Skin in Balance

Trace how skin responses help regulate body temperature.

HAP.3.2 "Investigate specific mechanisms (e.g., feedback and temperature regulation) through which the skin maintains homeostasis."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Circle changes in temperature, underline the skin responses they trigger, and number one chain of signals and effects that moves core temperature toward its usual range.

From Track Practice to the Bus Stop

1. At the finish of a sunny track practice, Nia's skin feels warm and damp. Working muscles have released heat, and her core temperature has begun to rise. Temperature sensors in her body send information to the hypothalamus, a control center in the brain. It signals sweat glands to release sweat onto her skin. As sweat evaporates, it takes heat from her body. The hypothalamus also signals small blood vessels in her skin to widen. More warm blood flows near the surface, so heat can pass to the cooler air. Both responses help move her core temperature toward its usual range.

2. Later, Nia waits outside after sunset. The air is cold, and temperature sensors report the change. The hypothalamus now signals small vessels in her skin to narrow. Less warm blood reaches the surface, reducing the heat lost to the air. Her skin may feel cool even while her internal organs stay warmer. Sweat production also drops, so less heat is lost through evaporation. These responses do not create heat; they help conserve it. If her core temperature falls far enough, muscles may shiver to make heat, but shivering is a muscle response, not a skin response.

3. This shifting pattern is called negative feedback: a change away from the usual core temperature triggers responses that oppose that change. As the core temperature returns toward its usual range, the hypothalamus reduces the signals for cooling or heat conservation. Skin responses have limits. In very humid air, sweat evaporates slowly, so heavy sweating may cool the body poorly. In severe cold, narrowing skin vessels can reduce heat loss, but it cannot stop it. Skin helps regulate internal conditions by changing both heat release and heat conservation, not by keeping the skin at one fixed temperature.

2 ANSWER WITH EVIDENCE

Use the passage

1. After track practice, how does a rise in Nia's core temperature lead to cooling through sweat?

2. Why does widening skin blood vessels help Nia lose heat after practice?

3. At the cold bus stop, how do two skin responses help Nia conserve heat?

4. If Nia sweats heavily in very humid air, why might her core temperature remain high despite that cooling response?

3 YOUR TURN

Your own words

A student leaves a warm, humid greenhouse for a cool, dry hallway while still sweaty. In four to five sentences, predict how evaporation and skin blood vessels affect heat loss before and after the move, and explain how feedback changes the body's response as core temperature moves toward its usual range.

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PART 1 · READ AND MARK

Circle changes in temperature, underline the skin responses they trigger, and number one chain of signals and effects that moves core temperature toward its usual range. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	After track practice, how does a rise in Nia's core temperature lead to cooling through sweat?	**Temperature sensors send information to the hypothalamus, which signals sweat glands to release sweat. Evaporation takes heat from her body.**
2	Why does widening skin blood vessels help Nia lose heat after practice?	**Wider vessels bring more warm blood near the skin's surface, where heat can pass to the cooler air.**
3	At the cold bus stop, how do two skin responses help Nia conserve heat?	**Skin blood vessels narrow, bringing less warm blood to the surface, and sweat production drops, reducing heat loss through evaporation.**
4	If Nia sweats heavily in very humid air, why might her core temperature remain high despite that cooling response?	**Humid air slows sweat evaporation, so sweating removes less heat from her body.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

In the warm, humid greenhouse, sweat evaporates slowly, so it removes less heat even if the student sweats heavily. If the student's core temperature is high, skin blood vessels widen to release more heat. In the cool, dry hallway, sweat evaporates faster, and the cooler air allows more heat to leave through the skin. As core temperature returns toward its usual range, negative feedback reduces the cooling signals; if the student becomes too cold, skin vessels narrow to conserve heat.

Accept responses that distinguish the trigger, the hypothalamus's signals, and the effects of skin responses on heat loss. Students may note that vessels can remain widened just after the move and narrow later if cooling continues.