Sugar on the Clock

Use a controlled test to compare dissolving rates.

PS.6 "Obtain, evaluate, and communicate information to explain how the properties of various types of solutions make them useful in real-world applications. a. Plan and carry out investigations to determine how various factors..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline what stayed the same in every trial, circle the condition that changed in each nonbaseline trial, and number the trials from fastest to slowest. Use your marks to judge what the results show.

A Faster Drink Mix

1. At a drink stand, a volunteer wants sugar to disappear quickly in water before serving a drink. Sugar is the solute, and water is the solvent. A dissolving-rate test measures how long a fixed amount of sugar takes to disappear, not how much sugar can dissolve in total. Temperature, exposed surface area, and stirring could each change that time.

2. Four trials each used 2 grams of sugar and 100 milliliters of water. The baseline used one intact sugar cube in water at 20°C without stirring. Each other trial changed only one condition: warmer water, crushed sugar with more exposed surface, or stirring. A stopwatch started when sugar touched water and stopped when no solid remained.

TIME FOR 2 GRAMS OF SUGAR TO DISSOLVE

Trial	Conditions	Time (seconds)
Baseline	Intact cube, 20°C, no stirring	120
Warm	Intact cube, 40°C, no stirring	55
Crushed	Crushed sugar, 20°C, no stirring	70
Stirred	Intact cube, 20°C, stirring	80

3. Warm water gave the shortest time in this test. The trials do not show what happens when two conditions change together, or how much sugar can eventually dissolve in each cup. These times apply to these materials and amounts, not every solute. Repeating each trial would help check whether the pattern is reliable.

2 ANSWER WITH EVIDENCE

Use the passage

1. How many seconds did warming the water save compared with the baseline? What does that result show about dissolving rate in this test?

2. How did the crushed trial differ from the baseline, and what result suggests that exposed surface area mattered?

3. If the volunteer cannot heat the water, which tested change was faster, crushing or stirring? Cite both times.

4. A classmate claims the warm trial proves that more sugar can dissolve in warm water. Does this test support that claim? Explain.

3 YOUR TURN

Your own words

Design a two-trial test to find out whether stirring changes how fast table salt dissolves in water. Describe what you would change, what you would keep the same, how you would measure the result, and one practical use for what you learn.

Sugar on the Clock

PART 1 · READ AND MARK

Underline what stayed the same in every trial, circle the condition that changed in each nonbaseline trial, and number the trials from fastest to slowest. Use your marks to judge what the results show. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How many seconds did warming the water save compared with the baseline? What does that result show about dissolving rate in this test?	**Warming saved 65 seconds, from 120 to 55 seconds. The sugar dissolved faster in the warmer water.**
2	How did the crushed trial differ from the baseline, and what result suggests that exposed surface area mattered?	**The same mass of sugar was crushed instead of left as an intact cube. It dissolved in 70 seconds rather than 120 seconds.**
3	If the volunteer cannot heat the water, which tested change was faster, crushing or stirring? Cite both times.	**Crushing was faster: 70 seconds for crushed sugar compared with 80 seconds for stirring an intact cube.**
4	A classmate claims the warm trial proves that more sugar can dissolve in warm water. Does this test support that claim? Explain.	**No. Every trial used 2 grams of sugar, and the test measured time to dissolve, not the greatest amount that could dissolve.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would put 2 grams of table salt into each of two cups containing 100 milliliters of water at 20°C. I would stir one cup at a steady pace and leave the other cup unstirred. I would start a timer when the salt enters each cup and stop it when no solid salt remains. Comparing the times would show whether stirring changed the dissolving rate in this test. The result could help someone prepare a saltwater rinse quickly.

Accept other fair two-trial plans that change only stirring, keep salt amount and water conditions constant, and measure time until the salt dissolves. A practical use should relate to preparing a salt solution.