

Markscheme

May 2021








Biology








On-screen examination

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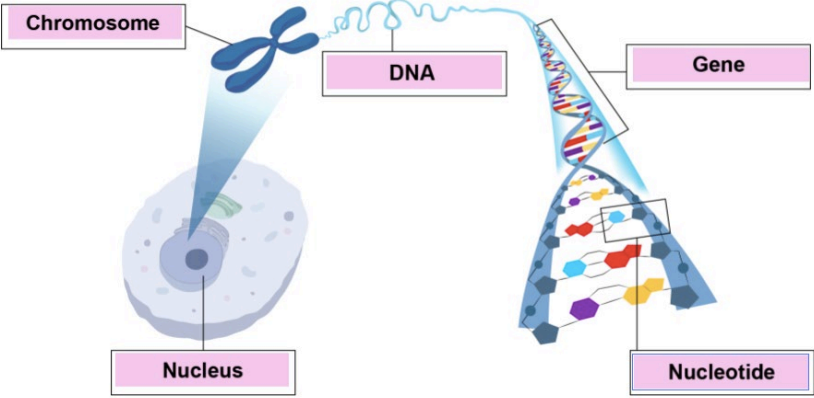
The following are the annotations available to use when marking responses.

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
	Horizontal wavy line 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

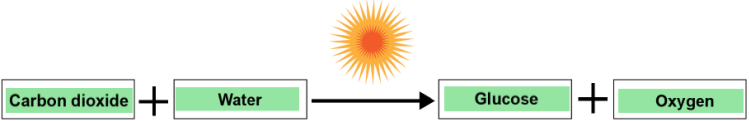
- 1 Mark positively. Give candidates credit for what they have achieved and what is correct. Do not deduct marks for incorrect responses.
- 2 Follow the markscheme provided and award only whole marks.
- 3 Each marking point appears on a separate line.
- 4 The maximum mark for each subpart is indicated 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 underlined 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	Criterion															
1 a	<table border="1"> <tr> <td></td> <td>Bacteria cells</td> <td>Animal cells</td> </tr> <tr> <td>Mitochondria</td> <td></td> <td>present</td> </tr> <tr> <td>Cell wall</td> <td>present</td> <td></td> </tr> <tr> <td>Cell membrane</td> <td>present</td> <td>present</td> </tr> <tr> <td>Nucleus</td> <td></td> <td>present</td> </tr> </table> <p>First mark for one row or column correct</p> <p>Second mark for all correct</p>		Bacteria cells	Animal cells	Mitochondria		present	Cell wall	present		Cell membrane	present	present	Nucleus		present	<p><i>Accept any indication that a feature is present</i></p>	2	A
	Bacteria cells	Animal cells																	
Mitochondria		present																	
Cell wall	present																		
Cell membrane	present	present																	
Nucleus		present																	
b	<p>Accept any two reasonable advantages of the 3D model, for example [2 max]:</p> <ul style="list-style-type: none"> • closer to reality • easier to visualise • can see what is moving • gives more detail about organelles • can study relationship between organelles in space 	<p><i>Accept structure in place of organelle</i></p> <p><i>Do not accept clearer</i></p>	2	A															
c	 <p>First mark for two correct</p> <p>Second mark for all correct</p>	<p><i>Allow position of Gene and DNA to be reversed</i></p>	2	A															

d	dd	<i>Do not accept d</i>	1	A													
e	<table border="1"> <tr> <td colspan="2" rowspan="2"></td> <th colspan="2">Father's alleles</th> </tr> <tr> <th>D</th> <th>d</th> </tr> <tr> <th rowspan="2">Mother's alleles</th> <th>d</th> <td>Dd</td> <td>dd</td> </tr> <tr> <th>d</th> <td>Dd</td> <td>dd</td> </tr> </table> <p>All cells of table correct</p> <p>50 % or 1:1 or 1/2</p>			Father's alleles		D	d	Mother's alleles	d	Dd	dd	d	Dd	dd	<p><i>ECF from part d</i></p> <p><i>Allow a completed grid showing only one copy of the mother's alleles</i></p> <p><i>Accept 2:2 or 2/4</i></p>	2	A
				Father's alleles													
		D	d														
Mother's alleles	d	Dd	dd														
	d	Dd	dd														
f	<p>Variation results in a range of characteristics or An example of a characteristic showing variation</p> <p>Individual with favourable characteristic is likely to survive or Survival of the fittest</p> <p>Survivors are more likely to reproduce</p> <p>Characteristics are passed on or Offspring has favourable characteristics</p> <p>Species becomes better adapted to its environment or Favourable characteristics become more common in the species</p>	ORA	5	A													

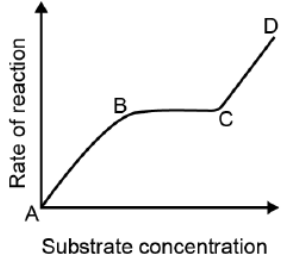
2	a	<p>Producer: grasses or (oak) tree</p> <p>Omnivore: (black) bear</p> <p>Primary consumer: deer or rabbit or squirrel or (black) bear</p>	<p><i>Do not accept plant</i></p>	3	A
	b	<p>Identification of change resulting from the housing development, for example, [1 max]:</p> <ul style="list-style-type: none"> • more food is available • the foxes' habitat has been destroyed • trash is not a suitable food source <p>Correctly linked impact on fox population, [1 max]:</p> <ul style="list-style-type: none"> • (so) the population of foxes increases • (so) the population of foxes decreases 	<p><i>Only award the second mark if the first is given</i> <i>Do not allow extinction.</i></p>	2	A
	c	<p>(Foxes) eat more rabbits or squirrels and (so) the number of rabbits or squirrels decreases</p> <p>(so) more grass or acorns (available for deer) or less competition for grass or acorns</p> <p>(so) the deer population would increase</p> <p>or</p> <p>Foxes have an alternative food source or consume less prey and (so) the number of rabbits or squirrels increases</p> <p>(so) less grass or acorns (available for deer) or more competition for grass or acorns</p> <p>(so) the deer population would decrease</p>	<p><i>Only award the third mark if the first or second marks are awarded</i></p>	3	A

3	a	Plant B		1	C
	b	<p>Accept any reasonable suggestion, for example [1 max]:</p> <ul style="list-style-type: none"> • plant B was a native plant • better hiding places • more leaves or branches to hide • better camouflage 		1	C
	c	<p>Accept any similarity from the list [1 max]:</p> <ul style="list-style-type: none"> • both have provided hiding places for prey • both were better than no plants <p>Accept any difference from the list [1 max]:</p> <ul style="list-style-type: none"> • native plants give higher survival rates (than non-native) • there is a greater range between the two native plants 	ORA	2	C
	d	<p>To show the effect of plants on results</p> <p>or</p> <p>It is a control (experiment)</p>	<p>WTTE</p> <p><i>Do not accept reference to control variables</i></p>	1	C

4	a		<p>Accept reactants and products in either order</p>	1	A
	b	<p>IV: distance of light source from plant</p> <p>DV: volume of gas produced or number of bubbles (in a fixed time)</p> <p>Any two reasonable control variables, for example [2 max]:</p> <ul style="list-style-type: none"> • temperature of the water • same plant or length of plant or number of leaves used for each trial • same light bulb or lamp • same concentration of CO₂ in water 	<p>ORA, WTTE Accept light intensity</p> <p>Do not accept rate of photosynthesis as this cannot be measured directly. Accept oxygen, do not accept carbon dioxide or air</p>	4	B
	c	<p><input type="text" value="the rate of photosynthesis decreases"/></p> <p>(because) light intensity decreases or (because) the temperature decreases</p> <p>A correct explanation linked to photosynthesis, for example [1 max]:</p> <ul style="list-style-type: none"> • less light is absorbed by chlorophyll • less light is converted to chemical energy (oxygen, glucose) • there is less kinetic energy • there are fewer successful collisions 	<p>No ORA for second marking point</p> <p>Accept energy as an alternative to light. ORA for third marking point. Award separately</p>	3	B

5	a	(temperature controlled) water bath	Accept a description of a water bath using standard lab equipment Do not accept thermostat or thermometer alone	1	B
	b	Increase the number of different temperatures (IV) tested		1	C
	c	To (collect enough data to) calculate an average To reduce (the impact of) experimental error or increase accuracy of results or identify outliers	Accept mean Do not accept references to precision Accuracy must refer to the data, not the method	2	B
	d	Use a measuring cylinder to measure volume (rather than just counting bubbles) or Count bubbles for a longer time or Multiple students count bubbles and calculate an average	Do not accept answers related to filming as this equipment was not provided	1	C
	e	6(.00) Any two from the list below [2 max]: <ul style="list-style-type: none"> • include unit for temperature • need consistent presentation of significant figures for average data • improve heading for average column • add a title to the table • plot the results as a (line or scatter) graph 	Do not accept improvements to the method Do not accept bar graph	3	C
	f	Trial 1 for temperature 40°C	Accept 6	1	C
	g	Accept any reasonable suggestion, for example [1 max]: <ul style="list-style-type: none"> • calculate the average omitting the outlier • re-do the trial 	WTTE Do not accept repeat the whole experiment	1	C
	h	Hypothesis is valid up to 39°C Partially valid or not valid and above 39 °C	Accept any value in the range 38 - 40°C	2	C
	i	<u>Enzymes</u> (involved in photosynthesis) (enzymes) denature or (so) the substrate no longer fits in the active site or enzyme can no longer catalyse the reaction (so) less <u>photosynthesis</u> is happening (above 39°C)	WTTE	3	C

6		1	2	3	4	15	B
	V (Variables)	IV as length or a measurable DV or one CV is identified	IV as length and a measurable DV and one CV is identified	IV as length and a measurable DV and two CV are identified			
	H (Hypothesis)	Formulates a hypothesis connected to a relevant variable	Formulates a testable hypothesis correctly linked to (stated) DV (no explanation)	Formulate a testable hypothesis correctly linked to (stated) DV with correct scientific explanation	Formulate a testable hypothesis correctly linked to (stated) DV with correct scientific explanation and including correct use of term chlorophyll or chloroplast		
	E (Equipment)	Equipment to measure (stated) DV or manipulate IV or monitor one CV	Equipment to measure the (stated) DV and equipment to manipulate the IV or monitor one CV				
	M (Method)	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 (Data)	Plans to repeat at least three trials or to collect data for at least five increments	Plans to repeat at least three trials and collect data for at least five stated increments				

7	a	<p>Substrate Enzyme Enzyme Product</p> <p>One enzyme labelled correctly</p> <p>All correct</p>	<p><i>Ignore any errors in other enzyme for the first mark</i></p>	2	A
b		<p>First two marks: A and B As the (substrate) concentration increases and the rate increases or There is a positive correlation between (substrate) concentration and rate</p> <p>More substrate available for enzymes to act on or A greater number of successful collisions between enzyme and substrate</p> <p>Second two marks: B and C As the substrate (concentration) increases and the rate is unchanged or constant</p> <p>(as) all the active sites are occupied or (as) the (concentration of) enzyme is limiting</p>	<p>WTTE</p>	4	C
c				1	C

8	a	Arteries have more elastic fibres (in their walls) Arteries have thicker <u>walls</u> or are (more) muscular	<i>Accept arteries are more elastic</i>	2	A
	b	Any two reasonable advantages, for example [2 max]: <ul style="list-style-type: none"> • weight loss • improved mood or mental health • increased fitness • reduced risk of developing other medical issues, eg, heart disease. Any two reasonable disadvantages, for example [2 max]: <ul style="list-style-type: none"> • may lead to injuries or muscle ache or soreness • may lead to complications for people in risk groups • hard to keep up or long-term effect only 	<i>Do not accept responses not related to health. Accept only one medical issue.</i>	4	D
	c	(medication causes) blood vessels to stop contracting or relax (so) the blood vessel (lumen) increases in diameter or volume or (so) the same volume of blood flows through a larger space A correct use of one of the terms [1 max]: volume, vasodilation, dilate, lumen.	<i>Accept arteries or veins</i>	3	D

9			1	2	3	4	11	D
		1. Individual (impact of prescribing medication)	States an impact on an individual's lifestyle	States one impact with justification or two impacts	States a positive and negative impact with justification of one	States a positive and negative impact with justification of both		
		2. Society (Positive and negative impacts)	States an impact on society	States an impact with justification or two impacts	States a positive and negative impact with justification of one	States a positive and negative impact with justification of both		
		3. A (Concluding appraisal)	Attempts a concluding appraisal	Gives a concluding appraisal with opinion that includes relevant detail or different lines of argument.	Gives a concluding appraisal with opinion that includes relevant detail and different lines of argument			

10	a	<p>The pill increases melatonin levels or Melatonin levels must be high to go to sleep</p> <p>(when stressed) melatonin levels need to be higher (than normal) because cortisol levels are higher (than normal) or To balance or compensate for increase in cortisol (caused by stress)</p>	<p><i>Do not accept the pill promotes melatonin production</i></p> <p><i>Do not accept melatonin causes cortisol to decrease</i></p>	2	D
	b	<p>Accept any reasonable benefit, for example [1 max]:</p> <ul style="list-style-type: none"> • easy to keep • rats are mammals so similar to humans • easy to control external variables that might impact sleep <p>Accept any reasonable limitation, for example [1 max]:</p> <ul style="list-style-type: none"> • different physiology • side effects may not be measurable • rats exist in a controlled laboratory environment (unlike humans) <p>Any two reasonable ethical considerations, for example [2 max]:</p> <ul style="list-style-type: none"> • reference to exposure to stress • side effects are unknown • they cannot give consent • reference to breeding rats only for use in experiments <p>A concluding appraisal</p> <p>A justification of the appraisal</p>		6	D