

## Earth History Teacher Rubrics and Directions

- 1.a. Using the tools provided, observe the three rock samples, A, B, and C. One is sandstone, one is shale, and one is limestone. Make a chart to record your observations for each sample; include sample letter, color, texture, fossil evidence, and reaction to acid.

This item measures the student's ability to observe and organize data.

**Criterion for a complete response:**

1. Chart should include: identify A, B, and C; texture; color; fossil evidence; and reaction to HCl test. See sample chart below.

| Rock Sample | Color | Texture | Fossil Evidence | Reaction to Acid |
|-------------|-------|---------|-----------------|------------------|
| A           |       |         | Ferns           | No Fizz          |
| B           |       |         | None            | No Fizz          |
| C           |       |         | Yes/No          | Yes Fizz         |

| Code | Response  |
|------|---|
|      | <b><i>Complete Response</i></b>   |
| 20   | Includes correctly constructed chart with complete and correct data.                |
| 29   | Any other scientifically correct response.  |
|      | <b><i>Partially Correct Response</i></b>  |
| 10   | Includes correctly constructed chart with two or fewer omissions or errors in data. |
| 19   | Any other partially correct response.   |
|      | <b><i>Incorrect Response</i></b>  |
| 70   | Omits an organized chart.   |
| 71   | Includes an organized chart with more than two omissions or errors in data.         |
| 76   | Repeats the stem of the question.   |
| 79   | Any other incorrect response.   |
|      | <b><i>Non-response</i></b>  |
| 90   | Crossed out, erased, illegible, or impossible to interpret.                         |
| 99   | Blank.  |

1.b. Use your data table to identify each rock.

This item measures the student's ability to identify rock samples.

**Criterion for a complete response:**

1. Identifies the rock names (A–shale, B–sandstone, C–limestone)

| Code | Response   |
|------|--|
|      | <b><i>Complete Response</i></b>                                |
| 20   | Includes correctly identified rock samples (see sample chart). |
|      | <b><i>Partially Correct Response</i></b>                       |
| 10   | Correctly identifies one out of the three rock samples.        |
|      | <b><i>Incorrect Response</i></b>                               |
| 70   | Incorrectly identifies rock samples.                           |
| 76   | Repeats the stem of the question.                              |
| 79   | Any other incorrect response.                                  |
|      | <b><i>Non-Response</i></b>                                     |
| 90   | Crossed out, erased, illegible, or impossible to interpret.    |
| 99   | Blank.   |

**Note to teachers:**

- Use    A Hermit shale  
       B Coconino sandstone  
       C Toroweap limestone

2. What information can a geologist infer by examining sedimentary rock?

This item measures student understanding of the use of sedimentary rocks to infer Earth’s past.

**Criterion for a complete response:**

1. Student indicates that sedimentary rocks provide information about Earth’s past. This can include information on the environment, the relative layering of rock layers, or how the environment changed due to the changing rock layers. Examples: *The rocks tell what the environment was like. The rocks can tell which was deposited first, second, or third.*

| Code | Response   |
|------|--|
|      | <b><i>Complete Response</i></b>  |
| 20   | Meets criterion.   |
| 29   | Any other scientifically correct response.   |
|      | <b><i>Partially Correct Response</i></b>   |
| 10   | Response refers to the <u>properties</u> of sedimentary rocks rather than the environment of deposition. Examples: <i>The rocks have fossils. The rocks react with acid.</i> |
| 19   | Any other partially correct response.  |
|      | <b><i>Incorrect Response</i></b>   |
| 70   | Response only indicates rock type: limestone, shale, sandstone.  |
| 79   | Any other incorrect response.  |
|      | <b><i>Non-Response</i></b>   |
| 90   | Crossed out, erased, illegible, or impossible to interpret.  |
| 99   | Blank.   |

3. Observe the sample you identified as limestone. What can you infer about the environment in which this limestone layer (D) was formed?

This item measures the student’s knowledge that seashell fossils occur in a marine environment or aquatic environment.

**Criterion for a complete response:**

1. Infers that this layer formed in an aquatic or marine environment.

| Code | Response  |
|------|---|
|      | <b><i>Complete Response</i></b>                             |
| 10   | Response meets criterion.                                   |
| 19   | Any other scientifically correct response.                  |
|      | <b><i>Incorrect Response</i></b>                            |
| 70   | States seashells were deposited on a beach.                 |
| 71   | States rock layer formed at sea level.                      |
| 72   | States rock layer was formed on land.                       |
| 76   | Repeats the stem of the question.                           |
| 79   | Any other incorrect response.                               |
|      | <b><i>Non-Response</i></b>                                  |
| 90   | Crossed out, erased, illegible, or impossible to interpret. |
| 99   | Blank.  |

4. Why is this limestone layer (D) no longer on the top surface?

This item measures the student's understanding of the concept of sediment deposition in undisturbed layers.

**Criterion for a complete response:**

1. Includes the idea that more sediment (layers) has been deposited (formed) on top of the seashell layer.

| Code | Response  |
|------|---|
|      | <b><i>Complete Response</i></b>   |
| 10   | Response meets criterion.   |
| 19   | Any other scientifically correct response.  |
|      | <b><i>Incorrect Response</i></b>  |
| 70   | States more layers grew on top of the seashell layer.                                   |
| 71   | States the layer was eroded by various factors; for example, the water, the river, etc. |
| 72   | States the layer sank.  |
| 76   | Repeats the stem of the question.   |
| 79   | Any other incorrect response.   |
|      | <b><i>Non-Response</i></b>  |
| 90   | Crossed out, erased, illegible, or impossible to interpret                              |
| 99   | Blank   |

5. Which layer of the cliff is the oldest and which layer is the youngest? Explain why.

This item measures the student's understanding of layering.

**Criteria for a complete response:**

1. Includes that layer A is the youngest and layer G is the oldest.
2. Includes that rock layers are generally successively deposited one on top of the other.

| Code | Response  |
|------|---|
|      | <b><i>Complete Response</i></b>   |
| 20   | Response meets criteria one and two.  |
| 21   | States layer A is the youngest and layer G is the oldest because of superpositioning. |
| 29   | Any other scientifically correct response.  |
|      | <b><i>Partially Correct Response</i></b>  |
| 10   | Response meets criteria one.  |
| 11   | Gives explanation but omits youngest and oldest.                                      |
| 19   | Any other partially correct response.   |
|      | <b><i>Incorrect Response</i></b>  |
| 70   | Names layer G as the youngest and layer A as the oldest.                              |
| 71   | Names other layers as oldest and youngest.  |
| 76   | Repeats the stem of the question.   |
| 79   | Any other incorrect response.   |
|      | <b><i>Non-Response</i></b>  |
| 90   | Crossed out, erased, illegible, or impossible to interpret.                           |
| 99   | Blank.  |

6. Observe the sample you identified as sandstone. What can you infer about the environment in which sandstone layers (B and E) were formed?

This item measures the student’s understanding that sandstone was deposited in a beach environment or at the edge of water.

**Criterion for a complete response:**

1. Infers that this layer formed in a beach environment or near the water’s edge.

| Code | Response  |
|------|---|
|      | <b><i>Complete Response</i></b>                             |
| 10   | Response meets criterion.                                   |
| 19   | Any other scientifically correct response.                  |
|      | <b><i>Incorrect Response</i></b>                            |
| 70   | States sandstone formed under water.                        |
| 76   | Repeats the stem of the question.                           |
| 79   | Any other incorrect response.                               |
|      | <b><i>Non-Response</i></b>                                  |
| 90   | Crossed out, erased, illegible, or impossible to interpret. |
| 99   | Blank.  |

7. Observe the sample you identified as shale. What can you infer about the environment in which shale layer (C) was formed?

This item measures the student’s understanding that shale was formed in a still water environment such as a marsh or pond.

**Criterion for a complete response:**

1. Infers that this layer formed in a still water environment or indicates pond, lake, or other still water environment.

| <b>Code</b> | <b>Response</b>   |
|-------------|---|
|             | <b><i>Complete Response</i></b>                             |
| 10          | Response meets criterion.                                   |
| 19          | Any other scientifically correct response.                  |
|             | <b><i>Incorrect Response</i></b>                            |
| 70          | States shale formed in the ocean.                           |
| 76          | Repeats the stem of the question.                           |
| 79          | Any other incorrect response.                               |
|             | <b><i>Non Response</i></b>                                  |
| 90          | Crossed out, erased, illegible, or impossible to interpret. |
| 99          | Blank.  |

8. Observe layers D, C, and B. Layer D is limestone. Layer C is shale. Layer B is sandstone. This one location has three different rock types. What changes can you infer occurred to the environment during the time period when layers D, C, and B were deposited?

This item measures the student’s understanding that the different rock layers indicate that the environment changed (the area was under water when the limestone formed, then the water was calm for the shale to form, and then the area became a beach for the sandstone to form).

**Criterion for a complete response:**

1. Indicates that the environment changed from being under water to being above water.

| Code | Response   |
|------|--|
|      | <b><i>Complete Response</i></b>                                    |
| 10   | Response meets criterion.  |
| 19   | Any other scientifically correct response.                         |
|      | <b><i>Incorrect Response</i></b>                                   |
| 70   | Indicates that the environment went from being dry to under water. |
| 76   | Repeats the stem of the question                                   |
| 79   | Any other incorrect response                                       |
|      | <b><i>Non-Response</i></b>   |
| 90   | Crossed out, erased, illegible, or impossible to interpret         |
| 99   | Blank  |

9. The three pictures above show the same land area over a period of time. Describe how weathering, erosion, and deposition changed the land surface over time.

This item measures the student's understanding of weathering, erosion, and deposition in the context of change over time.

**Criterion for a complete response:**

1. Describes each of the processes that occur to cause the changes in landforms (i.e., over this time period, rock has been broken down by wind or water, and the land surface has become more rounded. The weathered material has been carried away by wind or water from the land surface and deposited in another location due to gravity.).

| Code | Response  |
|------|---|
|      | <b><i>Complete Response</i></b>                             |
| 20   | Response meets criterion.                                   |
| 29   | Any other scientifically correct response.                  |
|      | <b><i>Partially Correct Response</i></b>                    |
| 10   | Describes only two processes but omits deposition.          |
| 11   | Describes only two processes but omits weathering.          |
| 12   | Describes only two processes but omits erosion.             |
| 19   | Any other partially correct response.                       |
|      | <b><i>Incorrect Response</i></b>                            |
| 70   | Describes only one process.                                 |
| 71   | Incorrectly describes two or more processes.                |
| 76   | Repeats the stem of the question.                           |
| 79   | Any other incorrect response.                               |
|      | <b><i>Non-Response</i></b>                                  |
| 90   | Crossed out, erased, illegible, or impossible to interpret. |
| 99   | Blank.  |

10. The Delaware River begins in the mountains of New York and Pennsylvania. The river deposits sand sediments at the mouth of the Delaware Bay. Delaware beaches are covered by sand. Describe how the processes of weathering, erosion, and deposition are responsible for the sand.

This item measures the student’s understanding of the processes involved in the formation of sand sediments.

**Criterion for a complete response:**

1. Describes each of the processes that occur to cause the sand to form (i.e., rock in the mountains has been broken down by wind. The weathered material has been carried away by the river and deposited on the beach.)

| Code | Response  |
|------|---|
|      | <b><i>Complete Response</i></b>                             |
| 20   | Response meets criterion.                                   |
| 29   | Any other scientifically correct response.                  |
|      | <b><i>Partially Correct Response</i></b>                    |
| 10   | Describes only two processes but omits deposition.          |
| 11   | Describes only two processes but omits weathering.          |
| 12   | Describes only two processes but omits erosion.             |
| 19   | Any other partially correct response.                       |
|      | <b><i>Incorrect Response</i></b>                            |
| 70   | Describes only one process.                                 |
| 71   | Incorrectly describes two or more processes.                |
| 76   | Repeats the stem of the question.                           |
| 79   | Any other incorrect response.                               |
|      | <b><i>Non Response</i></b>                                  |
| 90   | Crossed out, erased, illegible, or impossible to interpret. |
| 99   | Blank.  |

11. Below is a geologic timeline. How do geologists know about Earth’s past if humans were not present on the Earth at that time? Give an example.

This item measures the student’s understanding of the use of sedimentary rocks and fossils to infer about Earth’s past.

**Criteria for a complete response:**

1. Indicates that the rocks and fossils provide evidence to Earth’s past.
2. Provides an accurate example using sedimentary rock layers or fossils to infer Earth’s past.

| <b>Code</b> | <b>Response</b>   |
|-------------|---|
|             | <b><i>Correct Response</i></b>                              |
| 10          | Response meets criterion above.                             |
| 19          | Any other completely correct response.                      |
|             | <b><i>Incorrect Response</i></b>                            |
| 70          | Response lacks example.                                     |
| 76          | Repeats the stem of the question.                           |
| 79          | Any other incorrect response.                               |
|             | <b><i>Non-Response</i></b>                                  |
| 90          | Crossed out, erased, illegible, or impossible to interpret. |
| 99          | Blank.  |

12.a. Geologists believe that the continents are continually moving. About 225 million years ago, the continents were connected together, but today the continents are separated. Describe one piece of evidence that geologists use to support this theory.

This item measures student’s understanding of the fossil evidence, rock type evidence, and match of continental coastline evidence that supports Plate Tectonic Theory.

**Criterion for a complete response:**

1. Describes that index fossils can be found on different continents or rock types match from one continent to another, or the coastlines of the continents fit together like a puzzle.

| Code | Response   |
|------|--|
|      | <b><i>Correct Response</i></b>   |
| 10   | Response meets criterion above.  |
| 19   | Any other completely correct response.   |
|      | <b><i>Incorrect Response</i></b>   |
| 70   | Describes fossil evidence but does not indicate that the fossils are index fossils.      |
| 71   | States that rocks “match” but does not indicate that rocks match on separate continents. |
| 72   | States that the continents fit together but does not indicate the coastlines.            |
| 76   | Repeats the stem of the question.  |
| 79   | Any other incorrect response.  |
|      | <b><i>Non-Response</i></b>   |
| 90   | Crossed out, erased, illegible, or impossible to interpret.                              |
| 99   | Blank.   |

12.b. Energy must be provided for things to move. Where does the energy come from for the continents to move?

This item measures student recall knowledge that energy from Earth's interior is responsible for the movement of continents.

**Criterion for a complete response:**

1. Indicates that the energy comes from inside the Earth.

| <b>Code</b> | <b>Response</b>   |
|-------------|---|
|             | <b><i>Correct Response</i></b>                              |
| 10          | Response meets criterion above.                             |
| 19          | Any other completely correct response.                      |
|             | <b><i>Incorrect Response</i></b>                            |
| 70          | States that the energy comes from the sun.                  |
| 76          | Repeats the stem of the question.                           |
| 79          | Any other incorrect response.                               |
|             | <b><i>Non-Response</i></b>                                  |
| 90          | Crossed out, erased, illegible, or impossible to interpret. |
| 99          | Blank.  |