

Biology A

General Certificate of Secondary Education

Unit **A162/02**: Modules B4, B5, B6 (Higher Tier)

Mark Scheme for January 2013

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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:

Annotation	Meaning
/	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	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

<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid red; padding: 2px;">L1</div> <div style="border: 1px solid red; padding: 2px;">L2</div> <div style="border: 1px solid red; padding: 2px;">L3</div> </div>	indicate level awarded for a question marked by level of response
<div style="border: 1px solid red; padding: 2px;">▲</div>	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		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

- 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)	$6\text{CO}_2 + 6\text{H}_2\text{O}$ (1) $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ (1)	2	<p>allow any order</p> <p>formulae must be correct including correct use of subscripts</p> <p>allow an unbalanced equation as long as all four compound formulae are correct = 1 mark</p>	
	(b)	(i)	C (1)	1	
		(ii)	<p>(confident because): the (mean) values are the same/similar/very close/closest (1) the results were repeated (ten times) (1) (repeats mean) results are repeatable/reliable/valid (1)</p> <p>(not confident because): size of bubbles vary (1) difficulty counting bubbles (1) size of pondweed might be different (in the two tubes) (1)</p> <p>the temperature might be different (in the two tubes) (1) need more data/tests (to be sure) (1)</p>	2	<p>mark whole answer crediting any two points</p> <p>must imply both values</p> <p>ignore accurate</p> <p>ignore ref to different species of pondweed (as given in the question) allow any other reasonable difference in variables</p> <p>ignore idea of human error ignore idea that data is wrong/inaccurate</p>

Question	Answer	Marks	Guidance								
(iii)	<p>any TWO from: control/measure the (water) temperature in the test tubes; control pH; control length/mass/amount/size of pondweed / number of leaves; control carbon dioxide levels; control volume/amount of water;</p> <p>control distance from light source; use more light intensities / measure the light intensity ;</p> <p>leave experiment for a longer time; allow plant to equilibrate before measuring bubbles;</p> <p>collect the (oxygen) bubbles in a measuring cylinder / gas syringe / ref to measuring volume of oxygen (as more accurate than bubbles);</p>	1	<p>two points required for one mark</p> <p>ignore ref to repeats / using more species of pondweed (both given in question)</p> <p>do not allow extensions to the investigation, i.e. where a new variable is changed</p> <p>do not allow use different light intensities</p>								
(c)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; padding: 5px;">role in photosynthesis</th> <th style="text-align: center; padding: 5px;">cell structure</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">contains the genetic code for making the enzymes needed</td> <td style="text-align: center; padding: 5px;">nucleus</td> </tr> <tr> <td style="padding: 5px;">allows oxygen to pass out of the cell</td> <td style="text-align: center; padding: 5px;">(cell) membrane/(cell) wall</td> </tr> <tr> <td style="padding: 5px;">contains chlorophyll and enzymes</td> <td style="text-align: center; padding: 5px;">chloroplast(s)</td> </tr> </tbody> </table>	role in photosynthesis	cell structure	contains the genetic code for making the enzymes needed	nucleus	allows oxygen to pass out of the cell	(cell) membrane/(cell) wall	contains chlorophyll and enzymes	chloroplast(s)	1	<p>both answers required for one mark</p>
role in photosynthesis	cell structure										
contains the genetic code for making the enzymes needed	nucleus										
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Question		Answer	Marks	Guidance
	(d) (i)	(cell) membrane; respiration;	1	both answers required for one mark
	(ii)	(link between respiration and energy): anaerobic respiration/less aerobic respiration so less energy/ATP released (1) no/less energy for active transport/active uptake (1)	2	do not allow 'no energy' allow 'produced'
		Total	10	

Question		Answer	Marks	Guidance
2	(a)	carbon dioxide + ethanol (1)	1	both answers required for one mark allow any order allow correct formula for carbon dioxide (CO ₂)
	(b)	(animal cells) produce lactic acid (1)	1	do not allow lactic acid if given with carbon dioxide/oxygen ignore references to lack of oxygen / use of glucose as the substrate / ref to energy/ATP released
	(c) (i)	1500(%) (1)	1	if no response in the table, check whole page for the answer
	(ii)	(link between oxygen and respiration): more oxygen means more aerobic respiration in B / less oxygen means anaerobic respiration/less aerobic respiration in A (1) (link between energy and cell division): more energy in B means more cell division/growth / less energy in A means less cell division/growth (1)	2	'B has oxygen and is aerobic respiration' = 0 marks 'B has oxygen and is aerobic respiration. A does not have oxygen and is anaerobic respiration' = 1 mark do not allow 'reproduction' (as given in the question)

Question	Answer	Marks	Guidance
(iii)	<p>(Level 3) Answer describes the effect of adriamycin on the cell cycle and includes a detailed explanation of this effect. Explanation is logically sequenced and includes most key points. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>(Level 2) Answer describes the effect of adriamycin on the cell cycle and includes some explanation of this effect. Explanation may not be logically sequenced or may be missing some key points. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>(Level 1) Answer may describe the effect of adriamycin on the cell cycle and includes some attempt at an explanation of this effect. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>(Level 0) Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to A*</p> <p>do not allow idea that adriamycin stops the chromosomes copying (this is given in the stem)</p> <p>Indicative scientific points include:</p> <p>description:</p> <ul style="list-style-type: none"> • rate of growth/reproduction/number of new yeast cells produced will stop/be reduced/stay the same • more cells will die than be produced • this will happen quickly/immediately <p>explanation:</p> <ul style="list-style-type: none"> • (copying of chromosomes) is part of the cell cycle • it takes place during the phase of cell growth • chromosome replication / DNA copying • two strands of DNA / chromosomes separate • nucleus divides • new (daughter) cells are formed • mitosis • adriamycin prevents this happening • cell division/mitosis can not take place <p>ignore ref to individual cell growth ignore ref to meiosis</p>
(d)	oxygen; methane; fuel;	2	3 correct responses = 2 marks 2 correct responses = 1 mark 1 or 0 correct responses = 0 marks
	Total	13	

Question		Answer	Marks	Guidance
3	(a)	1, 5, (2), 15, 11	2	4 correct responses = 2 marks 3 correct responses = 1 mark 2 or fewer correct responses = 0 marks
	(b) (i)	36% (1) C pairs with G / if G is 36%, C must be the same (1)	2	allow bonds/joins/goes together/matches
	(ii)	different genes code for/make different proteins / this (second) gene codes for a different protein/AW (2)	2	allow genes code for/make proteins = 1 mark
	(c)	messenger RNA/mRNA (1)	1	allow upper or lower case letters
	(d)	base sequence/triplet code changes so different <u>amino acids</u> are coded for (1) different sequence of amino acids means a different protein is made (1)	2	do not allow the idea that amino acids are 'made' allow frameshift mutation / 'it would have been 1 and 5 and is now 9 and 7' / 'code is now ATC TGC' as long as it is clear that this will lead to different <u>amino acids</u>

Question	Answer	Marks	Guidance
(e)	<p>(Level 3) Answer gives a good description of the processes taking place and attempts to explain how they are controlled by genes. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>(Level 2) Answer gives a description of the processes taking place, and includes some scientific details not shown on the diagram. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>(Level 1) Answer gives a simple description of the processes taking place, but only includes points shown on the diagram. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>(Level 0) Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points at Level 1 include:</p> <p>process A:</p> <ul style="list-style-type: none"> • produces specialised cells • these cells can be used for tissue replacement <p>process B:</p> <ul style="list-style-type: none"> • produces unspecialised cells • these form a new cell culture <p>Indicative scientific points at Level 2 include:</p> <ul style="list-style-type: none"> • embryonic stem cells can be used to produce any other type of cell • differentiation • cells are replicating / dividing / mitosis • identical copies / cloning • example of tissue replacement • examples of a specialised cell <p>Indicative scientific points at Level 3 include:</p> <ul style="list-style-type: none"> • stem cells remain unspecialised until 8-cell stage • embryonic stem cells have the potential to switch on / off genes • switching on/off of specific genes leads to cell specialisation • genes that are switched on code for the proteins that the cell needs • different types of cell require different types of protein
	Total	15	

Question		Answer	Marks	Guidance								
4	(a)	any two from: involuntary/automatic/without thinking; rapid/fast/quick/immediate; short-lived/doesn't last long;	1	two answers required for one mark								
	(b) (i)	A – receptor; B – sensory neuron; C – relay/intermediate neuron; D – motor neuron; E – effector/muscle;	3	5 correct responses = 3 marks 3 or 4 correct responses = 2 mark 2 correct responses = 1 marks 0 or 1 correct responses = 0 marks if 'neuron' is missing throughout, deduct one mark allow nerve/nerve cell for neuron throughout ignore CNS allow effector neuron								
	(ii)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">... no processing of information is required.</td> <td style="text-align: center; width: 20px;">✓</td> </tr> <tr> <td style="height: 15px;"> </td> <td> </td> </tr> <tr> <td style="height: 15px;"> </td> <td> </td> </tr> <tr> <td style="height: 15px;"> </td> <td> </td> </tr> </table>	... no processing of information is required.	✓							1	if more than one box is ticked = 0 marks
... no processing of information is required.	✓											
	(c)	max 2 for identifying: reflex/response = crying / fear (1) primary stimulus = (loud) noise (1) secondary stimulus = rat (1) the (reflex) response becomes associated with secondary stimulus/rat (regardless of presence of primary stimulus) (1)	3									
Total			8									

Question		Answer	Marks	Guidance
5	(a)	<p>only one/the first neuron releases the chemical/transmitter substance (1)</p> <p>only one/the second/next neuron has the <u>receptor</u> (sites/molecules) (1)</p>	2	<p>must be clear that there are two separate neurons – one releasing the chemical and one with receptors</p> <p>allow pre-synaptic neuron allow one side of the synapse releases the chemical</p> <p>allow post-synaptic neuron allow one side of the synapse has receptors</p> <p>ignore nerve ignore sensory/motor ignore ref to reuptake</p>
	(b)	<p>blocks; removed; increases; increases;</p>	2	<p>4 correct responses = 2 marks 3 or 2 correct responses = 1 mark 1 correct response = 0 marks</p>
	(c)	<p>cerebral cortex/cerebral hemisphere/cerebrum/frontal lobe (1)</p>	1	
	(d)	<p>(support / reasons why there IS NOT a correlation): not enough data (1) only small range of noise levels used (1) noise levels are not measured accurately/quantitatively (1) not all data fits the pattern /specific example of this (1) results are similar in all rooms (1)</p> <p>(challenge / reasons why there IS a correlation): quiet rooms are better (at remembering the numbers) / noisy rooms are worse (at remembering the numbers) (1) as rooms get quieter, performance gets better (1)</p>	3	<p>max 2 for either support or challenge needs to be clear whether the point is support or challenge</p> <p>need to see this stated explicitly</p> <p>need a description of the pattern/trend</p> <p>'in the quiet rooms they do better, in the noisy room they do less well and in the very noisy room they do worst' = 2 marks</p>

Question	Answer	Marks	Guidance
(e)	<p>(Level 3) Answer includes a detailed description of the model with well-described links to the way it relates to the investigation. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>(Level 2) Answer includes a detailed description of model. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>(Level 1) Answer includes a basic description of the model with some features of the model missing. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>(Level 0) Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to A*</p> <p>Indicative scientific points include:</p> <p>features of model:</p> <ul style="list-style-type: none"> • memory is the storage and retrieval of information • information held in short term memory • information can be moved to long term memory/stored by repetition / reinforcement • recalling the information is called retrieval • lack of reinforcement means information can be forgotten • this represents as an ‘exit route’ within models for memory <p>allow any clear reference to the points above shown in a labelled diagram</p> <p>link to investigation:</p> <ul style="list-style-type: none"> • the sequence of numbers represented the information • models are limited in explaining how memory works • more likely to remember the sequence if there is a pattern, e.g. 5, 10, 15 at the start • credit any valid link between noise and results in the experiment, e.g. in quiet room it is easier to repeat sequence so more likely to remember, in loud room more distractions/stimuli
	Total	14	
	Paper total	60	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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Head office
Telephone: 01223 552552
Facsimile: 01223 552553

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