Name _____ Date _____

Fossil Evidence and Change Over Time

Directions: Read the passage and study the table. Most questions use them, and one asks you to apply the same ideas to a new place.

Reading Rock Layers

Fossil shark teeth are much easier to find than fossil shark skeletons. A shark's skeleton is made of cartilage, a flexible tissue that usually rots away, but its teeth are hard. That difference says a lot about how fossils form and why the record they leave has gaps.

A fossil is the preserved remains or traces of a living thing from long ago, such as a shell, a bone, a leaf print, a footprint or a burrow. Most fossils are found in sedimentary rock, which forms when layers of sand, mud or other sediment pile up and slowly harden. A living thing has the best chance of becoming a fossil if sediment buries it quickly, before it rots or is eaten, and hard parts like shells, bones and teeth are preserved far more often than soft parts. Most living things never became fossils, and many fossils that did form have been worn away or are still buried. For these reasons, the fossil record, which means all the fossils found so far and what they show, is incomplete.

New sediment settles on top of older sediment. So, in undisturbed layers, lower layers are usually older than the layers above them. This idea is called the law of superposition, and the Danish scientist Nicolaus Steno described it in 1669. It lets geologists work out the relative age of layers and the fossils in them: whether one is older or younger than another, without giving an age in years. Layers are not always undisturbed, though. Forces inside Earth can fold layers until some are upside down, and faults can shift whole blocks of rock, so geologists look for these signs before using the rule.

Comparing fossils from many layers and places reveals patterns. Older layers often hold fossils of organisms quite unlike anything alive today. Some kinds of organisms show up in older layers but in no younger layers anywhere scientists have looked, a sign that they became extinct, meaning they have no members still alive. Other kinds show up only in younger layers. Together, these patterns are evidence that life on Earth has changed over long periods of time.

A team studied five undisturbed layers in one canyon wall. To compare the layers fairly, they searched a 2-square-meter area of each layer for 3 hours and recorded every fossil they found.

Fossils found in a 2-square-meter area of each layer of one canyon wall, searched for 3 hours per layer

Layer	Kinds of fossils found	Number of fossils found
1 (top)	Leaves of flowering plants, small mammal teeth	14
2	Fern leaves, dinosaur footprints	9
3	Clam shells, fish teeth	31

Layer	Kinds of fossils found	Number of fossils found
4	Trilobites, clam shells	22
5 (bottom)	Worm burrows	6

1. For each term from the passage, pick the description that fits it best.

Write the letter of the matching answer on each line.

1. _____ Fossil
2. _____ Sedimentary rock
3. _____ Law of superposition
4. _____ Relative age
5. _____ Extinct

Choices for question 1

A. Having no members still alive

B. In undisturbed layers, lower layers are usually older than higher ones

C. Whether something is older or younger than something else, with no number of years

D. The exact age of a rock, measured in years

E. The preserved remains or traces of a living thing from long ago

F. Rock that forms as layers of sand, mud or other sediment harden

2. Among the five layers in the table, which is most likely the oldest?

A. Layer 1, at the top

B. Layer 5, at the bottom

C. All five layers are the same age, because they are in one canyon wall

D. Layer 3, which holds the most fossils

3. Why does the passage say the law of superposition works for undisturbed layers?

A. Disturbed layers never contain any fossils, so they cannot be dated.

B. Only undisturbed layers are made of sedimentary rock.

C. In disturbed places, new sediment settles underneath older sediment.

D. Folding and faults can move or overturn layers, so in disturbed rock a lower layer is not always older.

4. Using relative age, what can you say about the fern leaves in layer 2 and the trilobites in layer 4?

A. The fern leaves are most likely younger than the trilobites, but relative age does not tell how many years younger.

B. They are the same age, because both are fossils.

C. The trilobites are younger, because they are buried deeper.

D. The fern leaves are exactly 2 million years younger than the trilobites.

5. The team gave every layer a 2-square-meter search area and 3 hours of searching. How does that make their fossil counts more useful?

A. It makes every layer end up with the same number of fossils.

B. Each layer got the same amount of searching, so the counts are fair to compare.

C. It lets the team find each layer's age in years.

D. It keeps the fossils in the right order inside the rock.

6. Layer 5 holds only worm burrows and the fewest fossils of the five layers. Which choice gives one possible reason?

A. No living things existed when layer 5 formed.

B. The team searched layer 5 for less time than the other layers.

C. Layer 5 is the youngest layer, so its fossils have not formed yet.

D. Worms have soft bodies that rarely become fossils, though their burrows can be preserved.

7. Trilobite fossils appear in layer 4 but in no layer above it in this canyon wall. What can the team conclude from this canyon wall alone?

A. Trilobites became extinct the moment layer 4 finished forming.

B. Trilobites lived when layer 4 formed, but one canyon wall cannot show whether or when they became extinct.

C. Trilobites slowly changed into the clams found in layer 3.

D. Trilobites lived at the same time as the dinosaurs that left footprints in layer 2.

8. According to the passage, which is one reason the fossil record is incomplete?

A. Many fossils that formed have worn away or are still buried.

B. Every fossil that ever formed has already been found.

C. Fossils can form only from animals, never from plants.

D. Only living things from the last few thousand years can become fossils.

9. What does the team's layer-by-layer record show about this canyon wall?

A. In this canyon wall, every kind of fossil appears in every layer.

B. In this canyon wall, trilobites and dinosaurs lived at the same time.

C. In this canyon wall, the deepest layer holds the most fossils of any layer.

D. In this canyon wall, the kinds of fossils differ from layer to layer, and flowering plant leaves and mammal teeth show up only in the top layer.

10. In most places, layers with trilobite fossils lie below layers with dinosaur footprints. In one mountain range, geologists find a trilobite layer lying on top of a dinosaur-footprint layer, and the rocks show signs of strong folding. What is the best explanation?

A. Folding turned the layers over, so the older trilobite layer now lies on top.

B. The law of superposition does not work for rocks that hold fossils.

C. Footprints are not real fossils, so the footprint layer cannot be compared.

D. Trilobites lived after the dinosaurs in this one place.