Where Water Goes

Investigate how water moves through Earth materials.

EN.ESS2.5 "Plan and conduct investigations of how the structure and resulting properties of water interact with the Earth's materials and surface processes."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the steps that make the sand and gravel test a fair comparison, then circle the measurements collected. Number two details that help explain why water moved differently through the materials.

After the Rain

1. After a storm, a gravel path dries while a nearby patch of sand stays damp. Water does not move through these materials in the same way. Each H_2O molecule has an uneven charge: its oxygen end is slightly negative, and its hydrogen ends are slightly positive. This polarity helps water molecules cling to one another, called cohesion, and to many mineral surfaces, called adhesion. Water can also rise into narrow spaces between grains by capillary action. Grain size and the spaces between grains can therefore affect how quickly water drains and how much remains behind.

2. A class investigates drainage using dry sand and gravel. They put the same volume of each material into separate containers of the same size, with identical mesh-covered holes in the bottoms. They pour 100 mL of water into each container at the same rate and collect the water that drains out. They measure the collected volume after two minutes and again after ten minutes. To check whether the pattern holds, they repeat the test twice with fresh, dry materials. Using the same amount of water and the same equipment helps them test the effect of the material rather than an unrelated difference.

3. In one trial, the gravel released 78 mL in two minutes, while the sand released 34 mL. After ten minutes, the totals were 88 mL and 63 mL. The sand held more of the added water at both times, though some could also remain in the mesh or container. Larger gaps between gravel pieces offered an easier route downward. Narrower spaces between sand grains gave water more contact with mineral surfaces. This test models part of infiltration during a storm, but it cannot by itself predict flooding on a hillside, where slope, plant roots, and rainfall rate also matter.

2 ANSWER WITH EVIDENCE

Use the passage

1. Why did the class use the same volume of dry material and the same amount of water in both containers?

2. How did the class measure drainage over time, and why did they repeat the test?

3. Use a measurement and a property of water to explain why sand held more water than gravel.

4. The class wants to investigate runoff on a hillside next. Which factor named in the passage could they change, and what should they keep the same to test its effect?

3 YOUR TURN

Your own words

Design a test comparing how much water equal-size pieces of porous sandstone and dense, unfractured granite take up. Describe your measurements, at least two conditions you would keep the same, a way to repeat the test, and a prediction that links water's adhesion to pore space.

Where Water Goes

PART 1 · READ AND MARK

Underline the steps that make the sand and gravel test a fair comparison, then circle the measurements collected. Number two details that help explain why water moved differently through the materials. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Why did the class use the same volume of dry material and the same amount of water in both containers?	**These controls help isolate the effect of material type on drainage.**
2	How did the class measure drainage over time, and why did they repeat the test?	**They measured water collected after two and ten minutes. Repeating the test checked whether the drainage pattern held.**
3	Use a measurement and a property of water to explain why sand held more water than gravel.	**After ten minutes, sand had released 63 mL, compared with gravel's 88 mL. Sand's narrower spaces give water more contact with mineral surfaces, to which it can adhere.**
4	The class wants to investigate runoff on a hillside next. Which factor named in the passage could they change, and what should they keep the same to test its effect?	**They could change the slope while keeping the material and the amount of water the same.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would weigh dry pieces of sandstone and granite, soak each in water for ten minutes, blot each the same way, and weigh them again. The increase in mass would estimate water uptake. I would use equal-size pieces, the same water depth, and the same soaking time. I would repeat the test with more dry pieces of each rock. I predict the sandstone would gain more mass because water can enter its connected pores and adhere to surfaces inside them. Dense granite has fewer spaces for water to enter.

Accept plans that measure water uptake by another workable method and control conditions that could affect the comparison. Predictions should connect adhesion and pore space without claiming that all sandstone or granite samples behave identically.