Sponge Showdown

Design a fair test of water absorption per unit of sponge.

ZOO.2.5 "Enrichment: Use an engineering design process to determine the quantity of water that may be absorbed per unit in a natural sponge versus a synthetic sponge.*"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the test conditions held constant. Circle the table values you need to calculate water absorbed per gram of dry sponge in each trial.

Choosing a Cleanup Pad

1. A marine sponge is an animal whose porous body moves water through many tiny channels. A natural bath sponge is its cleaned, dried supporting skeleton, while a synthetic sponge is made from manufactured porous material. Both can hold water, but a larger piece may hold more simply because it has more material. A fair comparison needs a shared unit.

2. An engineering team is choosing a material for reusable cleanup pads. Its design goal is to absorb the most water per gram of dry sponge. The team cuts four samples to the same dry mass, 5.0 grams each. Every sample soaks in 200 milliliters of water for 60 seconds, then drips for 30 seconds before weighing.

3. The table reports two trials for each material. For each trial, subtract dry mass from mass after dripping to estimate grams of water absorbed. Divide that difference by 5.0 grams to find grams of water absorbed per gram of dry sponge. Compare the average of the two trials for each material before recommending a pad.

SPONGE ABSORPTION TEST

Material	Trial	Dry mass (g)	Mass after dripping (g)
Natural	1	5.0	28.0
Natural	2	5.0	30.0
Synthetic	1	5.0	35.0
Synthetic	2	5.0	33.0

2 ANSWER WITH EVIDENCE

Use the passage

1. How many grams of water did the natural sponge absorb per gram of dry sponge in trial 1? Show your calculation.

2. How many grams of water did the synthetic sponge absorb per gram of dry sponge in trial 2? Show your calculation.

3. Which material better meets the team's design goal? Compare the average water absorbed per gram across both trials for each material.

4. Suppose the synthetic samples dripped for only 10 seconds instead of 30 seconds. How could this affect the comparison?

3 YOUR TURN

Your own words

Design a follow-up test comparing water absorbed per cubic centimeter of dry sponge instead of per gram. In 4 to 5 sentences, explain how you will measure dry volume, keep two test conditions the same, calculate absorption per cubic centimeter, and use repeat trials to choose a material.

ANSWER KEY

Sponge Showdown

HIGH SCHOOL · ZOO.2.5

PART 1 · READ AND MARK

Underline the test conditions held constant. Circle the table values you need to calculate water absorbed per gram of dry sponge in each trial. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How many grams of water did the natural sponge absorb per gram of dry sponge in trial 1? Show your calculation.	**(28.0 − 5.0) ÷ 5.0 = 4.6 grams of water per gram of dry sponge.**
2	How many grams of water did the synthetic sponge absorb per gram of dry sponge in trial 2? Show your calculation.	**(33.0 − 5.0) ÷ 5.0 = 5.6 grams of water per gram of dry sponge.**
3	Which material better meets the team's design goal? Compare the average water absorbed per gram across both trials for each material.	**Natural: 4.8 g/g. Synthetic: 5.8 g/g. Synthetic better meets the goal by 1.0 g/g.**
4	Suppose the synthetic samples dripped for only 10 seconds instead of 30 seconds. How could this affect the comparison?	**The synthetic samples might retain more water, making their absorption per gram appear higher than it would under the same drip time.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I will cut rectangular blocks from each sponge and measure their length, width, and height to calculate each dry volume in cubic centimeters. I will soak every block in the same volume of water for 60 seconds and let it drip for 30 seconds. For three blocks of each material, I will subtract dry mass from mass after dripping, then divide that difference by the block's dry volume. I will choose the material with the higher average grams of water absorbed per cubic centimeter.

Accept equivalent calculations with units. For the follow-up design, accept other workable ways to measure dry volume if the response also controls test conditions, uses repeat trials, and compares water absorbed per unit of volume.