

Layers of Rock

Students are presented with the problem of creating a drawing of rock layers in a cliff by interpreting the notes of a geologist. To solve this problem, students must apply the concepts they learned in the chapter, including relative and absolute dating.

◆ Expected Outcome

Students should make a drawing that roughly matches the figure at the bottom of this page. They should label the rock layers A–F from the bottom up, draw the intrusion from the bottom up partway into layer D, and draw the extrusion between layers C and D. Students should also be able to place the fossils as shown in the figure below.

◆ Content Assessed

This activity assesses students' knowledge of the law of superposition, extrusions, intrusions, index fossils, relative and absolute dating, the geologic time scale, and major events in Earth's history. The degree of difficulty of the activity can vary, depending on whether you allow students to refer to Sections 4 and 5 while answering the questions under Analyze and Conclude.

◆ Skills Assessed

interpreting data, applying concepts, making models, inferring

◆ Materials

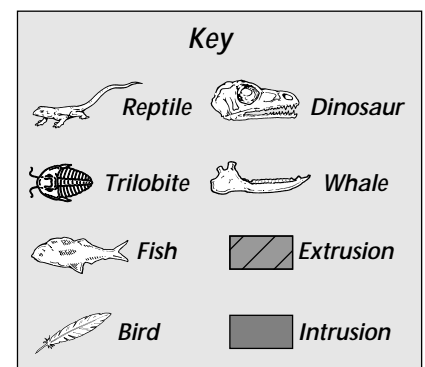
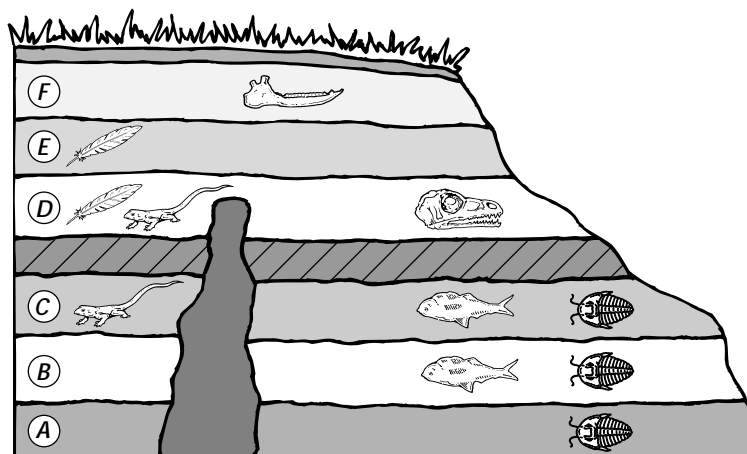
◆ Students will need a pencil and paper. A ruler might also help them make their drawings.

◆ Time

30 minutes

◆ Monitoring the Task

- ◆ For students who have difficulty with reading, you can read the geologist's notes aloud once or twice, slowly so students can take detailed notes.
- ◆ Suggest that students draw the sedimentary rock layers first, then add the extrusion and intrusion, and finally add symbols for the different types of fossils.
- ◆ Tell students that there is no "correct" symbol for each kind of fossil; they can make their own symbols as long as each symbol is identified in the key.



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In assessing students' performance, use the following rubric.

	4	3	2	1
Making the Drawing	The student makes an excellent drawing that correctly places rock layers A–F, correctly places the intrusion and extrusion, correctly places all the fossils found, and includes a complete symbol key.	The student makes a good drawing that correctly places rock layers A–F, correctly places the intrusion and extrusion, correctly places most of the fossils found, and includes a complete symbol key.	The student makes a drawing that correctly places rock layers A–F, correctly places either the intrusion or extrusion, correctly places a few of the fossils found, and includes a symbol key.	The student makes a drawing that incorrectly places rock layers A–F, incorrectly places the intrusion and extrusion, incorrectly places the fossils found, and/or includes a poorly done symbol key or no symbol key.
Concept Understanding	The student demonstrates a mastery of the concepts related to relative and absolute dating of rocks, the use of index fossils, and major events in Earth's history.	The student demonstrates an adequate understanding of the concepts related to relative and absolute dating of rocks, the use of index fossils, and major events in Earth's history.	The student demonstrates a partial understanding of the concepts related to relative and absolute dating of rocks, the use of index fossils, and major events in Earth's history.	The student demonstrates a weak understanding of the concepts related to relative and absolute dating of rocks, the use of index fossils, and major events in Earth's history.



PERFORMANCE ASSESSMENT

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◆ Problem

Last spring, a team of geologists made a study of the rock layers exposed on the side of a cliff. Here are the notes one of the geologists made.

“On this cliff, we can see six layers of sedimentary rock. There is an extrusion between the third and fourth oldest layers. Through dating a sample of that rock, we determined the extrusion to be 250 million years old. An intrusion extends from the bottom layer into the fourth oldest layer. Through dating a sample of that rock, we determined the intrusion to be 100 million years old. We also looked for fossils. In the three oldest layers, we discovered fossil trilobites. In the second and third oldest layers, we found fossils of fishes. We found reptile fossils in the third oldest layer and the layer above it. In the younger layer that had a reptile fossil, we also discovered a dinosaur fossil. We found bird fossils in the second and third youngest layers. Most interesting was the fossil from a whale we found in the youngest layer.”

This geologist needs a drawing for the final report that shows what the team found. How can you make a drawing from the geologist’s notes?

◆ Procedure

1. Make a list of every feature the geologist found that could help you make a drawing of the site.
2. Make a drawing from your list. Label the sedimentary rock layers A–F, from oldest to youngest.
3. Create a key that tells what symbols you used on the drawing.

◆ Analyze and Conclude

Answer the following questions on a separate sheet of paper.

1. Which rock layer is the oldest? Explain how you know.
2. How did the geologists probably date the extrusion and intrusion? Explain.
3. Why didn’t the geologist include dates in the notes for the sedimentary rock layers?
4. What is the age of sedimentary rock layer D? Explain how you determined its age.
5. By inferring from the fossils in layer B, could this rock layer have been deposited in the Cambrian Period? Why or why not?
6. By inferring from the fossils in each layer, describe a major event in the history of life on Earth that occurred at about the time of the extrusion.
7. In which era was layer F deposited? How do you know?

