Markscheme

May 2023

Biology

On-screen examination

14 pages

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The following are the annotations available to use when marking responses.

Annotation	Explanation
	Correct point, place at the point in the response where it is clear that the candidate deserves the mark. For use in analytically marked questions only.
	Omission, incomplete
CON	Contradiction
	Valid part (to be used when more than one element is required to gain the mark)
	Error carried forward
	Dynamic annotation, it can be expanded to surround work
	Underline tool that can be expanded
	Highlight tool that can be expanded to mark an area of a response

Annotation	Explanation
	Not good enough
	The candidate has given a response but it is not worthy of any marks
	Text box used for additional marking comments
	Seen; must be stamped on all blank response areas and on duplicate pages of concatenated responses
	Vertical wavy line that can be expanded
	Words to that effect
	Award 1, 2, 3, 4 marks. For use in holistically marked questions only

Markscheme instructions

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

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.

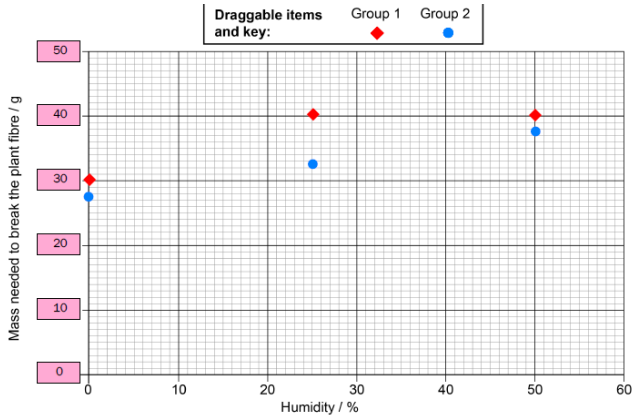
20 Questions with higher mark allocations will generally be assessed using a level response method using task specific clarifications developed with reference to the criteria level descriptors. A candidate's work should be reviewed to determine holistically the mark for each row of the holistic grid and a mark awarded for each row.

Question		Answers	Notes	Total	Crit.
1	a	Knee	*Accept ankle or knuckle*	**1**	**A**
	b	Bicep		**1**	**A**
	c	***Accept any two from the list, [max 2]*** • one muscle contracts while the other extends • X (Bicep) contracts ***or*** shortens ***and*** to flex ***or*** bend the arm • Y (Tricep) contracts ***or*** shortens ***and*** to extend ***or*** straighten the arm		**2**	**A**
	d	***Accept any reasonable similarity, for example [max 1]*** • produce energy ***or*** ATP • use glucose ***Accept any reasonable difference, for example [max 1]*** • aerobic requires oxygen / anaerobic does not • waste products are different (water and CO_2 ***or*** lactic acid) • anaerobic releases less energy	*Do **not** accept ethanol*	**2**	**A**
	e	***Protection: Accept any reasonable function, for example [max 1]*** • protect the organs • (hard) bones of the skeleton reduce the risk of injury on impact ***Blood cell production: Accept any reasonable function, for example [max 1]*** • (long) bones contain bone marrow • (long) bones produce stem cells	*Accept named examples* *Accept named examples* *Do **not** accept mineral storage*	**2**	**A**

2	**a**	***Accept any two reasonable benefits, for example [max 2]*** • slows ripening • prevents microbe growth ***or*** keeps food safe to eat for longer • reduces waste ***or*** extends shelf-life	*WTTE*	**2**	**A**
	b	(This temperature range) reduces ***or*** stops microorganism activity ***or*** reproduction Does not freeze (at this temperature range) ***One correct justification, [max 1]*** • slows deterioration of food • prevents ice damage ***or*** freezer burn ***or*** changes in appearance	*Do **not** accept "kill*s" *WTTE*	**3**	**A**
	c	(Bacteria has) decreased in volume ***or*** shrunk ***or*** shrivelled Water has left ***or*** (bacteria is) dehydrated By osmosis	*Do **not** accept references to salt moving* *Accept a correct description of osmosis if not named*	**3**	**A**

3	**a**	Speed up reactions ***or*** biological catalyst Build up molecules ***or*** break down molecules	*Accept specific examples*	**2**	**A**
	b	 All correct	*A selection must be made in **all** boxes*	**1**	**A**
	c	The (observable) characteristics of an organism (resulting from the expression of genes)	*Incorrect use of "gene" is a CON, award 0*	**1**	**A**
	d	***Similarity, [max 1]*** • highest levels directly after birth • both decrease (after birth) ***Justification, [max 1]*** • maternal milk is primary food source • decrease as transition to other food sources ***Difference, [max 1]*** • production is much higher in pigs • pigs level off later than rats • production decreases at a faster rate or earlier in pigs ***Justification, [max 1]*** • consume more lactose ***or*** pigs are bigger than rats • rats transition to other foods earlier than pigs • pigs and rats mature at different rates		**4**	**A**
	e	The higher the % lactose tolerance, the higher the milk consumption	*ORA Do **not** accept linear or proportional*	**1**	**A**
	f	***Accept any reasonable suggestion, for example [max 1]*** • data not available for all countries • correlation does not guarantee causation • people choose not to drink milk for reasons other than lactose intolerance • data is from one year or one source only		**1**	**A**

4	**a**	How does the humidity affect the mass needed to break the fibre?		**1**	**B**
	b	***Independent variable:*** humidity ***Dependent variable:*** mass ***and*** needed to break the fibre	*Do **not** accept strength*	**2**	**B**
	c	***Accept any two reasonable control variables, for example [max 2]*** • diameter of fibre • storage ***or*** room temperature • length of fibre • age of plant • storage time • type of plant	*Do **not** accept increments of mass* *Accept length of time masses are hung on fibres* *Do **not** accept use the same fibre*	**2**	**B**
	d	The DV is only affected by the IV	*WTTE*	**1**	**B**
	e	Greater range of data Better for identifying a pattern ***or*** Repeats Can repeat to give an average, identify anomalous data	*WTTE*	**2**	**C**

	f	 Equal increments on Y axis scale Three points plotted correctly All six points plotted correctly Data points matching the key	*Ignore the key for mp 2* *Ignore the key for mp 3* *Only award mp 4 if at least three points are correctly plotted*	**4**	**C**
	g	***Group 1:*** increases ***and*** then plateaus ***Group 2:*** Increases ***and*** linear	*WTTE*	**2**	C
	h	Natural variation in fibre strength or fibres come from a different plant Less precise equipment gave less valid outcome	*WTTE*	**2**	C

5	**a**	95 (micrometres) ± 5	*Ignore incorrect units*	**1**	**C**
	b	Candidate's value from part (a) – 80 $\left(\frac{\text{Difference}}{80}\right)\times 100$ Evidence of calculation rounded to nearest %	*ECF from part (a)* *Award third marking point for any correctly rounded percentage if calculation is seen*	**3**	**C**
	c	***Any two increases in size from the list, [max 2]*** • cells or vacuoles • cell walls • gaps ***or*** lamella Water enters the fibres ***or*** cells by osmosis ***or*** diffusion (as humidity increases) larger difference between cell and environment ***or*** (as humidity increases) more rapid entry of water (into the cell)		**4**	**C**
	d	***Accept any reasonable suggestion, for example [max 1]*** • (change in) mass • length in other planes ***or*** 3 dimensions • measure the increase of the labelled parts of the diagram ***Accept any correctly linked justification, for example [max 1]*** • to calculate the % water absorbed • to calculate (increase in) volume (rather than length) • to see if all parts increased at the same rate ***or*** find out where the water had gone		**2**	**C**

6	**a**	***Accept any CV from the list, [max 1]*** • volume of NaOH • fibres immersed in same chemical ***or*** NaOH • initial fibre length ***or*** diameter • type of fibre (agave)		**1**	**B**
	b	So the method could be repeated ***or*** Compared with other processes ***or*** Because time in the solution might affect the results ***or*** Time (in solution) is a control variable	*WTTE*	**1**	**C**
	c	***Accept any three points from the following, [max 3]*** • identify the alkali (as NaOH) • include a reference to direction of change of IV • include a possible range of IV concentrations • specify fibres are agave • specify what will be measured	*Accept aspects of a re-written hypothesis* *Do **not** accept include adding scientific justification as an improvement*	**3**	**B**
	d	***First marking point:*** Hypothesis is valid ***or*** partially valid ***and*** as the extension increases from 0-2 or 5% (NaOH) ***Second marking point linked to hypothesis being invalid:*** • between 2 or 5 – 10% the extension decreases • above 10% as there is no clear increase or decrease despite the change in concentration	*WTTE* *Accept reference to a plateau, do **not** accept constant*	**2**	**C**

7

	1 mark	2 marks	3 marks	4 marks
RQ	A simple RQ	RQ linked to % fibre and length		
V	IV as fibre % ***or*** DV as length ***or*** one CV is identified	IV as fibre % ***and*** DV as length ***and*** one CV is identified	IV as fibre % ***and*** DV as length ***and*** two CV are identified	
E	Equipment for basic set up ***or*** equipment to measure length (stretch)	Equipment for basic set up ***and*** equipment to measure length (stretch)		
M	Attempt at a method but detail is insufficient to collect relevant data	Detail of method is incomplete but some relevant data could be collected	Detail of method is sufficient to follow and similar data could be collected	Detail of method is sufficient to repeat the experiment
D	Plans to repeat at least three trials ***or*** to collect data for at least five fibre %	Plans to repeat at least three trials ***and*** collect data for at least five stated fibre %	Plans to repeat at least three trials ***and*** collect data for at least five stated fibre % ***and*** including 0% and 20% fibre	
S	A relevant comment about safety e.g. taking care with heavy masses, breaking ropes			

15 B

8	**a**	Transpiration		**1**	**A**
	b	Fewer bees will mean there is less pollination of the flowers This may reduce the population of plants (which will) result in less food being available (for consumers) Link to how biodiversity is reduced	*Accept references to plant reproduction*	**4**	**D**
	c	***Individual:*** Action Correctly linked justification Difficulty linked to action ***Government:*** Action Correctly linked justification Difficulty linked to action Simple conclusion Further justification of conclusion drawing on both individual and government		**8**	**D**

<table>
<tr>
<td>9</td>
<td></td>
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<table>
<tr><th></th><th>1 mark</th><th>2 marks</th><th>3 marks</th><th>4 marks</th></tr>
<tr><td>Environmental</td><td>States one environmental aspect for green roofs or one for solar panels</td><td>States one environmental aspect for green roofs and one for solar panels or states two environmental aspects for green roofs or solar panels</td><td>States one environmental aspect for green roofs and one for solar panels and with further justification of one aspect</td><td>States one environmental aspect for green roofs and one for solar panels and with further justification for both aspects</td></tr>
<tr><td>Economic</td><td>States one economic aspect for green roofs or one for solar panels</td><td>States one economic aspect for green roofs and one for solar panels or states two economic aspects for green roofs or solar panels</td><td>States one economic aspect for green roofs and one for solar panels and with further justification of one aspect</td><td>States one economic aspect for green roofs and one for solar panels and with further justification for both aspects</td></tr>
<tr><td>Biosolar</td><td>Solar panels work more efficiently or more efficient use of space</td><td>Solar panels work more efficiently when cooled by plants or more efficient use of space by combining two purposes</td><td></td><td></td></tr>
<tr><td>Location</td><td>States a reasonable factor</td><td>States a reasonable factor with justification</td><td></td><td></td></tr>
<tr><td>Conclusion</td><td>Gives a concluding statement</td><td></td><td></td><td></td></tr>
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<td>13</td>
<td>D</td>
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