

## **GCSE**

### **Biology A**

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

General Certificate of Secondary Education

### **Mark Scheme for June 2016**

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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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**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
words	underlined words must be present in answer to score a mark
ecf	error carried forward
AW/owtte	alternative wording
ORA	or reverse argument

	indicate uncertainty or ambiguity
	benefit of doubt
	contradiction
	incorrect response
	error carried forward
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	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. If a candidate alters his/her response, examiners should accept the alteration.
- 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 boxes 3 and 4 are required for the mark:

Put ticks (✓) in the  
two correct boxes.

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth  
1 mark.

Put ticks (✓) in the  
two correct boxes.

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth  
0 marks.

Put ticks (✓) in the  
two correct boxes.

<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

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 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

<b>Edinburgh</b>	
<b>Manchester</b>	
<b>Paris</b>	
<b>Southampton</b>	

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).

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

Question			Answer	Marks	Additional guidance
1	a	i	A	1	accept correct indication on diagram
		ii	13 <input type="checkbox"/> 26 <input checked="" type="checkbox"/> 46 <input type="checkbox"/> 52 <input type="checkbox"/>	1	
		iii	nucleus to be correctly labelled	1	<b>Accept</b> arrows (either direction) <b>Accept</b> correct line without word nucleus
		iv	84 (2)	2	award one mark for the correct working (e.g. 2100 x 4/100)
	b	i	a set of chromosomes from each parent <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	
			<b>Total</b>	<b>6</b>	

Question			Answer	Marks	Additional guidance
2	a	i	8	1	
	a	ii	<p><input type="checkbox"/></p> <p>the stem cells are unspecialised cells</p> <p><input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p>the stem cells can become any type of cell</p> <p><input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p>	2	
	b	i	<p><b>any two from the following :</b></p> <p>cells become/replace pancreatic cells;</p> <p>cells will start making insulin for the patient;</p> <p>so blood glucose can be regulated;</p> <p>patients will no longer need to take insulin injections;</p>	2	<p><b>accept</b> repair the pancreas, but NOT repair pancreatic cells</p> <p><b>ignore</b> blood glucose decreases</p>
		ii	<p><b>any two from the following :</b></p> <p>no ethical/moral issues or example e.g. right to life;</p> <p>don't need to harm/destroy/kill embryos;</p> <p>maybe more difficult to obtain embryo cells ORA;</p> <p>bone marrow cells can be taken from the patient;</p> <p>reduced chance of rejection;</p>	2	<p><b>ignore</b> safer/more risky</p> <p><b>accept</b> more bone marrow cells than embryo cells</p>



Question			Answer	Marks	Additional guidance
		iii	<p>The Government</p> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	
	c		90 hours	1	
	d		<p>Tissue</p> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	
			<b>Total</b>	<b>10</b>	

Question			Answer	Marks	Additional guidance
3	a	i	All correctly plotted (2 marks)  Five or six correctly plotted (1 mark)	2	<b>Allow</b> 1 square error margin  <b>If plotted points invisible</b> , score marks from line of best fit.  <b>ignore</b> bar chart  Points to be plotted: 0.00, 0 0.02, 20 0.04, 28 0.06, 35 0.08, 40 0.12, 43 0.14, 43
	a	ii	Continuous, correct and smooth line of best fit, going through all plotted points, including the origin	1	<b>Accept</b> points joined with straight lines dot-to-dot  <b>Allow</b> 1 square error margin.  <b>If plotted points invisible</b> , score marks if line passes through the correct points on the graph  <b>Do not accept</b> straight line of best fit <b>Allow</b> ecf
	a	iii	42	1	<b>Allow</b> 41 – 43 <b>Allow</b> ecf - correct reading of data from line

Question		Answer	Marks	Additional guidance
	a iv	<p>Any two from</p> <p>as carbon dioxide increases (the rate of) photosynthesis/reaction increases OR there is a positive correlation;</p> <p>idea that increasing carbon dioxide has no further effect/ rate remains constant/rate plateaus;</p> <p>because there is another limiting factor/ named limiting factor/<math>\text{CO}_2</math> is no longer a limiting factor;</p>	2	<p><b>do not accept</b> in reverse: as photosynthesis increases, carbon dioxide increases / OWTTE</p> <p><b>do not accept</b> rate of photosynthesis decreases</p>
	a v	<p>(it is an) outlier / anomalous result / anomaly (1)</p> <p>it does not fit the trend / pattern / line of best fit (1)</p>	2	<p><b>Allow</b> does not fit in</p> <p><b>Ignore</b> does not match /look similar to other results</p>

Question		Answer	Marks	Additional guidance
	b	<p><b>Level 3 (5-6 marks)</b> Uses point(s) of information provided alongside biological knowledge. Quality of written communication does not impede communication of the science at this level</p> <p><b>Level 2 (3-4 marks)</b> Uses point(s) of information provided. Quality of written communication partly impedes communication of the science at this level</p> <p><b>Level 1 (1-2 marks)</b> States condition(s) required for growth. Quality of written communication impedes communication of the science at this level</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit</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>Conditions</b></p> <ul style="list-style-type: none"> <li>• Temperature</li> <li>• use heaters/greenhouse (to raise temperature)</li> <li>• pH (of soil)</li> <li>• light (intensity)</li> <li>• use lamps to increase light intensity</li> <li>• water</li> <li>• minerals /nitrates</li> <li>• provide fertilisers (to provide minerals)</li> <li>• carbon dioxide levels should be above that of atmospheric levels</li> <li>• burn fuels to produce CO<sub>2</sub></li> </ul> <p><b>Using information provided</b></p> <ul style="list-style-type: none"> <li>• pH (of the soil) 6-8/neutral ORA</li> <li>• temperature 28-35 ORA</li> </ul> <p><b>Biological knowledge</b></p> <ul style="list-style-type: none"> <li>• optimising conditions for <b>enzymes ORA</b></li> <li>• correct reference to limiting factors</li> </ul>
	c	<b>Diffusion (1)</b>		
		<b>Total</b>	<b>15</b>	

Question		Answer	Marks	Additional guidance																		
4	a	<p><b>Level 3 (5-6 marks)</b> Identifies some problems with experimental design <b>AND</b> suggests improvements directly linked to the problem.</p> <p>Quality of written communication does not impede communication of the science at this level</p> <p><b>Level 2 (3-4 marks)</b> Identifies some problems with experimental design <b>and</b> suggests improvements, unlinked.</p> <p>Quality of written communication partly impedes communication of the science at this level</p> <p><b>Level 1 (1-2 marks)</b> Identifies either a problem <b>OR</b> an improvement.</p> <p>Quality of written communication impedes communication of the science at this level</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit</p>	6	<p><b>This question is targeted at grades up to C</b></p> <p><b>Indicative scientific points may include</b></p> <table border="1"> <thead> <tr> <th>Problem</th> <th>Improvement</th> </tr> </thead> <tbody> <tr> <td>Only 5 cress seedlings used</td> <td>Increase the number of cress seedlings</td> </tr> <tr> <td>Light is from other sources</td> <td>Eliminate light from other areas/grow in a box with light from one direction only</td> </tr> <tr> <td>Could be due to another factor</td> <td>Try light source from other angles to see if results are similar</td> </tr> <tr> <td>5 days may not be long enough</td> <td>Extend experiment beyond 5 days</td> </tr> <tr> <td>No repeats carried out</td> <td>Repeat experiment</td> </tr> <tr> <td>One seedling did not grow towards the light</td> <td>Repeat experiment</td> </tr> <tr> <td>Some blocked from light because seedlings not all the same size</td> <td>Use seedlings all the same size/put smaller plants near front/ensure <b>evenly</b> lit</td> </tr> <tr> <td>Idea that sunlight can be variable</td> <td>Use fixed light source/lamp (from side)</td> </tr> </tbody> </table>	Problem	Improvement	Only 5 cress seedlings used	Increase the number of cress seedlings	Light is from other sources	Eliminate light from other areas/grow in a box with light from one direction only	Could be due to another factor	Try light source from other angles to see if results are similar	5 days may not be long enough	Extend experiment beyond 5 days	No repeats carried out	Repeat experiment	One seedling did not grow towards the light	Repeat experiment	Some blocked from light because seedlings not all the same size	Use seedlings all the same size/put smaller plants near front/ensure <b>evenly</b> lit	Idea that sunlight can be variable	Use fixed light source/lamp (from side)
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Question		Answer	Marks	Additional guidance
	b	Plants are able to get <b>more</b> light (1) so they can photosynthesise/make glucose/make sugar (1)	2	<b>ignore</b> nearer the sun/get more sun/attracts sunlight <b>accept</b> make starch/make food <b>accept</b> reverse arguments
	c	Meristems <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	1	
		<b>Total</b>	<b>9</b>	

Question		Answer	Marks	Additional Guidance												
5	a	brain (1) spinal cord (1)	2	Ignore spine												
	b	i	2	award 2 marks for 3 correct responses award 1 mark for 2 correct response No marks for 1 correct response												
		<table border="1"> <thead> <tr> <th>Statement</th> <th>True</th> <th>False</th> </tr> </thead> <tbody> <tr> <td>Light sensitive cells.....</td> <td></td> <td>✓</td> </tr> <tr> <td>Hormone secreting cells.....</td> <td></td> <td>✓</td> </tr> <tr> <td>Muscle cells .....</td> <td>✓</td> <td></td> </tr> </tbody> </table>	Statement	True	False	Light sensitive cells.....		✓	Hormone secreting cells.....		✓	Muscle cells .....	✓			
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Muscle cells .....	✓															
		ii	C	1												
		iii	Tomas	1												

Question		Answer	Marks	Additional Guidance
	c	<p><b>Level 3 (5-6 marks)</b> States several features of both systems and comparison is clear. Quality of written communication does not impede communication of the science at this level</p> <p><b>Level 2 (3-4 marks)</b> States some features of both systems Quality of written communication partly impedes communication of the science at this level</p> <p><b>Level 1 (1-2 marks)</b> States some features of either system. Quality of written communication impedes communication of the science at this level</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit</p>	6	<p><b>This question is targeted at grades up to E</b> <b>Indicative scientific points may include</b></p> <p><b>Nervous system features</b></p> <ul style="list-style-type: none"> <li>• receptor/brain</li> <li>• electrical (impulses)</li> <li>• fast (response)</li> <li>• neurones</li> <li>• short lived (response)</li> </ul> <p><b>Endocrine system features</b></p> <ul style="list-style-type: none"> <li>• produced by a gland</li> <li>• chemical</li> <li>• slow response</li> <li>• (transported) in the blood</li> <li>• response lasts a long time</li> </ul> <p><b>Example of comparison – 6 marks at level 3.</b> The nervous system has a fast response whereas the hormonal system is slow. The nervous system uses neurones.</p> <p><b>Allow</b> any evidence of direct comparison e.g. use of “er” or but / whereas etc.</p>
		<b>Total</b>	<b>12</b>	



Question		Answer	Marks	Additional guidance
6	a	<u>long term memory</u> still works (1) problems with <u>short term memory</u> (1)	2	<b>Accept</b> long term better than short-term (2 marks).
	b	MRI/CAT/CT scan	1	<b>Do not accept</b> X rays.
	c	repetition/chunking/pattern/link to stimulus	1	<b>Do not accept</b> write it down unless qualified by repeated. <b>Accept</b> any sensible answer.
		<b>Total</b>	<b>4</b>	

Question		Answer	Marks	Additional guidance
7		enzymes (1) anaerobic (1) energy (1) glucose (1)	4	
		<b>Total</b>	<b>4</b>	

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