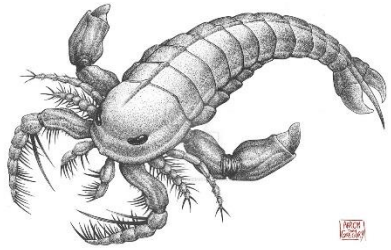
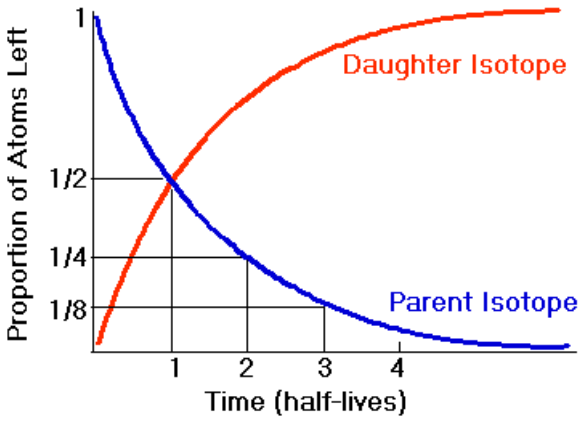
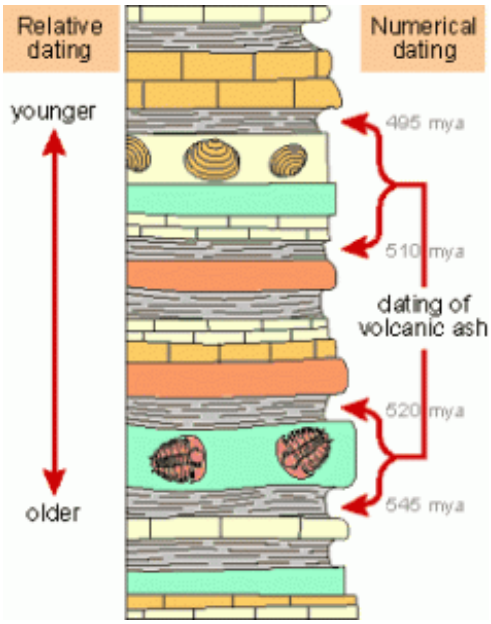
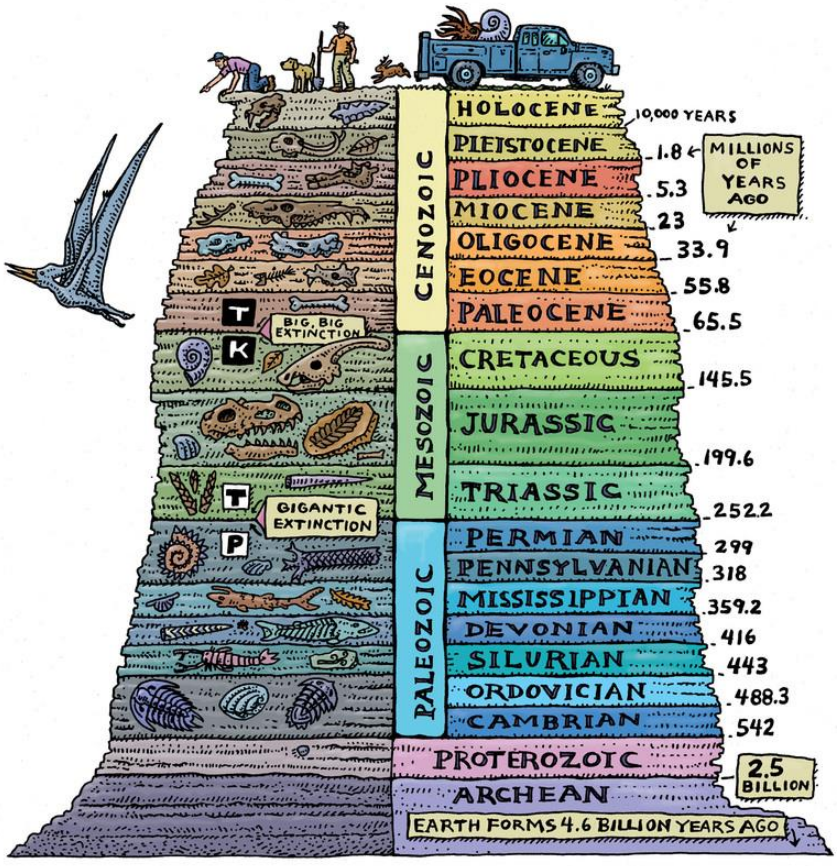
Practice Packet



Topic 6: Earth's History







Vocabulary: _____

Lesson 1: _____

Lesson 2: _____

Lesson 3: _____

Lesson 4: _____

Lesson 5: _____

Name: _____

PRACTICE PACKET: TOPIC 6 Earth's History

VOCABULARY

For each word, provide a short but specific definition from YOUR OWN BRAIN! No boring textbook definitions. Write something to help you remember the word. Explain the word as if you were explaining it to an elementary school student. Give an example if you can. Don't use the words given in your definition!

Relative Dating:_____

Absolute Dating: _____

Original Horizontality: _____

Principal of Superposition: _____

Folded: _____

Faulted: _____

Intrusion: _____

Extrusion: _____

Correlation: _____

Index Fossil: _____

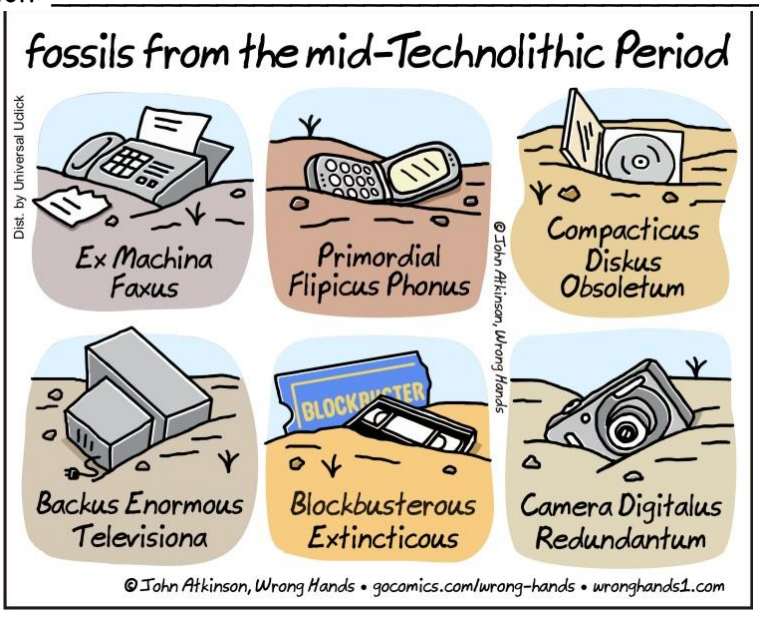
Unconformity: _____

Half-Life: _____

Carbon 14: _____

Uranium 238: _____

Theory of Organic Evolution: _____



PRACTICE PACKET: TOPIC 6 Earth's History

Lesson 1 –Relative Dating

Objective:

- I can explain the difference between Relative & Absolute Dating
- I can describe original horizontality & law of superposition.
- I can differentiate between the intrusions & extrusions
- I can describe inclusions & veins

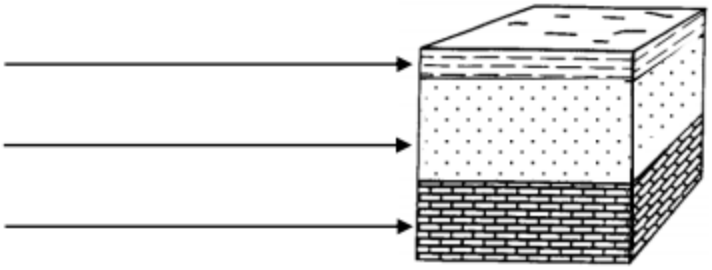
There are two main categories for geologic time, relative time and absolute time. Relative time places events in sequence of occurrence focusing on what happened first, second and so on. Absolute time puts an approximate age of a rock, fossil or even how long ago an event took place. Keeping in mind that rocks form in horizontal layers, the law of superposition states that the oldest layers in an undisturbed set of rock strata (layers) are on the bottom. When folding, faulting or tilting occur, it is important to remember that the rocks needed to be there in order for them to have been displaced. This means the faults, folds and tiling is younger than the rocks that have moved. It does not lead to an exact date of the event but is essential in determining which rock layer is older and which is younger.

1. What is the difference between relative time and actual time?

2. According to the law of superposition, where are the oldest layers in a undisturbed set of rock strata located?

3. Explain why events such as folding, faulting and tilting of rocks are younger than the rocks the move.

4. Use the map symbols on page 7 of the Earth Science Reference Tables to label each of the rock layers on the arrows in the diagram below.



5. Which rock layer is the oldest layer?
   _____

6. Which rock layer is the youngest layer?
   _____

7. An **intrusion** occurs when magma moves up through the rock layers but **does not reach the surface**. Once solidified, the magma forms an [intrusive / extrusive] igneous rock. The principle of crosscutting states that the intrusion is always [younger / older] than the rock it cuts across.

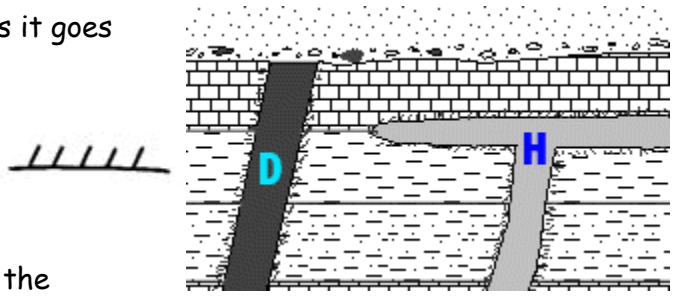
8. What type of metamorphism occurs where the magma changes the existing rock by "touching" it?

9. An **extrusion** occurs when magma moves up through the rock layers and **reaches the surface**. Once solidified, the magma forms an [intrusive / extrusive] igneous rock.

10. What must be there first, the **intrusion** or the rocks it goes through?

11. What must be there first, the **extrusion** or the rocks it goes through?

12. Label the type of metamorphism that is illustrated in the diagram to the right.



13. What letter represents the intrusion & extrusion on the diagram to the right? Remember the intrusion does not reach the surface.

    Intrusion: _____ Extrusion: _____

14. How did you figure out which was the intrusion & which was the extrusion?

15. What is missing on the top of the extrusion? _____ This is because it is not in contact with any rocks on the top.

16. Name the rock layer that formed first. _____

17. Name the rock layer that formed second. _____

18. Name the rock layer that formed third. _____

19. After rock layers 1, 2, & 3 were formed _____ **D** went through the rock layers and <u>reached the surface</u>.

20. Name the rock layer that formed forth. _____

21. After the rock layers were formed magma (H) went up through the layers. This is called an

    _____

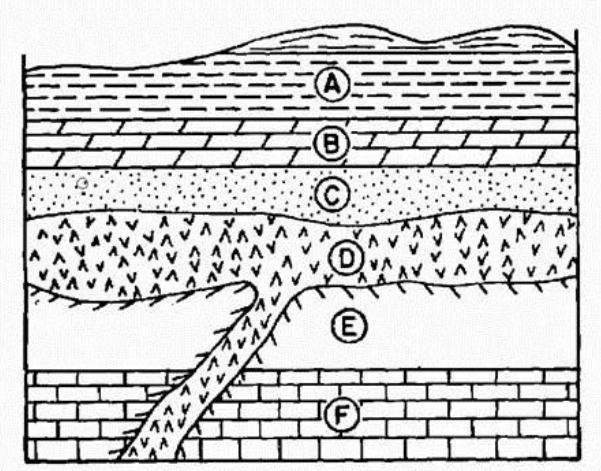
22. What metamorphic rock formed above H in the zone of contact metamorphism?

Things to Remember:

- Intrusion has contact metamorphism all around it
- An extrusion has no contact metamorphism is on the top
- Sediments are deposited and rocks are formed in horizontal layers.
- If a rock layer is folded, tilted or faulted, it happened after the rock layers were formed.

PRACTICE PACKET: TOPIC 6 Earth's History

Writing the sequence of event: Using the sedimentary rock map symbols on page 7 of the Earth Science Reference Tables write the sequence of events for the rock strata (layers) below. Remember to include how the rock layer was formed as well as the rock name.
The first & last one has been done for you.



23. **Oldest:** F, Limestone

_____, _____

_____, _____

_____, _____

_____, _____

_____, _____

Erosion of Earth's surface

24. **Oldest:** G, Limestone

_____, _____

Folding of _____

Fault _____

_____, _____

_____, _____

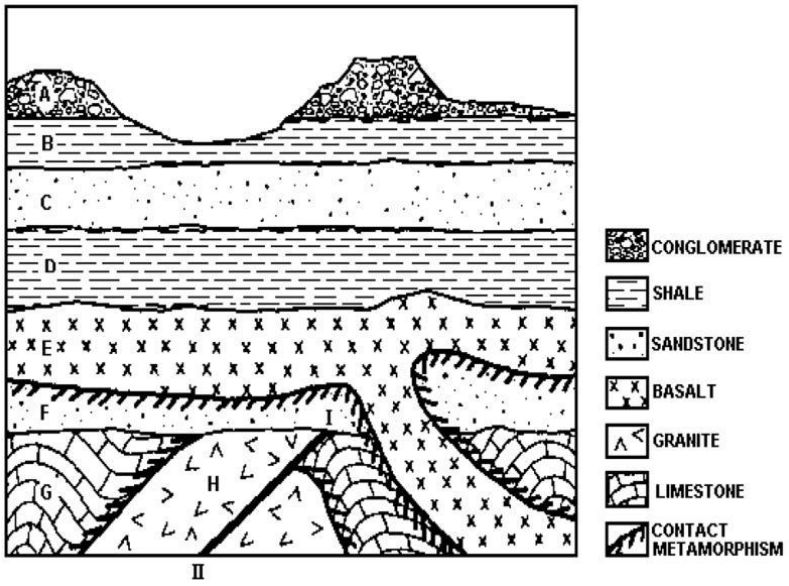
_____, _____

_____, _____

_____, _____

_____, _____

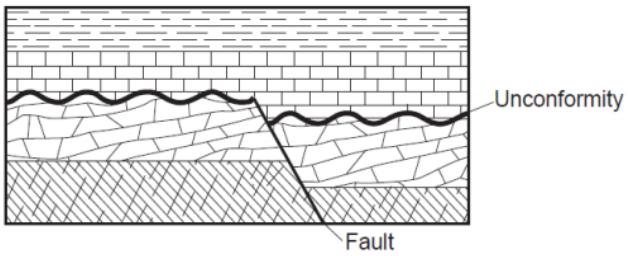
_____

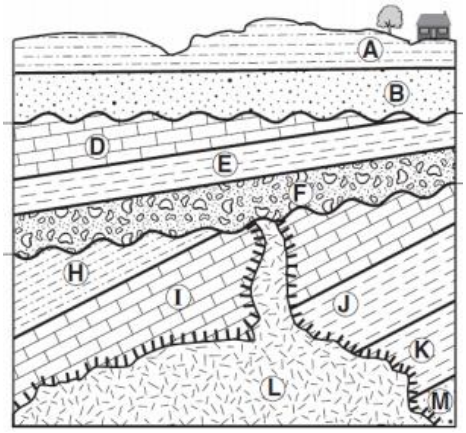


II

Regents Questions:

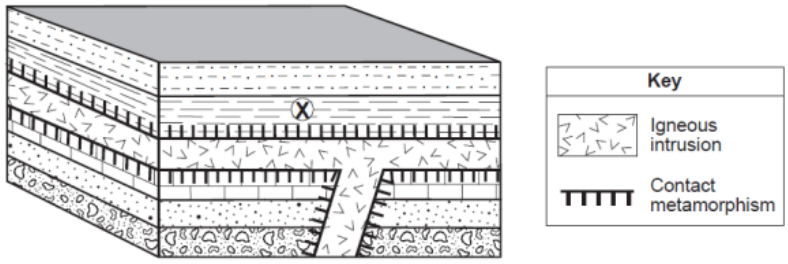
1. The geologic cross section shows rock layers that have not been overturned. The fault is older than the
   a. slate
   b. unconformity
   c. marble
   d. shale





2. Which inference about rock units D, E, and H can best be supported by evidence in the cross section?
   a. They contain mostly sand-sized sediment.
   b. They contain both land and marine fossils.
   c. They were altered by contact metamorphism.
   d. They were deposited as horizontal layers and were later tilted.

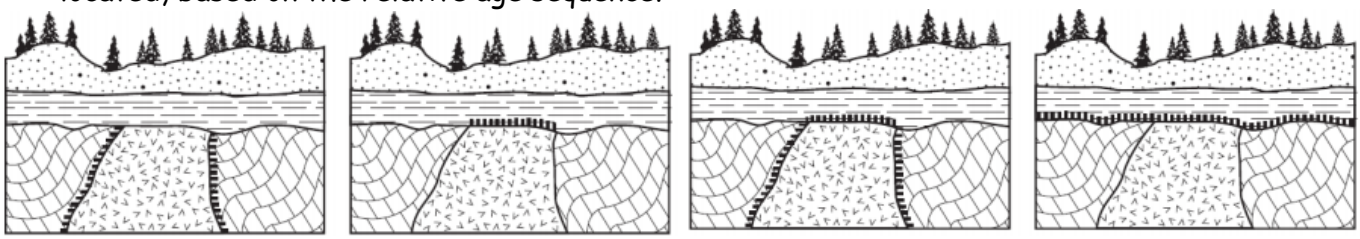
3. Describe the evidence represented in the diagram that indicates that the shale layer and the limestone layer are older than the igneous intrusion.



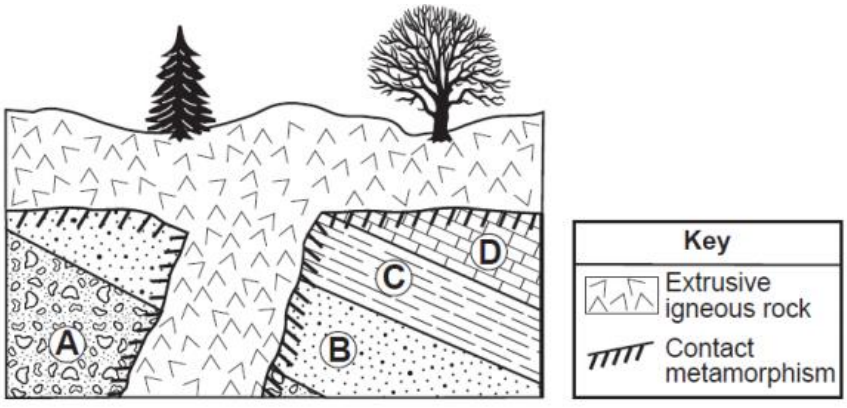
4. The cross section below represents four different rock units. The symbol for contact metamorphism has been omitted from the cross section. The sequence below represents the relative ages of the rock units from oldest to youngest.

limestone → granite → shale → sandstone

Which cross section below represents where the symbol for contact metamorphism would be located, based on the relative age sequence?



Base your answers to questions 5 through 9 on the cross section below and on your knowledge of Earth science. The cross section represents a portion of Earth's crust. Letters A, B, C, and D indicate sedimentary rock layers that were originally formed from deposits in a sea. The rock layers have not been overturned.



5. Identify the name of the contact metamorphic rock formed at the boundary of the igneous rock and rock layer B.

6. Describe one piece of evidence that suggests that rock layer C formed in a deeper sea environment than did rock layer A.

7. Geologic events V through Z are listed below
   - **V.** Metamorphism of some sedimentary rock
   - **W.** Formation of sedimentary rock layers
   - **X.** Tilting and erosion of sedimentary rock layers
   - **Y.** Intrusion/extrusion of igneous rock
   - **Z.** Erosion of some igneous rock

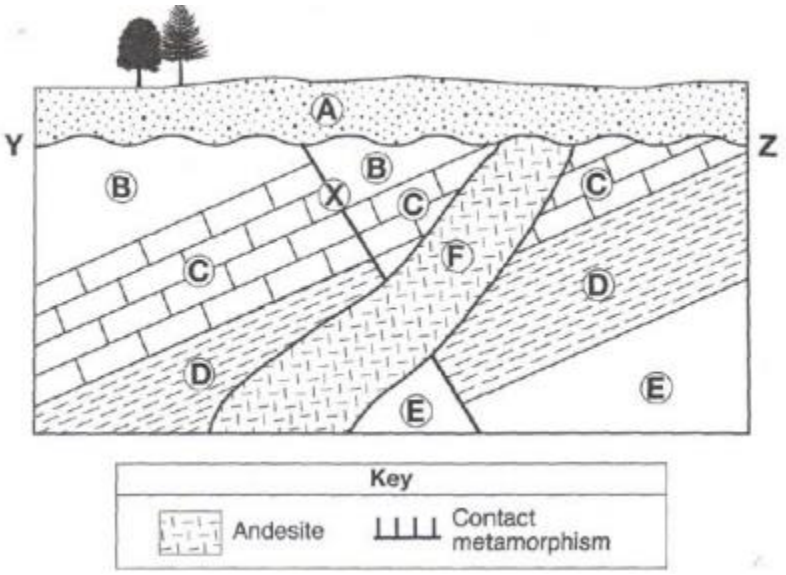
List the letters V through Z to indicate the correct order of the geologic events, from oldest to youngest, that formed this portion of Earth's crust.

8. Describe one piece of evidence represented in the cross section that indicates Earth's crust has moved at this location.

9. Identify the mineral composition of rock layer D.

ASSESS YOURSELF ON THIS LESSON: _____/9
If you missed more than 3, do the Additional Practice. If not, go on to the next hw video!!!

Base your answers to questions 1 through 6 on the geologic cross section of Earth s crust below and on your knowledge of Earth science. Letters A through F identify rock units. Letter X identifies a fault. Wavy line YZ represents an unconformity. The locations of contact metamorphism and the map symbols for sedimentary rock layers B and E have been omitted.



1. On the cross section above, draw two arrows, one on each side of fault X, to show the relative direction of movement of the rock units that occurred during faulting.

2. Layer B is composed of clay-sized particles and layer E is composed of halite crystals. On the cross section above, fill in layer B and layer E on both sides of the fault with the correct sedimentary rock map symbols.

3. On the cross section above, draw the contact metamorphism symbol to indicate all locations where contact metamorphism has occurred.

4. Indicate the relative ages of geologic features B, E, F, and X, by listing the letters from oldest to most recent.

5. What does the layer YZ represent?

6. Draw in the contact metamorphism symbol on F in the correct locations.

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/6
If you missed more than 2 see me for extra help and/or re-watch the lesson video assignment.

PRACTICE PACKET: TOPIC 6 Earth's History

Lesson 2 – Correlation

Objective:

- I can correlate rock layers
- I understand what an index fossil is
- I can describe unconformities

There are several ways to correlate (match) rock strata (layers). The easiest way is called walking the outcrop. This is when you can physically walk along on outcrop and follow the rock strata. An outcrop is any rock strata that are exposed at Earth's surface. Most times rock strata are not continuously exposed; it may be hidden underneath soil or simply missing due to extreme erosion. In order to have a complete sequence of events, many layers of rock strata from several outcrops are compared because sometimes there are unconformities (missing rock layers). Unconformities are caused by extreme weathering and erosion (breakdown and movement of the rock). When a rock layer is missing in a sequence it does not mean it was never there, it means that some agent of erosion removed it.

Index fossils in the rock is another way to correlate outcrops . Index fossils are considered geologic time markers. Three things that make a good index fossil are that they are easily recognized, the specimen lived for a short amount of geologic time and they were wide spread geographically. A third time marker is volcanic ash falls. They are also geographically wide spread and can be matched to specific volcanic events.

1. What does the word correlation mean? _____
2. What is another name for rock strata? _____
3. What is an outcrop? _____
4. Why is it important to look at several outcrops in order to have a complete sequence of events?

5. What is an unconformity?

6. What are unconformities caused by?

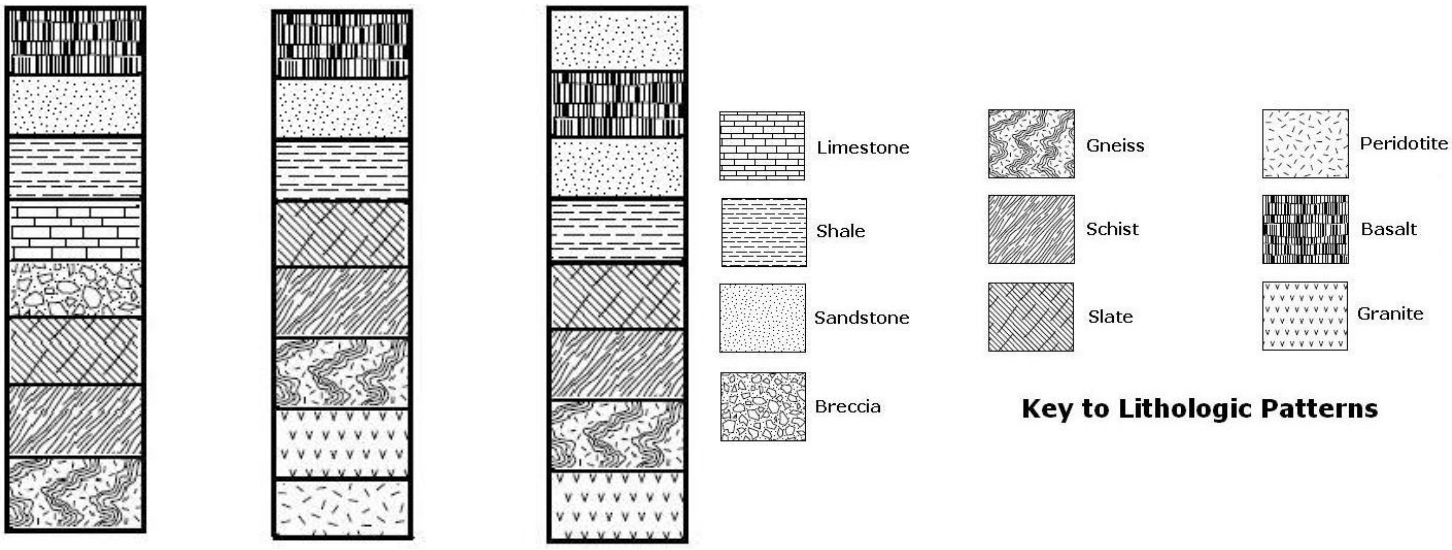
7. What **two** other methods are used to correlate rock outcrops?

8. List the three things that make a good index fossil.

9. Why are volcanic ash falls good time markers?

PRACTICE PACKET: TOPIC 6 Earth's History

An example rock correlation using rock type only: Study the diagram below of three rock outcrops. Correlate the identical rock layers from one outcrop to the other (Numbering them while you go, 1 being the oldest). When you are finished, list the rock types in order from oldest to youngest in the space provided.



Oldest

_____

_____

_____

_____

_____

_____

_____

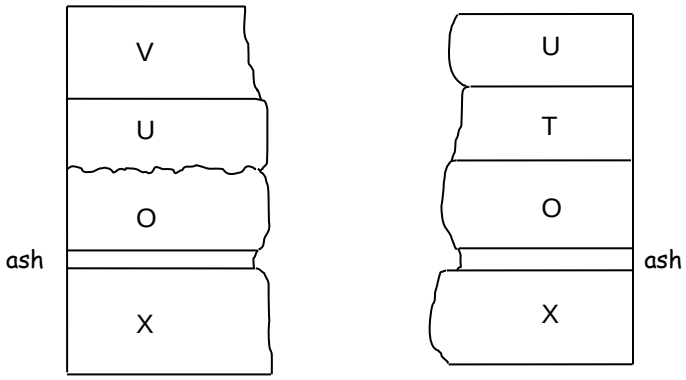
_____

_____

_____

Youngest

An example rock correlation using index fossils and volcanic ash deposit: The letters in the outcrop diagrams represent index fossils. Correlate the rock layers using the index fossils and the ash deposit. List the index fossils and the ash deposit from oldest to youngest.



Youngest _____

_____

_____

_____

_____

_____

Oldest _____

PRACTICE PACKET: TOPIC 6 Earth's History

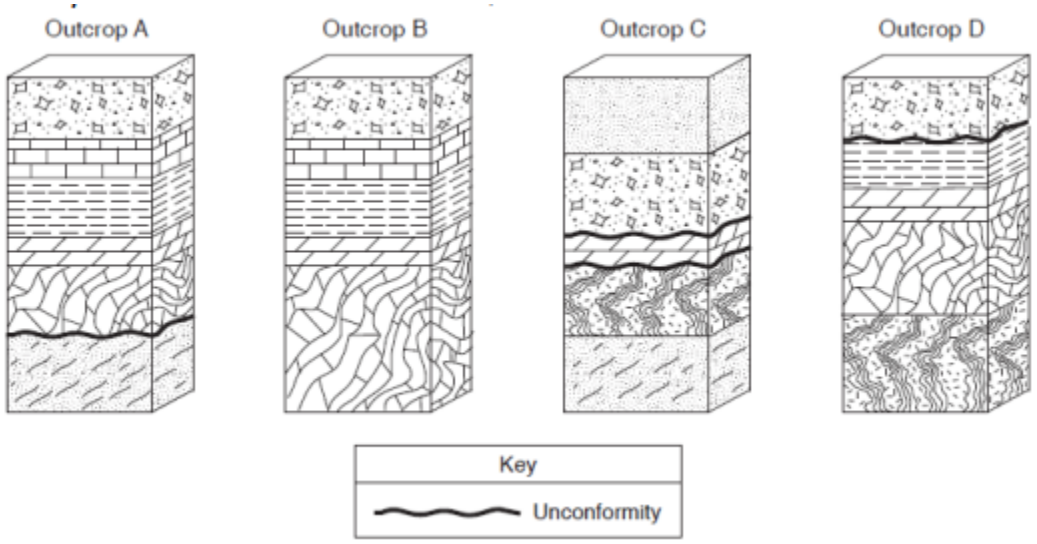
1. What characteristics does a fossil need to have to be considered an index fossil?

2. Why is the layer with index fossil T missing in outcrop 1? _____

3. What are some of the characteristics of a volcanic ash deposit that makes it an excellent geologic time marker?

Cut & Glue Correlation:

The diagrams below are of four rock outcrops, A, B, C, and D, located within 15 kilometers of each other. The rock layers have not been overturned.



1. Tear off the last page of this packet and carefully cut out each of the rock layers.
2. Find the rock layers that match Outcrop A in the diagram above.
3. Place the 6 cut out rock layers in order on your desk, according to Outcrop A. Leave a space to where the unconformity is. This indicates a rock layer is missing.
4. Look at Outcrop B. If there any layers that are in Outcrop B that are not in the sequence on your desk, add them to the sequence keeping the correct order. DO NOT take away any layers.
5. Look at Outcrop C. If there any layers that are in Outcrop C that are not in the sequence on your desk, add them to the sequence keeping the correct order. DO NOT take away any layers. **Hint:** the layer that was missing in Outcrop A is located in Outcrop C.
6. Look at Outcrop D. You have used all of your rock layers already. Make sure that if you go from top to bottom in the rock sequence for Outcrop D that they are in order. DO NOT take away any layers.
7. Glue the completed sequence in the space provided.
8. Using the rock symbols in the Earth Science Reference Tables on page 7, write the name of each rock layer to the right of each symbol.

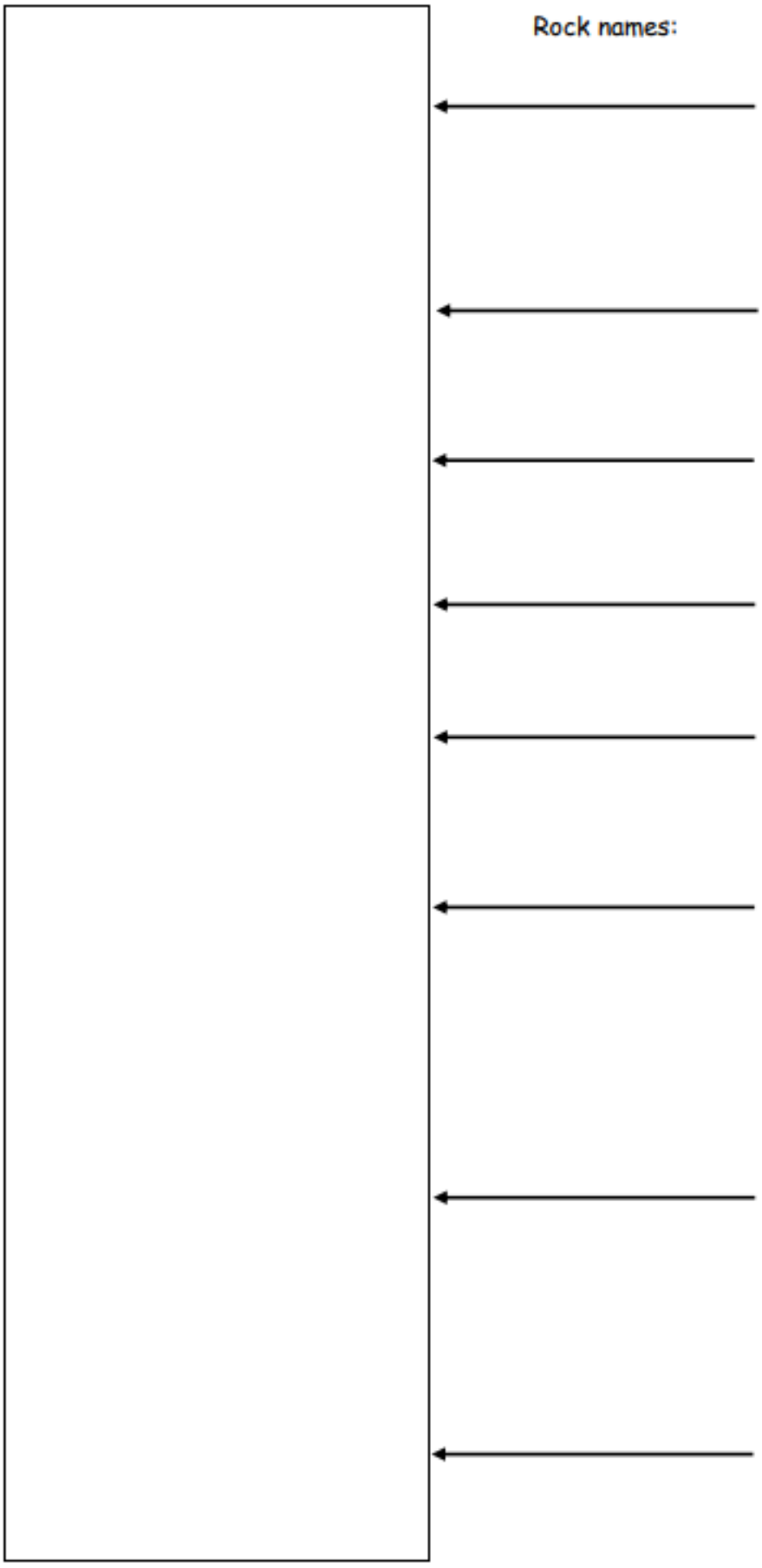
9. Find the unconformity in Outcrop A. Name the rock that is missing.

10. There are two unconformities in Outcrop C. Name the **two** missing rock layers missing due to the erosion <u>closest to the top</u> of the outcrop.

11. Name the missing rock layer that is illustrated by the second unconfomity.

12. Name the missing rock layer in Outcrop D.

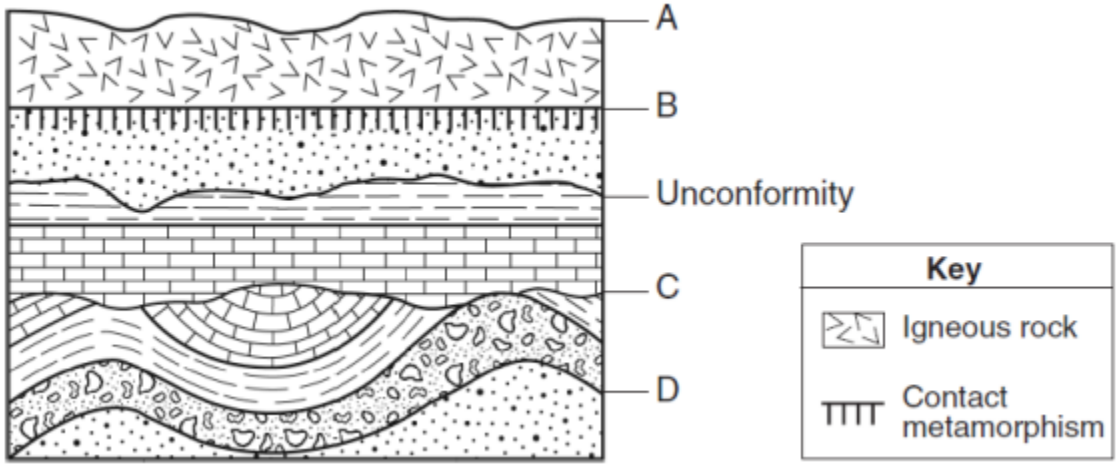
13. Explain why it is necessary to have more than one outcrop when determining the complete sequecnce of events.



PRACTICE PACKET: TOPIC 6 Earth's History

Regents Questions:

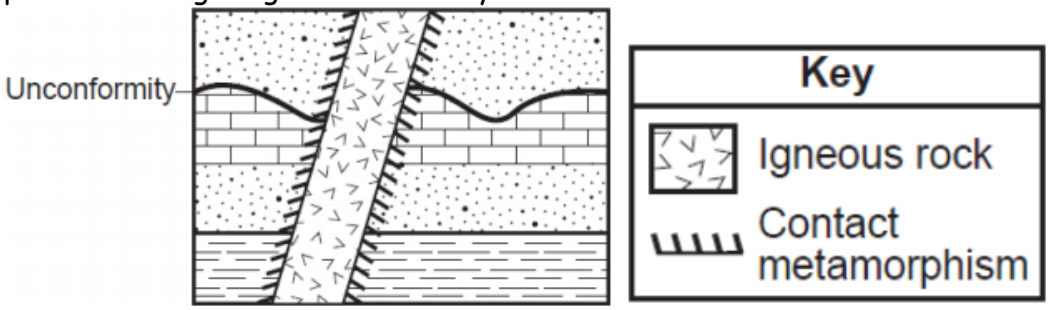
1. The cross section below represents several rock units within Earth's crust. Letter A represents Earth's surface. Letters B, C, and D indicate boundaries between rock units. One of the unconformities is labeled.



Which lettered boundary is most likely another unconformity?

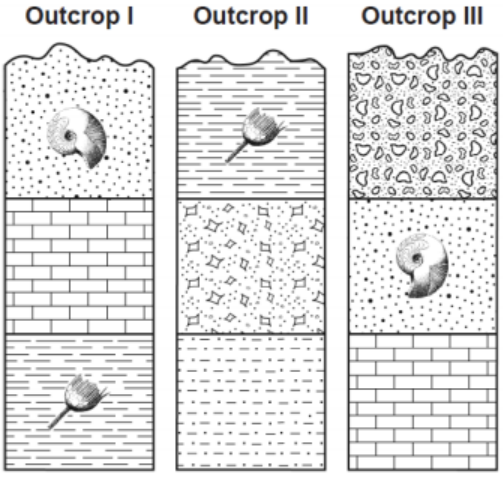
a. A b. B c. C d. D

2. The geologic cross section below includes an unconformity and an igneous intrusion. Which two events produced the geologic unconformity in the rock record?



a. intrusion of magma, followed by contact metamorphism
b. intrusion of magma, followed by erosion of rock layers
c. erosion of rock layers, followed by deposition of more sediments
d. erosion of rock layers, followed by intrusion of magma

3. The cross sections below represent three outcrops, labeled I, II, and III, containing some New York State index fossils. The rock layers have not been overturned.

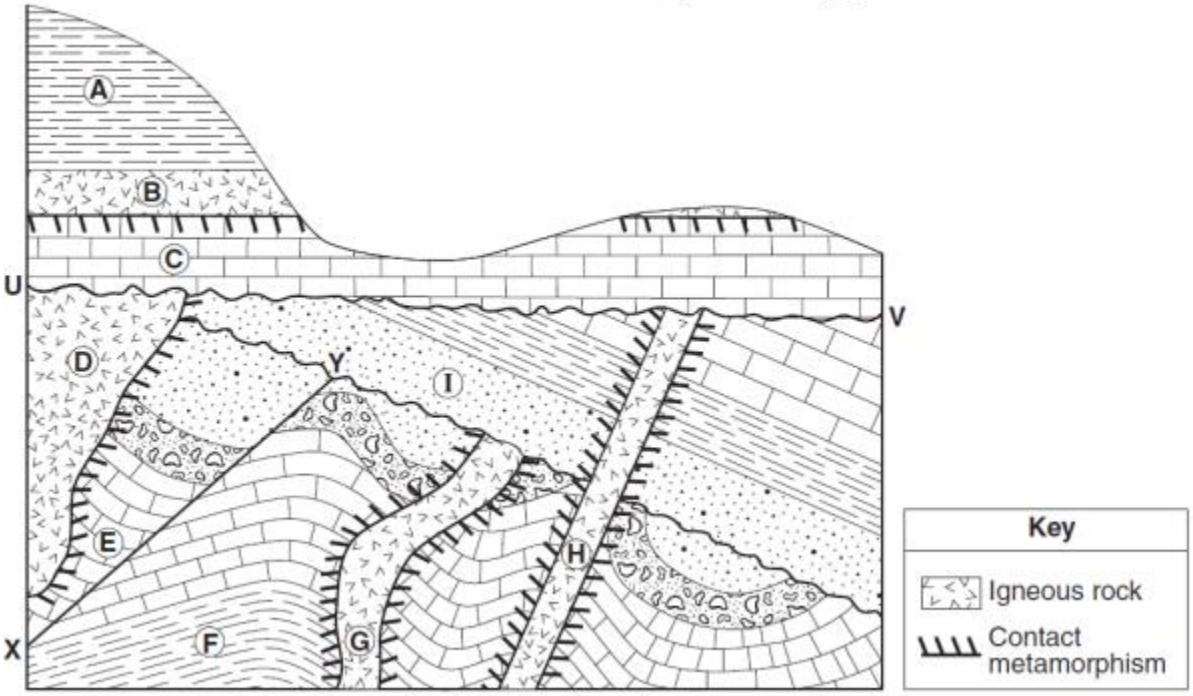


When the rock layers in the three outcrops are correlated, the oldest layer is the

a. shale layer in outcrop I
b. siltstone layer in outcrop II
c. limestone layer in outcrop III
d. conglomerate layer in outcrop III

PRACTICE PACKET: TOPIC 6 Earth's History

Base your answers to questions 4 through 7 on the cross section of part of Earth's crust in your answer booklet and on your knowledge of Earth science. On the cross section, some rock units are labeled with letters A through I. The rock units have not been overturned. Line XY represents a fault. Line UV represents an unconformity.



4. On the cross section below, draw two arrows, one on each side of line XY, to show the direction of relative movement that has occurred along the fault.

5. Write the letter of the oldest rock unit in the cross section.

6. Identify the contact metamorphic rock that formed between rock units B and C.

7. The table below shows the ages of the igneous rock units, determined by radioactive dating. How many million years ago did rock unit I most likely form?

Rock Unit	D	G	H	B
Age (million years)	420	454	420	140

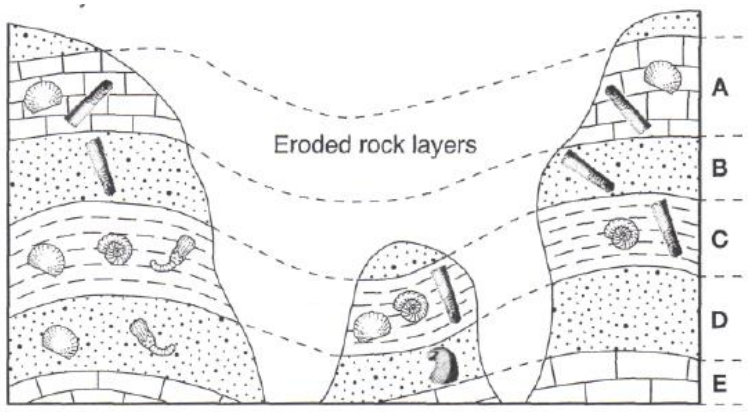
ASSESS YOURSELF ON THIS LESSON: _____/7

If you missed more than 2, do the Additional Practice. If not, go on to the next hw video!!!

1. Volcanic ash deposits found in the geologic record are most useful in correlating the age of rock layers if the volcanic ash was distributed over a
   a. large area during a short period of time
   b. small area during a short period of time
   c. large area during a long period of time
   d. small area during a long period of time

PRACTICE PACKET: TOPIC 6 Earth's History

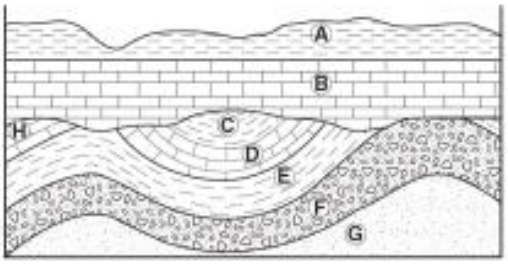
2. The diagram below represents three bedrock outcrops. The layers have not been overturned. Letters A through E identify different rock layers. Fossils found in the rock layers are shown. Which fossil could be classified as an index fossil?



3. Each index fossil existed for a relatively short geologic time interval. State one other characteristic that each fossil must have to be considered an index fossil.

Base your answers to questions 4 through 6 on the geologic cross section below in which overturning has not occurred. Letters A through H represent rock layers.

4. Which sequence of events most likely caused the unconformity (erosion) shown at the bottom of rock layer B?
   a. folding → uplift → erosion → deposition
   b. intrusion → erosion → folding → uplift
   c. erosion → folding → deposition → intrusion
   d. deposition → uplift → erosion → folding



5. The folding of rock layers G through C was most likely caused by
   a. erosion of overlying sediments
   b. the collision of lithospheric plates
   c. contact metamorphism
   d. the extrusion of igneous rock

6. Which two letters represent bedrock of the same age?
   a. A and E b. F and G c. B and D d. D and H

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/6
If you missed more than 2 you should see me for extra help and/or re-watch the lesson video assignment.

Lesson 3 – Absolute Dating

Objective:
- I can explain absolute dating
- I understand what half life means
- I can use the Radioactive Decay chart on the ESRT
- I can answer radioactive decay questions

Absolute time is usually determined by radioactive dating. Certain rocks contain radioactive isotopes (unstable elements). Over time the isotopes stabilize into a new element known as the decay product. It takes a specific amount of time for $\frac{1}{2}$ of the original isotope to change into the decay product. This is known as one half-life. A half –life is the amount of time required for one half of the isotope to disintegrate into its decay product. Since nothing affects the decay rate of these isotopes, scientists can determine the age of a rock by comparing the amount of decay product with the amount of original isotope found in the rock. The absolute age of a specimen (fossil) or rock is used to help place things in relative order on a time scale.

Certain isotopes are used to date specific materials. Carbon-14 isotopes, for example, are used to determine the approximate age of most organic material such as wood, charcoal, animals, etc. When these organisms die the Carbon-14 begins to decay into Nitrogen-14. They cannot be used to date material older because the half-life of Carbon-14 is too short, only 5,700 years. Uranium-238 can be used to date rocks as old as Earth (4.5 billion years old), because it has a very long half life.

1. How is absolute time determined? _____
2. What are radioactive isotopes? _____
3. What is the stabilized isotope called? _____
4. What is a half life? _____
5. What do scientists compare in order to determine the age of a rock? _____

   _____
6. Which isotope is used to date organic materials? _____
7. Why? _____
8. Which isotope can be used to date rocks as old as Earth? _____
9. Why? _____
10. Why can't Uranium-238 be used to determine the age of a fossil of a dinosaur? _____

    _____

"Interpreting the Radioactive Decay Data Chart" ESRT front page

1. What are the four radioactive isotopes listed on the reference tables?

   a. _____ c. _____

   b. _____ d. _____

2. What is the decay product (daughter) of the following radioactive isotopes?

   a. Carbon 14 → _____

   b. Potassium-40 → _____

   c. Uranium-238 → _____

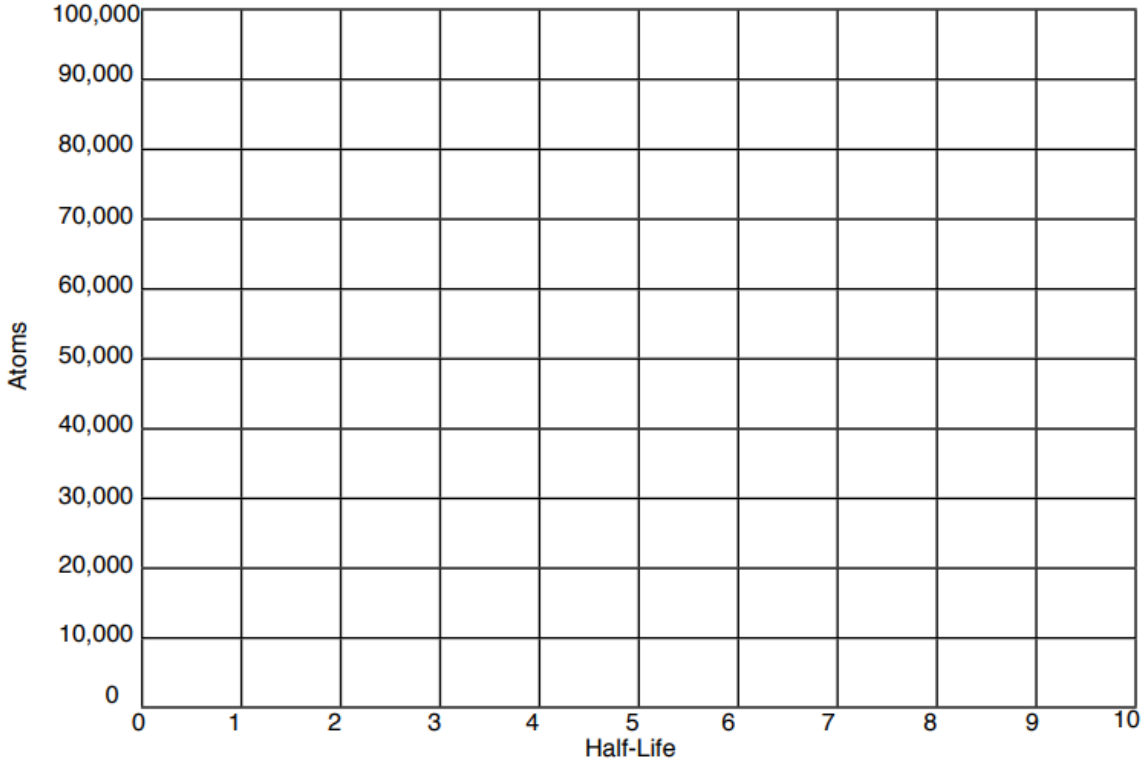
   d. Rubidium-87 → _____

3. What is the half-life of the following radioactive isotopes (not scientific notation)?
    a. Carbon 14: _____
    b. Potassium-40: _____
    c. Uranium-238: _____
    d. Rubidium-87: _____

4. Complete the following table which shows the process of decay for Carbon-14.

Half-Life	Years	Atoms of C-14	Atoms of N-14
0	0	100,000	0
1	5,700	50,000	50,000
2			
3			
4			
5			
6			
7			
8			
9			
10			

5. Draw a line graph showing the changing amounts of both C-14 and N-14 through 10 half-lives.

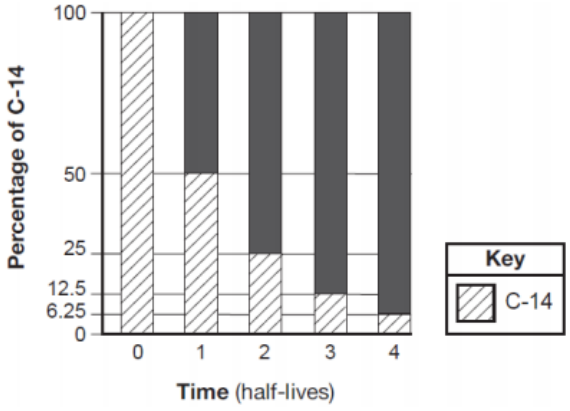


6. If Carbon-14 goes through 2 half-lives...
    a. How many years have gone by? _____
    b. What percentage of the original mass will remain? _____
7. If Potassium-40 goes through 3 half-lives...
    a. How many years have gone by? _____
    b. What percentage of the original mass will remain? _____
8. If you begin with a 400 gram sample of Rubidium-87 and only 100 grams remain...
    a. How many half-lives have gone by? _____
    b. How old is the sample? _____
9. If 12.5 pounds of a 100 pound chunk of Carbon-14 remain...
    a. How many half-lives have gone by? _____
    b. How old is the sample? _____
10. Which radioactive isotope would be best used in dating the following items:
    a. A buried tree stump: _____
    b. The oldest known rocks on Earth: _____

Regents Questions

1. Potassium-40 is useful for radioactive dating of the Palisades sill because the half-life of potassium-40
    a. decreased as the amounts of ^{40}Ar and ^{40}Ca in the sill increased
    b. remained constant during the radioactive decay process
    c. increased as pressure from the overlying sedimentary rock increased
    d. was shortened by the high temperature of the magma that formed the sill

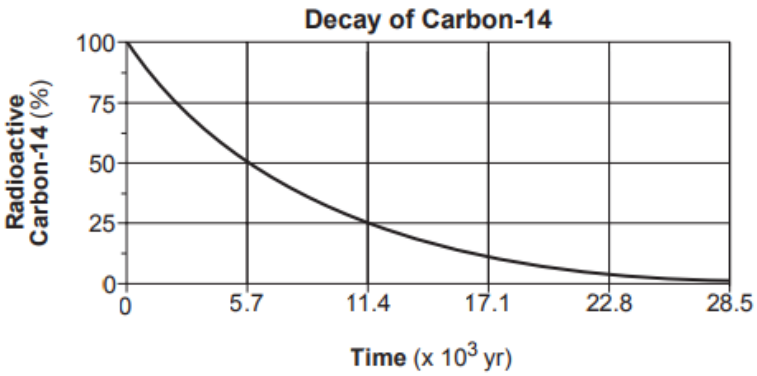
2. The solid black sections of the bars on the graph represent the percentages of
    a. carbon-14 from the original sample that has not decayed.
    b. uranium-238 from the original sample that has not decayed.
    c. nitrogen-14 decay product resulting from the radioactive decay.
    d. lead-206 decay product resulting from the radioactive decay.



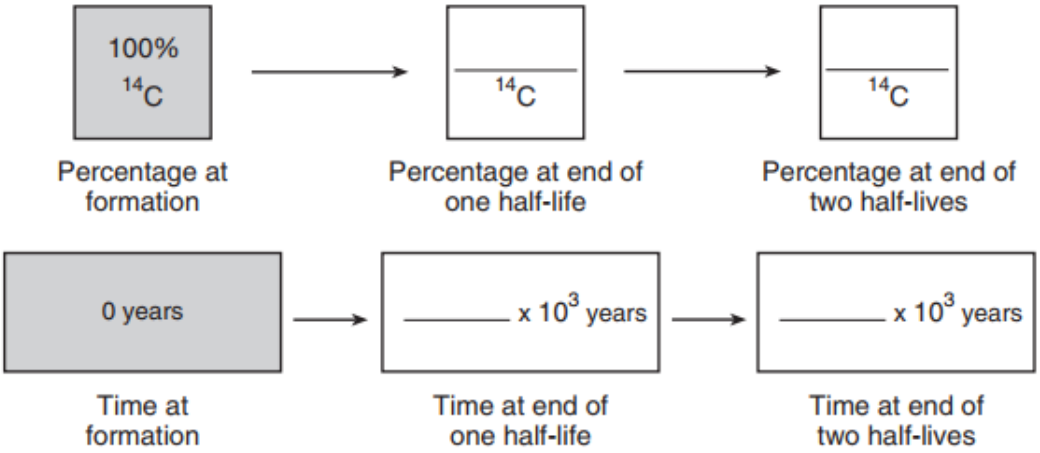
3. A fossil formed 11,400 years ago. Which percentage of the original amount of carbon-14 remains in the fossil?
    a. 100% b. 50% c. 25% d. 12.5%

4. Radioactive decay of ^{40}K atoms in an igneous rock has resulted in a ratio of 25 percent ^{40}K atoms to 75 percent ^{40}Ar and ^{40}Ca atoms. How many years old is this rock?
   a. 0.3×10^9 y b. 1.3×10^9 y c. 2.6×10^9 y d. 3.9×10^9 y

Base your answers to questions 5 through 8 on the graph below and on your knowledge of Earth science. The graph shows the rate of decay of the radioactive isotope carbon-14 (^{14}C).



5. Complete the flow chart by filling in the boxes to indicate the percentage of carbon-14 remaining and the time that has passed at the end of each half-life.



6. Identify the decay product formed by the disintegration of carbon-14.

7. Explain why carbon-14 cannot be used to accurately determine the age of organic remains that are 1,000,000 years old.

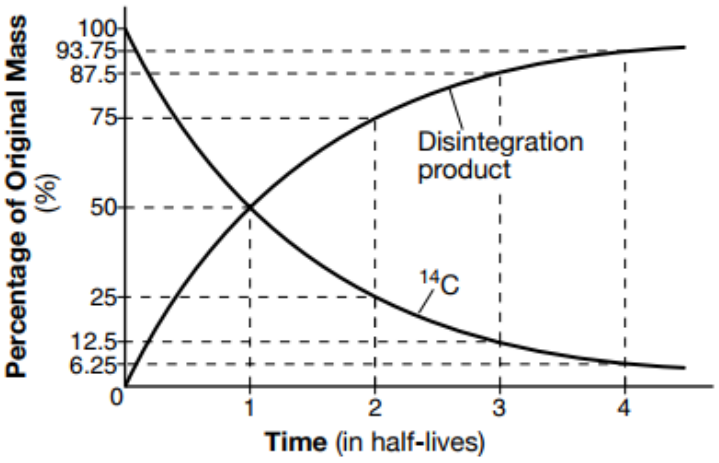
8. State the name of the radioactive isotope that has a half-life that is approximately the same as the estimated time of the origin of Earth.

9. The table below shows the radioactive decay of carbon-14. Part of the table has been left blank. After 22,800 years, approximately what percentage of the original carbon-14 remains?
   a. 15% c. 12.5%
   b. 6.25% d. 3.125%

Half-Life	Original Carbon-14 Remaining (%)	Number of Years
0	100	0
1	50	5,700
2	25	11,400
3		17,100
4		
5		

PRACTICE PACKET: TOPIC 6 Earth's History

Base your answers to questions 10 through 12 on the graph and on your knowledge of Earth science. The graph shows the percentages of the radioactive isotope carbon-14 (^{14}C) and its disintegration product produced during four half-lives of radioactive decay



10. Radioactive carbon-14 is often useful in determining the absolute age of geologic samples because radioactive isotopes
    a. decay at a regular rate
    b. remain unchanged over time
    c. become less stable during decay
    d. stabilize after four half-lives

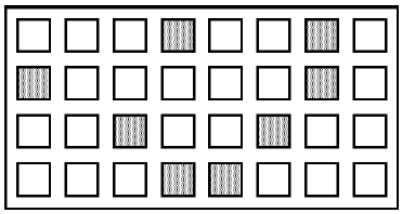
11. Which disintegration product is represented on the graph?
    a. ^{206}Pb b. ^{40}Ar c. ^{87}Sr d. ^{14}N

12. How many half-lives have passed if a sample contains 25% of its original carbon-14?
    a. 1 half-life b. 3 half-lives c. 2 half-lives d. 4 half-lives

ASSESS YOURSELF ON THIS LESSON: _____/12
If you missed more than 3, do the Additional Practice. If not, go on to the next hw video!!!

1. Radioactive dating of fossils and rocks is possible because radioactive isotopes
    a. are found in all fossils and rocks
    b. disintegrate into organic substances
    c. are easily collected and measured
    d. disintegrate at a predictable rate

2. The graph below shows the radioactive decay of rubidium-87. What percentage of rubidium-87 atoms will be left after four half-lives?
    a. 25.0%
    b. 12.5%
    c. 6.25%
    d. 3.125%



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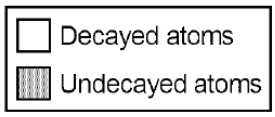


3. The diagram represents the present number of decayed & undecayed atoms in a sample that was originally 100% radioactive material. If the half-live of the radioactive material is 1,000 years, what is the age of the sample represented by the diagram?

PRACTICE PACKET: TOPIC 6 Earth's History

Base your answers to questions 4 & 5 on the information below and on your knowledge of Earth science.

A scientist found the bone of a mastodont. In the lab, the scientist found that 12.5% of the original radioactive C-14 still remained in the bone.

4. Identify the element formed when carbon-14 (^{14}C) undergoes radioactive decay.

5. Explain why ^{14}C was used to date the mastodont bone.

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/5
If you missed more than 2 you should see me for extra help and/or re-watch the lesson video assignment.

Lesson 4 – Geologic History

Objective:
- I can read the Geologic History of NYS chart in the ESRT
- I can describe the different Eon & Era's
- I remember how to use the Generalized Bedrock of NYS map in the ESRT

When looking into geologic history, events are used as time markers. The appearance or mass extinction of organisms is the bases of the Geologic time scale. It is broken up into Eon's, Era's, Periods and Epochs. Pages 8 and 9 of the Earth Science Reference Tables shows this division of time and the events that our associated with it. It is arranged with the oldest rock layers (and events) on the bottom, and the youngest on top.

Up until the Phanerozoic Eon, most organisms did not have hard body parts or shells, and thus there is a limited amount of evidence of their existence. Once more complex life began to appear the fossil record started showing a more complete record of Earth's history. It is inferred that more complex life-forms evolved from less complex life-forms and that most life-forms that existed on Earth have become extinct.

1. What is used as time markers when studying geologic history?

2. What is the division of the geologic time scale based on?

3. What are the divisions of the geologic time scale?

4. Where are the oldest events located on the geologic time scale?

5. Why were fossils difficult to find before the Phanerozoic Eon?

6. What appeared to give scientist a more complete record of Earth's history?

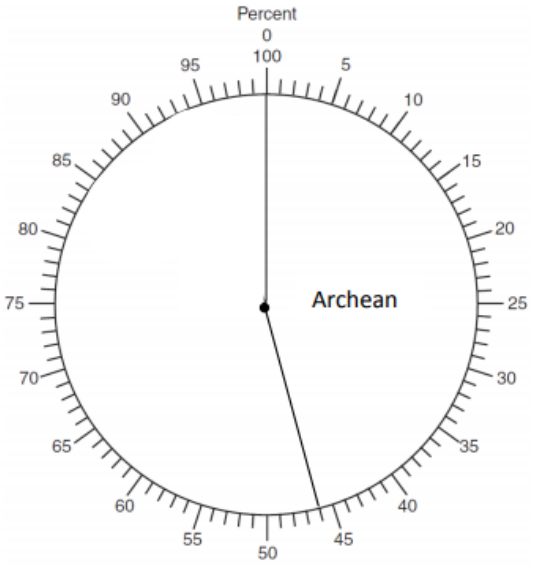
"Interpreting the Geologic History of New York State Chart" ESRT pg 8 & 9

1. Lightly color the PreCambrian Section blue. *Be careful it starts on page 8 & goes all the way to page 9 under the **DARK** line.*
2. Underneath where it says "Estimated time of origin of Earth and solar system" write the words START (OLDEST)
3. Lightly color the Paleozoic Section purple. *Be careful it starts on page 8 & goes all the way to page 9.*
4. Lightly color the Mesozoic Section green. *Be careful it starts on page 8 & goes all the way to page 9.*
5. Lightly color the Cenozoic Section yellow. *Be careful it starts on page 8 & goes all the way to page 9.*
6. There are two places on the chart that have the age of occurrence. Ii is located under the "Eon" column and the Epoch column. Highlight "Million years ago" located under both locations on the chart.
7. Fill in the chart below with the beginning & end of each Era. The Archean has been done for you. In order to determine the pecentage of geologic time for an era, divide the length of the Era by the estimated origin of Earth.

$$\textbf{percent of time} = \frac{\textbf{Length of Era}}{\textbf{time of origin}} \textbf{ x 100}$$

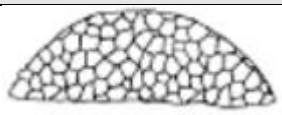
Era	Beginning of Era (MYA)	End of Era (MYA)	Length of the Era (Million years)	% of total time (nearest whole number)
Archean	4600	2500	2100	46%
Proterozoic				
Paleozoic				
Mesozoic				
Cenozoic				

8. Using the Pie chart to the right, graph and LABEL the percentages of each Era in the table above. The Archean Era has already been done. m) Shade in the **entire** Precambrian Eon in blue. (Hint it is made up of two sections)
9. What percent does the Precambrian Eon take up in Earth's History?



PRACTICE PACKET: TOPIC 6 Earth's History

10. The "Life on Earth" column lists the appearance and / or extinction of some of the organisms on Earth that existed at a particular time. Highlight the word LIFE in the title.
11. The "Important Geologic Events in New York" column gives some examples of events that have helped shape New York, oceans and landmasses. Highlight the word EVENT in the title.
12. "Time Distribution of Fossils" has black lines to show how long an organism lived for. The letters on each line are specific types of those organisms (Index Fossils)
13. Color the line for Trilobites red & lightly color over the correct letters (A, B, & C) on the bottom of the chart above the trilobite index fossil pictures.
14. Repeat the procedure above using a different color for each line.
15. Find the following, Index Fossils, Life on Earth, & Geologic Events on page 8 & 9 & fill in the chart below.

Fossil/Event	Approx. Age	Epoch	Period	Era	Organism Name	Organism Group
						
Abundant Reptiles						
						
Burges shale fauna						
						
Pangea begins to break up						
Earth's First Forests						
Advance & retreat of last continental ice						
Erosion of Teconic Mountains						
						
Oldest known Rocks			Archean			

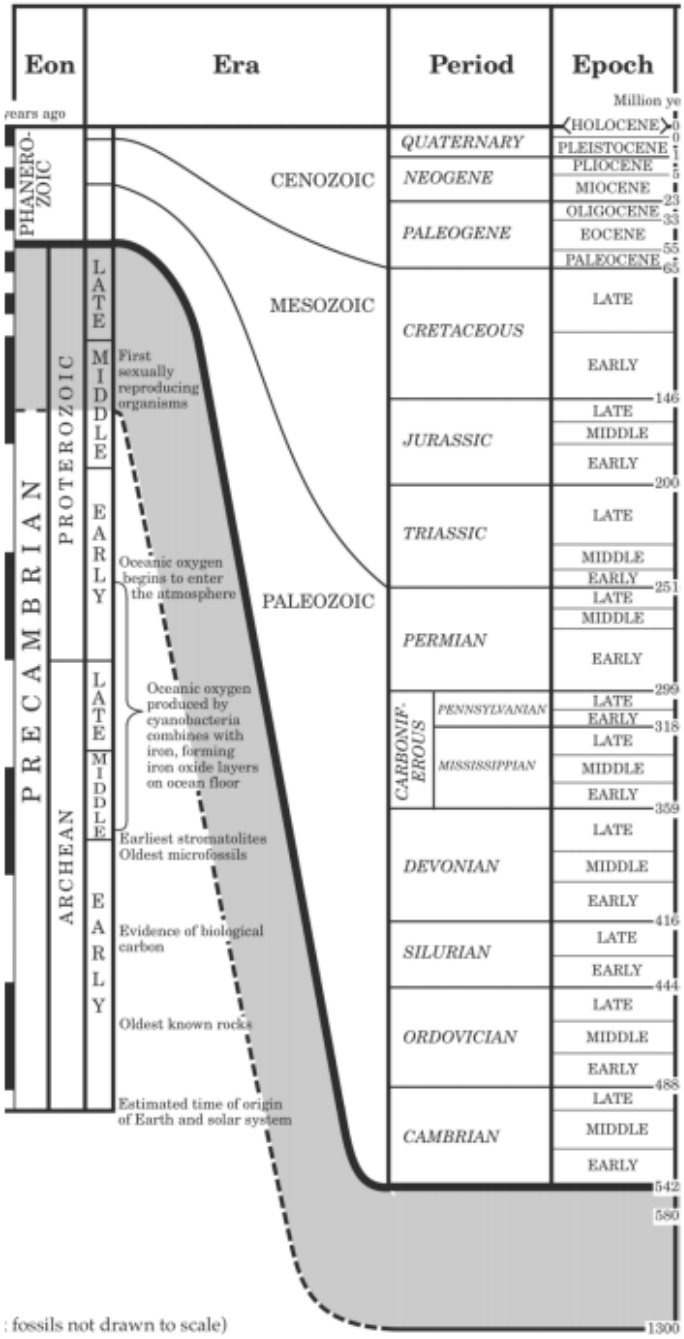
"Interpreting the Generalized Bedrock Geology of NY State Map" ESRT pg 3
& "Geologic History of New York State Chart" ESRT pg 8

1. Turn to page 3 in the Earth Science Reference Tables. Look at the bottom left side of the page under —Geologic Periods and Eras in New York State. Highlight any periods and eras or epochs that are mentioned, on the table to the right, beginning with Cretaceous.
2. Turn to page 8 in the Earth Science Reference Tables.
3. Look under the column labeled —NY Rock Record. If the section has some kind of shading in it, it means that the rock record is there. If it is blank, it means it is not present in New York State.
4. Is there a connection between the times you highlighted (Periods, Eras, Epochs) and the rocks that are present in New York State.

5. Name the four periods where the rock layer is complete.

6. Name three periods that have absolutely no rock record in New York State.

7. An unconformity (missing rock record) occurs when there extreme erosion. Both the Neogene and Paleogene periods have no rock record. Look to the far right of the table on pages 8 and 9 of the reference tables and read the event description at the very top. What caused the rock record during those two periods to go missing?



8. There are different ways to state of age of rocks. You can either name the era, period, or epoch or state the age in millions of years. For example, how old is the Allegheny Plateau?
_____ or _____million years old
name on key between … and …

9. Name three index fossils that may be found Elmira, NY. (there are more than three)

10. Why is it unlikely that any index fossils will be found in the Adirondack Mountains.?

PRACTICE PACKET: TOPIC 6 Earth's History

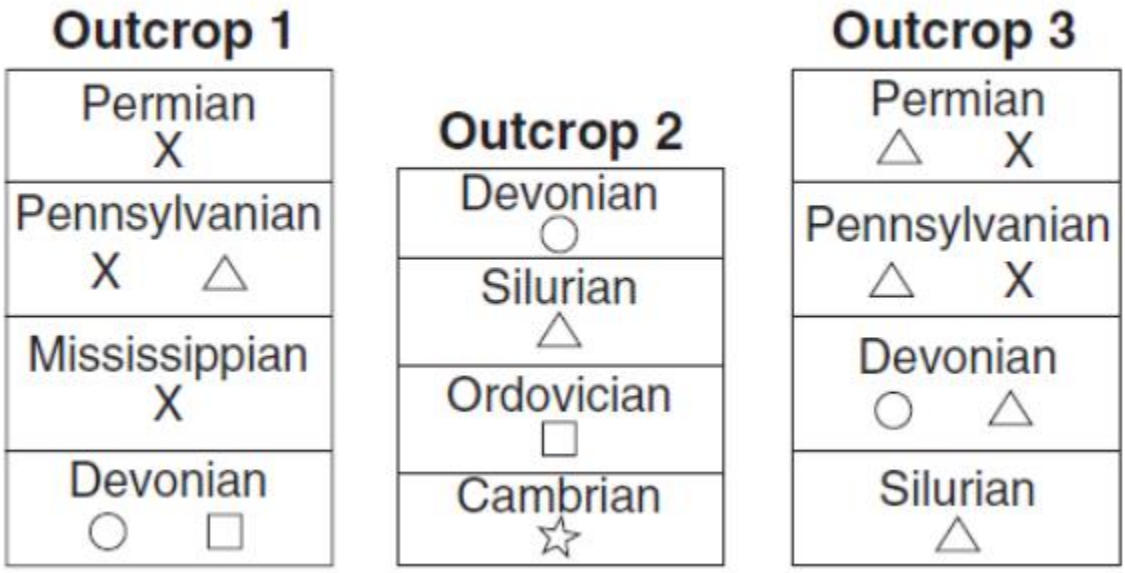
Regents Questions:

1. Fossils of which type of animal would most likely be found in the surface bedrock of the Catskills?
   a. reptiles b. brachiopods c. mammals d. birds

2. Which geologic event occurred in New York State at approximately the same time as the extinction of dinosaurs and ammonoids?
   a. formation of the Queenston Delta
   b. deposition of the sands and clays underlying Long Island
   c. initial opening of the Atlantic Ocean
   d. advance and retreat of the last continental ice sheet

3. Rifting of tectonic plates in eastern North America during the Jurassic Period was responsible for the
   a. formation of the Catskill delta
   b. first uplift of the Adirondack Mountains
   c. Alleghenian orogeny
   d. opening of the Atlantic Ocean

Base your answers to questions 4 through 7 on the cross sections below and on your knowledge of Earth science. The cross sections represent three bedrock outcrops, 1, 2, and 3, found several kilometers apart. The geologic time period when each sedimentary rock layer formed is shown. The symbols represent fossils of different types of organisms present in the rock layers.



4. Draw the fossil symbol that represents the best index fossil. Describe one piece of evidence shown in the outcrops that indicates that this fossil has characteristics of a good index fossil.

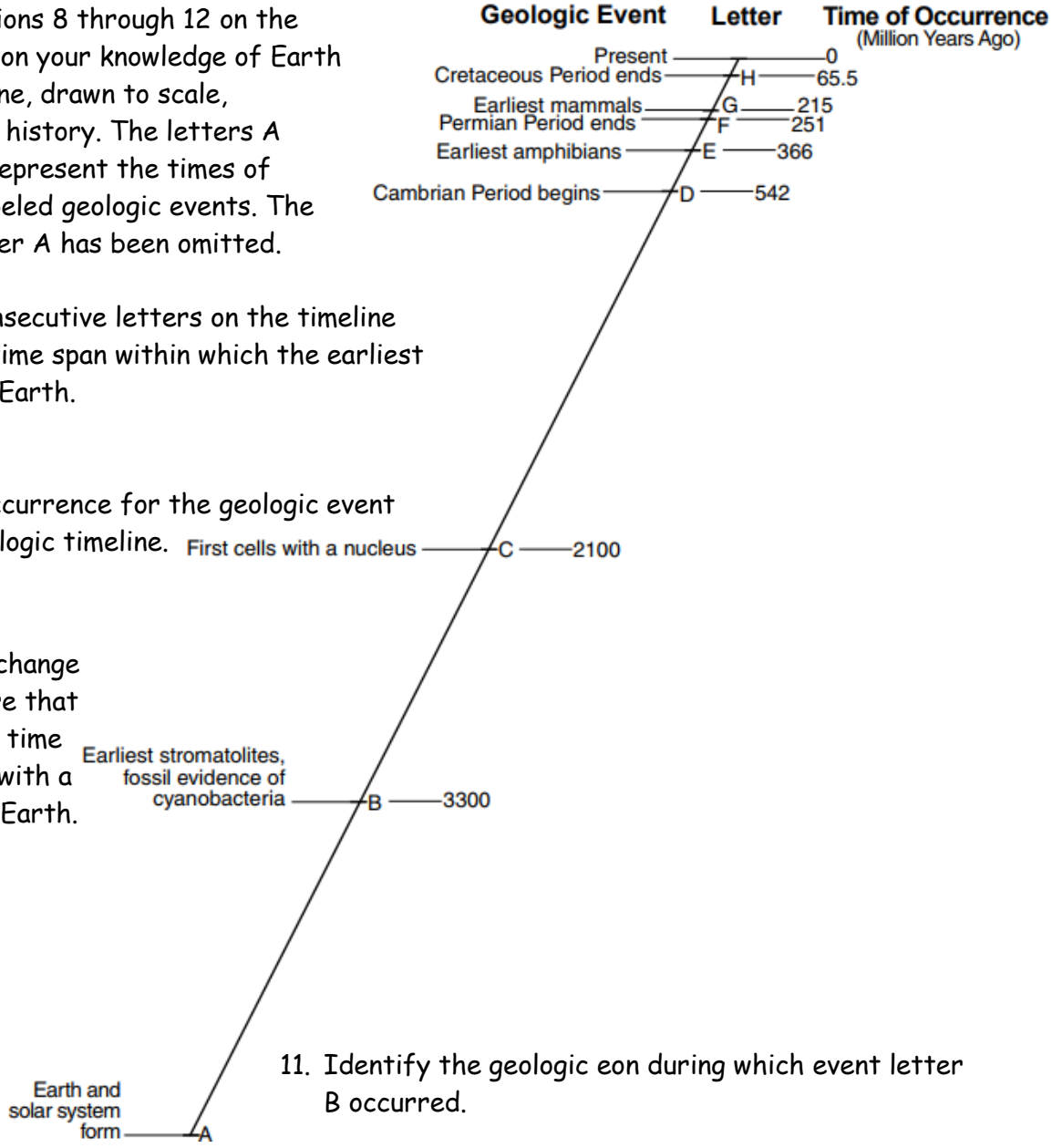
5. Write the outcrop number of the cross section that could be found in New York State. Describe the evidence that supports your answer.

6. Explain why the geologic age of these rock layers could not be accurately dated using carbon-14.

7. Explain why the index fossil Coelophysis is not preserved in any of the rock outcrops.

PRACTICE PACKET: TOPIC 6 Earth's History

Base your answers to questions 8 through 12 on the geologic timeline below and on your knowledge of Earth science. The geologic timeline, drawn to scale, represents Earth's geologic history. The letters A through H on the timeline represent the times of occurrence for specific, labeled geologic events. The time of occurrence for letter A has been omitted.



8. Identify the two consecutive letters on the timeline that represent the time span within which the earliest insects appeared on Earth.

9. State the time of occurrence for the geologic event labeled A on the geologic timeline.

10. Describe the major change in Earth's atmosphere that was occurring at the time when the first cells with a nucleus appeared on Earth.

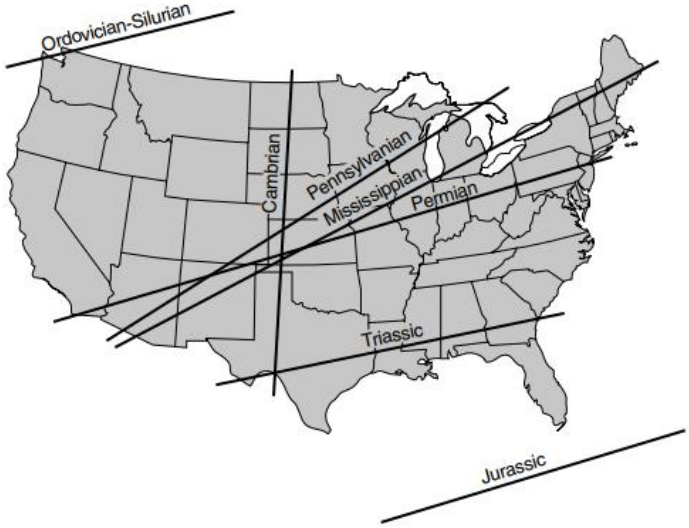
11. Identify the geologic eon during which event letter B occurred.

12. The table below lists the five major mass extinctions that occurred on Earth during the Paleozoic and Mesozoic Eras.

Time of Mass Extinction	Description of Mass Extinction Events
Letter *H* on timeline	Dinosaurs, along with 80% of all organisms
End of Triassic	Most ammonoids, many brachiopods and gastropods, 80% of four-legged animals
Letter *F* on timeline	Largest mass extinction in history, 90% of all species
Late Devonian	70-80% of marine species
Late Ordovician	85% of marine species

Identify the group of marine organisms found in the 2011 Edition Reference Tables for Physical Setting/ Earth Science that became extinct during the largest mass extinction in history.

13. Labeled lines on the map show the inferred location of Earth's equator during the middle of several geologic periods. Approximately how many million years ago (mya) was the region around current-day Watertown, New York, located the nearest to the equator?

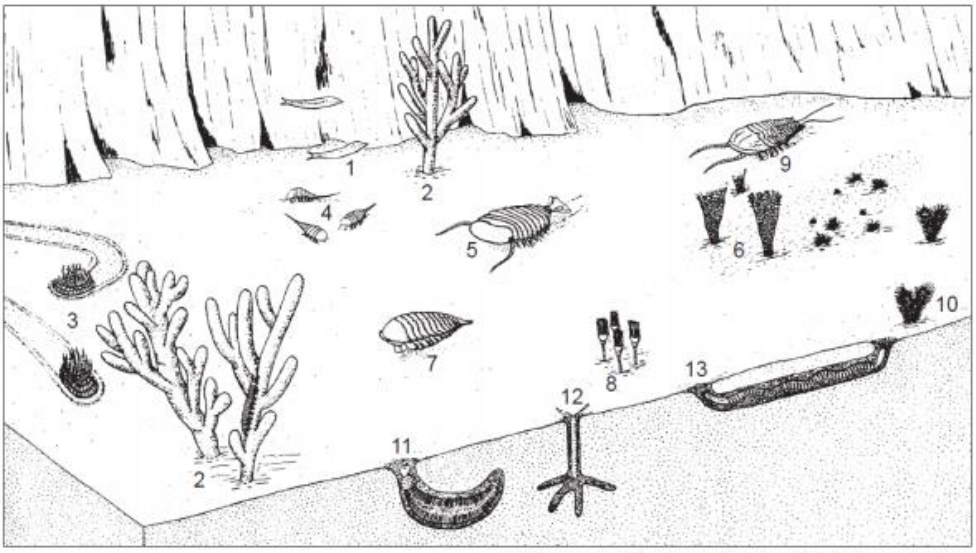


a. 270 mya
b. 300 mya
c. 340 mya
d. 450 mya

ASSESS YOURSELF ON THIS LESSON: _____/13
If you missed more than 3, do the Additional Practice. If not, go on to the next hw video!!!

Base your answers to questions 1 through 3 on the passage and diagram below and on your knowledge of Earth science. The diagram represents some of the Burgess shale community of organisms that existed together during part of the Cambrian Period. Thirteen different types of organisms are numbered in the diagram.

Burgess Shale Fossils



Adapted from: Briggs, et al., *The Fossils of the Burgess Shale*, Smithsonian Institution Press, 1994

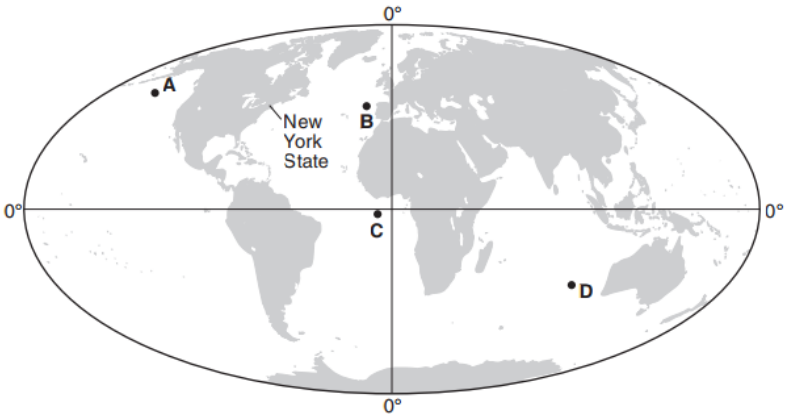
The Burgess shale fossil discovery revealed unique Cambrian life-forms, most of which were not present in the previously known fossil record. Normally, soft body parts of dead organisms are destroyed by scavengers and bacteria on the ocean floor. However, in the deep-water depositional environment of the Burgess shale, oxygen was lacking and organisms were buried rapidly, preserving the unique community seen in the diagram. The soft-bodied organisms had previously been unknown. The Burgess shale fossils were originally found in a layer of bedrock in southwestern Canada.

1. During which epoch of the Cambrian Period were the Burgess shale organisms and sediments deposited?

2. Explain why so many soft body parts of organisms were preserved in the Burgess shale.

3. Identify the number of one organism in the diagram that is most likely a trilobite. _____

4. The map shows the present-day positions of the continents. Points A through D represent locations on Earth's surface. The location of New York State on the North American continent is indicated. Which letter best represents the inferred position of the New York State region on Earth at the end of the Devonian Period?



   a. A c. C
   b. B d. D

5. During which geologic time period did the earliest reptiles and great coal-forming forests exist?
   a. Devonian b. Carboniferous c. Quaternary d. Pennsylvanian

6. According to plate tectonic theory, during which geologic time interval did the continents of North America and Africa separate, resulting in the initial opening of the Atlantic Ocean?
   a. Mesozoic Era b. Paleozoic Era c. Proterozoic Eon d. Archean Eon

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/6
If you missed more than 2 you should see me for extra help and/or re-watch the lesson video assignment.

Lesson 5 – Evolution

Objective:
- I can explain the Theory of Organic Evolution
- I can state the order of life on Earth
- I can describe what happened to most of life on Earth

Evolution is the gradual change in organisms from generation to generation. How well a species could adapt to a changing environment, find necessary food, avoid being eaten and its ability to reproduce are directly related to its survival. Evidence of evolution is provided by fossils, in that many organisms that once existed, are now extinct. For example, there was a mass extinction of the dinosaurs at the end of the Mesozoic Era. This is believed to be caused by a meteor impact which put so much dust and debris into the atmosphere that certain plants and eventually the dinosaurs became extinct. Humans have existed for only a very short amount of geologic time and depending on how well we can adapt will determine how long we will be here.

Scientists believe that the evolution of life also caused dramatic changes in the composition of Earth's atmosphere. Earth's atmosphere used to be composed of mainly carbon dioxide which came from outgassing of volcanoes as Earth cooled. Earth's earliest life-forms were bacteria called cyanobacteria. They used energy from the Sun for photosynthesis and oxygen was released as a byproduct. This is how scientists believe the atmosphere we have today was formed. What once was primarily carbon dioxide is now 78% nitrogen and 21% oxygen.

1. What is evolution? _____

2. Where can you find evidence of evolution? _____
3. What do scientists believe caused the extinction of dinosaurs? _____
4. How long have humans been on Earth? _____
5. What element was abundant in Earth's early atmosphere? _____
6. What is the name of the oxygen producing bacteria? _____
7. What process released oxygen as a byproduct? _____

Regents Questions:

1. Much of the evidence for the evolution of lifeforms on Earth has been obtained by
   a. studying the life spans of present-day animals
   b. correlating widespread igneous ash deposits
   c. radioactive dating of metamorphic rock
   d. examining fossils preserved in the rock Record

2. It is inferred that during the early Archean Era the atmosphere of Earth contained water vapor, carbon dioxide, nitrogen, and other gases in small amounts. These gases probably came from
   a. precipitation of groundwater
   b. evaporation of Paleozoic oceans
   c. volcanic eruptions
   d. convection currents in the mantle

3. Earth's early atmosphere formed during the Early Archean Era. Which gas was generally absent from the atmosphere at that time?
   a. water vapor b. nitrogen c. carbon dioxide d. oxygen

Base your answers to questions 4 and 5 on the data table below and on your knowledge of Earth science. The data table shows information on six major mass extinction events that occurred many million years ago (mya) in Earth's history.

Some Major Mass Extinctions in Earth's History

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

4. More than half of brachiopod species became extinct at the end of the
   a. Devonian Period
   b. Silurian Period
   c. Ordovician Period
   d. Cambrian Period

5. Which event is generally accepted as the cause of the mass extinction that occurred 65.5 million years ago?
   a. volcanic eruption b. continental collision c. asteroid impact d. sea-level change

Base your answers to questions 6 through 9 on the passage and chart below, and on your knowledge of Earth science. The chart identifies some human species and the times when they are believed to have existed.

Human Species

Modern humans, Homo sapiens, appear to have evolved through several species of earlier members of the genus Homo. Each of these human species possessed specific features that made that species distinct. Many lived in (or at least have been discovered in) specific geographic areas, and existed for specific time ranges shown in the chart. In many cases, fossil remains are partial, often consisting of only teeth and skulls. Interpretation of human evolution continues to change with new discoveries.

Human Species Distributed Through Time

Human Species	Time of Existence from Fossil Evidence (million years ago)
Homo sapiens	0.25 to the present
Homo neanderthalensis	0.35 to 0.03
Homo rhodesiensis	0.6 to 0.1
Homo heidelbergensis	0.6 to 0.3
Homo mauritanicus	1.2 to 0.6
Homo erectus	1.5 to 0.2
Homo ergaster	1.8 to 1.25
Homo habilis	2.25 to 1.4

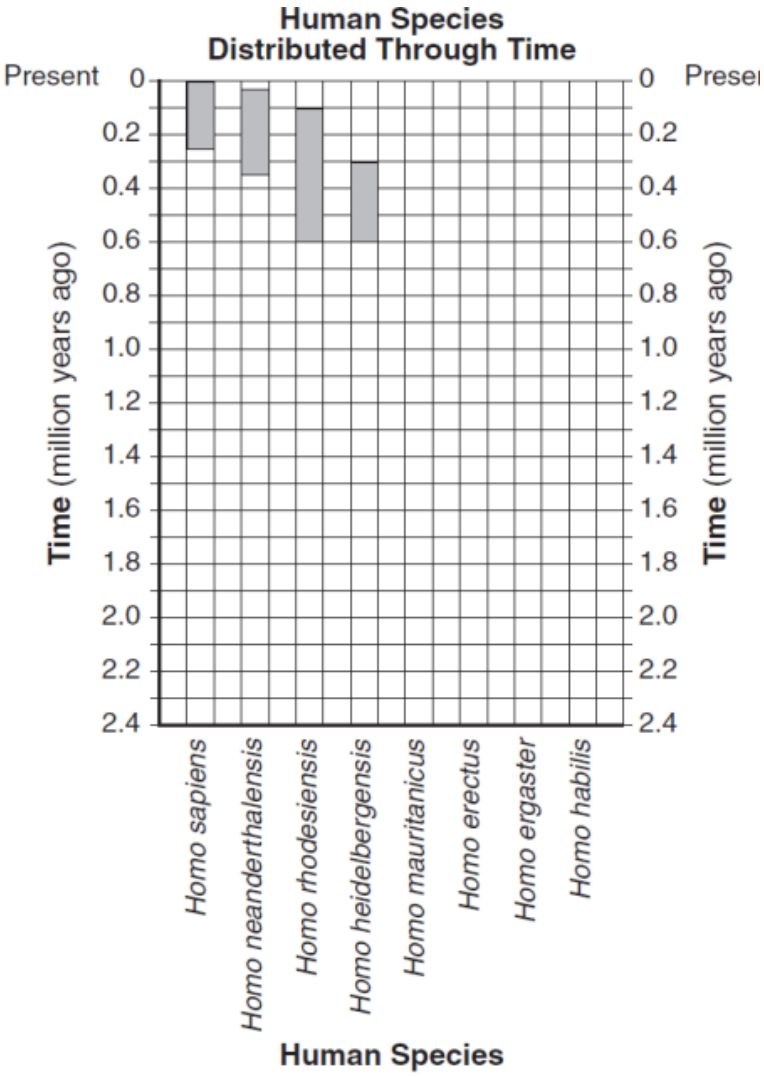
6. Complete the graph in below by drawing a bar to represent the time span that each human species existed. The bars for the first four species listed have already been drawn.

7. Which human species shown in the chart was the first to exist?

8. One species of the genus Homo could have evolved directly from another species of the genus Homo only if the other species:
   - existed before the new species appeared
   - did not become extinct before the new species appeared

   Identify two species of the genus Homo from which *Homo neanderthalensis* may have directly evolved.

9. During which geologic epoch did the Homo mauritanicus species exist?



ASSESS YOURSELF ON THIS LESSON: _____/9

Outcrop diagrams

Cut out each rock type