

Heat Clues

Use a pattern in test results to explain heat transfer and plan a fair test.

7.5.A "identify and apply patterns to understand and connect scientific phenomena or to design solutions;"

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB In the table, underline all four numbers in the Temperature Drop column. Draw a downward arrow from each temperature drop to the next one, and circle the layer count beside the smallest drop.

Testing Felt Layers

- ① During a cold-weather test, students wrapped identical jars of warm water in different numbers of felt layers. Each jar began at 60°C and sat in the same room for 20 minutes. The table shows how much each jar's temperature dropped. A smaller drop means the water kept more of its thermal energy.

WARM WATER JAR TEST

Felt Layers	Temperature Drop After 20 Minutes
0	12°C
1	8°C
2	5°C
3	3°C

- ② The results form a pattern: as the number of felt layers rises, the temperature drop becomes smaller. Felt traps pockets of air. Air is a poor conductor, so less thermal energy moves from the warm water to the cooler room. The drops are not equal amounts, but every added layer reduced cooling in this test.
- ③ A camping group wants to keep soup warm on a chilly hike. They can use this pattern to choose a container with insulating material, rather than a thin metal cup alone. They should also test one variable at a time, such as the number of insulation layers, while keeping the starting soup temperature, container size, and waiting time the same.

2

ANSWER WITH EVIDENCE

Use the passage

1

State the pattern between the number of felt layers and the temperature drop.

2

Compare the jars with 0 felt layers and 3 felt layers. What two temperature drops show that felt reduced cooling?

3

Use the passage to explain why felt layers help warm water stay warm.

4

Why should the camping group keep the waiting time the same when testing different numbers of insulation layers?

3

YOUR TURN

Your own words

YOUR TURN: Plan a fair test of three cup coverings for keeping hot cocoa warm. In each row, name a covering, list conditions you would keep the same, and predict its temperature drop. Include one covering with no insulation and one with more than one felt layer.

CUP COVERING	CONDITIONS KEPT THE SAME	PREDICTED TEMPERATURE DROP

PART 1 • READ AND MARK

In the table, underline all four numbers in the Temperature Drop column. Draw a downward arrow from each temperature drop to the next one, and circle the layer count beside the smallest drop. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	State the pattern between the number of felt layers and the temperature drop.	As the number of felt layers increases, the temperature drop decreases.
2	Compare the jars with 0 felt layers and 3 felt layers. What two temperature drops show that felt reduced cooling?	The jar with 0 layers dropped 12°C, and the jar with 3 layers dropped 3°C.
3	Use the passage to explain why felt layers help warm water stay warm.	Felt traps pockets of air. Because air is a poor conductor, less thermal energy moves from the warm water to the cooler room.
4	Why should the camping group keep the waiting time the same when testing different numbers of insulation layers?	They should change only one variable at a time. If waiting time changes, they cannot tell whether the insulation layers or the different waiting time caused the temperature change.

PART 3 • YOUR TURN (SAMPLE ANSWER)

CUP COVERING	CONDITIONS KEPT THE SAME	PREDICTED TEMPERATURE DROP
No insulation	Same cup size, cocoa amount, starting temperature, room, and waiting time	Largest temperature drop
1 felt layer	Same cup size, cocoa amount, starting temperature, room, and waiting time	Smaller drop than no insulation
3 felt layers	Same cup size, cocoa amount, starting temperature, room, and waiting time	Smallest temperature drop

Accept equivalent statements that identify the inverse pattern between felt layers and temperature drop and connect insulation to reduced heat transfer. For the Your Turn table, accept reasonable coverings and predictions if the student controls key conditions and predicts less cooling with added felt layers.