Color Under Cover

Test competing models against temperature data

FSL.3D "Students will apply scientific literacy and thinking skills to evaluate theoretical models, inferences, and experimental results found in various experimental designs including, but not limited to..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each model's prediction. Circle the table values that test those predictions so you can decide which model the data support.

Which Surface Heats Faster?

1. On a clear afternoon, a class tested whether surface color changes heating. They painted identical metal squares black or white. Every square began at 22°C. Some lay in direct sunlight; others rested in shade nearby. After ten minutes, students measured each square's surface temperature. They repeated each condition three times and reported the average.

2. Model A says dark paint absorbs more incoming sunlight than pale paint. It predicts a larger temperature rise for black squares in sunlight, but little difference in shade. Model B says black paint makes a surface warm faster regardless of light. It predicts a larger rise for black squares in both settings. The averages appear below.

AVERAGE SURFACE TEMPERATURES

Light setting	Paint color	Start (°C)	After 10 min (°C)
Sunlight	Black	22	38
Sunlight	White	22	30
Shade	Black	22	23
Shade	White	22	23

3. The class concluded that its data favor Model A over Model B. Still, the test used only one type of metal, two paint colors, and a single ten minute period. The averages also hide variation among repeated trials. A prediction for cloudy conditions should use the models carefully: cloudy skies reduce direct sunlight but do not block all light.

2 ANSWER WITH EVIDENCE

Use the passage

1. Does the sunlight result support Model A's prediction? Use the temperature rises for both colors.

2. Does the shade result support or contradict Model B's prediction? Explain with table values.

3. Compare the temperature gap between colors in sunlight and in shade. What pattern does this reveal about light?

4. Why do these results favor Model A without proving it applies to every surface?

3 YOUR TURN

Your own words

On a cloudy morning, some sunlight still reaches the squares, but less than on the clear afternoon. Predict how the temperature gap between black and white squares might compare with the gaps in the table. In three sentences, use Model A and both light settings as evidence, then explain one uncertainty.

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PART 1 · READ AND MARK

Underline each model's prediction. Circle the table values that test those predictions so you can decide which model the data support. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Does the sunlight result support Model A's prediction? Use the temperature rises for both colors.	**Yes. In sunlight, black rose 16°C and white rose 8°C, so black had the larger rise.**
2	Does the shade result support or contradict Model B's prediction? Explain with table values.	**It contradicts Model B's prediction. Both colors rose from 22°C to 23°C in shade; black did not warm faster.**
3	Compare the temperature gap between colors in sunlight and in shade. What pattern does this reveal about light?	**The final temperatures differ by 8°C in sunlight and 0°C in shade. In this test, the color difference appeared only with direct sunlight.**
4	Why do these results favor Model A without proving it applies to every surface?	**The results fit Model A, but the class tested only one metal, two colors, and one time period. The averages also hide differences among trials.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Under cloudy skies, I predict the black square will finish warmer than the white square, but the gap will be smaller than the 8°C gap in direct sunlight. Model A links the difference to absorbed sunlight, and the table shows no gap in shade. The experiment did not test cloudy conditions, so the size of the gap is uncertain.

Accept a reasoned prediction that places the cloudy gap between the sunlight and shade gaps, or states that its exact size cannot be determined. Students should connect their prediction to Model A and both table settings.