# Skin Under Pressure

Trace how skin structures protect the body during changing conditions.

**HS-AP2-1** "Analyze the structural characteristics and functional importance of the integumentary system to maintain homeostasis of the body."

NAME _____ DATE _____

## 1 READ AND MARK

Read it twice

**YOUR JOB** Underline three skin structures, circle a function of each, and connect each structure to its function with a pencil line to show how it helps maintain stable internal conditions.

### A Game, a Scrape, and a Change in Temperature

1. During a summer basketball game, Maya slides across the court and scrapes her knee. Her skin is more than a covering. The outer epidermis has tough, keratin-rich cells and water-resistant lipids that slow water loss and block many microbes. Below it, the dermis contains blood vessels, nerves, and sweat glands. A deeper layer of fatty tissue helps cushion the body and slows heat loss. At the scrape, the broken epidermis no longer forms a continuous barrier, so microbes can enter more easily. Protecting the break matters because an infection can disrupt the body's stable internal conditions.

2. Minutes later, Maya feels hot as her muscles release heat. Sweat glands in her dermis send watery sweat through ducts to the skin's surface. When that water evaporates, it takes heat away from her body. At the same time, blood vessels in the dermis widen, bringing more warm blood near the surface so heat can leave it. These responses help keep her internal temperature within a safe range. On a humid day, sweat evaporates more slowly, even if her skin feels soaked. Moving air can speed evaporation, but heavy sweating can also reduce the body's water supply.

3. After the game, Maya rests in a cooler gym. Temperature-sensitive nerve endings in her skin send information toward her brain, which helps coordinate changes in sweating and blood flow. As her body cools, sweating decreases and surface blood vessels narrow, reducing heat transfer to the surroundings. Fat beneath the dermis provides some insulation, although it cannot prevent all heat loss. Water on skin or clothing can draw heat away as it evaporates, especially when air moves across it. Skin therefore responds to changing conditions, but its protections have limits: a damaged barrier, lost water, or rapid cooling can threaten homeostasis.

## 2 ANSWER WITH EVIDENCE

Use the passage

1. How does Maya's scrape change the epidermis's ability to help maintain stable internal conditions?

2. Why might Maya stay hotter on a humid day even if her skin is soaked with sweat?

3. How does the change in Maya's dermal blood vessels during rest differ from the change during play, and why does that matter?

4. Why could continued heavy sweating after Maya cools threaten homeostasis? Explain two effects using the passage.

## 3 YOUR TURN

Your own words

A student scrapes a knee while walking home in cold rain. In four sentences, explain how two different skin structures affect the student's homeostasis, how rainwater could increase heat loss, and one action that would protect the student.

ANSWER KEY

# Skin Under Pressure

HIGH SCHOOL · HS-AP2-1

## PART 1 · READ AND MARK

Underline three skin structures, circle a function of each, and connect each structure to its function with a pencil line to show how it helps maintain stable internal conditions. Accept any marking that follows this job and points at the right text.

## PART 2 · ANSWERS

| # | QUESTION | ANSWER |
|---|---|---|
| 1 | How does Maya's scrape change the epidermis's ability to help maintain stable internal conditions? | **The scrape breaks the epidermis's continuous barrier, making it easier for microbes to enter and cause an infection.** |
| 2 | Why might Maya stay hotter on a humid day even if her skin is soaked with sweat? | **Sweat cools Maya when it evaporates. Humid air slows evaporation, so less heat leaves her body.** |
| 3 | How does the change in Maya's dermal blood vessels during rest differ from the change during play, and why does that matter? | **During play, the vessels widen to bring warm blood near the surface and release heat. During rest in the cooler gym, they narrow to reduce heat loss.** |
| 4 | Why could continued heavy sweating after Maya cools threaten homeostasis? Explain two effects using the passage. | **Evaporating sweat could cool her further, and heavy sweating could reduce her body's water supply.** |

## PART 3 · YOUR TURN (SAMPLE ANSWER)

The scrape breaks the epidermis, so microbes can enter more easily. Blood vessels in the dermis narrow in the cold, reducing heat loss from the body. Rainwater evaporating from the student's clothing can carry away more heat. Covering the scrape with a clean bandage would help protect it from microbes.

Accept other accurate structure-function links from the passage, including insulation by fat or temperature sensing by nerve endings. For Part 3, the action may address either the broken barrier or heat loss.