Heat on the Move

Use temperature data to trace thermal energy transfer

PS.1.b "Collect, analyze, and use data to explain how thermal energy is transferred by conduction, convection, and radiation."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline details in the passage that show how thermal energy could reach each thermometer, and circle each setup's starting and final temperatures in the table.

Three Ways Heat Travels

1. In a school lab, students tested how thermal energy reaches places away from a heat source. Every thermometer began at 22 °C, and each reading was taken four minutes after heating began. A metal spoon's bowl sat in hot water while its handle remained out of the water. A thermometer touched the far end of the handle.

2. In a clear cup, students warmed water gently from below. They measured the water near the bottom and near the surface. Warm water becomes less dense and tends to rise, while cooler water sinks. This movement can carry thermal energy through a liquid, even to places that do not touch the heater.

3. A lamp shone on a dark card across a gap of still air. A second card sat behind an opaque screen, which blocked the lamp's light but allowed air to move around it. Both cards started at the same temperature. Thermal energy can also travel through direct contact between particles or as electromagnetic waves that cross empty space.

TEMPERATURE READINGS

Setup	Thermometer location	Start (°C)	After 4 min (°C)
Spoon in hot water	Far end of handle	22	35
Water warmed below	Near surface	22	31
Water warmed below	Near bottom	22	34
Card facing lamp	On card	22	30
Card behind screen	On card	22	23

2 ANSWER WITH EVIDENCE

Use the passage

1. How much did the far end of the spoon handle warm? Explain how thermal energy reached that end.

2. Compare the two water readings. What evidence suggests that convection carried thermal energy toward the surface?

3. Compare the two cards' temperature changes. How do the readings support radiation as a way energy reached the card facing the lamp?

4. A student says radiation is always slower than conduction because the spoon warmed more than the card facing the lamp. Use the data and the setups to assess this claim.

3 YOUR TURN

Your own words

Design a different test for one thermal energy transfer method using objects not in the passage. In 3 to 5 sentences, name two conditions to compare, state what temperature data you would collect and when, predict a result, and explain how that result would support your chosen method.

ANSWER KEY

Heat on the Move

HIGH SCHOOL · PS.1.b

PART 1 · READ AND MARK

Underline details in the passage that show how thermal energy could reach each thermometer, and circle each setup's starting and final temperatures in the table. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How much did the far end of the spoon handle warm? Explain how thermal energy reached that end.	**It warmed 13 °C. Thermal energy moved by conduction through the metal spoon from its bowl toward the handle.**
2	Compare the two water readings. What evidence suggests that convection carried thermal energy toward the surface?	**The surface warmed 9 °C, while the water near the bottom warmed 12 °C. The surface warmed even though the cup was heated from below, consistent with warmer water rising.**
3	Compare the two cards' temperature changes. How do the readings support radiation as a way energy reached the card facing the lamp?	**The card facing the lamp warmed 8 °C, but the screened card warmed only 1 °C. Blocking the lamp's light greatly reduced warming, supporting transfer by radiation.**
4	A student says radiation is always slower than conduction because the spoon warmed more than the card facing the lamp. Use the data and the setups to assess this claim.	**The spoon warmed 13 °C and the card warmed 8 °C in four minutes. That does not prove one method is always slower because the setups used different objects and heat sources.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would place one end of a metal strip against a warm heat pack and keep an identical strip nearby without touching the pack. Both strips would start at the same temperature, and I would measure their far ends at the start and after three minutes. I predict the strip touching the pack will have a larger temperature rise at its far end. That result would support conduction because energy can enter the strip through contact and move along it.

Accept explanations that use the temperature changes as evidence and identify the relevant transfer method. For the open task, accept a feasible comparison with timed temperature measurements and a prediction linked to conduction, convection, or radiation.