

# **Twenty First Century Science Biology A**

General Certificate of Secondary Education

Unit **A161/01**: Modules B1, B2, B3 (Foundation Tier)

## **Mark Scheme for January 2012**

---

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

© OCR 2012

Any enquiries about publications should be addressed to:

OCR Publications  
PO Box 5050  
Annesley  
NOTTINGHAM  
NG15 0DL








Telephone: 0870 770 6622  
Facsimile: 01223 552610  
E-mail: [publications@ocr.org.uk](mailto:publications@ocr.org.uk)

## 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

	reject
	correct response
L1 , L2 , L3	Allocate level of 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>			✓			✓	✓	✓	✓	
<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

- f. 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)	<p>any correct answers eg</p> <table border="1"> <thead> <tr> <th>inherited</th> <th>environment</th> <th>inheritance and environment</th> </tr> </thead> <tbody> <tr> <td>eye colour</td> <td>scars</td> <td>weight</td> </tr> <tr> <td>dimples</td> <td>hair colour</td> <td>skin colour</td> </tr> <tr> <td>blood group</td> <td>language</td> <td>height</td> </tr> <tr> <td>sex/gender</td> <td>accent</td> <td>hair colour</td> </tr> <tr> <td>genetic disease</td> <td>tattoo</td> <td>personality</td> </tr> <tr> <td>hair colour</td> <td>piercing</td> <td>behaviour</td> </tr> <tr> <td>skin colour</td> <td>tan</td> <td>intelligence</td> </tr> </tbody> </table>	inherited	environment	inheritance and environment	eye colour	scars	weight	dimples	hair colour	skin colour	blood group	language	height	sex/gender	accent	hair colour	genetic disease	tattoo	personality	hair colour	piercing	behaviour	skin colour	tan	intelligence	3	<p><b>accept</b> tongue rolling for 'inherited' OR 'inheritance and environment'</p> <p><b>accept</b> correctly named feature, if qualified eg nose shape (for inherited only)</p> <p><b>ignore</b> repeated responses – give one mark for first use, unless qualified</p> <p><b>apply</b> 'list rule' within each box</p>
inherited	environment	inheritance and environment																										
eye colour	scars	weight																										
dimples	hair colour	skin colour																										
blood group	language	height																										
sex/gender	accent	hair colour																										
genetic disease	tattoo	personality																										
hair colour	piercing	behaviour																										
skin colour	tan	intelligence																										
	(b)	<table border="1"> <tbody> <tr> <td>Genes are instructions for making proteins.</td> <td>✓</td> </tr> <tr> <td>Some genes are instructions for making...</td> <td>✓</td> </tr> <tr> <td>Genes are made up of chromosomes.</td> <td></td> </tr> <tr> <td>Some characteristics are controlled by...</td> <td>✓</td> </tr> <tr> <td>Genes are instructions for making...</td> <td></td> </tr> <tr> <td>Some genes are instructions for making fats.</td> <td></td> </tr> </tbody> </table>	Genes are instructions for making proteins.	✓	Some genes are instructions for making...	✓	Genes are made up of chromosomes.		Some characteristics are controlled by...	✓	Genes are instructions for making...		Some genes are instructions for making fats.		2	<p>3 correct = 2 marks</p> <p>2 correct = 1 mark</p>												
Genes are instructions for making proteins.	✓																											
Some genes are instructions for making...	✓																											
Genes are made up of chromosomes.																												
Some characteristics are controlled by...	✓																											
Genes are instructions for making...																												
Some genes are instructions for making fats.																												
	(c)	<table border="1"> <tbody> <tr> <td></td> <td></td> <td colspan="2" style="text-align: center;"><b>male / father / dad / sperm</b></td> </tr> <tr> <td></td> <td></td> <td></td> <td style="text-align: center;">Y</td> </tr> <tr> <td rowspan="2" style="text-align: center; vertical-align: middle;"><b>female / mother / mum / egg</b></td> <td></td> <td style="text-align: center;">XX</td> <td style="text-align: center;">XY</td> </tr> <tr> <td></td> <td style="text-align: center;">XX</td> <td style="text-align: center;">XY</td> </tr> </tbody> </table>			<b>male / father / dad / sperm</b>					Y	<b>female / mother / mum / egg</b>		XX	XY		XX	XY	3	<p>male female labels correct = 1 mark</p> <p>Y correct = 1 mark</p> <p>XX    XY or YX } correct = 1 mark</p> <p>XX    XY or YX }</p>									
		<b>male / father / dad / sperm</b>																										
			Y																									
<b>female / mother / mum / egg</b>		XX	XY																									
		XX	XY																									
<b>Total</b>			<b>8</b>																									

Question		Answer	Marks	Guidance
2	(a)	one; dominant;	2	<b>reject</b> if more than one ring drawn around each set of responses.  treat each set of responses independently. <b>accept</b> any indication of correct response.
	(b)	<b>any two from:</b> recessive; need both alleles; can be carrier; both parents must have one or two (recessive) alleles;	2	<b>accept</b> more than one recessive allele  <b>accept</b> gene = allele  <b>accept</b> reverse arguments for Huntington's disease



Question	Answer	Marks	Guidance
(c)	<p><b>[Level 3]</b> Have one use and two or more implications described in detail and linked. Answers specifically relate to embryos or adults or children. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p><b>[Level 2]</b> Have one use and one implication not necessarily linked but described in less detail. Answers just relate to a person. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p><b>[Level 1]</b> Have a description of one use OR implication. Not related to a person or assume it is a person. 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>Uses may include:</b></p> <ul style="list-style-type: none"> <li>• to find out if a (genetic) disorder/disease has been inherited / carrier</li> <li>• to find out reaction to a drug</li> <li>• paternity test</li> <li>• to find out the sex/gender</li> </ul> <p><b>If candidate only describes ‘implications’, limit to L1</b> <b>If candidate only describes ‘uses’, limit to L1</b></p> <p><b>Implications may include:</b></p> <ul style="list-style-type: none"> <li>• to decide whether to terminate a pregnancy</li> <li>• decide whether to have children</li> <li>• insurance implications</li> <li>• employment implications</li> <li>• unreliability of tests / false negs / false positives</li> <li>• possible miscarriage/ harm to unborn baby</li> <li>• stress / counselling</li> <li>• tailor made treatments</li> <li>• embryo selection / gene therapy</li> <li>• who else should you tell in your family</li> <li>• preparation for newborn/ rest of life</li> <li>• religious/ethical implications</li> </ul> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>

Question		Answer	Marks	Guidance
2	(d)	valid argument for, eg medical benefit; valid argument against, eg idea of playing God/do not know consequences	2	<p>e.g.</p> <p><b>for</b></p> <p>can plan ahead make decisions the right to know have the correct treatment might become ill in the future</p> <p><b>ignore</b> knowing that the person has the disease/ save lives or cure disease</p> <p><b>against</b></p> <p>any ethical idea / unnatural / playing God / against religious beliefs insurance implications employment implications false pos and false neg possible miscarriage / damage embryo</p> <p><b>ignore</b> reference to cost/ unqualified 'it is wrong'</p>
			<b>Total</b>	<b>12</b>

Question		Answer	Marks	Guidance
3	(a)	microorganisms attacking cells; producing toxins;	2	<b>accept</b> killing/destroying/invading/infecting = attacking <b>accept</b> named cell <b>ignore</b> microorganism reproduction
	(b)	(i) 6 sets of doubling/ $120 \div 20 = 6$ ; 64;	2	64 alone scores 2 marks
		(ii) <b>any two from:</b> bacteria reproduce <b>very quickly</b> ; bacteria cause food poisoning; idea that longer food is left the greater the risk/ more bacteria;	2	<b>accept</b> bacteria grow but <b>ignore</b> bacteria spread <b>accept</b> make you ill/sick/ get a disease = food poisoning
	(c)	(i) 1;	1	<b>accept</b> any indication of correct response.
		(ii) <b>any two from:</b> <b>no</b> because it could have been caused by something else/ the animal could have a different disease; only by checking the bacteria were the same could he be sure; he should then have done the procedure several times to see if he got the same result/ he only did it once; 'finding 5' must be included;	2	
		(iii) checked / evaluated / reviewed/ comparing (against Koch's results); replicated/ tested it again themselves/ repeat/ further tests;	2	
		<b>Total</b>	<b>11</b>	

Question		Answer	Marks	Guidance								
4	(a)	systolic is when heart is contracting; diastolic when heart is relaxing;	2	<b>ignore</b> references to values								
	(b)	<table border="1"> <tr> <td>low</td> <td>ideal</td> <td>pre-high</td> <td>high</td> </tr> <tr> <td>Paul</td> <td>Dave Ranjit</td> <td></td> <td>Peter</td> </tr> </table>	low	ideal	pre-high	high	Paul	Dave Ranjit		Peter	2	4 correct = 2 marks 3 or 2 correct = 1 mark
low	ideal	pre-high	high									
Paul	Dave Ranjit		Peter									

Question	Answer	Marks	Guidance
(c)	<p><b>[Level 3]</b> Answer includes appropriate explanation AND appropriate action. The answer justifies the action needed to reduce blood pressure OR multiple explanations/actions given. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p><b>[Level 2]</b> Answer includes appropriate explanation AND appropriate action. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p><b>[Level 1]</b> Answer includes appropriate explanations OR appropriate actions. 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 E</b></p> <p><b>Indicative scientific points at Level 3 may include:</b></p> <p><i>explanations</i></p> <ul style="list-style-type: none"> <li>• high blood pressure can cause heart disease/heart attack</li> <li>• could be symptom free</li> <li>• high blood pressure is linked to other named conditions such as stroke</li> </ul> <p><i>actions</i></p> <ul style="list-style-type: none"> <li>• take <b>more</b> exercise</li> <li>• <b>improve</b> diet eg. low salt/fat intake (<b>accept</b> low sugars) / healthy diet</li> <li>• reduce stress</li> <li>• stop smoking</li> <li>• reduce alcohol intake</li> </ul> <p><b>Indicative scientific points at Levels 1 &amp; 2 may include:</b></p> <p><i>explanations</i></p> <ul style="list-style-type: none"> <li>• high blood pressure links to other conditions/heart problems</li> <li>• have the right to know</li> </ul> <p><i>actions</i></p> <ul style="list-style-type: none"> <li>• unqualified ref. to changes in diet/smoking/drinking alcohol/stress and exercise</li> <li>• visit doctor/hospital/take tablets/medicines</li> </ul> <p><b><i>If candidate states only explanations or actions, limit to L1</i></b></p> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
	<b>Total</b>	<b>10</b>	

Question			Answer	Marks	Guidance
5	(a)	(i)	1	1	
		(ii)	<p><b>[Level 3]</b>            Answer gives an explanation of how insecticide use in nearby fields could affect the river water and the species in the river and making appropriate references to the data. Quality of written communication does not impede communication of the science at this level.            (5 – 6 marks)</p> <p><b>[Level 2]</b>            Answer selects data to support trends (for either yes or no). Quality of written communication partly impedes communication of the science at this level.            (3 – 4 marks)</p> <p><b>[Level 1]</b>            Answer picks out general trends from the data (for either yes or no). 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 D</b></p> <p><b>Indicative scientific points at Level 3 may include:</b>            Yes/agree because:</p> <ul style="list-style-type: none"> <li>• insecticide could have dissolved in rain water</li> <li>• then run/washed into the river</li> <li>• data show that water quality score was <b>steady/constant</b> (before May), then <b>decreased</b> during May</li> <li>• insecticide in the water could kill the insects/indicator species</li> <li>• may also have killed other species</li> <li>• death of insects may have decreased numbers of other species in food web/that feed on insects</li> <li>• total number of species showed large decrease in May (from 37 in Jan and 34 in Mar down to 9 in May)</li> <li>• some doubt of 'yes' due to insufficient data/ other factors</li> </ul> <p><b>If candidate states 'no', limit to L2</b></p> <p><b>Indicative scientific points at Level 2 may include:</b>            Yes/agree because:</p> <ul style="list-style-type: none"> <li>• numbers of species dropped eg. from 37/34 to 9</li> <li>• water quality changed/dropped from 12 to 5</li> <li>• insecticide / it got into the river</li> <li>• fewer insects affects other animals</li> </ul> <p>No/disagree/cannot be certain because:</p> <ul style="list-style-type: none"> <li>• other factors may have had an effect eg. seasons, temperature, disease, other pollutants</li> </ul>

Question			Answer	Marks	Guidance
5	(a)	(ii) cont			<p><b>Indicative scientific points at Level 1 may include:</b></p> <p>Yes/agree because:</p> <ul style="list-style-type: none"><li>• number of insects dropped</li><li>• water quality dropped/polluted</li><li>• insecticide/it killed insects</li></ul> <p>No/disagree because:</p> <ul style="list-style-type: none"><li>• it could have been caused by something else</li><li>• insufficient data from observations recorded</li></ul> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>

Question			Answer	Marks	Guidance
	(b)	(i)	(phyto)plankton/algae;	1	<b>accept</b> shark/dolphin/turtle <b>reject</b> unqualified fish/seaweed
		(ii)	lichens;	1	<b>accept</b> moss/liverwort/ black spot (fungus) <b>reject</b> birds
	(c)		levels of nitrate; levels of carbon dioxide;	2	<b>allow</b> answer ticked, circled or underlined in list if answer line blank
			<b>Total</b>	<b>11</b>	



Question		Answer	Marks	Guidance
6	(a)	protecting the rain forests	✓	2 if more than two boxes ticked deduct 1 mark for each additional incorrect response.  <b>accept</b> any indication of correct response
		increasing the population of a species		
		reducing large scale monoculture	✓	
		decreasing the genetic variation within species		
		using wood rather than oil for fuel		
	(b)	Sustaining demand by growing more crops.		1 more than one box ticked = 0 marks  <b>accept</b> any indication of correct response
	Preventing any change happening to the...			
	Exploring new environments such as outer...			
	Meeting the needs of people today without...	✓		
	Supplying crops all the year round from...			
	(c) (i)	<b>any three from:</b> less energy used; less pollution/fumes/CO <sub>2</sub> created; less land fill/litter; less use of raw materials/resources/(crude) oil;	3	<b>ignore</b> rubbish <b>ignore</b> recycling <b>accept</b> reverse argument
	(ii)	<b>any two from:</b> energy still used in production / transport; idea of slow decomposition/ breakdown (in oxygen deficient land fill sites); still uses raw materials/resources/ oil:	2	<b>accept</b> long time to rot/breakdown
<b>Total</b>			<b>8</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)

**[www.ocr.org.uk](http://www.ocr.org.uk)**

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

**Oxford Cambridge and RSA Examinations**  
is a Company Limited by Guarantee  
Registered in England  
Registered Office; 1 Hills Road, Cambridge, CB1 2EU  
Registered Company Number: 3484466  
OCR is an exempt Charity

**OCR (Oxford Cambridge and RSA Examinations)**  
Head office  
Telephone: 01223 552552  
Facsimile: 01223 552553

© OCR 2012

