Period/Era	Type of Bedrock (Names of rocks)	Sedimentary or Metamorphic?
Adirondack Mountains			
Atlantic Coastal Plains			
The Catskills			
Erie-Ontario Lowlands			
Taconic Mountains			
Hudson-Mohawk Lowlands			

HW

Name: _____ Period: _____

EARTH'S HISTORY MAGIC SQUARE

Directions: Place the number of the correct answer in the proper space in the Magic Square box. Add the totals of the numbers both across and down. If they are equal, you have found the magic number!

orogeny	fossil	fault	Index fossil	Magic Number
Radioactive decay	correlation	unconformity	outgassing	= _____
Principle of cross-cutting	Igneous intrusion	evolution	Principle of Original Horizontality	
Principle of Superposition	Submergence	Principle of Uniformitarianism	Half life	

1. Time needed for half the atoms in a radioactive sample to change to the decay product.
2. Any preserved remains or traces of life.
3. A crack in rock which indicates crustal movement.
4. In any sequence of undisturbed strata, the oldest layer is at the bottom and higher layers are successively younger.
5. A natural process that occurs when unstable elements change into a more stable element.
6. Through Earth's history, living things have changed in form from a few simple organisms to a great diversity of more complex organisms.
7. Magma flows in between rock layers and solidifies into another layer of rock
8. The seeping out of gases from Earth's interior through cracks and volcanic eruptions to Earth's surface
9. Any geologic feature which cuts across or penetrates another body of rock must be younger than the rock that is penetrated.
10. The layer or layers of rock missing from a rock sequence, causing a gap in the layers due to erosion.
11. The matching of rock layers from one area with those of another area
12. Sedimentary rock is formed underwater in flat layers.
13. Very useful for correlation because the organism lived for a very short time, but over a wide, geographic area.
14. When an area is flooded
15. Processes that happen today also happened in the past.
16. A mountain-building event.

As I flew at night into the Las Vegas McCarran International Airport, the Strip casinos rose like man-made mountains from a desert of low, dark buildings. The lights called to me, and once I reached them, I ducked into a blackjack area and watched desperate people try to beat the house—which, of course, they never would (see “Big Game Theory,” page 58). I sigled up to a table, but before even one card got tossed my way I realized that the blaring music—*na na na na, hey hey-ey, good-bye*—was telling me what the casino wanted me to say to my money. That moment also reminded me of my real reason for coming to Vegas. I was here not for the man-made mountains but for the much more spectacular real ones just outside of town.

I escaped the casino, rested up in an inexpensive hotel, and the next morning set off to the Red Rock Canyon National Conservation Area, which includes a 13-mile scenic drive about a half hour west of the Strip. The landscapes around Las Vegas present an exceptionally stark account of plate tectonics in action, as nearly 2 billion years of pushing and shoving have

scrambled the layers of the earth's crust—aptly enough, not unlike a deck of shuffled cards. Dune-shaped mountains display 520-million-year-old gray limestone, formed from the remains of marine organisms that once filled a shallow ocean covering the western United States. The limestone sits neatly atop 180-million-year-old red sandstone, representing ancient Jurassic sand dunes. A period of violent tectonic thrusting during the Cretaceous reorganized the rocks into their current arrangement.

I arrived at 8 a.m., early enough to beat the crowds. The first few trails were populated with people dressed

for the casinos, but they were easy enough to shake. (A warning to casual day-trippers: Open-toed shoes are no match for these trails.) A mile in, I found welcome solitude and spectacular views.

My destination was the **Keystone Thrust Fault**, formed during the same Cretaceous uplift that built the shuffled mountains. The fault is among the park's most significant geologic features in terms of size and surface exposure. Along the way, I encountered a couple returning to the trailhead. “We couldn't find it,” one of the pair complained. “There's no *there* when you get there.” For-

tunately, during my planning I had spoken with Michael Wells, a geologist at the University of Nevada, Las Vegas (UNLV), who had advised me what to look for. On the edge of a slight basin would be an abrupt horizontal shift between limestone and sandstone, with the older limestone slightly higher than the younger rock. “You can stand on the thrust,” he had told me. Jubilantly arriving, I planted one foot on red sand and the other on gray and took a photo, thinking of *Mama Cass Elliot*: “They tell me the fault line runs right through here.”

Red Rock's 196,000 acres lie adjacent to another product of the Cretaceous—the stunning **Spring Mountains**—which I explored the following day. Formed when massive slabs of seabed limestone were thrust on top of one another, the Springs are in many ways a distinct eco-island, complete with locally endemic species. The highest point is the summit of **Charleston Peak**, just shy of 12,000 feet. Rising from scorching desert, Charleston Peak is blanketed with ponderosa pines and bears snow as late as May. I managed to hike high enough to have some trouble breathing, though the waterfall at trail's end made me glad I had kept going.

My next target, on day three, was a traveling mountain. Between 5 and

Gambling on Geology

LAS VEGAS,
NEVADA, USA

BY REBECCA COFFEY

19 million years ago, the Pacific Plate's northwest movement tugged the North American Plate westward, breaking Frenchman Mountain off the Colorado Plateau, home to the Grand Canyon. The plate interactions hauled the mountain 50 miles west and deposited it on the eastern edge of what is now metropolitan Las Vegas. Layer for layer, the rocks of Frenchman match those of the Grand Canyon. And, like the canyon, Frenchman is famous for an enormous gap in the ages of two adjacent rock strata. Stephen Rowland, a paleontologist in the UNLV department of geoscience, told me that the Precambrian granite and schist at the base are about 1.7 billion years old. Sitting immediately above them is Tapeats sandstone, just a half-billion years old. The missing 1.2 billion years—25 percent of the earth's age—is a gap known as the Great Unconformity. Rowland says that the granite and schist formed deep inside an ancient mountain range. Erosion eventually wore the mountains down, exposing the older rocks. Rising sea levels then buried them in sand, which became the younger stone.

Seeing the geologic remnants of the prehistoric ocean that once covered the region got me curious about the gargantuan water recovery effort that makes a desert megalopolis like Las Vegas possible, so I made my last stop the **Clark County Wetlands Park Nature Preserve**, just south of Frenchman. There, wastewater from the city is cleaned before being shunted back into Lake Mead, the city's primary freshwater supply. A water purification plant handles most of the task, but the wetlands' strategically planted vegetation helps. There is no smell, and the 130 acres of flora provide habitat for an impressive variety of wildlife.

As dusk descended and the air cooled, I heard a coyote in the distance. This may not be what most people think of when they imagine getting wild in Vegas, but for me it felt perfect. D

Name _____ Date _____ Per _____

Gambling on Geology

1. Identify 2 pieces of evidence in the article that show earthquakes have occurred at the Red Rock Canyon.

2. Describe how limestone was formed in these mountains in the middle of a desert in Las Vegas, Nevada.

3. Draw a picture of how the rock layers in Red Rock Canyon would appear before and after the 'violent tectonic thrusting'.

Before

After

4. How could older limestone rock be found at a higher elevation than younger sandstone rock at the Keystone Thrust Fault?

5. Explain how Frenchman Mountain can be located hundreds of miles from the Grand Canyon but contain matching rock layers.

6. Describe the processes that formed the Great Unconformity.

7. Compare and contrast the formation and features of Red Rock Canyon and the Keystone Thrust Fault, describing at least two similarities and one difference.

Name

Date

Period

Base your answers to questions 1 through 3 on the passage below.

Earth's Early Atmosphere

Early in Earth's history, the molten outer layers of Earth released gases to form an early atmosphere. Cooling and solidification of that molten surface formed the early lithosphere approximately 4.4 billion years ago. Around 3.3 billion years ago, photosynthetic organisms appeared on Earth and removed large amounts of carbon dioxide from the atmosphere, which allowed Earth to cool even faster. In addition, they introduced oxygen into Earth's atmosphere, as a by-product of photosynthesis. Much of the first oxygen that was produced reacted with natural Earth elements, such as iron, in the lithosphere and produced new varieties of rocks and minerals. Eventually, photosynthetic organisms produced enough oxygen so that it began to accumulate in Earth's atmosphere. About 450 million years ago, there was enough oxygen in the atmosphere to allow for the development of an ozone layer 30 to 50 kilometers above Earth's surface. This layer was thick enough to protect organisms developing on land from the ultraviolet radiation from the Sun.

1. Identify the temperature zone of the atmosphere in which the ozone layer developed.
2. State *one* reason why the first rocks on Earth were most likely igneous in origin.
3. Identify *one* mineral with a red-brown streak that formed when oxygen in Earth's early atmosphere combined with iron.