



# GCSE

## Biology A

General Certificate of Secondary Education

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

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

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## 1. 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
words	underlined words must be present in answer to score a mark
ecf	error carried forward
AW/owtte	alternative wording
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

<span style="border: 1px solid red; padding: 2px;">R</span>	reject
	correct response
<span style="border: 1px solid red; padding: 2px;">L1</span> , <span style="border: 1px solid red; padding: 2px;">L2</span> , <span style="border: 1px solid red; padding: 2px;">L3</span>	draw attention to particular part of candidate's response
<span style="border: 1px solid red; padding: 2px;">^</span>	information omitted

## 2. 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.

Eg

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 1 mark.

Put ticks (✓) in the two correct boxes.

✓
✗

This would be worth 0 marks.

Put ticks (✓) in the two correct boxes.

✗
✗
✓
✓

This would be worth 1 mark.

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- 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, eg 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, eg 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.

Eg 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>			✓			✓	✓	✓	✓	
<b>Manchester</b>	✓	x	✓	✓	✓				✓	
<b>Paris</b>				✓	✓		✓	✓	✓	
<b>Southampton</b>	✓	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.

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Question			Answer	Mark	Guidance																
1	(a)	(i)	Sarah AND Wendy (1)	1	<b>accept</b> either way round																
		(ii)	Mary AND Dave (1) Pete AND Liz (1) Jane (1)	3	minus 1 mark for each name over five names names can be in any order.																
		(iii)	<table border="1"> <tbody> <tr> <td>Cystic fibrosis is caused by a recessive allele.</td> <td>✓</td> </tr> <tr> <td>The symptoms of cystic fibrosis appear at about the age of forty.</td> <td></td> </tr> <tr> <td>Cystic fibrosis is caused by environmental factors.</td> <td></td> </tr> <tr> <td>The symptoms include difficulty in breathing because of thick mucus.</td> <td>✓</td> </tr> <tr> <td>If a person with cystic fibrosis has a non-carrier partner, there is a 50:50 chance of having children with cystic fibrosis.</td> <td></td> </tr> <tr> <td>The genotype of a cystic fibrosis carrier is heterozygous.</td> <td>✓</td> </tr> <tr> <td>The alleles for cystic fibrosis occur in two different places on the same chromosome.</td> <td></td> </tr> <tr> <td>Cystic fibrosis can be transmitted by coughs and sneezes.</td> <td></td> </tr> </tbody> </table>	Cystic fibrosis is caused by a recessive allele.	✓	The symptoms of cystic fibrosis appear at about the age of forty.		Cystic fibrosis is caused by environmental factors.		The symptoms include difficulty in breathing because of thick mucus.	✓	If a person with cystic fibrosis has a non-carrier partner, there is a 50:50 chance of having children with cystic fibrosis.		The genotype of a cystic fibrosis carrier is heterozygous.	✓	The alleles for cystic fibrosis occur in two different places on the same chromosome.		Cystic fibrosis can be transmitted by coughs and sneezes.		3	minus 1 mark for each additional incorrect response
Cystic fibrosis is caused by a recessive allele.	✓																				
The symptoms of cystic fibrosis appear at about the age of forty.																					
Cystic fibrosis is caused by environmental factors.																					
The symptoms include difficulty in breathing because of thick mucus.	✓																				
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Question		Answer	Mark	Guidance
	(b) (i)	<p><i>any two from:</i>            males live longer ORA (1)            live longer as time progresses / life expectancy has increased (1)            gaps between males and females closes in later years (1)            peak for males occurs before that for females (1)            life expectancies converge at 2004 / greatest difference at 1999 (1)</p>	2	<b>note</b> this is looking for comparisons so simply quoting data from the graph does not score.
	(ii)	<p>(males / females life expectancy) continues to increase (1)            in line with the trend of the graph / improvements in health care (1)</p> <p>OR</p> <p>females' life expectancy get closer to males' life expectancies / meet (1) because gap is decreasing (1)</p> <p>OR</p> <p>gap will decrease (1) no explanation (0)</p>	2	<p><b>accept</b> one prediction and correct explanation = 2 marks</p> <p><b>ignore</b> any reference to line falling</p> <p>must have correct prediction to go on to score explanation mark</p>
<b>Total</b>			<b>11</b>	



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Question	Answer	Mark	Guidance
2	<p><b>[Level 3]</b> Include many points from <i>parents individuals</i> and many from <i>society</i>. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p><b>[Level 2]</b> Includes some points from <i>parents individuals</i> and some from <i>society</i> Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p><b>[Level 1]</b> Includes some points from either <i>parents individuals</i> OR <i>society</i>. There may be limited use of specialist terms. 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 A*</b></p> <p><b>Indicative scientific points may include:</b></p> <p><b>Parents and individuals may include</b></p> <ul style="list-style-type: none"> <li>• the knowledge will allow you to make life choices</li> <li>• put your mind at rest or know the extent of the problem</li> <li>• whether or not to tell family</li> <li>• can they get treatment for their condition</li> <li>• counselling / stress</li> <li>• whether or not to have children</li> <li>• reliability of tests (false pos false neg)</li> <li>• risk of miscarriage from tests</li> <li>• whether or not to have IVF / reject faulty embryos</li> <li>• whether or not to have an abortion</li> <li>• adoption</li> </ul> <p><b>Society may include</b></p> <ul style="list-style-type: none"> <li>• idea of freedom of information</li> <li>• getting life insurance</li> <li>• employment implications</li> <li>• idea of misuse of information</li> <li>• is it ethically / morally the right thing to do?</li> </ul> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks</b></p>
	<b>Total</b>	<b>6</b>	

Question		Answer	Mark	Guidance	
3	(a)	the medicine taken to cure the disease	1	both needed	
		other microorganisms that take advantage of the situation			
		damage done to cells			✓
		the length of time that the illness lasts			
		toxins produced by the microorganism			✓
		people who are ill tend to eat less food			

Question	Answer	Mark	Guidance
(b)	<p><b>[Level 3]</b> Includes most of the relevant points regarding <b>mechanism AND immunity</b>. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p><b>[Level 2]</b> Includes most relevant points regarding <b>mechanism OR immunity</b>. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p><b>[Level 1]</b> Includes vague account ie not enough information. 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>Mechanism</b></p> <ul style="list-style-type: none"> <li>• microorganism has antigens</li> <li>• that trigger production of antibodies</li> <li>• by white blood cells</li> <li>• white blood cells can also engulf/digest / clump / neutralise any microorganisms</li> <li>• to kill/destroy microorganism</li> </ul> <p><b>Immunity</b></p> <ul style="list-style-type: none"> <li>• correct explanation of memory cells</li> <li>• idea of rapid production provides immunity from future infections</li> <li>• idea of specificity.</li> </ul> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks</b></p>

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Question		Answer	Mark	Guidance
	(c)	<u>benefits outweigh risk</u> (1) idea of greater good for the majority of people / lots of lives could be saved (1)	2	<b>e.g.</b> more people saved than die <b>ignore</b> reference to cancer kills
	(d) (i)	how bad the symptoms and effects of flu are (1)	1	<b>accept</b> any correct reference to how dangerous / fatal / serious the disease is. <b>ignore</b> how severe it is
	(ii)	the greater the fatality rate the more deaths there are (1)	1	<b>accept</b> either direction  <b>allow</b> positive correlation
	(iii)	<i>any two from:</i> people travelled less (so less likely to pass on the flu) (1) people lived in remote communities (1) idea that Russian flu may not have been as infective/less severe strain (1) Russian flu lasted for shorter time (1) smaller population, (worldwide, in early 1800s) (1) possible inaccurate record (in 1800s) (1)	2	<b>ignore</b> reference to medicines / vaccinations <b>ignore</b> reference to mutation <b>ignore</b> references to climate <b>ignore</b> references to immunity  <b>accept</b> ORAs
		<b>Total</b>	<b>13</b>	

Question		Answer				Mark	Guidance
4	(a)		Test	Open-label	Blind	3	1 mark for each correct column
			A	✓			
			B		✓		
			C	✓			
			D		✓		
	(b)	cells / tissues (1) <u>healthy</u> people (1) ill (volunteers) / patients (1)				3	

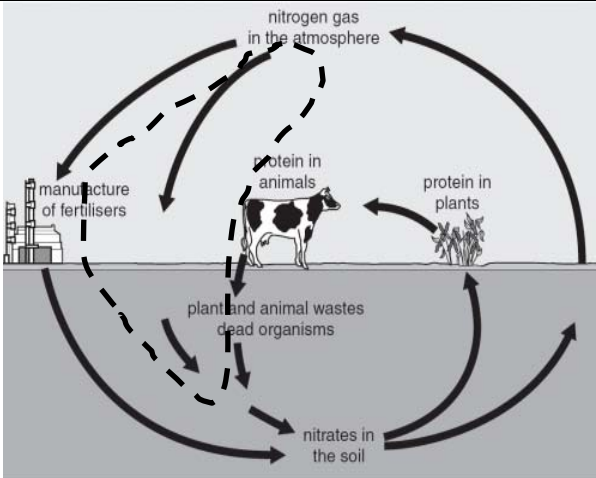
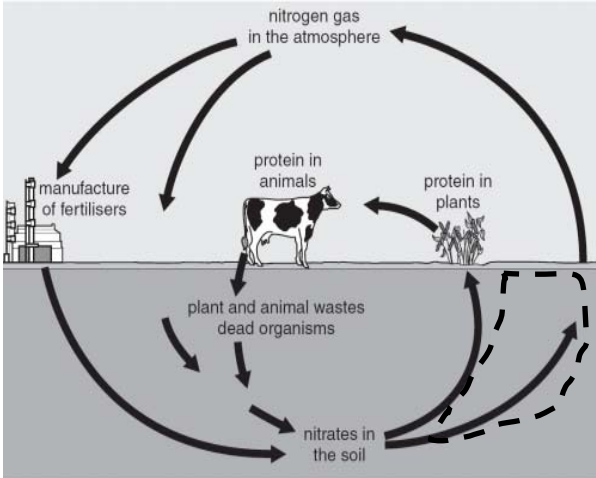
Question	Answer	Mark	Guidance
(c)	<p><b>[Level 3]</b> Includes at least 1 indicative level 3 point concerning ethical or social issues. Quality of written communication does not impede communication of the science at this level.  (5 – 6 marks)</p> <p><b>[Level 2]</b> Includes some of indicative level 2 points even if benefit and risk are not discussed. Quality of written communication partly impedes communication of the science at this level.  (3 – 4 marks)</p> <p><b>[Level 1]</b> Brief vague account that refers to idea of risk and benefit only. 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 A</b></p> <p><b>Indicative scientific points at level 3 may include an ethical or social argument:</b></p> <ul style="list-style-type: none"> <li>• as this is a question that cannot be answered by science, different people will hold different views</li> <li>• idea that the financial pot is a fixed size and that this will divert resources from elsewhere.</li> <li>• should people who are healthy divert resources from people who are ill</li> </ul> <p><b>ignore</b> vague reference to side effects unless clearly indicates benefit and risk <b>ignore</b> testing</p> <p><b>Indicative scientific points at level 2 may include:</b></p> <ul style="list-style-type: none"> <li>• how much will it cost?</li> <li>• is it right to give medicine to healthy people? (not qualified with ethical or social argument)</li> <li>• should only 'at risk' people get the drug?</li> <li>• life style choices could reduce / affect heart disease</li> </ul> <p><b>ignore</b> vague reference to side effects unless clearly indicates benefit and risk <b>ignore</b> testing</p> <p><b>Indicative scientific points at level 1 may include:</b></p> <ul style="list-style-type: none"> <li>• what are the benefits of the drug?</li> <li>• what are the risks of the drug?</li> <li>• does it benefit the majority of people?</li> <li>• idea of benefits outweigh the risks = 2 marks at L1</li> </ul> <p><b>ignore</b> vague reference to side effects unless clearly indicates benefit and risk <b>ignore</b> testing <b>Use the L1, L2, L3 annotations in Scoris; do not use ticks</b></p>

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Question		Answer	Mark	Guidance
	(d) (i)	bar must reach a height of between 500 to 510 (just above the 500 line) (1)	1	<b>note</b> it must be no higher above the 500 line than white males are above the 600 line and no lower than the 500 line.
	(ii)	African Americans (1)	1	<b>accept</b> African American male or female.
	(iii)	<i>any two from:</i> age; weight / BMI / obesity; cholesterol levels etc; diet / fat intake / salt intake / alcohol; smokers; family history / genetics; exercise / fitness; where they live; occupation; stress level; diabetes;	2	<b>ignore</b> life style / healthy <b>ignore</b> environment
	(iv)	<i>any two from:</i> more exercise; better diet; do not smoke or drink as much;	2	<b>accept</b> reverse argument  <b>ignore</b> have better / healthier life style
		<b>Total</b>	<b>18</b>	

Question	Answer	Mark	Guidance
5 (a) (i)	 <p>The diagram illustrates the nitrogen cycle. It is divided into two horizontal sections: the atmosphere above and the ground below. In the atmosphere, 'nitrogen gas in the atmosphere' is shown. A solid arrow points from the atmosphere to a factory labeled 'manufacture of fertilisers'. A dashed arrow points from the factory back to the atmosphere. In the ground section, 'plant and animal wastes dead organisms' are shown. A solid arrow points from these wastes to 'nitrates in the soil'. A dashed arrow points from the nitrates back to the atmosphere. On the ground surface, there is a cow labeled 'protein in animals' and some plants labeled 'protein in plants'. A solid arrow points from the nitrates in the soil to the plants. A dashed arrow points from the cow back to the nitrates in the soil. A solid arrow also points from the plants to the cow.</p>	1	anywhere inside the dashed line  if candidate uses multiple Fs and one is incorrect then zero marks
(ii)	 <p>This diagram is identical to the one in the first row, showing the nitrogen cycle with 'nitrogen gas in the atmosphere', 'manufacture of fertilisers', 'protein in animals', 'protein in plants', 'plant and animal wastes dead organisms', and 'nitrates in the soil'. However, in this version, the dashed arrows are not fully connected, representing an incomplete cycle.</p>	1	anywhere inside the dashed line  if candidate uses multiple Ds and one is incorrect then zero marks



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Question		Answer	Mark	Guidance
	(iii)	microorganisms/ bacteria (1)	1	<b>ignore</b> plant roots / decomposers
	(b)	respiration (1) photosynthesis (1)	2	either way round
	(c) (i)	carbon dioxide is increasing over time (1) yearly / seasonal fluctuations (1)	2	<b>allow</b> positive correlation
	(ii)	<i>any three from:</i>  <b>advantages</b> data collected over long time (1) idea of not affected by pollution (1)  <b>disadvantages</b> only one collection point (1) idea that mountain top is not typical / not in city / isolated (1)	3	
	(iii)	<i>any two from:</i>  photosynthesis (takes in carbon dioxide) (1) plants photosynthesise in summer but not winter (1)  burning fossil fuels (1) used in winter (so CO <sub>2</sub> released) (1)	2	
		<b>Total</b>	<b>12</b>	
		<b>Paper Total</b>	<b>60</b>	

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