

Rock Strata Check-Up: Twelve Items and a Synthesis

Learning target: I can apply the laws of superposition, original horizontality, lateral continuity, cross-cutting relationships and fossil succession, calculate ages from half-lives, and explain how geologists combine relative and absolute dating to organize Earth's history.

Retrieval and mastery check

About 40 min

Individual

MS-ESS1-4 · practice

MS-ESS2-2 · supports

independent practice

writing

Name _____

Date _____

Period _____

Directions

Complete this check-up alone, without notes. Items 1 to 12 are retrieval practice and can be scored as a quiz; item 13 is a short synthesis paragraph. Items 1 to 5 refer to the quarry figure. Show your work on the numeric items. Points are given beside each item; 40 points in all.

You will need: This worksheet, Pencil, Ruler for item 11

Quarry wall for items 1 to 5, top to bottom

1 Gravel, flat	top
2 Sandstone with leaf fossils, flat	
3 Limestone with shell fossils, tilted 25 degrees	
4 Shale, tilted 25 degrees	
5 Sandstone, tilted 25 degrees	bottom

Use this figure for items 1 to 5. A dike of igneous rock cuts layers 2, 3, 4 and 5 but not layer 1. A fault offsets layers 3, 4 and 5 and stops at the flat surface under layer 2. The surface between layers 3 and 2 is flat and cuts across the tilted tops of 3, 4 and 5.

Part A: Retrieval items

1. Which layer in the figure is the oldest? 2 pts
- ☐ A. Layer 1, because it is on top
 - ☐ B. Layer 3, because it holds the most fossils
 - ☐ C. Layer 5, because it is at the bottom of an unbroken, right-side-up sequence
 - ☐ D. Layer 2, because it is the first flat layer
2. Which rule tells you that layers 3, 4 and 5 were tilted after they formed? 2 pts
- ☐ A. Law of superposition
 - ☐ B. Principle of original horizontality
 - ☐ C. Principle of lateral continuity
 - ☐ D. Law of fossil succession
3. True or false: the dike is older than layer 2 because the dike is below layer 1. 3 pts
- ☐ True ☐ False Explain your thinking:
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-
4. Which is older, the fault or the dike, and how do you know? 2 pts
- ☐ A. The fault, because it stops under layer 2 while the dike cuts layer 2
 - ☐ B. The dike, because igneous rock is always older than sedimentary rock
 - ☐ C. The dike, because it is wider than the fault
 - ☐ D. They are the same age, because both cut layers 3, 4 and 5
5. What does the flat surface between layer 3 and layer 2 represent, and what does it tell you about the rock record at this quarry? 3 pts
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-
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6. Uranium-235 has a half-life of 704 million years. A zircon crystal has gone through 3 half-lives. How old is it, and what percent of its original uranium-235 remains? Show both calculations. 3 pts
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-
-
7. A fossil useful for matching layers in distant places should be easy to _____, found over a _____ area, and come from a species that lived for a _____ span of time. Such a fossil is called an _____ fossil. 3 pts
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-

8. Explain why a lab cannot give the age of sandstone layer 5 in years by measuring its sand grains, and name one thing in the figure the lab could date in years. 3 pts

9. A canyon separates two cliffs. The left cliff shows, from the top, a white layer over a red layer over a gray layer; the right cliff shows the same three layers in the same order and thickness. What can you conclude, and by which rule? 2 pts

- ☐ A. The right cliff is younger, by superposition
- ☐ B. The layers were once continuous and the canyon is younger than all of them, by lateral continuity and cross-cutting
- ☐ C. The two cliffs formed at different times, because they are separated
- ☐ D. The gray layer is the youngest, by original horizontality

10. A volcanic ash layer's zircon has 6.25% of its uranium-235 left. How many half-lives have passed, and how old is the ash? A shale layer lies directly on top of the ash; write one sentence about the shale's age. 3 pts

11. Draw a side view of three flat layers. Add a dike that cuts only the bottom two layers and stops below the top layer. Number the four features (three layers and the dike) from 1 = oldest to 4 = youngest, and write beside the drawing the rule that fixes the dike's number. 3 pts

12. Two geologists describe the same basalt layer. One says 'it is younger than the limestone below it.' The other says 'it is 31 million years old.' Name the kind of dating each one used and explain why both statements are needed to tell the layer's story. 3 pts

Part B: Synthesis

- 13.** Explain how geologists use rock strata to organize Earth's history. Your paragraph must (a) describe how at least three rules put events in order, using the quarry figure for examples, (b) explain how absolute dating of igneous rock attaches years to that order, and (c) state one thing the rock record cannot tell us and why. Use at least four vocabulary terms correctly and underline them.

8 pts

Three questions before every item

Before answering an item about the figure, ask: Is this stack undisturbed and right-side up where I am looking? What cuts what? Is the item asking for an order (relative) or a number of years (absolute)? For the half-life items, write a halving table (100, 50, 25, 12.5, 6.25) and count the steps; each step is 704 million years. For the synthesis, write one sentence per rule, then one sentence about years, then one about limits.

Revise your first story

Take out your answer to q7 on Worksheet 1 (the Pelican Point cliff story). Rewrite it using the rules and vocabulary of this chapter, with each event supported by a named rule. Then write two sentences about which of your original guesses turned out to be right and which the chapter changed, and why.