What Wears Rock?

Plan a fair test of weathering rate

ESS.2B.6 "Plan and conduct a scientific investigation to determine how factors (e.g., wind velocity, water velocity, ice, and temperature) may affect the rate of weathering."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the factor changed in the investigation, circle what stays the same, and number the steps used to measure weathering rate. These marks will help you judge whether the test can answer its question.

Testing a Faster Current

1. After a storm, a creek can turn brown with rock particles. Does faster water wear down sandstone more quickly? A class could test that question in two shallow channels built by their teacher. Both channels would hold similar pieces cut from the same sandstone block. Small pumps would send water past the rocks for two hours. A flow meter at each rock would show the water speed: 0.2 meters per second in one channel and 0.6 meters per second in the other. Water speed is the factor deliberately changed; rock material is not.

2. Before the test, students would dry and weigh each rock. They would keep the channels, water source, starting rock size, and test time the same. They would add no sand or gravel because extra particles striking a rock could cause wear on their own. After the water runs, students would collect the rocks, dry them in the same way, and weigh them again. Mass lost is starting mass minus final mass. Dividing mass lost by two hours gives the weathering rate in grams per hour. Three rocks at each speed would help reveal whether one unusual rock affected the result.

3. Suppose the three slow-water rocks each lose about 0.3 gram, while the three fast-water rocks each lose about 0.7 gram. These are example results, not proof that every stream behaves the same way. Students would compare the average mass lost per rock at each speed, then calculate each group's rate. If the faster group repeatedly loses more mass per hour, the evidence supports the idea that faster water increases wear under these conditions. Students should also inspect both channels for stray sediment. If gravel entered only one channel, they could not tell whether water speed or gravel caused the extra wear.

2 ANSWER WITH EVIDENCE

Use the passage

1. What factor would the class change, and what two settings would it compare?

2. How would the class measure a rock's weathering rate in grams per hour?

3. Using the example results, what is the weathering rate for a fast-water rock?

4. Why should the class check for gravel in both channels before linking a difference in wear to water speed?

3 YOUR TURN

Your own words

Design a different investigation to test whether freezing and thawing wet sandstone affects its weathering rate. Name your comparison groups, what you would keep the same, how you would repeat the test, and how you would measure and compare rates.

ANSWER KEY

What Wears Rock?

HIGH SCHOOL · ESS.2B.6

PART 1 · READ AND MARK

Underline the factor changed in the investigation, circle what stays the same, and number the steps used to measure weathering rate. These marks will help you judge whether the test can answer its question. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What factor would the class change, and what two settings would it compare?	**The class would change water speed, comparing 0.2 and 0.6 meters per second.**
2	How would the class measure a rock's weathering rate in grams per hour?	**Subtract the rock's final dry mass from its starting dry mass, then divide the mass lost by two hours.**
3	Using the example results, what is the weathering rate for a fast-water rock?	**About 0.35 gram per hour, because 0.7 gram divided by two hours is 0.35 gram per hour.**
4	Why should the class check for gravel in both channels before linking a difference in wear to water speed?	**Gravel striking rocks could cause extra wear. If it entered only one channel, water speed would not be the only difference.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would dry and weigh six similar sandstone pieces, then add the same amount of water to each. I would freeze and thaw three pieces once a day for six days. I would keep the other three wet but above freezing for the same six days. I would use the same type of container for every piece. At the end, I would collect, dry, and weigh each rock and any loose grains separately. For each rock, I would divide its mass lost by six days, then compare the groups' average rates.

Accept equivalent plans that compare rocks exposed to ice with rocks kept above freezing while holding other conditions steady. The rate must include a measured change divided by a stated time or number of cycles.