

- M1.(a)** (i) cerebral cortex  
*accept cerebrum / cerebral hemisphere* 1
- (ii) MRI (scan)  
*allow CAT / CT scan*  
*do **not** accept MIR*
- or**
- electrode stimulation  
*allow electrical stimulation* 1
- (b) (i) sharp point stimulates (pain) receptor (in the skin)  
*must be in correct order* 1
- to send (nerve) impulse  
*ignore information and messages* 1
- via sensory neurone 1
- to spinal cord  
*do **not** accept spine, ignore CNS* 1
- crosses synapse  
*allow synapse in any correct context* 1
- to other (relay) neurones / to brain  
*do **not** accept motor neurone*  
*allow explanation in a flow diagram* 1
- (ii) damage must be between arms and legs / below arms  
*accept below the waist* 1

since information from nerves in arms still reaches the brain / information from the legs doesn't reach the brain

1  
[10]

**M2.** (a) Y - spinal cord / central nervous system / CNS  
*do not accept spine*  
*ignore nerve / nervous system / coordinator*  
*ignore grey / white matter* 1

W - receptor / nerve ending  
*ignore sensory / neurone / stimulus* 1

X - effector / muscle  
*allow gland* 1

(b) any **two** from: eg  
*accept reverse argument for each marking point*

- reflex action quicker
- effect of reflex action over shorter period
- hormone involves blood system and reflex involves neurones / nerve cells  
*ignore nervous system / nerves*
- reflex involves impulses and hormone involves chemicals
- reflex action affects only one part of the body  
*ignore involves brain*  
*ignore outside / inside stimuli*

2

[5]

**M3.** (a) any **three** from:

- streamlined shape enables it to swim quickly (to catch fish)
- wings (provide power) to move quickly (to catch fish)  
*allow 'flippers'*
- wings used for steering
- white underside / dark top acts as camouflage (so prey less likely to see it)
- long / sharp beak to catch fish

3

(b) any **three** from:

- reduces (total) surface area of penguins exposed to wind / cold atmosphere
- reduced number of penguins exposed (to wind / cold)  
*accept reference to movement in or out of the huddle*  
*accept outer ones insulate / act as barrier*
- reducing heat loss  
*allow reduced cooling*
- 'share' body warmth / heat

3

(c) (i) any **two** from:

- size of tubes
- volume of (hot) water  
*accept amount of (hot) water*
- left for same length of time  
*allow measured at same time intervals*
- starting temperature

2

(ii) any **two** from:

- tube alone (**C**) lost heat most (rapidly)
- tube **B** intermediate
- tube **A** least (rapidly)  
*allow correct use of figures for all 3 tubes*  
*ignore just quoting final temperature*

2

(iii) confirms suggestion

*no mark awarded*

*accept correct answers referring to other suggestions in (b)*

since (both outer and inner) tubes in bundle lost heat less rapidly (than 'stand – alone' tube)

*comparison needed*

1

penguins in a huddle lose less heat (than single ones)

*accept 'it is the same for penguins'*

1

(d) **if the core body temperature is too high**

blood vessels supplying the skin (capillaries) dilate / widen

*accept reference to arteries / arterioles but **not** veins / capillaries*

*do **not** accept references to movement of blood vessels*

*ignore enlarge / expand*

*reference to skin / surface required only once*

1

so that more blood flows through the (capillaries) in skin / near surface

*reference to 'more' needed at least once to gain 2 marks*

1

and more heat is lost

*reference to 'more' needed at least once to gain 2 marks*

1

**if the core body temperature is too low**

blood vessels supplying the skin (capillaries) constrict / narrow

*allow full marks if 'too low' given first*

*if no other marks awarded, allow vasodilation when too warm*

***and** vasoconstriction when too cold for 1 mark*

1

(e) (i) wings move to provide movement for diving

*allow muscles contract / work*

1

energy (for movement) comes from respiration

*do **not** allow produces / makes / creates energy*

*allow energy comes from / is supplied by / is released by respiration*

1

respiration / muscle contraction also releases heat

*allow produces heat*

1

(ii) any **three** from:

- feet not / less used **or** no muscle contraction in feet  
*allow little energy / heat released through respiration in feet*  
*do **not** allow veins / capillaries*
- vessels supplying feet constrict / less blood to feet
- so temperature in feet cools / decreases
- more heat loss from large surface area or rapid flow of cold water over foot

3

[22]

<b>M4.</b>	(a) tissue → organ → organ system <i>one right for 1 mark</i> <i>three right for 2 marks</i>	2
	(b) <b>Epithelial tissue</b> → covers the outside and the inside of the stomach <i>more than one line from a tissue = no mark</i>	1
	<b>Glandular tissue</b> → produces digestive juices	1
	<b>Muscular tissue</b> → allows food to be churned around the stomach	1
	(c) (i) light <i>ignore dark</i>	1
	(ii) moving (to the dark)	1
	(iii) any <b>two</b> from:	
	<ul style="list-style-type: none"> <li>• use more woodlice</li> <li>• repeat the experiment</li> <li>• run for a longer time</li> </ul>	2
		<b>[9]</b>

- M5.** (a) detect changes in surroundings **or** detect stimuli  
*allow any named stimulus for skin*

1

convert information to impulse  
*allow send impulse to sensory neurones / brain*

1

- (b) (i)

muscle	contract(ion)
gland	release / secrete / produce chemical / hormone / enzyme

*1 mark for each effector*  
*1 mark for each response*  
*response must match type of effector (if given)*  
*ignore examples*  
*ignore relax(ation) / movement for contraction*  
*do **not** allow expansion for muscles*

4

- (ii) any **one** from:

- (maintain temperature at which) enzymes work best
  - so chemical reactions are fast(est)
  - prevent damage to cells / enzymes
- allow prevent enzymes being denatured (by temperature being too high)*

1

[7]



**M6.** Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also apply a 'best-fit' approach to the marking.

**0 marks**

No relevant content.

**Level 1 (1 – 2 marks)**

There is a description of thermoregulation **or** at least one correct mechanism (skin, sweat glands or muscles) but roles may be confused.

**Level 2 (3 – 4 marks)**

There is a description of thermoregulation **or** some correct mechanisms (sweating, shivering, blood flow in the skin).

**Level 3 (5 – 6 marks)**

There is a clear description of thermoregulation by TC or skin **and** some correct control mechanisms.

**examples of biology points made in the response:**

*full marks may be awarded for detailed description of what happens if the core temperature is either too high or too low*

- temperature receptors in TC
- the TC detects (core) body / blood temperature
- temperature receptors in the skin send impulses to the TC, giving information about skin temperature
- if the core body temperature is too high: blood vessels / arterioles supplying the skin capillaries dilate / vasodilation

***do not** accept refs to veins instead of arterioles or answers that imply blood vessels have moved up / down through the skin.*

- so that more blood flows (through the skin) and more heat is lost
- sweat glands release more sweat to cool the body
- by evaporation
- if the core body temperature is too low: blood vessels supplying the skin capillaries constrict
- to reduce the flow of blood (through the skin) and less heat is lost
- *allow idea of blood diverted to vital organs in extreme cold*
- muscles may shiver to release (heat) energy
- from respiration, some of which is lost as heat

[6]