

# Communication & homeostasis

## Question Paper 1

**Time allowed:** 46 minutes

**Score:** /34

**Percentage:** /100

### Grade Boundaries:

A*	A	B	C	D	E
>69%	56%	50%	42%	34%	26%

## Question 1

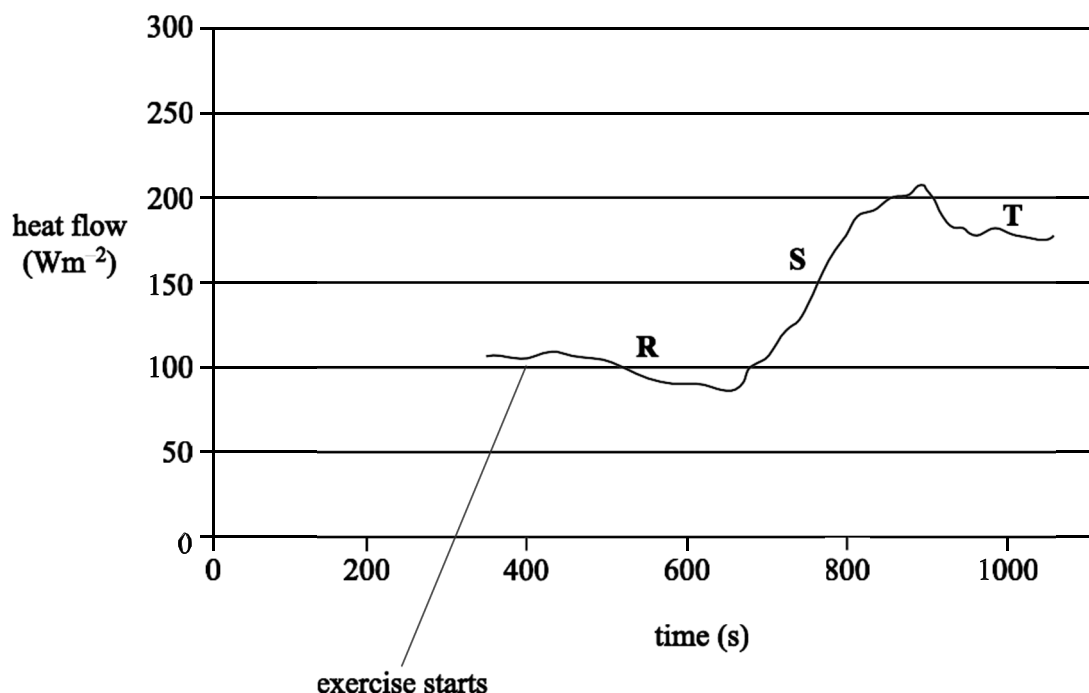
Which of the options, **A** to **D**, correctly describes how an endotherm would respond to an increase in temperature?

- A. dilation of arterioles near the surface of the skin
- B. erector muscles contract, causing hairs to stand up
- C. rapid contractions of skeletal muscles
- D. sweat glands release less sweat

[1]

## Question 2

**Fig. 11.1** shows the heat flow through the skin of an athlete during vigorous exercise. Exercise starts at 400 seconds.



**Fig. 11.1**

Blood flow can be directed to those parts of the body that make the greatest demands.

Which row gives the best explanation of the stages in **Fig. 11.1**?

	<b>R</b>	<b>S</b>	<b>T</b>
<b>A</b>	Blood directed away from skin to avoid excess heat loss	Blood directed towards skin to release excess heat	Balance achieved between loss of excess heat and the need for oxygen in the muscles
<b>B</b>	Blood directed away from skin and towards the muscles to supply more oxygen for respiration	Blood directed towards skin to release excess heat	Balance achieved between heat loss and excess heat created in the muscles
<b>C</b>	Blood directed away from skin to avoid excess heat loss	Blood directed towards skin to gain heat from the environment	Balance achieved between heat loss and excess heat created in the muscles
<b>D</b>	Blood directed away from skin and towards the muscles to supply more oxygen for respiration	Blood directed towards skin to gain heat from the environment	Balance achieved between loss of excess heat and the need for oxygen in the muscles

[1]

### Question 3

The maintenance of a stable body temperature is an important aspect of homeostasis in endotherms. This is known as thermoregulation.

(a) (i) State where the **core** body temperature is monitored. [1]

(ii) Name the type of sensory cell in the skin that detects changes in environmental temperature. [1]

(iii) Name the corrective homeostatic mechanism that works to restore any changes in body temperature to the normal range. [1]

(b) Endotherms respond in different ways to changes in environmental temperature. Some of these responses are listed below:

<b>J</b>	secretion of adrenaline
<b>K</b>	sweating
<b>L</b>	shivering
<b>M</b>	contraction of erector pili muscles (attached to base of hairs)
<b>N</b>	curling up
<b>O</b>	finding shade
<b>P</b>	vasoconstriction of arterioles near to skin surface

Use the letters, **J** to **P**, to identify:

(i) the responses that conserve heat. [1]

(ii) the responses that cool the body. [1]

(iii) a physiological response that generates heat. [1]

(iv) a behavioural (not physiological) response to a decrease in environmental temperature. [1]

- (c) Different endotherms have evolved different physiological and behavioural adaptations to assist with temperature control.

Explain how each of the following adaptations help the animal to control its body temperature.

- (i) Elephants have large, thin ears that they move backwards and forwards when hot. **[2]**

- (ii) Penguins living in cold climates have 'shunt' blood vessels. These shunt vessels link arterioles carrying blood towards their feet with small veins that carry blood away from their feet.

**[1]**

**[Total: 10]**

## Question 4

Coordination and control, using electrical and chemical methods, are vital in the correct functioning of multicellular organisms.

(a) Complete the following paragraphs by writing the **most suitable** word or term in each case.

Multicellular organisms need to monitor and ..... to changes in both their external and internal environments. Organisms also need to co-ordinate the activities of different ..... in the body. The way in which cells communicate with each other is known as ..... and this is achieved by the nervous and hormonal systems.

A regulatory mechanism known as ..... is used to maintain the internal environment at a relatively constant level despite changes in the environment. This maintenance of a stable internal environment is known as .....

**[5]**

(b) Identify the following:

- (i) an organ that has both endocrine and exocrine functions. **[1]**
- (ii) the cells that form the myelin sheath around an axon. **[1]**
- (i) the hormone produced by the  $\alpha$ -cells in the Islets of Langerhans. **[1]**
- (iv)** the nerve that stimulates cardiac muscle and has the opposite effect to the accelerator nerve. **[1]**
- (v)** an effector in the skin that is involved in temperature regulation. **[1]**

**[Total: 10]**

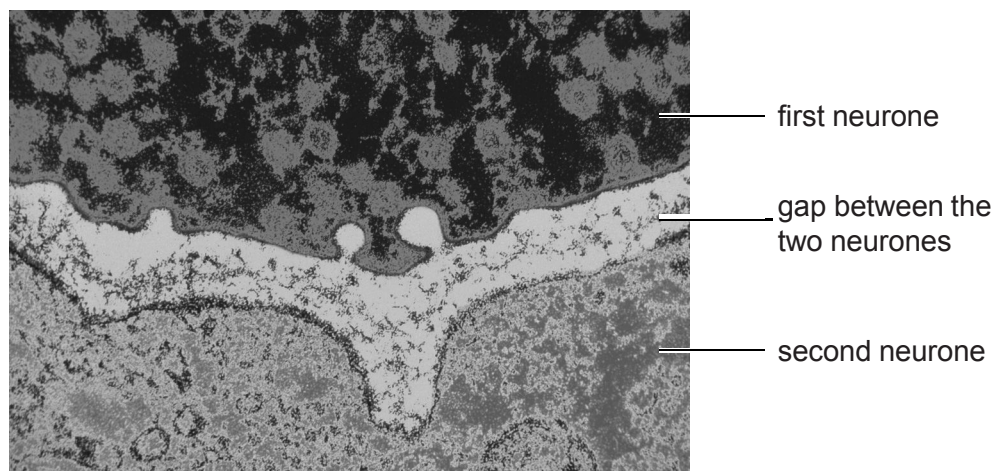
## Question 5

(a) The cells of the body need to communicate with one another.

State the name given to this process of communication.

[1]

(b) Fig. 1.1 is an electron micrograph of the junction between two neurones.



**Fig. 1.1**

(i) State the name given to the gap between the two neurones at this junction.

[1]

(ii) Outline how the first neurone communicates with the second neurone across the gap.



*In your answer, you should use appropriate technical terms, spelt correctly.*

[3]



**(iii)** Outline the importance of the junctions between neurones in the functioning of the nervous system.

The nervous system and the hormonal system are involved in the maintenance of core body temperature. **[3]**

(c) Give the **most suitable** word or term that has the same meaning as each of the following descriptions:

(i) animals that are able to regulate and maintain their core body temperature within narrow limits; **[1]**

(ii) the increase in the diameter of the lumen of an arteriole to allow more blood to flow through. **[1]**

(d) (i) Name a hormone that increases the metabolic rate and so generates heat. **[1]**

**[1]**

(ii) Name the part of the brain where the thermoregulatory centre is located.

**[Total: 12]**