Heat on the Move

Trace how thermal energy crosses a system boundary.

7.8.A "investigate methods of thermal energy transfer into and out of systems, including conduction, convection, and radiation;"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline every detail that shows thermal energy entering or leaving the system. Circle each use of *conduction*, *convection*, or *radiation* so you can trace the method and direction of transfer.

Soup at the Campsite

1. At a campsite, a metal pot of soup sits on a hot metal burner. Treat the soup, pot, and spoon as one system. Thermal energy enters this system when the hot burner touches the bottom of the pot. In conduction, energy moves through direct contact between particles. The metal pot conducts energy from its hot bottom toward its cooler sides. A metal spoon in the soup also becomes warmer because particles in the spoon and soup collide. The surrounding air is outside the system.

2. As the soup heats, thermal energy also moves by convection. The liquid near the pot bottom warms, expands, and becomes less dense. Cooler, denser liquid sinks to replace it. This repeating motion forms convection currents that spread energy through the soup. Much of the liquid can warm even though it never touches the pot. Air above the stove can form currents too. Warm air rises and cooler air moves in. Convection transfers energy by the movement of liquids or gases, so it can carry thermal energy into other parts of the system.

3. Even without contact or moving fluid, the system can gain or lose thermal energy by radiation. The hot burner and hot pot emit infrared radiation. Some radiation from the burner reaches the pot, adding energy. At the same time, the warm pot and soup emit radiation to cooler surroundings, carrying energy out of the system. Radiation can travel across empty space, unlike conduction and convection. Later, sunlight can warm the pot by radiation even if the stove is off. More than one transfer method may occur at the same time.

2 ANSWER WITH EVIDENCE

Use the passage

1. What contact in the campsite system causes conduction to add thermal energy, and where does the energy move next in the pot?

2. How does the liquid's density change start a convection current in the soup?

3. Give one radiation event that brings thermal energy into the system and one radiation event that carries thermal energy out.

4. Why can conduction, convection, and radiation occur in the campsite system at the same time? Use one detail from the passage for each method.

3 YOUR TURN

Your own words

Choose a different everyday system. In three panels, sketch one conduction, one convection, and one radiation transfer that could occur. In each panel, draw an arrow and write a caption that names the method and tells whether thermal energy enters or leaves your system.

ANSWER KEY

Heat on the Move

GRADE 7 · TEKS 7.8.A

PART 1 · READ AND MARK

Underline every detail that shows thermal energy entering or leaving the system. Circle each use of *conduction*, *convection*, or *radiation* so you can trace the method and direction of transfer. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What contact in the campsite system causes conduction to add thermal energy, and where does the energy move next in the pot?	**The hot metal burner touches the pot bottom. Energy then conducts from the hot bottom toward the cooler sides of the pot.**
2	How does the liquid's density change start a convection current in the soup?	**Liquid near the bottom warms, expands, and becomes less dense. Cooler, denser liquid sinks to replace it, creating a repeating current.**
3	Give one radiation event that brings thermal energy into the system and one radiation event that carries thermal energy out.	**Radiation from the hot burner reaches the pot and adds energy. The warm pot and soup emit radiation to cooler surroundings, carrying energy out.**
4	Why can conduction, convection, and radiation occur in the campsite system at the same time? Use one detail from the passage for each method.	**Conduction occurs where the burner touches the pot. Convection occurs as warm soup rises and cooler, denser soup sinks. Radiation occurs as the burner sends infrared radiation to the pot and the warm pot and soup emit radiation outward.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Panel 1: System is a mug of hot cocoa. An arrow goes from the mug to a cool tabletop. Conduction carries thermal energy out of the system. Panel 2: An arrow goes upward from the cocoa surface with rising air. Convection carries thermal energy out of the system. Panel 3: An arrow goes from sunlight through a window to the mug. Radiation carries thermal energy into the system.

Accept equivalent descriptions that correctly identify direct contact for conduction, moving liquids or gases for convection, and infrared energy traveling without contact for radiation. For Your Turn, check that each panel has a correct method, a sensible arrow direction, and a stated system boundary.