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Answers

Exam-style questions

Check your answers to the questions in this issue.

Exam focus: heat and performance (pp. 7–9)

Adam Morton

1

- thermoregulation: temperature-sensitive receptors in the skin and hypothalamus detect increases in temperature
- hypothalamus and autonomic nervous system stimulate...
- ...sweating and loss of heat through evaporation
- cutaneous vasodilation — increased blood flow to skin — heat lost through radiation

2

- earlier onset of sweating
- great rate of sweating
- improved blood flow to the skin via autonomic nervous system habituation
- takes 4–6 days for majority of benefit

3

- Cardiovascular drift occurs during extended periods of continuous exercise (e.g. marathon) in hot conditions.
- Prolonged sweating leads to dehydration.
- Dehydration reduces blood plasma volume and increases blood viscosity.
- This reduces stroke volume and requires the heart to work harder (increased heart rate) to maintain cardiac output.
- Cardiovascular drift is a rise in heart rate over time for a given exercise intensity.

Exam focus: consolidating knowledge of the cardiovascular system (pp. 18–21)

Anna Snook

- 1** Haemoglobin transports oxygen in the blood. Myoglobin both stores and transports oxygen in the muscle. In contrast, myoglobin has a higher affinity for oxygen than haemoglobin, so oxygen binds more readily to it.
- 2** The skeletal muscle pump is where contracting muscles shorten and bulk, squeezing veins that lay between the muscle belly and long bones, literally helping to push blood back to the heart. The respiratory pump works through the pressure changes that occur when breathing, encouraging blood back to the heart. One-way pocket valves in veins prevent backflow of blood to the heart along with smooth muscle, which involuntarily contracts and squeezes blood back to the heart. The suction pump action of the heart is where blood is actively drawn back into the heart owing to the increase in output. Gravity also plays a role.
- 3** Chemoreceptors located in the aortic arch and carotid arteries detect an increase in blood acidity brought about through increases in carbon dioxide production as a by-product of aerobic respiration. Body movement is detected by proprioceptors, including muscle spindles and Golgi tendon organs. Baroreceptors detect blood pressure changes. Thermoreceptors detect temperature changes. Each relays information to the cardiac control centre in the medulla oblongata, which responds by increasing sympathetic nervous system activity sending the hormone adrenaline, which travels to the SA node of the heart to increase heart rate.
- 4** Anticipatory rise is caused by the hormone adrenaline. The release of adrenaline from the adrenal glands is caused by an increase in sympathetic nervous system activity. Adrenaline travels via the bloodstream to the sinoatrial node to stimulate an increase in heart rate. The result of this increase in heart rate is that it prepares the performer for exercise by increasing transport and delivery of oxygen to exercising muscles. The cardiac control centre is in the medulla oblongata within the brainstem and governs this response.

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