Heat Test Plans

Use scientific ideas to plan and evaluate a fair design test.

PS.1.b.iv "planning and carrying out investigations apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the scientific idea and the design goal. Circle the variable the students changed, then number three details they kept the same to make the test fair.

Which Covering Slows Warming?

1. Students in Maya's class needed to keep a cup of cold water from warming during a 20-minute walk outside. They applied the idea that heat moves from warmer air to cooler objects. Their goal was to compare cup coverings, not to see which cup happened to start coldest. The team chose three coverings: no wrap, one layer of cotton fabric, and bubble wrap. Each covering was placed around an identical cup with a lid for the test.

2. To make the test fair, the students poured 200 milliliters of water at 8°C into every cup. They set all cups on the same shaded bench and began timing at the same moment. The covering type was the variable they changed. Cup size, lid type, water amount, starting temperature, location, and test time were controlled variables. After 20 minutes, they measured each water temperature with the same thermometer. They planned three trials because one measurement could be unusual.

3. The bubble-wrapped cup had the lowest average final temperature, 11°C. The cotton-covered cup averaged 14°C, while the uncovered cup averaged 17°C. Because all cups began at 8°C, the bubble-wrapped cup warmed by 3°C. The others warmed by 6°C and 9°C. The evidence supports bubble wrap as the best tested covering because it slowed heat transfer the most. The class could improve confidence by repeating the trials on another day and averaging the results again for each covering.

2 ANSWER WITH EVIDENCE

Use the passage

1. What problem were the students trying to solve, and what scientific idea guided their test?

2. What variable did the students change? Name two controlled variables.

3. Why did the students use the same thermometer and plan three trials?

4. Which covering should the class choose? Use the temperature evidence to explain your answer.

3 YOUR TURN

Your own words

A lunchbox must keep a warm tortilla warm for 15 minutes. Complete the table to plan a fair test of three covering materials, including what will stay the same, how you will measure results, and a prediction for each design.

COVERING MATERIAL	WHAT STAYS THE SAME	HOW RESULTS ARE MEASURED	PREDICTION

ANSWER KEY

Heat Test Plans

GRADES 7-8 · PS.1.b.iv

PART 1 · READ AND MARK

Underline the scientific idea and the design goal. Circle the variable the students changed, then number three details they kept the same to make the test fair. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What problem were the students trying to solve, and what scientific idea guided their test?	**They wanted to keep cold water from warming. They used the idea that heat moves from warmer air to cooler objects.**
2	What variable did the students change? Name two controlled variables.	**They changed the cup covering. Controlled variables included cup size, lid type, water amount, starting temperature, location, and test time.**
3	Why did the students use the same thermometer and plan three trials?	**Using the same thermometer helped make measurements consistent. Three trials reduced the effect of one unusual measurement.**
4	Which covering should the class choose? Use the temperature evidence to explain your answer.	**They should choose bubble wrap. Its average final temperature was 11°C, so it warmed only 3°C, less than cotton or no wrap.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

COVERING MATERIAL	WHAT STAYS THE SAME	HOW RESULTS ARE MEASURED	PREDICTION
Felt sleeve	Same tortilla mass, starting temperature, container, room, and 15-minute test	Measure temperature with the same thermometer at 0 and 15 minutes; repeat three trials	It will stay warmer than no covering.
Foam sleeve	Same tortilla mass, starting temperature, container, room, and 15-minute test	Measure temperature with the same thermometer at 0 and 15 minutes; repeat three trials	It will keep the tortilla warmer than the felt sleeve.
No covering	Same tortilla mass, starting temperature, container, room, and 15-minute test	Measure temperature with the same thermometer at 0 and 15 minutes; repeat three trials	It will have the lowest final temperature.

Accept any accurate statement of the heat-transfer principle and any two listed controlled variables. For Part 3, accept reasonable materials and predictions if the plan changes only the covering and gives a consistent temperature measurement method.