Markscheme

May 2024

Biology

On-screen examination

18 pages

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.

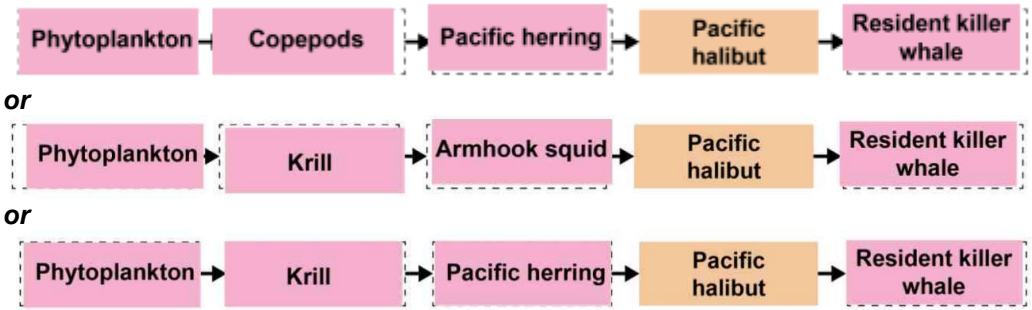
18 Marks should not be awarded where there is a contradiction in an answer. Add CON to the candidate response at the point where the contradiction is made.

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 holistically to determine the mark awarded for each aspect.

Question		Answers	Notes	Total	
1	a	Production of offspring Reproduction Permanent increase in size Growth Reaction to an internal or external stimulus Response One correct All correct		2	A
	b	***One reasonable feature, for example [max 1]*** • large size or surface area • can flap ears • thin • increased blood flow or can vasodilate ***Link to heat loss, for example [max 1]*** • large area for heat loss or evaporative cooling • can fan itself or create a breeze • smaller distance for heat exchange • increased heat exchange as blood carries heat away from body to ears	*Do **not** accept to balance body temperature*	2	A
	c	(larger surface area) means more light can be absorbed ***or*** more chlorophyll present ***or*** More stomata may be present ***Any correct justification from the list, [max 1]*** • (more) photosynthesis or glucose produced • (more) transpiration • (more) gas exchange	*Allow absorbance of CO_2, ignore reference to O_2*	2	A

	d	(smaller surface area) minimizes water loss ***or*** (cacti) can survive in areas with limited water (due to) less evaporation or transpiration	*Do **not** accept protection against being eaten*	**2**	**A**
	e	(large) surface area allows for more efficient exchange of (named) materials ***or*** heat (small) volume means fewer metabolic processes ***or*** less material required ***or*** shorter distance for materials to travel (high) SA to V ratio allows exchange rates to meet metabolic needs	*Do not award mp1 when the ratio is used.*	**3**	**A**

2	**a**	 ***or*** ***or*** All correct		**1**	**A**
	b	Killer whales feed on organisms from different trophic levels Armhook squid ***or*** pacific herring are secondary consumers ***and*** chinook salmon ***or*** pacific halibut are tertiary consumers ***or*** Killer whales are tertiary consumers when they eat armhook squid ***or*** pacific herring ***and*** killer whales are quaternary consumers when they eat chinook salmon ***or*** pacific halibut	*Mp1 can be shown through complete food chains. Allow ref to food chain in 2a.* *Mp2 gets mp1.*	**2**	**A**
	c	To reduce competition ***or*** They eat what is (abundant) in their areas	*WTTE*	**1**	**A**
	d	***Relevant differences between the whales, for example, [max 2]*** • fins size or shape • size • patches or markings • prey • communication Could stop them interbreeding However further data is needed to confirm this hypothesis	*Accept physical differences, behavioural differences, different hunting preferences, different geographical locations*	**4**	**A**

	e	(Genome mapping) compares the genetic code (of different organisms) Genetic similarities or differences can be used to decide if they are different species or not A correct use of the term base ***or*** chromosome ***or*** DNA ***or*** gene ***or*** genetic	*WTTE* *Mp2 implies mp 1* *Only award mp3 if one of the previous mp is given.*	**3**	**A** **D**
	f	(Yes) references to more than one difference between the whales ***or*** (No) not enough information or variation within a species is natural or they are still too similar	*Accept reference to sub-species or ecotype, not type.*	**1**	**A**

3	**a**	Tape measure		**1**	**B**
	b	54 years	*Check table and response box for value*	**1**	**C**
	c	***Accept any reasonable suggestion, for example [max 1]*** • values in different units will lead to incorrect estimates • depends on the units in the growth factor		**1**	**B**
	d	***Please award zero for this question***		**0**	
	e	***Accept any reasonable justification, for example [max 1]*** • wood at the top of the tree is younger • the age may be underestimated • distance between rings is bigger (so easier to count)	*ORA*	**1**	**C**
	f	Tropical one has a wider diameter ***or*** circumference ***or*** larger cross-section Faster growth due to more optimal conditions ***or*** there are fewer limiting factors Tropical one has no ***or*** less obvious growth rings Less (no) significant seasonal variation ***or*** trees grow continuously	*Accept named example, ORA* *Do not accept references to size of bark*	**4**	**C**
	g	***Accept any reasonable limitation for growth factor values, for example [max 1]*** • using growth factors only gives an estimate • growth factor values are (global) averages • growth can be affected by variables not considered in the growth factor ***Accept any reasonable limitation for counting growth rings, for example [max 1]*** • counting rings can only be done on dead trees • cannot be used for trees without growth rings (like tropical trees)	*Accept named factor like location, climate, disease or damage* *Do not accept references to human error*	**2**	**C**

<table>
<tr><td rowspan="6">4</td><td>a</td><td>Too long to do the whole forest

(Random sample) is representative (of the forest) or avoids bias</td><td>WTTE</td><td>2</td><td>B</td></tr>
<tr><td>b</td><td>Accept any reasonable suggestion, for example [max 1]
• use a random number generator to select coordinates on the map
• drop a pin (on a map)</td><td></td><td>1</td><td>B</td></tr>
<tr><td>c</td><td>Student B and this prediction links DV to IV
or
Student B and is the only one with the correct DV (measuring height)</td><td>ORA</td><td>1</td><td>B</td></tr>
<tr><td>d</td><td>Given age in months
or
Use more significant figures or do not round (values)
or
Take the average height of trees for each age</td><td></td><td>1</td><td>C</td></tr>
<tr><td>e</td><td>2 points correctly plotted

All 5 points correctly plotted

x axis label Age and y axis label Height

Units for age and height given as y(ears) and m(etres)

Title refers to age and height

Title includes reference to sycamore tree</td><td><table><tr><th>Age / y</th><th>Height / m</th></tr><tr><td>80</td><td>22</td></tr><tr><td>40</td><td>17</td></tr><tr><td>20</td><td>12</td></tr><tr><td>10</td><td>7</td></tr><tr><td>5</td><td>3</td></tr></table></td><td>6</td><td>C</td></tr>
<tr><td>f</td><td>(Growth rate is) initially rapid or tree grows fast at the start

(Growth rate) slows with age or plateaus (but does not stop)</td><td>Do not accept references to linear or proportional relationships
Mp2 gains mp1</td><td>2</td><td>C</td></tr>
</table>

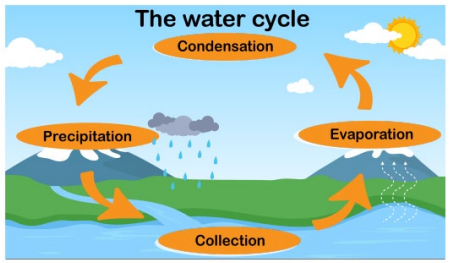
5	**a**	***IV:*** Height from which the seed is dropped ***DV:*** Time spent in the air ***Accept any two control variables, for example [max 2]*** • mass of seed ***or*** one paperclip used • length of wings • angle of wing • no wind in the testing space	*All variables must be qualified* *Accept same seed for one CV. 2nd CV must then not refer to properties of the seed*	**4**	**B**
	b	Only tested three heights Only two repeats per height	*Accept reference to number not being enough*	**2**	**C**
	c	***Accept any relevant improvement, for example [max 2]*** • increase the height • reduce the mass ***or*** size of the seeds • change the shape of the paper model • carry out the experiment outside ***Accept any correctly linked justification, for example [max 2]*** • trees are taller than 2 metres • seeds are much lighter ***or*** smaller than the paper models • (change the size) to better match the size of real seeds • (outside would give) a more realistic environment		**4**	**C**

6		**16**	B

	1 mark	**2 marks**	**3 marks**	**4 marks**	***Notes***
1.V	Explicitly states appropriate: IV ***or*** DV	Explicitly states appropriate: IV ***and*** DV	Explicitly states appropriate: IV ***and*** DV ***and*** one CV	Explicitly states appropriate: IV ***and*** DV ***and*** two CVs	*Only requirement is to state using the terminology of IV, DV and CV. No need to explain further.* *Do* ***not*** *accept reversed IV and DV.* ***Do not accept "****keeping equipment the same" as a CV.* ***Do not accept*** *calculated values as DV unless explicitly shown how calculated from measured values.*
2.H	Formulates a hypothesis connected to the variables but not explicitly linked to time	Formulates a hypothesis correctly linked to time with no explanation	Formulates a hypothesis with reasoning linked to relevant scientific ideas		*For two marks change alone is not good enough, IV and DVs need the direction of change.* *Scientific ideas might include drag, air resistance.*
3.E	Protractor ***and*** stopwatch				
4.M	Method is linked to IV ***or*** DV	Method is linked to IV ***and*** DV but is incomplete	Method linked to IV ***and*** DV and can be followed	Method linked to IV ***and*** DV and can be followed and include details on how to control main CVs	*A method that does not include how to vary the IV is incomplete and cannot be followed.* *Limited information about main CVs mean that data is unlikely to be relevant*. *If the method is repeated with a second IV, the maximum mark is 1 as there can only be one IV.*

5.D	Plans to conduct at least three trials **or** measures time for at least five different IV increments	Plans to conduct at least three trials ***and*** measures time for at least five angles	Plans to conduct at least three trials ***and*** measures time for at least five stated angles ***and*** plans to calculate averages		*The values of the five or more IV variations should be explicitly stated for 3 marks*.
6.S	A relevant comment about safety that is specific to the investigation				*Do not accept general considerations not linked to the specific investigation, e.g. wear a mask, tie hair back*. *Accept a comment about there not being any safety concerns if this is true for the planned investigation.*

7	**a**	***Excretion of waste:*** Waste builds up in the body ***or*** more water is reabsorbed (so) urine volume decreases ***or*** urine becomes more concentrated ***Temperature control:*** Sweat production decreases or less evaporative cooling (so) harder to regulate body temperature or cool down	*Accept toxins for waste.* *Accept harder stool or feces or constipation for mp1*	**4**	**D**
	b	Two arrows pointing left only Large arrow pointing left ***and*** small arrow pointing right	*Mp2 gains mp1*	**2**	**A**
	c	***Accept any two impacts on ecosystems, for example [max 2]*** • habitat destruction • space needed for equipment • disposal of concentrated waste ***Accept any two consequences of high energy use, for example [max 2]*** • emissions from fossil fuels • cost (of fuels) • fresh water produced may be expensive to buy • renewable energy source means consequences are low impact ***A concluding appraisal considering the benefits of a reliable supply of fresh water***	*Do **not** accept a decrease in sea water*	**5**	**D**

8	**a**	 All correct		**1**	A
	b	***Accept any reasonable consequence of increased precipitation, for example [max 1]*** • flooding • decrease in water quality • change in growing season • loss of habitat ***Accept any reasonable consequence of decreased precipitation, for example [max 1]*** • drought • effect on water supply (animals, humans, agriculture) • change in growing season • (fertile) land gained from lowering river levels • wildfires		**2**	D

8	**c**		**12**	D

Steps that could be taken to reduce water shortage in the home		
Mark	**Descriptor**	**Notes**
1	A statement of how water is used in the home	***Examples of statements*** • taking a shower • washing clothes • watering plants in the garden ***Examples of justifications*** • turning the shower off while using shampoo to wash your hair • using the water saving settings on the washing machine • using water left over from other task (grey water) to water the garden
2	A statement of how water is used in the home ***and*** a justification of how this use can be reduced	
3	Statements of at least two uses of water in the home ***and*** justification of how ***both*** of these uses can be reduced	

<table>
<tr><th colspan="3">A description of how an individual's dietary choices can affect their water footprint</th></tr>
<tr><th>Mark</th><th>Descriptor</th><th>Notes</th></tr>
<tr><td>1</td><td>A simple reference to the use of water in food production or transportation</td><td rowspan="4">Examples of simple references
• crops must be watered
• 15 415 l of water are required to produce 1 kg of beef

Examples of statements
• meat-based diet increases water footprint
• eating more vegetables reduces water footprint
• buying seasonal produce decreases water footprint

Examples of supporting evidence
• beef requires the highest volume of water to produce 1 kg
• less water is used to prepare or process the produce
• less water is required to transport the food (from where it is grown)</td></tr>
<tr><td>2</td><td>A statement of the effect of one dietary choice on water footprint</td></tr>
<tr><td>3</td><td>A statement of the effect of two dietary choices on water footprint
and
one supported by evidence</td></tr>
<tr><td>4</td><td>A statement of the effect of two dietary choices on water footprint
and
both supported by evidence</td></tr>
</table>

A suggestion of how government policies can influence water usage		
Mark	**Descriptor**	**Notes**
1	A statement of a government action	***Examples of government actions*** • educate about sustainable water use • encourage through campaigns • enforce by passing water use laws or imposing limits ***Examples of how actions would reduce water usage*** • making sustainable water use part of the curriculum would give people the tools to make sustainable decisions • subsidising water efficient technology would encourage consumers to buy it • tax or fine industries for excessive water use
2	A statement of a government action ***and*** how this would reduce water usage	
3	Two government actions ***and*** how ***both*** would reduce water usage	

Conclusion **(Concluding appraisal)**		
Mark	**Descriptor**	**Notes**
1	A basic conclusion	***Examples of a basic conclusion*** • as individuals we can make small steps to reduce the water we use daily • too much water is wasted in food production ***Examples of an appraisal*** • everyone can do their bit, but domestic usage is tiny compared to industry and agriculture. • governments actions can directly affect individual choices Imposing rules can ensure that individuals use water responsibly
2	An appraisal including actions by both individuals and groups	