

Scales of Change: Mastery Check

Learning target: I can show what I know about weathering, erosion, deposition and uplift, time and spatial scales, rates of change, sudden and gradual events, and uniformitarianism, and connect the ideas in a short explanation.

Retrieval and mastery check

About 40 min

Individual

MS-ESS2-2 · assesses

independent practice

writing

Name _____

Date _____

Period _____

Directions

Answer every item on your own without notes. For multiple-choice items, circle one letter. For numeric items, show the calculation with units. For the drawing item, use a ruler and label clearly. Part B is a paragraph; plan it for one minute before writing.

You will need: This worksheet, Pencil, Ruler for q12, Calculator (optional)

Part A: Retrieval (12 items)

1. Which statement describes weathering, erosion and deposition correctly?
 - ☐ A. Weathering carries rock away; erosion breaks it; deposition raises the crust.
 - ☐ B. Weathering breaks rock where it sits; erosion carries the pieces away; deposition drops them in a new place.
 - ☐ C. Weathering and erosion are two words for the same thing; deposition is the opposite of both.
 - ☐ D. Weathering happens only to sand; erosion happens only to boulders.
2. Which example best shows that a change can be large in space and fast in time?
 - ☐ A. A cave formation 30 cm long that took thousands of years
 - ☐ B. A continent that moved 2,500 km over 100 million years
 - ☐ C. Dust from an asteroid impact that cooled the whole planet within days
 - ☐ D. A beetle's footprint that pressed a few grains of sand
3. True or false: Uniformitarianism means that Earth's processes have always run at exactly the same speed, so sudden events did not happen in the past.
 - ☐ True ☐ False Explain your thinking:

4. A continent moves 3 cm per year. How far does it move in 2 million years? Give the answer in kilometers and show each unit step.

5. A hoodoo has a hard cap of rock on top of a softer pillar. Explain why the cap matters to the shape, and what finally happens to the hoodoo and why.

6. Fill in the process: _____ breaks rock apart in place; _____ carries loose rock away; _____ piles carried rock up in a new place; _____ raises a large area of crust from below.

7. A stream deepens its channel by 2 mm per year. At that rate, how many years would it take to cut a channel 40 m deep? Show your work.

8. Which is the best example of a **sudden** event whose **conditions took a long time to develop**?

- ☐ A. A volcanic eruption, because magma had been collecting underground for a long time before it erupted.
- ☐ B. A raindrop splash, because rain has fallen for billions of years.
- ☐ C. A river carving a canyon, because the river is still flowing.
- ☐ D. A glacier flowing downhill, because ice moves slowly.

9. Wind moves only a few sand grains at a time, yet some desert dunes are hundreds of meters tall. Explain how tiny changes can build something so large.

10. A mineral formation in a cave is 20 cm long and took 4,000 years to grow. Which cell of a time-and-space chart does it belong in?
- ☐ A. Small space, short time
- ☐ B. Small space, long time
- ☐ C. Large space, short time
- ☐ D. Large space, long time
11. A sea cliff retreats 0.4 m per year. A house stands 30 m from the edge. If the rate stays the same, in how many years will the edge reach the house? Then write one reason the real answer could be smaller.
- _____
- _____
- _____
12. Draw a time-and-space chart with two columns (small space, large space) and two rows (short time, long time). Place one labeled example in each of the four cells. Label both rulers.



Part B: Synthesis

13. Write a paragraph (5-7 sentences) that answers: **How can Earth's surface look stable from one year to the next and yet be constantly changing?** Your paragraph must use both scales (time and space), explain how small changes add up, include one sudden event and what set it up, and say what uniformitarianism lets scientists do.

Paragraph frame for Part B

Sentence 1: why a landscape looks stable (changes too small or slow to notice in a year). Sentence 2: an example of a slow change with a rate (millimeters or centimeters per year). Sentence 3: how that small change adds up over thousands or millions of years to a large one. Sentence 4: a sudden event and the slow conditions that set it up. Sentence 5: what the two rulers (time and space) tell you that one alone cannot. Sentence 6: what uniformitarianism lets scientists do with rates they measure today. Sentence 7: a closing sentence that answers the question.

Two-way check

After the quiz, trade with a partner and grade each other's chart (q12) using three checks: is each example really in the right cell for both rulers, are both rulers labeled, and could the partner explain why the large-space, short-time example is the hardest cell to fill? Then together write one more example for that cell that neither of you used.