

Biology A

General Certificate of Secondary Education

Unit **A222/02**: Modules B4, B5, B6 (Higher Tier)

Mark Scheme for January 2011

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by Examiners. It does not indicate the details of the discussions which took place at an Examiners' meeting before marking commenced.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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Guidance for Examiners

Additional Guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, e.g. mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

/	= alternative and acceptable answers for the same marking point
(1)	= separates marking points
not/reject	= answers which are not worthy of credit
ignore	= statements which are irrelevant - applies to neutral answers
allow/accept	= answers that can be accepted
(words)	= words which are not essential to gain credit
<u>words</u>	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW/owtte	= alternative wording
ORA	= or reverse argument

e.g. mark scheme shows 'work done in lifting / (change in) gravitational potential energy' (1)

"work done" = 0 marks

"work done lifting" = 1 mark

"change in potential energy" = 0 marks

"gravitational potential energy" = 1 mark

5. If a candidate alters his/her response, examiners should accept the alteration.
6. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

The example below illustrates how to apply this principle to an objective question.

e.g. for a one mark question, where ticks in boxes 3 and 4 are required for the mark

Put ticks (✓) in the two correct boxes.

✓
✓

This would be worth zero marks.

Put ticks (✓) in the two correct boxes.

✓
✓

This would be worth one mark.

Put ticks (✓) in the two correct boxes.

✓
✓
✓
✓

This would be worth one mark.

7. The list principle:

If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, e.g. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

8. Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.

If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses.

Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

e.g. if a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

Question		Expected Answers	Marks	Additional Guidance												
1	a	homeostasis (1)	[1]	more than 1 response = 0 marks accept any other indication of a correct response												
	b	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">part of the space suit</th> <th style="width: 33%;">part of the body</th> <th style="width: 33%;">function</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">temperature probe</td> <td style="text-align: center;">brain</td> <td style="text-align: center;">detects the temperature</td> </tr> <tr> <td style="text-align: center;">heating system</td> <td style="text-align: center;">effector</td> <td style="text-align: center;">processing centre</td> </tr> <tr> <td style="text-align: center;">control circuit</td> <td style="text-align: center;">receptor</td> <td style="text-align: center;">produces the response</td> </tr> </tbody> </table>	part of the space suit	part of the body	function	temperature probe	brain	detects the temperature	heating system	effector	processing centre	control circuit	receptor	produces the response	[2]	left hand side correct = 1 mark right hand side correct = 1 mark
part of the space suit	part of the body	function														
temperature probe	brain	detects the temperature														
heating system	effector	processing centre														
control circuit	receptor	produces the response														
	c	<p>rate of reaction increases (1)</p> <p>molecules move faster (1)</p> <p>increased frequency (and energy) of collisions/ more collisions/ successful collisions/ energetic collisions (between molecules) (1)</p>	[3]	<p>OWTTE</p> <p>accept bigger/more/larger</p> <p>accept particles = molecules</p> <p>accept correct ref to kinetic energy</p> <p>accept correct ref to enzyme/substrate complexes</p> <p>reject unqualified 'more energy'</p>												
	d	i	11.5 / 11.54 (2)	[2]	<p>correct response = 2 marks</p> <p>accept 12.0 / 12 (%)</p> <p>incorrect response but correct calculation = 1 mark max</p>											
		ii	20 to 25 (1)	[1]	accept any time within the range, including 20 or 25											
Total			[9]													

Question		Expected Answers	Marks	Additional Guidance
2	a	the movement of water AND from a high concentration of water/ dilute solution to a low concentration of water/ concentrated solution AND through a partially permeable membrane	[1]	OWTTE accept diffusion = movement accept correct references to water potential (from high to low or from less negative to more negative) accept area = solution accept semi-permeable / selectively permeable
	b	A B C	[1]	responses must be in the correct order three correct responses = 1 mark accept any other indication of a correct response
	c	(cells) in solution A /the smaller cells return to original shape/size / burst; (cells) in solution B /the original /normal cells will burst / bigger; cell fragments/ solution C not affected;	[2]	OWTTE 3 correct responses = 2 marks 2 correct responses = 1 mark 1 or 0 correct responses = 0 marks accept animal cells/cells get bigger = 1 response
Total			[4]	

Question	Expected Answers	Marks	Additional Guidance
3 a	pituitary gland (1)	[1]	more than one response = 0 marks accept any other indication of a correct response
	<p>production of ADH</p> <pre> graph LR ADH[production of ADH] urine[urine] alcohol[alcohol] Ecstasy[Ecstasy] dec[decreases] inc[increases] dec2[greater ... more ...] inc2[smaller ... less ...] dec3[] inc3[] dec4[] inc4[] alcohol --- dec alcohol --- inc Ecstasy --- inc Ecstasy --- dec dec --- dec2 dec --- dec3 inc --- inc2 inc --- inc3 </pre>	[2]	two correct lines for alcohol = 1 mark two correct lines for Ecstasy = 1 mark max = 2 marks more than two lines from either alcohol or ecstasy boxes – deduct 1 mark for each additional line
c	<p>EITHER ADH secretion/production is affected by the concentration/ amount of water/salt in the blood (plasma) OR as blood concentration increases then ADH secretion/ production increases (1)</p> <p>concentration of blood (plasma) returns to normal level / set point which suppresses/switches off ADH secretion/production (1)</p>	[2]	OWTTE accept body = blood accept reverse argument accept body = blood
Total		[5]	

Question		Expected Answers	Marks	Additional Guidance
4	a	<p>number of types of bases</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="border: 1px solid black; width: 100px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100px; height: 40px; margin-bottom: 5px; text-align: center;">four</div> </div> <p>joined together</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="border: 1px solid black; width: 100px; height: 40px; margin-bottom: 5px; text-align: center;">in twos</div> <div style="border: 1px solid black; width: 100px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100px; height: 40px; margin-bottom: 5px;"></div> </div>	[1]	more than one response = 0 marks
	b	separate/divide (1) copy/duplicate/replicate (1)	[2]	OWTTE accept part/open up = separate accept correct references to mRNA production reject copy followed by divide (incorrect order)
	c	any two from: <ul style="list-style-type: none"> • order of bases in DNA codes for the sequence of amino acids/ protein production; • order of amino acids forms the type of protein; • correct reference to mRNA production/activity (transcription/translation); 	[2]	OWTTE accept correct ref to triplet code/codon accept the sequence of amino acids determines the protein formed

Question		Expected Answers	Marks	Additional Guidance																
4	d		[1]	all four responses correct = 1 mark more than one response in a row = 0 marks																
					<table border="1"> <thead> <tr> <th></th> <th>true</th> <th>false</th> </tr> </thead> <tbody> <tr> <td>The sequence of bases in the DNA molecule will stay the same.</td> <td></td> <td>✓</td> </tr> <tr> <td>The sequence of amino acids used in the protein molecule will change.</td> <td>✓</td> <td></td> </tr> <tr> <td>The protein molecule produced is likely to stay the same.</td> <td></td> <td>✓</td> </tr> <tr> <td>Different amino acids may be used in protein production.</td> <td>✓</td> <td></td> </tr> </tbody> </table>		true	false	The sequence of bases in the DNA molecule will stay the same.		✓	The sequence of amino acids used in the protein molecule will change.	✓		The protein molecule produced is likely to stay the same.		✓	Different amino acids may be used in protein production.	✓	
					true	false														
		The sequence of bases in the DNA molecule will stay the same.				✓														
The sequence of amino acids used in the protein molecule will change.	✓																			
The protein molecule produced is likely to stay the same.		✓																		
Different amino acids may be used in protein production.	✓																			
Total			[6]																	
5	a	leaves; light; photosynthesis; sugars;	[2]	four correct = 2 marks three correct = 1 mark two or one correct = 0 marks accept any other indication of a correct response																
	b	auxin AND hormone (1)	[1]	two correct responses = 1 mark accept any other indication of a correct response																
	c	<div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> ... on the side of the shoot in the dark. <input checked="" type="checkbox"/> (1) <input type="checkbox"/> </div>	[1]	more than one response = 0 marks																
Total			[4]																	

Question		Expected Answers	Marks	Additional Guidance
6	a	George (1) Charley (1)	[2]	more than two responses – deduct 1 mark for each additional response accept any order of response accept any other indication of a correct response
	b	meristem/ cambium (1)	[1]	accept phonetic spelling
Total			[3]	
7	a	receptor diffusion receptor effector	[2]	four correct responses = 2 marks three correct responses = 1 mark two, one or zero correct responses = 0 marks accept any other indication of a correct response
	b	Only the sensory neuron releases ... <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> The sensory neuron membrane ... <input checked="" type="checkbox"/> (1)	[2]	one mark for each correct response. more than two responses – deduct 1 mark for additional response. ignore crosses in the remaining boxes. accept any other indication of a correct response
	c	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>removal of serotonin in the brains synapses</p> <div style="border: 1px solid black; padding: 2px; width: 60px; margin: 5px auto;">reduced</div> <div style="border: 1px solid black; padding: 2px; width: 60px; margin: 5px auto;"></div> <div style="border: 1px solid black; padding: 2px; width: 60px; margin: 5px auto;"></div> </div> <div style="text-align: center;"> <p>concentration of serotonin in the synapse</p> <div style="border: 1px solid black; padding: 2px; width: 60px; margin: 5px auto;"></div> <div style="border: 1px solid black; padding: 2px; width: 60px; margin: 5px auto;">increased</div> <div style="border: 1px solid black; padding: 2px; width: 60px; margin: 5px auto;"></div> </div> </div> <div style="text-align: center; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; display: inline-block;">Ecstasy</div> </div>	[1]	both correct lines = 1 mark more than one line on right hand or left hand side = 0 marks
Total			[5]	

Question		Expected Answers	Marks	Additional Guidance															
8	a	storage AND retrieval of information (1)	[1]	OWTTE must refer to both features accept accessed = retrieval															
	b	<table border="1"> <thead> <tr> <th>factors</th> <th>enhance</th> <th>inhibit</th> </tr> </thead> <tbody> <tr> <td>the information has a pattern</td> <td>✓</td> <td></td> </tr> <tr> <td>the information is repeated</td> <td>✓</td> <td></td> </tr> <tr> <td>the cerebral cortex is damaged</td> <td></td> <td>✓</td> </tr> <tr> <td>the information is associated with a colour</td> <td>✓</td> <td></td> </tr> </tbody> </table>	factors	enhance	inhibit	the information has a pattern	✓		the information is repeated	✓		the cerebral cortex is damaged		✓	the information is associated with a colour	✓		[2]	four correct responses = 2 marks three correct responses = 1 mark two or one correct responses = 0 marks
factors	enhance	inhibit																	
the information has a pattern	✓																		
the information is repeated	✓																		
the cerebral cortex is damaged		✓																	
the information is associated with a colour	✓																		
Total			[3]																

9	a	<p style="text-align: center;"> <input type="checkbox"/> There is no direct connection ... <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </p>	[1]	
	b	brain (1) motor (1)	[2]	responses must be in the correct order accept any other indication of a correct response
Total			[3]	

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