

Key to questions in the Explore Phase:

1. Choose three geologic periods. For each period, record the scientific names of the three most abundant taxa.
Answers will vary. Below are some answer possibilities.
Devonian: Brachiopoda, Mollusca, Cnidaria
Paleogene: Mollusca, Mammalia, Arthropoda
Cambrian: Trilobita, Regularis, Problematica
2. Which of the time units you selected were the most distinct from one another?
Answers will vary. The following answer would correspond to the answers given above. The Devonian and the Cambrian Periods are the most distinct from one another because they have no overlapping taxa.
3. How many years passed between these two units of time? Explain why this makes sense based on your answer above?
Answers will vary. The following answer would correspond to the answers given above. Between the Cambrian and Devonian Periods, 121.8 million years passed. This is sufficient time for life to evolve new forms, for climate and ecosystems to change, environmental pressures to differ, and for different organisms to flourish.
4. How does this relate to the role that evolution has played in the history of life?
Answers will vary.
Generally, evolution happens over very long time spans, on the scale of millions of years.
5. The Phanerozoic Eon contains three geologic eras. What are they?
The Paleozoic, Mesozoic, and Cenozoic

In your own words, describe what evidence exists within rock strata that could be used to distinguish one geologic era from another.

Answers will vary.

Due to evolution, life forms constantly change. When we look at rock layers and see completely different sets of fossils, it could be because there were significant changes in life forms due to evolution of new life. We can divide up the geologic time by these different sets of fossils. The fossils are the evidence for distinguishing one geologic era from another.

Key to questions in the Explain Phase:

1. What is the difference between the distribution of Ornithischia in the Cretaceous and the Paleogene?
During the Cretaceous Period, Ornithischia fossils were distributed across all of the continents, however there is no fossil evidence of Ornithischia during the Paleogene Period.

2. Determine which geologic period has the last fossil evidence of trilobites.
 The Permian Period was the last geologic period with fossil evidence of Trilobita.

Table 1.

	Earliest <u>geologic period</u> with fossil evidence	How many million years ago was the earliest <u>geologic period</u> ?*	Latest <u>geologic period</u> with fossil evidence	How many million years ago was the latest <u>geologic period</u> ? *	Time range in million years ago (MYA)
<u>Trilobites</u>	Cambrian	541	Permian	252.17	From 541 to 252.17 MYA
<u>Ornithischian dinosaurs</u>	Triassic	252.17	Cretaceous	66	From 252.17 to 66 MYA

Species that did and did not make it through the Permian Extinction Event:

Answers will vary. Possible answers:

Survived	Did not survive
Echinoderms (sea urchins), Pinopsida (conifers), Some brachiopods (bivalve mollusks)	Tabulata (tabulate corals), Trilobita (trilobites), Equisetopsida (a spore-bearing plant)

Key to questions in the Elaborate Phase:

Table 2.

	Earliest <u>geologic period</u> with fossil evidence	How many million years ago was the earliest <u>geologic period</u> ?*	Latest <u>geologic period</u> with fossil evidence	How many million years ago was the latest <u>geologic period</u> ? *	Time range in million years ago (MYA)
<u>Pecten</u>	Carboniferous	358.9	Quaternary	To present	From 358.9 to present
<u>Mariella</u>	Cretaceous	Beginning of the Cretaceous: 145	Cretaceous	Beginning of the Cretaceous: 66	79

1. Do *Pecten* fossils make for good index fossils? Why or why not?
 Although *Pecten* fossils are wide ranging, found in multiple marine habitats, and easy to identify, they span across multiple geologic periods and would therefore, not be good for determining the relative age of sedimentary rock strata.
2. If you found a *Mariella* fossil about how old would the rocks that contained it be in millions of years? How confident are you in that age range?
 Rocks containing *Mariella* fossils would be anywhere from 66 to 145 million years old. I am very confident because something very unusual would have had to happen to rocks outside of this time range in order for them to contain these rocks.

Key and rubric to questions in the Evaluate Phase:

Geologic Time Period	Index Fossil	Fossil Date Range
Permian	<i>Parafusulina</i>	252.2 to 298.9 mya
Triassic	<i>Monotis subcircularis</i>	201.3 to 252.2 mya
Jurassic	<i>Perisphinctes</i>	145 to 201.3 mya
Cretaceous	<i>Mariella</i>	66 to 145 mya
Fossil bank: <i>Mariella</i> (an ammonite), <i>Lystrosaurus</i> (a four-legged animal), <i>Glossopteris</i> (a woody plant), <i>Ostrea</i> (an oyster), <i>Perisphinctes</i> (a mollusk), <i>Neospirifer</i> (a small, shelled, sea creature), <i>Crocodylus</i> (a crocodile), <i>Parafusulina</i> (a shelled amoeba), and <i>Monotis subcircularis</i> (a mollusk).		

Prompt: Use data from your chart to give a scientific explanation for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.

	Not Yet Approaching Mastery	Approaching Mastery	Mastery
MS-ESS1-4: Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is	Student does not reference data in the chart, dates or terminology, or explanation of how index fossils are	Student explanation does not connect accurately to data in the chart, uses incorrect terminology or dates, or is missing key	Student accurately uses data, correct terminology (like <i>Parafusulin</i> or <i>Triassic</i>) and

used to organize Earth's 4.6-billion-year-old history.	restricted to discrete time ranges and how these time ranges were used to organize geologic time and establish the relative ages of major events in Earth's history is incorrect.	aspects of an explanation of how index fossils are restricted to discrete time ranges and how these time ranges were used to organize geologic time and establish the relative ages of major events in Earth's history.	dates from the chart to explain how index fossils are restricted to discrete time ranges and how these time ranges were used to organize geologic time and establish the relative ages of major events in Earth's history.
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