Heat on the Move

Find a central idea and the technical details that support it.

PS.1.f.i "obtaining, evaluating, and communicating information read scientific texts, including those adapted for classroom use, to determine the central idea and/or obtain scientific and/or technical information"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the one sentence that best states the passage's central idea. Number three technical details that explain how insulation slows thermal energy transfer.

How Insulation Works

1. Engineers use insulation to slow the transfer of thermal energy between places at different temperatures. In a cooler, foam insulation contains many tiny pockets of trapped air. Air transfers energy poorly compared with metal, so the foam reduces the rate at which heat moves from warm surroundings into cold food. Insulation does not create coldness or stop energy transfer completely. Instead, it gives heat less direct material through which to travel. This helps ice remain solid longer during a picnic.

2. Materials differ because their particles and structures affect how energy is transferred. Metals have particles arranged so that energy can pass through them quickly, making a metal spoon feel hot when one end rests in soup. Foam, wool, and fiberglass hold still air in small spaces. These spaces limit conduction, the transfer of thermal energy through direct contact. Shiny surfaces can also reflect some thermal radiation, energy that travels as waves. Different materials may slow different kinds of energy transfer.

3. Choosing insulation depends on the job. A winter coat uses layers of fabric and trapped air to reduce heat loss from a person's body to colder air. A spacecraft may use reflective layers because it faces strong radiation from the Sun. Engineers also consider mass, cost, safety, and whether a material works when wet. The best insulator is not always the thickest material. A useful design matches a material's properties to the main path by which thermal energy is likely to transfer.

2 ANSWER WITH EVIDENCE

Use the passage

1. What is the central idea of the passage?

2. Which technical detail explains why foam can help keep food cold in a cooler?

3. How does the passage connect a winter coat and a spacecraft to different kinds of thermal energy transfer?

4. Why does the author say that the best insulator is not always the thickest material? Use information from the passage.

3 YOUR TURN

Your own words

Choose an object that needs insulation, such as a drink bottle, house wall, or oven mitt. Write exactly three sentences that recommend a material or feature and explain how it would slow thermal energy transfer.

ANSWER KEY

Heat on the Move

GRADES 7-8 · PS.1.f.i

PART 1 · READ AND MARK

Underline the one sentence that best states the passage's central idea. Number three technical details that explain how insulation slows thermal energy transfer. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What is the central idea of the passage?	**Insulation slows thermal energy transfer, and effective insulation is chosen to match the way energy is most likely to transfer.**
2	Which technical detail explains why foam can help keep food cold in a cooler?	**Foam contains pockets of trapped air, and air transfers energy poorly compared with metal.**
3	How does the passage connect a winter coat and a spacecraft to different kinds of thermal energy transfer?	**A winter coat uses fabric layers and trapped air to reduce heat loss to colder air. A spacecraft may use reflective layers to deal with radiation from the Sun.**
4	Why does the author say that the best insulator is not always the thickest material? Use information from the passage.	**Different materials slow different kinds of energy transfer. A useful design matches a material's properties to the main path of thermal energy transfer, while also considering factors such as mass, cost, safety, and wet conditions.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

For a bottle that keeps cold water cold on a hot day, I would use foam with trapped air. Its still-air spaces would reduce conduction from the warm air into the bottle. A reflective outer surface could also reflect some thermal radiation.

Accept central-idea responses that include both slowing thermal energy transfer and matching a material to the transfer pathway. For the open response, accept reasonable object and material choices if the explanation accurately connects a material property to conduction or thermal radiation.