

Heat Changes Matter

Track how heat transfer affects temperature and state.

SC.7.P.11.1 "Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each sentence that tells what happens when heat enters or leaves a system. Circle each temperature change, and number each change of state.

Three Heat Events

- ① At a winter picnic, Maya places a sealed bottle of liquid water in a cooler packed with ice and salt. Thermal energy moves from the warmer water to the colder ice-and-salt mixture. As the water loses heat, its particles move more slowly. The water temperature drops. If enough heat leaves the water, the particles become locked into a solid arrangement, and the water freezes. Removing heat can therefore cause both a temperature change and a change of state.
- ② Later, Maya sets the frozen bottle on a sunny bench. Heat from sunlight and surrounding air enters the bottle. At first, the ice warms. When it reaches its melting point, continued heat breaks attractions that hold particles in solid positions. During melting, the temperature remains nearly constant while the solid becomes liquid. The added heat causes a change of state instead of a temperature increase. The process continues until all the ice has melted.
- ③ On a hot afternoon, a wet towel cools Maya's wrist as water on the towel evaporates. The water absorbs heat from her skin. Some liquid particles gain enough energy to escape into the air as water vapor. This liquid-to-gas change is evaporation. Because energy leaves Maya's skin, her skin temperature can decrease. In every case, identify the system first, then ask whether heat enters or leaves it and whether its temperature, state, or both can change.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 In the cooler, which way does thermal energy move, and what can happen to the water if enough heat leaves it?

2 Why does the ice's temperature remain nearly constant while it melts on the sunny bench?

3 What change of state happens to the towel water, and why can Maya's skin temperature decrease?

4 According to the passage, what two questions should you ask after you identify a system?

3 YOUR TURN _____ Your own words

Describe a different everyday event involving heat. In four sentences, identify the system, tell whether heat enters or leaves it, and explain whether its temperature, state, or both change.

PART 1 • READ AND MARK

Underline each sentence that tells what happens when heat enters or leaves a system. Circle each temperature change, and number each change of state. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	In the cooler, which way does thermal energy move, and what can happen to the water if enough heat leaves it?	Thermal energy moves from the water to the ice-and-salt mixture. The water temperature drops and it can freeze into a solid.
2	Why does the ice's temperature remain nearly constant while it melts on the sunny bench?	The added heat breaks attractions holding particles in solid positions. The energy causes melting, a solid-to-liquid change of state, instead of raising the temperature.
3	What change of state happens to the towel water, and why can Maya's skin temperature decrease?	The water evaporates, changing from liquid to gas. It absorbs heat from Maya's skin, so energy leaves her skin and its temperature can decrease.
4	According to the passage, what two questions should you ask after you identify a system?	Ask whether heat enters or leaves the system. Then ask whether its temperature, state, or both can change.

PART 3 • YOUR TURN (SAMPLE ANSWER)

A pat of butter sits in a warm pan. The butter is the system, and heat enters it from the pan. Its temperature rises until it reaches its melting point. As it melts from a solid to a liquid, added heat causes a change of state.

Accept equivalent wording that correctly identifies the direction of heat transfer and its effect on the named system. For melting, students should recognize that added heat can change state without increasing temperature.