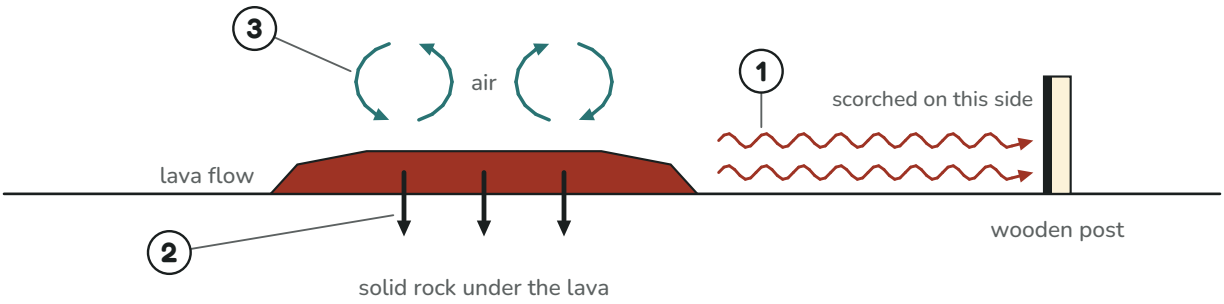
Heat Transfer: Name the Way It Moves

Grades 6-8

Name _____ Date _____

Directions: Left alone, thermal energy goes from a warmer thing to a cooler thing. **Conduction** hands it across where two materials touch. **Convection** takes it along inside a liquid or a gas that is on the move. **Radiation** sends it out as waves, which need no material to cross. In items 1 to 5 and in item 7, the answer is one of three words: **conduction, convection, radiation.**



Drawing for item 7: a side view of a lava flow on flat ground. A wooden post stands near the lava.

1. Batter is pressed between the two hot metal plates of a waffle iron. It browns where it meets the metal. _____

2. The burner of a hot-air balloon warms the air at the opening. That warmed air drifts upward, gathers under the crown of the balloon and takes its energy along. _____

3. After a clear, cold night, frost melts on the half of a lawn that the morning sun reaches. The shaded half, in air just as cold, stays white. _____

4. Bare feet stand on a cold tile floor, and the soles of the feet cool down. _____

5. A satellite sheds its waste heat from flat panels that face empty space. No air or other matter surrounds it. _____

6. A tub of ice cream at −18 °C is set down on packed snow at −2 °C. Energy moves out of the _____ and into the _____. How can you tell, when both of them feel cold?

7. In the drawing, each numbered arrow shows energy on the move. Name the way for each.
Arrow 1: _____ Arrow 2: _____ Arrow 3: _____

8. A hot baked potato has to stay warm for two hours on the way to a picnic. You may use two of these three things: a shiny silver emergency blanket, a thick wool mitten, an open steel can. Which two do you pick, and what does each one do to slow the loss of energy?

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Answer key

Items 1 to 5: one point each. Item 6: two points (direction, reason). Item 7: three points. Item 8: three points. Total 13. Accept "conducting", "convection current" and "radiant energy" or "infrared" for the three ways.

1. **conduction**
   The batter touches the hot plates, and energy passes straight across the contact.

2. **convection**
   The energy travels because the warmed air itself moves upward.

3. **radiation**
   The air is equally cold on both halves, so only the sunlight differs: waves from the Sun deliver the energy.

4. **conduction**
   Feet and floor touch. Energy leaves the warmer skin and enters the colder tile.

5. **radiation**
   With nothing touching the panels and no gas to flow, waves are the only way out.

6. **Out of the snow and into the ice cream. The snow is the warmer of the two (–2 °C is above –18 °C), and energy always leaves the warmer object.**
   Nothing called "cold" travels between them. What decides the direction is which temperature is higher, and here the gap is 16 °C.

7. **Arrow 1: radiation; Arrow 2: conduction; Arrow 3: convection**
   Arrow 1: sideways through the air to a post that touches nothing hot, and warm air would rise, not travel sideways. Arrow 2: straight down from the lava into the solid rock it rests on. Arrow 3: loops of moving air, up over the lava and down farther out.

8. **The blanket and the mitten. Wrapped around the potato, the shiny blanket reflects radiation back toward it. The wool mitten over the blanket holds still air in its fibers. Still air conducts poorly, which slows conduction to the outside.**
   One point for the pair and one for each job. For the blanket also accept "keeps steam and warm air in" (less convection). For the mitten also accept "insulator" or "stops air moving past the potato". The steel can is the weak choice: steel conducts quickly, and warm air rises out of its open top. A student who picks the can still earns the point for a correct job of the other thing chosen.