

Deep Time Check: Retrieval Practice and Synthesis

Learning target: I can show that I understand how Earth's age is known, how the geologic time scale is built from rock strata and organized by events, how to read its units and numbers, and how major changes in life, land and climate are recorded.

Retrieval and mastery check

About 35 min

Individual

MS-ESS1-4 · assesses

MS-ESS2-2 · supports

MS-LS4-1 · supports

independent practice

writing

Name _____

Date _____

Period _____

Directions

Work alone without notes or the textbook. Part A has twelve short items: circle the letter for multiple-choice items, write T or F and a reason for true-false items, show your work for numeric items, and draw clearly in the box. Part B is one written synthesis; plan it for a minute before you write. Budget about 20 minutes for Part A and 12 minutes for Part B.

You will need: This worksheet, Pencil, Calculator

Part A: Retrieval practice

1. Which evidence gives scientists the age of Earth, and why?

- ☐ A. The oldest rock found on Earth, because it formed when Earth did
- ☐ B. Meteorites and moon rocks, because they formed with Earth but were never recycled
- ☐ C. The deepest layer of the Grand Canyon, because it is the bottom of the rock record
- ☐ D. Fossils of the first microbes, because life began as soon as Earth formed

2. Convert: 2.5 Ga = _____ Ma. 66 Ma = _____ ka. Show the factor you used.

3. True or false, with a one-sentence reason: 'Rock strata by themselves tell geologists the ages of layers in years.'

☐ True ☐ False Explain your thinking:

4. Where do scientists place the boundaries between units of the geologic time scale?
- ☐ A. At equal intervals of time, like the hours on a clock
 - ☐ B. At equal thicknesses of rock, so each unit has the same amount of strata
 - ☐ C. Where the rock and fossil record shows a major change, such as a mass extinction
 - ☐ D. At every layer that can be dated in years
5. List the four units of the geologic time scale from longest to shortest, and name the one we live in at the longest level.

6. Which order of first appearances matches the fossil and rock record?
- ☐ A. Animals with shells, then microbes, then oxygen in the air
 - ☐ B. Microbes, then oxygen building up in the air, then animals with shells
 - ☐ C. Oxygen in the air, then animals with shells, then microbes
 - ☐ D. All three appear together in the oldest rocks
7. A shale layer lies between a lava flow dated 420 million years and an ash band dated 300 million years. State everything you can and cannot say about the shale's age, and name the kind of dating used on the lava and ash.

8. The most recent eon began about 539 million years ago and Earth is about 4,540 million years old. Calculate the percentage of Earth's history in that eon, to the nearest whole percent, and explain in one sentence why it takes up most of a classroom chart anyway.

9. Draw two cliffs 50 km apart that share one volcanic ash band. In cliff 1 draw two layers above the ash; in cliff 2 draw the ash on top and two layers below it. Label the oldest layer, the youngest layer, and write beside the ash band the rule that lets you match it between the cliffs.



10. Explain why today's atmosphere contains about 21 percent oxygen when the first atmosphere contained almost none. Include where the oxygen came from and one reason it took so long to build up.

11. True or false, with a one-sentence reason: 'The ice age ended about 11,700 years ago.'

☐ True ☐ False Explain your thinking:

12. Which observation most directly supports the idea that the moon formed from material knocked out of the young Earth?

- ☐ A. Moon rocks that closely match the chemistry of Earth's mantle
- ☐ B. Craters on the moon's surface
- ☐ C. The moon being smaller than Earth
- ☐ D. Meteorites found on Earth being 4.56 billion years old

Part B: Synthesis

- 13.** No rock on Earth is as old as Earth, and no single cliff shows more than a small part of Earth's history. Explain, in 6 to 8 sentences, how scientists still built a timeline of 4.54 billion years. Your answer must include: how the age of Earth was found; how rock records from different places are joined; how boundaries on the time scale are chosen; how ages in years are attached; and one reason the early part of the record is thin.

Plan the synthesis with five words

Before writing Part B, jot down these five words in order and write one fact next to each: meteorites, matching, boundaries, bookmarks, recycling. Each word is one of the five things your answer must include. Then turn each note into one or two sentences. If a multiple-choice item stumps you, cross out the answers you know are wrong first; there is usually one that contradicts something you drew or calculated earlier in the chapter.

One more boundary

Some scientists have proposed a new epoch, the Anthropocene, to mark the time when human activity began leaving a worldwide signature in sediments, such as plastic particles, radioactive fallout from 1950s weapons tests, and chemical changes in lake muds. In 2024 the official body that manages the time scale voted not to add it, partly over the question of whether the change is recorded sharply enough and whether a boundary set in the 1950s is useful. Using what you know about how boundaries are chosen, write a paragraph arguing for or against the proposal, with at least two reasons that use the rules from this chapter.