# 14. Coordination and response

## 14.4 Homeostasis

## Paper 3 and 4

Marking Scheme

## Q1.

| | | | |
|---|---|---|---|
| (a) | maintenance of a constant ;<br>internal environment ; | **2** | |

| | | | |
|---|---|---|---|
| (c) | **J** – sweat gland ;<br>**K** – receptor ;<br>**L** – fatty tissue ; | **3** | |

| | | | |
|---|---|---|---|
| (d) | *any three from:*<br>fatty (tissue), insulates / reduces heat loss ;<br>hair (erector) muscles contract to raise hair (away from the surface);<br>hair, insulates / traps a layer of air / reduces heat loss ;<br>muscle contraction / shivering ;<br>(shivering) generates heat from respiration ;<br>brain detects change in blood temperature AW ;<br>AVP ; | **3** | |

## Q2.

| | | | |
|---|---|---|---|
| (a) | homeostasis ; | **1** | |
| (b) | receptors ;<br>effectors ;<br>air ;<br>muscle ;<br>decreases ; | **5** | |

## Q3.

| | | |
|---|---|---|
| (a) | **C** (erector) muscle ;<br>**D** fatty tissue / fat cells ;<br>**E** blood vessel / (small) artery / (small) vein / capillary ;<br>**F** sweat gland ;<br>**G** sensory nerve ending / sensor / AW ; | **5** |
| (b) | receptors ;<br>brain ;<br>sweat ;<br>evaporates ;<br>homeostasis ; | **5** |

## Q4.

| | | | | | |
|---|---|---|---|---|---|
| (b) | changing condition | volume of urine | concentration of urine | **3** | one mark for each correct row |
| | increase in water uptake | increase | decrease | | |
| | increase in temperature | decrease | increase | | |
| | increase in exercise | decrease | increase | | |
| | ;;; | | | | |

## Q5.

| | | | |
|---|---|---|---|
| (a)(i) | 28.0 (°C) to 39.0 (°C) ; | **1** | |
| (a)(ii) | *any six from:*<br><br>1 (internal temperature is maintained by) homeostasis / negative feedback ;<br>2 external temperature detected by, (thermo)receptors / sensory neurones, in the skin ;<br>3 (nerve) impulses (via sensory neurones) to the brain ;<br><br>4 change / increase / decrease in, blood / internal / core, temperature is detected by the brain ;<br>5 (nerve) impulses are sent (via motor neurones) to (effectors in) the skin ;<br><br>*6, 7, and 8 when environmental temperature below body temperature / body is cold / before 3½ hours:*<br><br>6 vasoconstriction / arterioles become narrow ;<br>7 decrease in blood flow (to capillaries), to / in, the skin ;<br>8 shivering / increase in metabolism (to generate heat) / hairs raised (to trap air for insulation) ;<br><br>*9, 10 and 11 when environmental temperature above body temperature / body is hot / after 3½ hours:*<br><br>9 (increase in) sweating / produce sweat ;<br>10 vasodilation occurs / arterioles widen ;<br>11 increase of blood flow (to capillaries), to / in, the skin ;<br><br>12 AVP ; | **6** | MP5 **A** impulses are sent to, hair erector muscles / arterioles<br><br>MP7 **A** less blood to surface of the body<br>MP8 **A** increased metabolism described<br><br>MP12 e.g. ref. to insulation |

| | | | |
|---|---|---|---|
| (b) | <table><tr><th>name of the part</th><th>letter in Fig. 2.2</th><th>role in maintaining internal body temperature</th></tr><tr><td>fatty tissue<br>OR<br>hair</td><td>**D**<br><br>**F**</td><td>insulation</td></tr><tr><td>(hair) erector muscle</td><td>**E**</td><td>(contracts) to raise hair (to trap heat) / (relax to) lower hair (to lose heat)</td></tr><tr><td>receptor / sensor / sensory neurone</td><td>**B**</td><td>detect temperature changes</td></tr></table><br>;;; | **3** | one mark for each correct row<br><br>in row one the letter must agree with name of the part given |

## Q6.

| | | | |
|---|---|---|---|
| (b) | *any six from:*<br>1 *ref.* to, negative feedback / homeostasis ;<br>2 a change / increase / decrease, in blood glucose concentration is detected by the pancreas ;<br>3 pancreas produces / secretes, insulin / glucagon ;<br>4 insulin, decreases blood glucose concentration ;<br>5 insulin, stimulates conversion of glucose to glycogen ;<br>6 *idea that* conversion occurs in the liver / glycogen stored in liver ;<br>7 Insulin promotes (cellular) respiration ;<br>8 glucagon, increases blood glucose concentration ;<br>9 glucagon, stimulates conversion of glycogen to glucose ; | **6** | |

## Q7.

| | | | |
|---|---|---|---|
| (c)(i) | homeostasis ; | 1 | |
| (c)(ii) | *any three from:*<br>1 (blood) glucose concentration, is low / decreases ;<br>2 (causing) glucagon, secretion / production ;<br>3 glucagon, released from / produced in, pancreas ;<br>4 (glucagon stimulates) breakdown of glycogen / release of glucose (into the blood) ;<br>5 from liver / muscle ;<br>6 (blood) glucose concentration, goes (back) up / returns to normal / stays within limits ; | 3 | |

## Q8.

| | | | |
|---|---|---|---|
| (b)(i) | pancreas ; | 1 | |
| (b)(ii) | (type 1) diabetes ; | 1 | |
| (b)(iii) | reduces blood sugar concentration ; | 1 | |

## Q9.

| | | |
|---|---|---|
| (a)(i) | (because it is made of) a group of tissues working together to perform specific functions ; | 1 |
| (a)(ii) | brain ; | 1 |
| (a)(iii) | **A** (thermo)receptor ;<br>**B** sweat gland ;<br>**F** fatty tissue / fat cell(s) ; | 3 |
| (a)(iv) | *any three from:*<br>vasoconstriction (of arterioles / **E**) ;<br>shunt vessels / **D**, dilate / widen ;<br>less blood flow to skin (capillaries) / **F** ;<br>reduces heat loss from blood ; | 3 |

## Q10.

| | | | |
|---|---|---|---|
| (c) | (so that) enzymes do not denature / enzymes remain active / maintains optimum temperature for enzymes ;<br>*idea of* maintaining a constant rate of, reactions / metabolism / respiration ;<br>avoids to damage to other named (type of) protein ;<br>avoids damage to cell membranes ;<br>avoids, heatstroke / hyperthermia / overheating / dehydration / freezing / chills / becoming too cold / hypothermia ;<br>at high temperature sperm production, reduced / harmed ;<br>AVP ; | 4 | e.g. (permits) colonisation of different parts of the world / different climates active in, both day and night / different seasons |