Markscheme

November 2016

Biology

On-screen examination

14 pages

1 Mark positively. Give candidates credit for what they have achieved and what is correct. Do not deduct marks for incorrect responses.

2 Follow the markscheme provided and award only whole marks.

3 Each marking point appears on a separate line.

4 The maximum mark for each subpart is indicated in the "Total" column.

5 Where a mark is awarded a tick should be placed in the text at the precise point where it is clear the candidate deserves the mark.

6 Each marking point in a question part should be awarded separately unless there is an instruction to the contrary in the Notes column.

7 A question subpart may have more marking points than the total allows. This will be indicated by the word "***max***" in the Answer column. Further guidance may be given in the Notes column.

8 Additional instructions on how to interpret the markscheme are in bold italic text in the Answer column.

9 Alternative wording may be indicated in the Answer column by a slash (/). Either alternative is equally acceptable but the candidate cannot be rewarded for both as they are associated with the same marking point.

10 Alternative answers are indicated in the Answer column by "***or***". Either alternative is equally acceptable but the candidate cannot be rewarded for both as they are associated with the same marking point.

11 If two related points are required to award a mark, this is indicated by "***and***" in the answer column.

12 Words in brackets ( ) in the Answer column are not necessary to gain the mark.

13 Words that are <u>underlined</u> are essential for the mark.

14 In some questions a reverse argument is also acceptable. This is indicated by the abbreviation *ORA (or reverse argument)* in the Notes column. Candidates should not be rewarded for reverse arguments unless *ORA* is given in the Notes column.

15 If the candidate's response has the same meaning or is clearly equivalent to the expected answer the mark should be awarded. In some questions this is emphasized by the abbreviation *WTTE (or words to that effect)* in the Notes column.

16 When incorrect answers are used correctly in subsequent question parts the follow through rule applies. Award the mark and add ECF (error carried forward) to the candidate response.

17 The order of marking points does not have to be the same as in the Answer column unless stated otherwise.

18 Marks should not be awarded where there is a contradiction in an answer. Add CON to the candidate response at the point where the contradiction is made.

19 Do not penalize candidates for errors in units or significant figures unless there is specific guidance in the Notes column.

20 Questions with higher mark allocations will generally be assessed using a level response method using task specific clarifications developed with reference to the criteria level descriptors. Candidate's work should be marked using a best fit approach. A candidate's response should be reviewed to determine holistically the band in which the response falls. Once this has been determined, each bullet point within that band should be assessed to see if the candidate has met the requirements of the statement. Where those requirements are met, marks should be awarded, starting from the lowest available mark for that band.

Once this process has been completed if the highest (or lowest) mark available for that band has been determined, the examiner must check the band above (or below) to ensure that the initially correct determination of the band was correctly allocated. For example, there may be sufficient detail in the candidate's response to award the lowest mark of the band above.

NB. Marks are distributed unevenly across the mark bands as candidates have to include much more detail in their responses to access the highest mark bands.

Question		Answers	Notes	Total	Criterion
1	a	*muscular – respiratory – cardiovascular - nervous* all images correctly matched with labels		**1**	A
	b	tissue linked to appropriate system correctly linked function	*Award marks for answers seen in any of the three response boxes.* *Accept any tissue or organ linked to appropriate system.* *Must be correctly linked to the function of the tissue eg the heart pumps, do **not** accept the heart transports.*	**2**	A
	c	sensory / photo <u>receptors</u> neurons / nerve (cell) / impulse brain or spinal chord <u>motor</u> neurons / nerve (cell)	*Do **not** accept eyes.*	**4**	A
	d	option B (fight or flight) response protects the body from threat / injury / harm	 *WTTE*	**2**	A

<table>
<tr>
<td>2</td>
<td>a</td>
<td>
One process for each location, (4 max)

Any additional points, for example (4 max)
<table>
<tr><td>Mouth</td><td>• mechanical breakdown/chewing
• mix with amylase
• chemical breakdown starts</td></tr>
<tr><td>Stomach</td><td>• mechanical breakdown
• chemical breakdown
• acid environment kills bacteria
• other (named) enzyme
• process linked to named enzyme</td></tr>
<tr><td>Small intestine</td><td>• chemical breakdown
• neutralization of acid
• other (named) enzymes
• processes linked to named enzyme
• <u>bile</u> salts/chemicals for emulsification of lipids
• nutrients move/diffuse/active transport across villi <u>into bloodstream</u>/assimilation into the blood</td></tr>
<tr><td>Circulatory system</td><td>• transport to cells/around the body
• diffusion of nutrients <u>across cell membrane</u>/cell absorbs nutrients by diffusion</td></tr>
</table>
</td>
<td>Additional points can be for any correct location.</td>
<td>8</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td>diabetes
or
obesity</td>
<td></td>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>c</td>
<td>Any five points from the list below:
• converts glucose/monosaccharides to <u>energy</u>
• converts glucose/monosaccharides for use in respiration
• large quantity of carbohydrates metabolized into glucose/monosaccharides
• blood glucose levels become high
• insulin is released
• (insulin is released from the) pancreas
• glucose is converted to glycogen
• glycogen is stored (in fatty tissues)
• blood glucose level returns to normal</td>
<td>WTTE</td>
<td>5</td>
<td>A</td>
</tr>
</table>

3	a	***Any two reasons, (2 max)*** • smoking may have damaged the alveoli • reduced surface area of alveoli • excess mucus is produced ***or*** tar present in alveoli • excess mucus ***or*** tar causes poor oxygen diffusion • oxygen cannot diffuse across alveoli as easily • less oxygen in the blood ***or*** CO/carbon monoxide accumulates in the blood • less respiration to release energy is possible	*WTTE*	**2**	A
	b	any age in the range 55-60		**1**	C
	c	***Yes there are benefits and correctly linked justification, for example (1 max)*** • stopping at 45 delays onset of symptoms • stopping at 45 might avoid severe disability • stopping at 45 prolongs life expectancy • stopping at 65 prolongs life expectancy ***or*** ***There are no benefits and correctly linked justification, (1 max)*** stopping at 65 gives longer life than not stopping at all although smoker is likely to be severely disabled		**1**	A

4	a	(if) a model habitat has no trees (then) it will experience more evaporation / higher rate of evaporation / higher mass loss at higher temperatures (because) water is not preserved when no (model) trees are present	*ORA*	**3**	B
	b	temperature ***or*** presence of trees ***or*** absence of (model) trees mass change / loss ***or*** water loss ***Three control variables, for example*** • quantity of soil • type of soil • initial quantity of water • time • surface area of container • humidity of air • wind / air movement.	*Accept any reasonable and equally valid alternative.*	**5**	B
	c	range reflects temperatures that are observed in actual habitats ***or*** this temperature range is necessary to make the model realistic	*WTTE*	**1**	B
	d	"trees" present in the petri dishes would have added to the overall masses of model habitats	*WTTE* *Do **not** accept random error.*	**1**	C
	e	title: the effect of (different) temperature on water loss ***or*** mass change / loss from model habitats *y*-axis: mass change / loss of model habitat *y*-axis: unit of g / grams included	*Three components needed in the title.* *WTTE*	**3**	C D
	f	increase in mass change / evaporation with temperature relationship approx. exponential / not linear ***or*** at higher temperatures the increase in mass change is greater	*Do **not** accept comments about rate unless rates are calculated.* *Accept non uniform.*	**2**	C

	g	smaller mass changes overall in absence of trees compared to model habitat with trees smaller increase in mass change in absence of trees as temperature increases compared to model habitat with trees	*WTTE*	**2**	C
	h	results do not support prediction (because) absence of model trees causes lower water losses overall compared to presence of trees ***or*** (because) absence of model trees causes smaller increase in water loss as temperature increases compared to presence of trees	*ECF from response in part (a)* *ORA*	**2**	C
	i	1.3 / 1.4 g		**1**	C
	j	***Any two valid causes, for example (2 max)*** • temperature higher than 20°C • (more) air movement • containers were in the temperature controlled cabinet for more than 10 min • different, inaccurate balance used ***Correctly linked explanation for each cause given above, for example (2 max)*** • more evaporation • (different balance) causing readings to be inaccurate to roughly same extent	*Accept other plausible factors but reject factors that would not apply to **both** sets of data.*	**4**	C

<table>
<tr>
<td>5</td>
<td>a</td>
<td>
<table>
<tr><td>35</td><td>30</td><td>25</td><td>20</td><td>15</td><td>10</td><td>5</td><td>0</td></tr>
<tr><td>9.0</td><td>8.0</td><td>7.0</td><td>5.0</td><td>3.0</td><td>2.0</td><td>1.0</td><td>0.0</td></tr>
<tr><td>8.0</td><td>7.0</td><td>6.0</td><td>4.0</td><td>2.0</td><td>1.0</td><td>0.0</td><td>0.0</td></tr>
<tr><td>8.0</td><td>8.0</td><td>7.0</td><td>6.0</td><td>3.0</td><td>1.0</td><td>1.0</td><td>1.0</td></tr>
</table>
measurements taken at minimum two temperatures

measurements taken at minimum four temperatures

measurements taken at minimum six temperatures

fourth mark for evenly spaced temperatures
</td>
<td>Only award the fourth mark if at least four temperature measurements are taken.</td>
<td>4</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td>
<table>
<tr><td>35</td><td>30</td><td>25</td><td>20</td><td>15</td><td>10</td><td>5</td><td>0</td></tr>
<tr><td>8.3</td><td>7.7</td><td>6.7</td><td>5.0</td><td>2.7</td><td>1.3</td><td>0.7</td><td>0.3</td></tr>
</table>
all values correctly calculated

correctly expressed to one decimal place
</td>
<td>Use candidate’s values

Ignore one error in number of decimal places.</td>
<td>2</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>c</td>
<td>two points correctly plotted

all data points from the data table in part (a) correctly plotted</td>
<td>Refer to candidate’s values

More than two values must be plotted for the second mark.</td>
<td>2</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>d</td>
<td>
A similarity

the water loss increases as the temperature increases
initially the increase is small (per 5°C temperature increase)
at medium temperature the mass loss increases more than at low temperatures
at low to medium temperature the increases are roughly exponential

A difference

at high temperatures the mass loss in real plants shows smaller increases while the model trees experience bigger increases
the real plants appear to be approaching a plateau at high temperatures
the mass losses in the potted plants are greater than in the model

</td>
<td></td>
<td>2</td>
<td>C</td>
</tr>
</table>

	e	***Any three points, for example (3 max)*** • stomata (enable gas exchange and) permit water vapour to escape from leaves • stomata can open and close to regulate water loss (and gas exchange) • stomata open and close depending on temperature and humidity • stomata close when plants lose too much water to prevent drying out • the model trees have no stomata • model trees cannot regulate water loss so water loss will increase with temperature	*WTTE*	**3**	A
	f	transpiration / evaporation		**1**	A
	g	***One strength of the model, for example (1 max)*** • at low to medium temperatures the data collected using the model corresponds to the pattern seen in real plants ***One limitation of the model, for example (1 max)*** • at higher temperatures there are big differences in the patterns • (so) the model no longer provides data consistent with actual vegetation • model trees cannot simulate opening and closing of stomata • model trees do not imitate conditions of light or shade • temperature controlled cabinet is poor approximation of real/varying temperature ***Concluding statement*** • the model seems <u>partly</u> valid	*Accept any other equally valid points.*	**3**	C

<table>
<tr>
<td>6</td>
<td></td>
<td>
<table>
<tr><td>• states the problem to be studied
• some variables are referred to that are connected to the problem but these may not be explicitly identified</td><td>1-2</td></tr>
<tr><td>• formulates a hypothesis connected to the variables but not explicitly linked to the variables with no explanation
• independent or dependent variable and one control variable are identified
• some equipment is selected
• incomplete description of how the variables will be manipulated</td><td>3-6</td></tr>
<tr><td>• formulates a testable hypothesis correctly linked to the variables (no explanation) or formulates a (non-testable) hypothesis with correct scientific explanation
• independent variable and dependent variable and one control variable are identified
• relevant equipment is selected
• detailed description of how the variables will be manipulated
• use of some equipment outlined
• method is likely to give sufficient data relevant to the problem</td><td>7-12</td></tr>
<tr><td>• formulate a testable hypothesis correctly linked to the variables and with correct scientific explanation
• independent, dependent and at least two control variables are identified
• complete set of relevant equipment is selected
• detailed description of how the variables will be manipulated
• use of relevant equipment is described
• method is likely to give sufficient data relevant to the problem
• safety precaution is outlined</td><td>13-19</td></tr>
</table>
</td>
<td>19</td>
<td>B</td>
</tr>
</table>

7	a	***Any three reasonable causes, for example*** • use of herbicides • use of pesticides • monoculture agriculture • farmers stop planting cover crops such as clover and alfalfa • parasites	*WTTE*	**3**	A
	b	***Any three solutions (3 max)*** • move away from monoculture or diversify farms • plant bee friendly native flowers in home gardens, along roadsides, meadows • put back in cover crops to reduce use of fertilizer • put back in cover crops to provide food for the bees • ban use of pesticides/herbicides/fungicides (that harm bees) ***or*** • research new pesticides/herbicides/fungicides that do not harm bees ***Correctly linked reasons (3 max)***	*Do **not** allow pesticide used to kill weeds ORA.* *Allow incorrect use of pesticide for this mark.*	**6**	D

8	a	decreased / (–) minus sign 68 %		**2**	C
	b	***Any two reasonable points (2 max), for example*** • synthetic fertilizers are more efficient at fixing nitrogen than traditional methods • more effective fertilizers have been produced • increased use of pesticides means that there is less damage to crops • monoculture has led to more efficient farming practices • GM crops have improved nutrient uptake ***A correctly linked explanation for each point (2 max)***		**4**	C

<table>
<tr>
<td>9</td>
<td></td>
<td>
<table>
<tr><td>• ref to intensive farming
• statement that local changes to farming can impact global environment</td><td>1-2</td></tr>
<tr><td>• clear description to intensive farming with example stated
• outline of an ecological impact eg bee's role in pollination or colony collapse disorder
• statement that local changes to farming can impact global environment with stated example
• an economic impact identified</td><td>3-6</td></tr>
<tr><td>• clear description of intensive farming with clearly explained example
• description of an ecological impact eg bee's role in pollination or colony collapse disorder
• description of how local changes to farming can impact global environment with a clearly explained example
• a benefit or limitation identified and explained
• an economic impact explained</td><td>7-11</td></tr>
<tr><td>• clear description of intensive farming with clearly explained example
• description of more than one ecological impact
• description of how at least one ecological impact could affect farming
• discussion of how local changes to farming can impact global environment with a clearly explained example
• benefit and limitation both identified and explained
• an economic impact explained and linked to global food supply
• a concluding appraisal linking all the issues discussed previously</td><td>12-18</td></tr>
</table>
</td>
<td>18</td>
<td>D</td>
</tr>
</table>