Skin Under Stress

Connect skin structures to cooling, protection, and injury.

HAP.3 "Students will investigate the structures and functions of the integumentary system, including the cause and effect of diseases and disorders. Identify structures and explain the functions of the integumentary system..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the first mention of each of these five structures: epidermis, dermis, blood vessels, sweat glands, and sensory nerve endings. Circle a nearby phrase that explains what each one does, then give each structure and its circled phrase the same number.

A Hot Day for Skin

1 At a summer soccer game, Maya's skin does more than cover her arm. Skin is the cutaneous membrane, a protective covering that helps keep water inside and microbes outside. Its outer layer, the epidermis, forms the main barrier. Beneath it, the dermis supports structures needed for cooling and sensing. Blood vessels in the dermis widen or narrow to change how much heat reaches the surface. Sweat glands there release sweat onto the skin surface; evaporation carries heat away. Sensory nerve endings in the dermis detect painful heat, prompting Maya to move away from a hot metal bench.

2 When Maya becomes hot, her brain signals skin blood vessels to widen and sweat glands to release more sweat. Wider vessels bring more warm blood near the surface, increasing heat loss. As sweat evaporates, it removes heat; these responses help return body temperature toward its usual range. If Maya rests in the shade, the cooling demand drops, so sweating decreases. This is negative feedback: a change in temperature triggers responses that reduce the change. Sweat that drips off without evaporating provides much less cooling. On a humid day, evaporation slows, making the same responses less effective.

3 After the game, Maya brushes the hot bench and gets a small burn. If heat damages only the epidermis, the weakened barrier can let water escape and microbes enter more easily. A deeper burn that damages the dermis may injure sweat glands, blood vessels, and sensory nerve endings, reducing local cooling and heat detection. Even a shallow scrape breaks the epidermal barrier. Washing a minor scrape with clean running water and covering it with a clean dressing helps keep debris and microbes out while the barrier repairs. A large or deep burn needs medical care; a dressing alone cannot replace damaged tissue.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do the epidermis and dermis contribute differently to protection and heat control?

2. Trace two skin responses that help Maya's body temperature return toward its usual range when she becomes hot.

3. Why might Maya cool less effectively on a humid day even if her sweat glands release sweat?

4. How would a shallow scrape and a deep burn differ in their likely effects on skin function?

3 YOUR TURN

Your own words

A student burns a finger deeply enough to damage the dermis. In four sentences, explain two ways the injury could disrupt skin function, why a clean dressing is not enough, and what the student should do next.

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PART 1 · READ AND MARK

Underline the first mention of each of these five structures: epidermis, dermis, blood vessels, sweat glands, and sensory nerve endings. Circle a nearby phrase that explains what each one does, then give each structure and its circled phrase the same number. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do the epidermis and dermis contribute differently to protection and heat control?	**The epidermis forms the main barrier against water loss and microbes. The dermis supports structures such as blood vessels and sweat glands that help control heat loss.**
2	Trace two skin responses that help Maya's body temperature return toward its usual range when she becomes hot.	**Skin blood vessels widen, bringing more warm blood near the surface for heat loss. Sweat glands release more sweat, and its evaporation removes heat.**
3	Why might Maya cool less effectively on a humid day even if her sweat glands release sweat?	**Humidity slows evaporation, and sweat removes much less heat if it does not evaporate.**
4	How would a shallow scrape and a deep burn differ in their likely effects on skin function?	**A shallow scrape breaks the epidermal barrier. A deep burn can also damage dermal structures, reducing local cooling and heat detection.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The burn can damage the epidermis, weakening its barrier against water loss and microbes. If it also damages sweat glands in the dermis, less sweat can evaporate, reducing cooling at that spot. A clean dressing can help keep microbes out, but it cannot replace damaged tissue. The student should get medical care because the burn is deep.

Accept other passage-supported effects of a deep burn, including reduced heat detection or altered blood flow near the surface. The response should identify two disrupted functions, explain the dressing's limit, and call for medical care.