CHAPTER B — SKIN PHYSIOLOGY

B1 — The Overheated Runner

During a marathon medical camp, a physiotherapy student notices a runner with hot, dry skin despite high ambient temperature. The student recalls that sweating is critical for thermoregulation. The runner appears confused, with rising core temperature. The student must decide which physiological mechanism has likely failed.

Options

A. Sudomotor nerve activity decreased
B. Vasoconstriction of skin vessels
C. Excess sebaceous gland activity
D. Increased peripheral resistance

Reasoning

- Reduced sudomotor activity (A) → no sweating → heat intolerance.
- Vasoconstriction (B) traps heat but usually accompanies cold exposure.
- Sebaceous glands (C) unrelated to temperature control.
- Peripheral resistance (D) is cardiovascular, not skin cooling.

✅ Correct: A

B2 — The Frostbite Question

A physiotherapy intern treating a mountaineer notices pale, cold extremities. The tutor asks what skin mechanism is being activated to conserve core heat.

Options

A. Vasodilation of skin vessels
B. Vasoconstriction of skin vessels
C. Increased sweating
D. Increased melanin production

Reasoning

Cold triggers sympathetic vasoconstriction → reduces heat loss.

✅ Correct: B

B3 — The Burn Unit Puzzle

In a burn unit observation, a patient with extensive epidermal loss is having difficulty regulating temperature. The intern must reason which skin layer being destroyed contributes most to this problem.

Options

A. Stratum corneum barrier
B. Adipose tissue insulation
C. Dermal capillary plexus
D. Hair follicles

Reasoning

Dermal vasculature regulates heat exchange via vasodilation and vasoconstriction.

✅ Correct: C

B4 — The Sweating Paradox

During a high-intensity exercise session, a student notices one athlete sweating profusely but still maintaining normal body temperature, while another sweats minimally and overheats quickly. The student must identify the likely physiological difference.

Options

A. Higher sweat gland density
B. Better sebaceous secretion
C. Greater melanin concentration
D. Lower adipose tissue

Reasoning

Exercise thermoregulation depends heavily on sweat gland function and density.

✅ Correct: A

B5 — The Hydration Misjudgment

During a rehab session, a physiotherapy intern notices that an elderly patient's skin tents when gently pulled—a sign of dehydration. The mentor asks which physiological change explains this.

Options

A. Increased collagen hydration
B. Loss of skin elasticity due to reduced dermal water
C. Excess sebum secretion
D. Increased blood flow to skin

Reasoning

Dehydration reduces dermal water → decreased elasticity → skin tenting.

✅ Correct: B

B6 — The Sweat Composition Debate

Two interns argue about why sweat becomes saltier during intense exercise. One says glands just “push out more fluid.” The other recalls reabsorption mechanisms in sweat ducts.

Options

A. Duct reabsorption of NaCl decreases at high sweat rates
B. Glands actively add more salt to sweat
C. Sympathetic regulation reduces sweating
D. Keratinocytes release Na^+

Reasoning

High sweat rate → less time for NaCl reabsorption → saltier sweat.

✅ Correct: A

B7 — The Pressure Ulcer Insight

An immobilized patient develops a pressure ulcer. The physiotherapy student is asked which skin function failed first under unrelieved pressure.

Options

A. Thermoregulation
B. Sensation
C. Microcirculatory perfusion
D. Melanin production

Reasoning

Pressure compresses dermal vessels → ischemia → tissue damage.

✅ Correct: C

B8 — The Temperature Mismatch Observation

While using infrared thermography, a physiotherapy intern observes that areas with thick subcutaneous fat appear cooler than lean areas. The mentor asks for the physiological explanation.

Options

A. Adipose insulates and reduces heat loss
B. Fat increases skin blood flow
C. Fat tissue produces excess heat
D. Sweat glands are more active in fat regions

Reasoning

Fat acts as an insulator → surface remains cooler.

✅ Correct: A

B9 — The Itching Episode

A patient undergoing electrotherapy complains of itchiness under the electrode pads. The physiotherapy intern wonders if skin physiology is involved.

Options

A. Activation of Meissner corpuscles
B. Irritation of free nerve endings
C. Stimulation of Pacinian corpuscles
D. Activation of Merkel cells

Reasoning

Itch is mediated by free nerve endings.

✅ Correct: B

B10 — The UV Exposure Challenge

During a dermatology rotation, a physiotherapy student observes delayed tanning after repeated UV exposure. The tutor asks what physiological mechanism explains this.

Options

A. Sudden melanin oxidation
B. Increased melanin synthesis by melanocytes
C. Loss of keratinocyte nuclei
D. Increased sweat gland secretion

Reasoning

Delayed tanning = increased melanin synthesis and transfer to keratinocytes.

✅ Correct: B