

Observation, evidence, explanation

Target: Explain a temperature pattern using observations and a scientific idea. Prerequisites: read headings/°C/time, subtract and identify warming/cooling. Follow one sample from its start to finish. An observation describes a supplied reading. Evidence is a relevant observation selected for a question. An explanation connects evidence to a scientific idea.

H is 100 g of water in a covered cup. All surroundings stay at 23°C. Covered liquid water; no active heating/cooling, ice, phase change, direct sunlight or meaningful evaporative cooling. Room, cup, lid and supporting surfaces are at the stated surrounding temperature; it stays constant. Readings represent the sample temperature with a consistent procedure. This is a paper scenario, not apparatus instructions.

Start and finish of one sample

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Sample	Start (°C)	After 10 min (°C)
H	13	17

1. Identify the sample and surroundings, their starting temperatures, the interval and the sample’s change.

2. Classify these fictional statements: (a) H reads 17°C at 10 min; (b) I use 13 – 17°C to show warming; (c) energy transfers from warmer surroundings toward cooler water. Which adds a scientific explanation?

Vocabulary: sample = the matter being studied; surroundings = parts outside that sample; net = overall transfer after transfers in opposite directions are considered. You may point, speak or draw.

Explain this record

Question: Why did the water’s temperature change during these 15 minutes? We are explaining one pattern, not choosing a winning sleeve.

One 100 g covered liquid-water sample begins at 12°C. Surroundings stay at 24°C. Covered liquid water; no active heating/cooling, ice, phase change, direct sunlight or meaningful evaporative cooling. Room, cup, lid and supporting surfaces are at the stated surrounding temperature; it stays constant. Readings represent the sample temperature with a consistent procedure. This is a paper scenario, not apparatus instructions.

Supplied water readings from one run

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Elapsed time (min)	Water (°C)
0	12
5	14
10	16
15	17

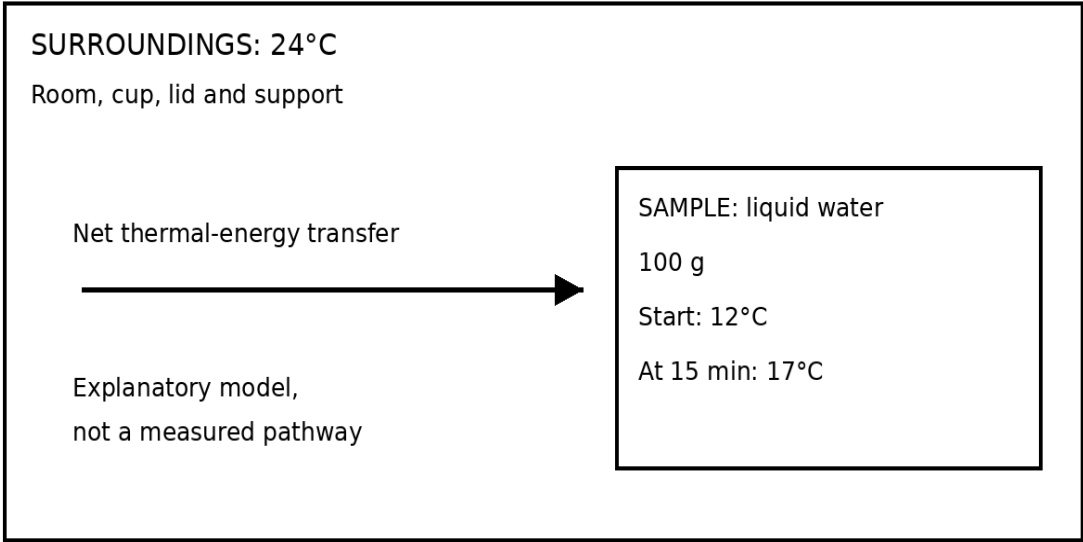
Fictional incomplete response: “It was 12°C at the start and 17°C at 15 minutes. It went up 5°C.”

1. Which part of this response describes the record? What explanatory connection is still missing?

2. Use the warmer/cooler parts and net energy transfer to extend the answer. Include a limit.

Model representation · Sample and surroundings

repeated:100 g water,12°C start → 17°C at 15 min; all surroundings 24°C. This representation explains the record. Its arrow is a scientific model, not a thermometer observation.



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Outer box: surroundings 24°C, including room, cup, lid and support. Inner box: liquid-water sample,100 g,12°C at start and 17°C at 15 min. One arrow points from surroundings toward water and is labeled net thermal-energy transfer. The arrow does not identify a pathway or show particles crossing.

1. What is observed in the table? What does the representation add? Does it prove that only conduction occurred?

The accompanying text describes every label and arrow. A diagram can show reasoning without a fixed paragraph format.

Guided practice · Explain a different record

One 100 g water sample begins at 37°C. Covered cup and other surroundings stay at 21°C. Covered liquid water; no active heating/cooling, ice, phase change, direct sunlight or meaningful evaporative cooling. Room, cup, lid and supporting surfaces are at the stated surrounding temperature; it stays constant. Readings represent the sample temperature with a consistent procedure. This is a paper scenario, not apparatus instructions.

One run, not four independent trials

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Elapsed time (min)	Water (°C)
0	37
5	34
10	32
15	30

1. Select two relevant readings and describe the size and direction of change.

2. Name sample/surroundings and the direction of net thermal-energy transfer. Explain how that connects to the readings.

3. Evaluate the fictional statement “The lower reading means a better sleeve.” What question are we answering, and what cannot this table establish?