

**Biology A**

General Certificate of Secondary Education

Unit **A161/02**: Modules B1, B2, B3 (Higher Tier)

**Mark Scheme for June 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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For answers marked by levels of response:

- a **Read through the whole answer from start to finish**
- b **Decide the level that best fits** the answer – match the quality of the answer to the closest level descriptor
- c **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

- d. 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.

### Annotations

Used in the detailed Mark Scheme:

Annotation	Meaning
/	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
 ,  , 	indicate level awarded for a question marked by level of response
	information omitted

### Subject-specific Marking Instructions

- Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).
- If a candidate alters his/her response, examiners should accept the alteration.
- 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.

*eg 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.*

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, eg 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.

eg if a question requires candidates to identify cities in England:

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).

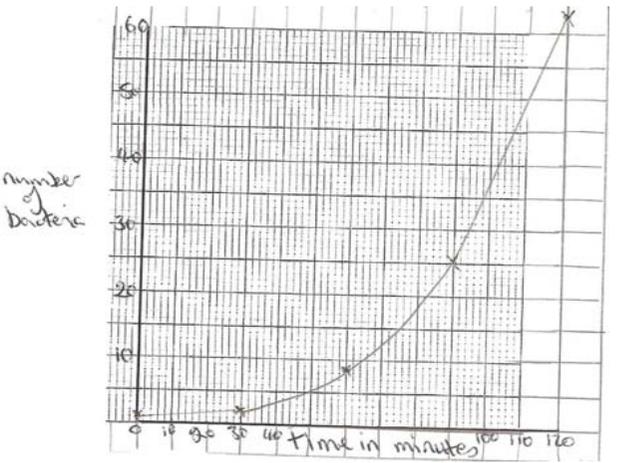
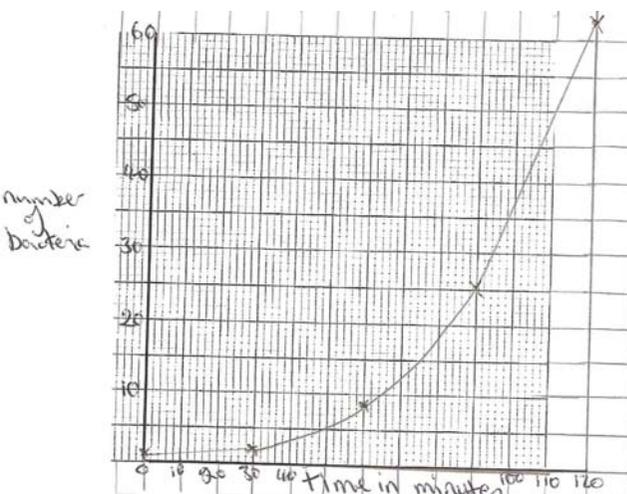
Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
<b>Score:</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>NR</b>

Question		Answer	Marks	Guidance																		
1	(a)	<table border="1"> <tr> <td>dominant</td> <td></td> <td>two alleles of a gene that are different</td> </tr> <tr> <td>genotype</td> <td></td> <td>the genetic makeup of an organism</td> </tr> <tr> <td>heterozygous</td> <td></td> <td>an allele that always shows an effect in the organism</td> </tr> <tr> <td>homozygous</td> <td></td> <td>an allele that only shows an effect if both alleles of the pair are the same</td> </tr> <tr> <td>phenotype</td> <td></td> <td>the observable characteristics of an organism</td> </tr> <tr> <td>recessive</td> <td></td> <td>two alleles of a gene that are the same</td> </tr> </table>	dominant		two alleles of a gene that are different	genotype		the genetic makeup of an organism	heterozygous		an allele that always shows an effect in the organism	homozygous		an allele that only shows an effect if both alleles of the pair are the same	phenotype		the observable characteristics of an organism	recessive		two alleles of a gene that are the same	3	all correct = 3 marks 4 or 5 correct = 2 marks 3 correct = 1 mark
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	(b) (i)	$\begin{array}{cc} gg & Gg; \\ gg & Gg \quad gg; \\ & Gg \quad gg; \end{array}$	3	1 mark for each correct row  if no fully correct rows allow 1 mark for all homozygous recessives (gg) correct  <b>accept</b> alternative letters if clearly upper and lower case used correctly																		
	(ii)	$\begin{array}{ccc} gg & \times & gg \\ Gg & \times & Gg \\ Gg & \times & gg \end{array} \quad \text{OR} \quad \begin{array}{ccc} gg & \times & Gg \end{array}$	2	combinations can be in any order  <b>accept</b> Gg either way round (Gg or gG)  all correct = 2 marks 2 correct = 1 mark																		

Question		Answer	Marks	Guidance
	(c)	risk of test egrisk of miscarriage/risk of infection/harm to fetus/risk to mother; will they terminate/abort; false negatives and positive results/test is not 100% accurate;	3	must have the idea of harm to mother or fetus do not allow "affect" fetus  <b>accept</b> idea of not keeping the fetus  do not credit references to ethical or financial considerations
		<b>Total</b>	<b>11</b>	

Question	Answer	Marks	Guidance
2	<p><b>Level 3 (5–6 marks)</b> Explains how clones can be formed in plants <b>and</b> animals.</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> Explains how clones can be formed in plants <b>or</b> animals.</p> <p>Quality of written communication partially impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> Shows understanding of what is meant by clones and gives examples in plants and/or animals</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 A</b></p> <p><b>Indicative scientific points at Level 2 and 3 may include:</b></p> <p><b>Animals</b></p> <ul style="list-style-type: none"> <li>• twins fertilised zygote separates, both halves develop into an individual (natural)</li> <li>• Greenfly reproducing asexually (natural)</li> <li>• nucleus of body cell transferred to empty egg cell (artificial)</li> </ul> <p><b>Plants</b></p> <ul style="list-style-type: none"> <li>• description of the formation of a runner/bulb (natural)</li> <li>• description of tissue culture or taking a cutting (artificial)</li> </ul> <p><b>Indicative scientific points at Level 1 may include:</b></p> <ul style="list-style-type: none"> <li>• clones are genetically identical</li> <li>• produced by asexual reproduction</li> <li>• human identical twins</li> <li>• runners or bulbs</li> <li>• (tissue culture) taking a cutting</li> <li>• nuclear transfer</li> </ul> <p>Ignore references to bacteria/mayfly</p> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
	<b>Total</b>	<b>6</b>	

Question		Answer	Marks	Guidance																
3	(a)	<table border="1"> <tr> <td>With a very low income, women are certain to get heart disease.</td> <td></td> </tr> <tr> <td>In women, each time income is halved, the risk of heart disease is doubled.</td> <td></td> </tr> <tr> <td>Men are more at risk of heart disease than women.</td> <td>✓</td> </tr> <tr> <td>With a high income, women are more at risk of heart disease than men.</td> <td></td> </tr> <tr> <td>There are other risk factors for heart disease apart from income.</td> <td></td> </tr> <tr> <td>No one at high income gets heart disease.</td> <td></td> </tr> <tr> <td>For men, the lower the income the greater the risk of heart disease.</td> <td>✓</td> </tr> <tr> <td>From middle to high income, the risk for women remains unchanged.</td> <td>✓</td> </tr> </table>	With a very low income, women are certain to get heart disease.		In women, each time income is halved, the risk of heart disease is doubled.		Men are more at risk of heart disease than women.	✓	With a high income, women are more at risk of heart disease than men.		There are other risk factors for heart disease apart from income.		No one at high income gets heart disease.		For men, the lower the income the greater the risk of heart disease.	✓	From middle to high income, the risk for women remains unchanged.	✓	3	if more than three boxes are ticked deduct one mark for each additional tick
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	(b)	C; 4;	2	<b>accept</b> any unambiguous indication using lines on table																
	(c)	<table border="1"> <tr> <td>All the men should be the same height.</td> <td></td> </tr> <tr> <td>Both men and women should be chosen at random</td> <td>✓</td> </tr> <tr> <td>The sample size should be as large as possible</td> <td>✓</td> </tr> <tr> <td>The woman should all have a high income.</td> <td></td> </tr> <tr> <td>Only people with a history of heart disease should be included.</td> <td></td> </tr> <tr> <td>The two groups should be checked that they match on as many factors as possible.</td> <td>✓</td> </tr> <tr> <td>The study should be a double blind trial.</td> <td></td> </tr> </table>	All the men should be the same height.		Both men and women should be chosen at random	✓	The sample size should be as large as possible	✓	The woman should all have a high income.		Only people with a history of heart disease should be included.		The two groups should be checked that they match on as many factors as possible.	✓	The study should be a double blind trial.		3	if more than three boxes are ticked deduct one mark for each additional tick		
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<b>Total</b>			<b>8</b>																	

Question	Answer	Marks	Guidance												
4 (a) (i)		2	<p>axis correctly plotted = 1 mark</p> <p>4 or 5 plots correct for their axes = 1 marks</p> <table border="1" data-bbox="1355 347 1975 539"> <thead> <tr> <th>Time in minutes</th> <th>Numbers of bacteria</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1</td> </tr> <tr> <td>30</td> <td>3</td> </tr> <tr> <td>60</td> <td>8</td> </tr> <tr> <td>90</td> <td>24</td> </tr> <tr> <td>120</td> <td>64</td> </tr> </tbody> </table> <p>bar chart = 0 marks</p>	Time in minutes	Numbers of bacteria	0	1	30	3	60	8	90	24	120	64
Time in minutes	Numbers of bacteria														
0	1														
30	3														
60	8														
90	24														
120	64														
		1	<p>line is smooth curve through points</p> <p>not straight lines/ruled dot to dot</p> <p><b>ignore</b> extrapolations</p> <p>if more than one line no mark eg straight line and curve</p> <p>no mark if bar chart plotted</p>												
(iii)	20	1	<b>accept 17-22</b>												

Question		Answer	Marks	Guidance												
	(iv)	fast multiplication; means more cell damage/toxins produced; needs to take antibiotics;	2													
	(b)	'A' because bacteria stimulate antibodies production/once antibodies B are produced A goes down	1	<b>ignore</b> reference to antibodies 'engulfing' bacteria												
	(c)	<table border="1"> <tbody> <tr> <td>engulf the bacteria</td> <td>✓</td> </tr> <tr> <td>stop the bacteria entering the body</td> <td></td> </tr> <tr> <td>cause the bacteria to mutate</td> <td></td> </tr> <tr> <td>cause the bacteria to reproduce</td> <td></td> </tr> <tr> <td>digest the bacteria</td> <td>✓</td> </tr> <tr> <td>produce antibodies against the bacteria</td> <td>✓</td> </tr> </tbody> </table>	engulf the bacteria	✓	stop the bacteria entering the body		cause the bacteria to mutate		cause the bacteria to reproduce		digest the bacteria	✓	produce antibodies against the bacteria	✓	2	3 correct = 2 marks 2 correct = 1 mark
engulf the bacteria	✓															
stop the bacteria entering the body																
cause the bacteria to mutate																
cause the bacteria to reproduce																
digest the bacteria	✓															
produce antibodies against the bacteria	✓															
	(d)	V; idea that <b>shape</b> fits	2	explanation must make reference to shape <b>accept</b> "same shape"/lock and key idea do not allow just the idea that they 'stick' together												
	(e) (i)	60-65	1													
	(ii)	memory	1													
	(iii)	first conclusion correct and second incorrect;(1)  (first conclusion correct as) <b>higher/faster</b> level of antibody response after second infection (1)  (second conclusion incorrect as) no information provided about antibiotics/explanation that because of high antibody level Jake does not need antibiotics;(1)	2	<b>accept</b> implications that first statement is correct and second incorrect  maximum 2 marks												
<b>Total</b>			<b>15</b>													

Question	Answer	Marks	Guidance
5	<p><b>Level 3 (5–6 marks)</b>            Explain blood pressure is the pressure of the blood on the walls of the arteries.            Explains <b>how</b> at least one factor affects blood pressure</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>            Explains why there are two blood pressure numbers.            Describes factors as increasing or decreasing blood pressure.</p> <p>Quality of written communication partially impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b>            Gives examples of factors which cause blood pressure to vary between individuals.</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 A/A*</b></p> <p><b>Indicative scientific points at Level 3 may include:</b></p> <ul style="list-style-type: none"> <li>• arteries have muscular walls to maintain pressure when heart is relaxing</li> <li>• how cholesterol deposits increase blood pressure</li> <li>• how exercise can reduce blood pressure</li> <li>• how aging/hardening arteries increase blood pressure</li> <li>• how nicotine increase blood pressure</li> </ul> <p><b>Indicative scientific points at Level 2 may include:</b></p> <ul style="list-style-type: none"> <li>• describes blood pressure measurement as two numbers</li> <li>• higher number is when heart is contracting</li> <li>• lower number is when heart is relaxing</li> <li>• 120/80 = normal</li> <li>• Eg increased fitness decreases blood pressure</li> </ul> <p><b>Indicative scientific points at Level 1 may include:</b></p> <ul style="list-style-type: none"> <li>• weight/fitness/age/stress/inheritance/drugs/smoking/salt/fat</li> <li>• genetic</li> </ul> <p>Ignore references to poor/healthy diet.</p> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
	<b>Total</b>	<b>6</b>	
6	(a) (i) <b>D;</b> has both largest population <b>and</b> greatest number of different species	2	mark as independent points
	(ii) <b>A</b>	1	
	(iii) genetic variation/variation within a species	1	<b>accept</b> DNA differences

Question	Answer	Marks	Guidance																
(b)	<table border="1" data-bbox="421 280 1048 903"> <tr> <td data-bbox="432 280 920 347">The ultimate source of energy for food webs is the Sun.</td> <td data-bbox="920 280 1048 347"></td> </tr> <tr> <td data-bbox="432 347 920 414">A new antibiotic is discovered in a rare species of plant.</td> <td data-bbox="920 347 1048 414">✓</td> </tr> <tr> <td data-bbox="432 414 920 481">A gene is identified that could make crops grow in a drier climate.</td> <td data-bbox="920 414 1048 481">✓</td> </tr> <tr> <td data-bbox="432 481 920 587">Classification is used to make it easier to identify different organisms.</td> <td data-bbox="920 481 1048 587"></td> </tr> <tr> <td data-bbox="432 587 920 654">Mutations are required for the development of a new species.</td> <td data-bbox="920 587 1048 654"></td> </tr> <tr> <td data-bbox="432 654 920 721">Evidence for evolution comes from the fossil record and from DNA.</td> <td data-bbox="920 654 1048 721"></td> </tr> <tr> <td data-bbox="432 721 920 788">Darwin's theory of natural selection.</td> <td data-bbox="920 721 1048 788"></td> </tr> <tr> <td data-bbox="432 788 920 903">All living organisms are dependent on other organisms for their survival.</td> <td data-bbox="920 788 1048 903">✓</td> </tr> </table>	The ultimate source of energy for food webs is the Sun.		A new antibiotic is discovered in a rare species of plant.	✓	A gene is identified that could make crops grow in a drier climate.	✓	Classification is used to make it easier to identify different organisms.		Mutations are required for the development of a new species.		Evidence for evolution comes from the fossil record and from DNA.		Darwin's theory of natural selection.		All living organisms are dependent on other organisms for their survival.	✓	3	
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All living organisms are dependent on other organisms for their survival.	✓																		
(c)	any correct example but must include <b>cause</b> and linked <b>effect</b>	1	Eg deforestation causes habitat destruction; burning fossil fuels leads to global warming  <b>ignore</b> unqualified reference to "pollution"																
	<b>Total</b>	<b>8</b>																	

Question		Answer	Marks	Guidance
7	(a)	<p><b>Level 3 (5–6 marks)</b> Gives a description of evolution AND speciation using key terms.</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> Gives a description of evolution OR speciation using key terms.</p> <p>Quality of written communication partially impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> Makes a simple statement about evolution OR speciation</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 on Evolution may include</b></p> <ul style="list-style-type: none"> <li>• Natural selection</li> <li>• variation</li> <li>• mutation</li> <li>• competition</li> <li>• selective survival/survival of best adapted/survival of fittest</li> <li>• reproduction</li> <li>• pass on characteristic/genes</li> </ul> <p><b>Indicative scientific points on Speciation may include</b></p> <ul style="list-style-type: none"> <li>• population gets <b>split</b> into two groups (eg new mountain range or new river etc)</li> <li>• reproductive isolation</li> <li>• different/changed environments</li> <li>• <b>split</b> populations become different</li> <li>• different species can not interbreed (eg due to mating seasons/courtship/genetic incompatibility)</li> </ul> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
		<b>Total</b>	<b>6</b>	
		<b>Paper Total</b>	<b>60</b>	

**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](mailto:general.qualifications@ocr.org.uk)

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