

**Biology A**

General Certificate of Secondary Education

Unit **A162/01**: Modules B4, B5, B6 (Foundation Tier)

**Mark Scheme for June 2012**

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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.

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**Annotations**

Used in the detailed Mark Scheme:

<b>Annotation</b>	<b>Meaning</b>
/	alternative and acceptable answers for the same marking point
(1)	separates marking points
<b>not/reject</b>	answers which are not worthy of credit
<b>ignore</b>	statements which are irrelevant - applies to neutral answers
<b>allow/accept</b>	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	credit alternative wording / or words to that effect
ORA	or reverse argument

Available in scoris to annotate scripts:

	indicate uncertainty or ambiguity
	benefit of doubt
	contradiction
	incorrect response
	error carried forward
	draw attention to particular part of candidate's response
	no benefit of doubt
	reject
	correct response
	draw attention to particular part of candidate's response
	information omitted

**Subject-specific Marking Instructions**

- a. Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).
- b. 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.

*e.g. for a one-mark question where ticks in the third and fourth boxes are required for the mark:*

✗
✗

*This would be worth  
1 mark.*

✓
✗

*This would be worth  
0 marks.*

✗
✗
✓
✓

*This would be worth  
1 mark.*

- c. 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.

d. Marking method for tick-box questions:

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 and other markings. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses. Credit should be given according to the instructions given in the guidance column for the question. 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 cities in England:

Edinburgh	<input type="checkbox"/>
Manchester	<input type="checkbox"/>
Paris	<input type="checkbox"/>
Southampton	<input type="checkbox"/>

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		✓		✓	✓		✓	
<b>Score:</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>NR</b>

- e. For answers marked by levels of response:
- i. **Read through the whole answer from start to finish**
  - ii. **Decide the level that best fits** the answer – match the quality of the answer to the closest level descriptor
  - iii. **To determine the mark within the level**, consider the following:

Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

- iv. Use the **L1**, **L2**, **L3** annotations in Scoris to show your decision; do not use ticks.

Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

Question			Answer	Marks	Guidance
1	(a)	(i)	80 (%) (2) $8 \div 10 \times 100$ (1)	2	correct answer = 2 marks
		(ii)	yes because( 80%) most are within the range (1)	1	no mark for saying 'yes'; the mark is for the explanation <b>accept</b> reverse argument <b>accept</b> ecf from part (i) (i.e. a correct explanation based upon the percentage the candidate calculated)
	(b)		axon slower (1)	1	two correct responses = 1 mark <b>must</b> be in correct order



Question	Answer	Marks	Guidance
(c)	<p><b>(Level 3)</b> Names most of the structures involved in a reflex arc can sequence these in the correct order <b>AND</b> names a spinal reflex. Quality of written communication does not impede communication of the science at this level. (5–6 marks)</p> <p><b>(Level 2)</b> Names some of the structures involved in a reflex arc <b>AND</b> shows some understanding of the correct sequence of a reflex arc. May name a spinal reflex arc. Quality of written communication partly impedes communication of the science at this level. (3–4 marks)</p> <p><b>(Level 1)</b> Shows an appreciation of some of the structures involved in a reflex arc but may not put them in the correct order <b>OR</b> can name a spinal reflex arc. Quality of written communication impedes communication of the science at this level. (1–2 marks)</p> <p><b>(Level 0)</b> Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p><b>This question is targeted at grades up to C</b></p> <p><b>Indicative scientific points may include:</b></p> <ul style="list-style-type: none"> <li>• stimulus is detected by receptor</li> <li>• impulse travels along sensory neurone (accept message for impulse)</li> <li>• impulse travels through relay neurone/CNS/spinal cord</li> <li>• impulse travels along motor neurone</li> <li>• travels to effector e.g. muscle/gland</li> <li>• response/named response</li> <li>• named example of a reflex</li> <li>• understands that the brain is not involved</li> </ul> <p><b>Use the L1, L2 and L3 annotations in Scoris, do not use ticks.</b></p>
	<b>Total</b>	<b>10</b>	

Question		Answer	Marks	Guidance									
2	(a)	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>...a gap between two adjacent neurons.</td> <td>✓</td> <td>(1)</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>				...a gap between two adjacent neurons.	✓	(1)				1	<b>accept</b> any clear indication of a correct response eg. crosses if no ticks shown or shaded boxes if more than 1 response = 0
...a gap between two adjacent neurons.	✓	(1)											
	(b) (i)	16.4 (1)	1	<b>do not accept</b> any rounding up or down									
	(ii)	(only) trial <b>B</b> (1) because the (average/mean) dose was greater than 10 mg (for 5 days)/ average value is 16.4 (1)	2	OWTTE <b>accept</b> more than the amount needed for the drug to be effective / more than the minimum needed (for dose to have an effect) <b>accept</b> reverse argument ie. insufficient dosage in trial A/ average value is 7.6									
	(iii)	(more impulses will be transmitted because) there is more serotonin in the synapse / serotonin is not taken back into the (first) neuron/ serotonin not reabsorbed (1)	1	<b>credit</b> idea that 'rate' of transmission will increase <b>accept</b> idea that impulses will be transmitted more easily <b>reject</b> idea that 'speed' of impulses will change <b>accept</b> not absorbed = not reabsorbed									

Question	Answer	Marks	Guidance
(c)	<p><i>any two from:</i></p> <p><b>electrical stimulation</b>  may harm the patient; (1)  intrusive or invasive; (1)  specific/ gives precise results; (1)  haemorrhage; (1)  infection; (1)  requires trained technicians/surgeon/doctor (1)</p> <p><b>AND any two from:</b></p> <p><b>brain scans</b>  does not harm the patient; (1)  provides detailed information about brain structure/effective way of mapping the brain; (1)  not intrusive; (1)  quicker; (1)  expensive; (1)  requires trained technicians; (1)</p>	4	<p><b>accept</b> may damage the brain</p> <p><b>accept</b> you can tell which part of the brain is active or OWTTE</p> <p><b>accept</b> could lead to further scientific developments in either technique but only credit once</p>
	<b>Total</b>	<b>9</b>	

Question			Answer	Marks	Guidance
3	(a)	(i)	0.5 (1)	1	
		(ii)	35 (1)	1	<b>allow</b> 34–36
		(iii)	(rate of reaction) drops (rapidly) (1) and then remains the same / unchanged/levels off (1)	2	OWTTE
	(b)		cow (1)	1	<b>allow</b> ecf from (a) (ii)
			<b>Total</b>	<b>5</b>	

Question		Answer	Marks	Guidance
4	(a)	chlorophyll (1) increase (1) purple (1)	3	responses <b>must</b> be in correct order
	(b)	(i) <i>any two from:</i> (bigger leaves) may contain more chlorophyll / chloroplasts; trap more light ; (1) (bigger leaves) may take in more carbon dioxide ; (1) which will affect the rate/amount of photosynthesis ; (1) for direct comparison; (1)	2	<b>ORA</b>  <b>accept</b> bigger leaves makes photosynthesis quicker = 1 mark
		(ii) temperature (1)	1	<b>ignore</b> water <b>reject</b> heat
		(iii) <i>any two from:</i> idea that he could collect (semi-)quantitative data ; (1) can identify outliers/errors/anomalies; (1) prove that the experiment is repeatable ; (1) gives greater confidence in observations/colour changes/conclusions ; (1) calculate <b>accurate</b> mean; (1)	2	<b>accept</b> reliable/gets the same results each time
	(c)	<i>any two from:</i> plant/leaf will have adapted to low light/dark conditions; (1) may have more chloroplasts/ chlorophyll ; (1) will be more efficient at / better at / quicker <b>photosynthesis</b> (1)	2	OWTTE <b>accept</b> used to =adapted to  <b>accept</b> fast rate/increased level= quicker (rate of photosynthesis)
<b>Total</b>			<b>10</b>	

Question			Answer	Marks	Guidance
5	(a)	(i)	oxygen (1) carbon dioxide (1)	2	<b>must</b> be in correct order <b>accept</b> correct formulae
		(ii)	glucose (1) ethanol (1)	2	<b>must</b> be in correct order <b>accept</b> correct formulae <b>accept</b> alcohol = ethanol
	(b)		<b>A</b> (1) <b>B</b> (1) <b>E</b> (1)	3	<b>must</b> be in correct order <b>accept</b> any clear indication of correct response

Question	Answer	Marks	Guidance
(c)	<p><b>(Level 3)</b> Response must include <b>most structures</b> with reference to their functions and to <b>both forms of respiration</b> (qualified), as appropriate. Quality of written communication does not impede communication of the science at this level. (5–6 marks)</p> <p><b>(Level 2)</b> Response must include <b>some structures</b> with reference to their functions and to <b>at least one</b> of the two forms of <b>respiration</b> (qualified). Quality of written communication partly impedes communication of the science at this level. (3–4 marks)</p> <p><b>(Level 1)</b> Response must include at least <b>one named structure</b> with reference to its function and to respiration (qualified) <b>OR</b> correctly identifies the sites of aerobic and anaerobic respiration. Quality of written communication impedes communication of the science at this level. (1–2 marks)</p> <p><b>(Level 0)</b> Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p><b>This question is targeted at grades up to C</b> <b>Indicative scientific points may include:</b></p> <p><b>cell membrane:</b></p> <ul style="list-style-type: none"> <li>• cell membrane oxygen passes into cell</li> <li>• oxygen used for aerobic respiration</li> <li>• cell membrane carbon dioxide passes out of cell (freely)</li> <li>• carbon dioxide released from aerobic/anaerobic respiration</li> <li>• cell membrane alcohol/ethanol passes out of cell</li> <li>• alcohol/ethanol released from anaerobic respiration</li> </ul> <p><b>cytoplasm:</b></p> <ul style="list-style-type: none"> <li>• <b>cytoplasm</b> contains enzymes for reactions</li> <li>• (these reactions) are anaerobic/aerobic respiration</li> <li>• <b>cytoplasm</b> is the site of enzyme/protein synthesis</li> <li>• enzymes used for anaerobic/aerobic respiration</li> </ul> <p><b>mitochondria:</b></p> <ul style="list-style-type: none"> <li>• <b>mitochondria</b> contain enzymes for reactions</li> <li>• (these reactions) are aerobic respiration</li> </ul> <p><b>nucleus:</b></p> <ul style="list-style-type: none"> <li>• <b>nucleus</b> contains genetic code/DNA for production of enzymes/proteins</li> <li>• (these enzymes/proteins) needed in respiration</li> <li>• aerobic respiration needs all structures</li> <li>• anaerobic respiration does not use mitochondria</li> </ul> <p><b>Use the L1, L2 and L3 annotations in Scoris, do not use ticks.</b></p>
	<b>Total</b>	<b>13</b>	

Question		Answer	Marks	Guidance
6	(a)	in box A (most) plants grow upwards/few have curved stems; in box B (most) plants grow with curved stems in both boxes number of curved stems has increased after 48 hours/more time	3	<b>accept</b> correct comparison between A and B = 2 marks
	(b)	<b>No because...</b>  <i>any two from:</i> other plants grow differently to cress; (1) light (from the sun) changes position throughout each day in the garden ; (1) other (competitive) plants will grow in the garden ; (1) most factors vary outdoors (e.g. temperature / moisture / light intensity) ; (1) predators will be present in the garden (e.g. slugs / birds / etc.) ; (1) cress seedlings observed for only 48 hours/ plants in garden grown for longer than 48 hours; (1)  <b>Yes because ...</b>  sun moves across the garden each day/plants follow the sun; (1)	2	no marks for saying 'no'; credit only given for supporting reasons  OWTTE  <b>accept</b> sun not always out/ darkness at night time     no marks for saying 'yes'; credit only given for supporting reasons if yes with correct explanation = 1 mark max
		<b>Total</b>	<b>5</b>	



Question	Answer	Marks	Guidance
7 (a)	<p><b>(Level 3)</b> Identifies both processes correctly <b>AND</b> can explain reasons for their decision. Quality of written communication does not impede communication of the science at this level. (5–6 marks)</p> <p><b>(Level 2)</b> Identifies both processes correctly <b>OR</b> identifies one correctly and can give some reasons for choice. Quality of written communication partly impedes communication of the science at this level. (3–4 marks)</p> <p><b>(Level 1)</b> Can identify one of the processes correctly, may identify a difference between the two processes. Quality of written communication impedes communication of the science at this level. (1–2 marks)</p> <p><b>(Level 0)</b> Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p><b>This question is targeted at grades up to C</b></p> <p><b>Indicative scientific points may include:</b></p> <p><b>A is growth</b></p> <ul style="list-style-type: none"> <li>• numbers of organelles increase</li> <li>• chromosomes are copied/DNA replicates</li> <li>• when the two strands of DNA molecule separate and new strands form alongside them</li> <li>• cells undergo growth in preparation for mitosis</li> <li>• this happens before mitosis</li> <li>• cells get bigger</li> </ul> <p>candidates may use data from the table to illustrate the points above</p> <p><b>B is mitosis/cell division</b></p> <ul style="list-style-type: none"> <li>• copies of chromosomes separate/divide</li> <li>• nucleus divides</li> <li>• organelles shared between new cells</li> <li>• same DNA found in nucleus of new cells</li> <li>• chromosome number identical/ retained in new cells produced by mitosis</li> <li>• new cells are genetically identical/clones</li> </ul> <p>candidates may use data from the table to illustrate the points above</p> <p><b>Use the L1, L2 and L3 annotations in Scoris, do not use ticks.</b></p>
(b)	different genes are switched on/off (1) genes code for different/specific proteins(1)	2	
	<b>Total</b>	<b>8</b>	

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