

Science A

Twenty First Century Science Suite

General Certificate of Secondary Education J630

Mark Schemes for the Units

January 2010

J630/MS/R/10J

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of pupils 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 2010

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

CONTENTS

GCSE Twenty First Century Science A (J630)

MARK SCHEMES FOR THE UNITS

Unit/Content	Page
Guidance for Examiners	1
A211/01 Modules B1, C1, P1 Foundation Tier	3
A211/02 Modules B1, C1, P1 Higher Tier	11
A212/01 Modules B2, C2, P2 Foundation Tier	19
A212/02 Modules B2, C2, P2 Higher Tier	26
A213/01 Modules B3, C3, P3 Foundation Tier	34
A213/02 Modules B3, C3, P3 Higher Tier	43
Grade Thresholds	52

Guidance for Examiners

Additional Guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, eg mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

/	= 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	= alternative wording
ORA	= or reverse argument

Eg mark scheme shows 'work done in lifting/(change in) gravitational potential energy' (1)
work done = 0 marks
work done lifting = 1 mark
change in potential energy = 0 marks
gravitational potential energy = 1 mark

5. Annotations:
The following annotations are available on SCORIS.

✓	= correct response
✗	= incorrect response
bod	= benefit of the doubt
nbod	= benefit of the doubt not given
ECF	= error carried forward
^	= information omitted
I	= ignore
R	= reject

6. If a candidate alters his/her response, examiners should accept the alteration.
7. 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.

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

This would be worth one mark.

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 one mark.

8. 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.

9. 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

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	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Manchester	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Paris	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Southampton	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Score:	2	2	1	1	1	1	0	0	0	NR

A211/01 Modules B1, C1, P1 Foundation Tier

Question		Expected Answers	Marks	Additional Guidance
1	a	unspecialised (1) specialised (1) genes (1) disorders (1)	[4]	accept any other clear indication of correct choice
	b	any three from for someone suffering from disorder/disease/injury; example of a disease/disorder/injury; against embryo is a living human; embryos are destroyed/aborted/miscarried; Unnatural; wrong in itself; against God/religious reasons;	[3]	maximum two marks for each of 'for' and 'against' accept 'curing' 'living' can be implied eg embryo is human but not just human embryo 'play God' = religious reasons ignore references to animal testing.
	c	<input type="checkbox"/> <input type="checkbox"/> genetically identical cells or organisms <input checked="" type="checkbox"/> (1) <input type="checkbox"/>	[1]	tick in any other box = 0 marks
Total			[8]	

Question		Expected Answers	Marks	Additional Guidance
2	a	<p>description</p> <p>... in a similar way to cystic fibrosis.</p> <p>Parents can be carriers of PKU.</p> <p>... caused by a recessive allele.</p>	[2]	choice of only top description box = 1 mark both top and bottom "explanation" boxes selected = 1 mark no extra boxes allowed
	b	<p>a protein <input checked="" type="checkbox"/> (1)</p>	[1]	tick in any other box = 0 marks
	c	i	2 1	[1] accept 'two' accept 'one' or 'a' both required in correct order for the mark

Question			Expected Answers	Marks	Additional Guidance																
2	c	ii	<table border="1"> <thead> <tr> <th colspan="2">sex chromosomes</th> </tr> </thead> <tbody> <tr> <td>male</td> <td>(X) Y</td> </tr> <tr> <td>female</td> <td>(X) X</td> </tr> </tbody> </table>	sex chromosomes		male	(X) Y	female	(X) X	[1]	no extra letters										
sex chromosomes																					
male	(X) Y																				
female	(X) X																				
	d		tests carry risk of abortion / religious objections / parents may not know they have disorder alleles / cost (1)	[1]	accept risk/harm/damage to (unborn) baby/losing the baby do not accept 'dangerous to baby' do not accept 'parents not wanting the test' reject 'too soon to tell'																
			Total	[6]																	
3	a	i		[1]	black circle must touch both open circles the open circles must not touch each other allow non linear shape if atoms labelled with correct names or C and O give mark																
		ii	any two from: plants/trees; by photosynthesis/make their own food; water/(acid) rain water/oceans/sea(s); dissolve/react/absorb;	[2]	dissolve/react/absorb only allowed if linked to water/rain water/oceans/sea(s)																
	b	i	<table border="1"> <thead> <tr> <th>statement</th> <th>Jane Jordan</th> <th>Mike Morris</th> <th>both of them</th> </tr> </thead> <tbody> <tr> <td>Coal should not ...</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>... the atmosphere.</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>... can be trapped.</td> <td>✓</td> <td></td> <td></td> </tr> </tbody> </table>	statement	Jane Jordan	Mike Morris	both of them	Coal should not ...		✓		... the atmosphere.			✓	... can be trapped.	✓			[3]	mark each row independently 1 mark for each correct row
statement	Jane Jordan	Mike Morris	both of them																		
Coal should not ...		✓																			
... the atmosphere.			✓																		
... can be trapped.	✓																				

Question			Expected Answers	Marks	Additional Guidance
3	b	ii	any two from: less fuel burned; for same amount of energy; less CO ₂ produced;	[2]	do not allow 'less pollution' alone - CO ₂ should be mentioned for mark
			Total	[8]	

4	a		<input type="checkbox"/> to reduce the pollution caused by cars <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/>	[1]	tick in any other box = 0 marks
	b	i	<input type="checkbox"/> <input type="checkbox"/> It is very different ... <input checked="" type="checkbox"/> (1) <input type="checkbox"/>	[1]	tick in any other box = 0 marks
		ii	202 to 206 (1)	[1]	allow numbers in reverse order both numbers must be given
		iii	204 (1)	[1]	

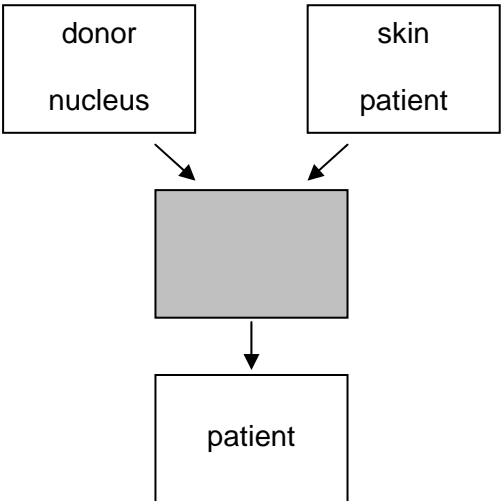
Question		Expected Answers	Marks	Additional Guidance
4	c	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> because these factors change ... <input checked="" type="checkbox"/> (1)	[1]	tick in any other box = 0 marks
	d	<input type="checkbox"/> It is a poisonous gas. <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/>	[1]	
Total			[6]	
5	a	In March 2008, the Cassini ... <input checked="" type="checkbox"/> Instruments on Cassini detected ... <input checked="" type="checkbox"/> The instruments also detected ... <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	[2]	three correct ticks and two blanks = 2 marks two correct ticks and at least two blanks = 1 mark one correct tick only = 0 If 4 ticks deduct 1 mark All 5 boxes ticked = 0

Question			Expected Answers	Marks	Additional Guidance
5	b	i	<input type="checkbox"/> Professor Cameron <input checked="" type="checkbox"/> Doctor Fraser <input checked="" type="checkbox"/> <input type="checkbox"/>	[1]	two correct ticks and two blanks = 1 mark
5	b	ii	<input type="checkbox"/> Professor Cameron <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/>	[1]	tick in any other box = 0 marks
		iii	Doctor Rogers <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	[1]	tick in any other box = 0 marks
			Total	[5]	

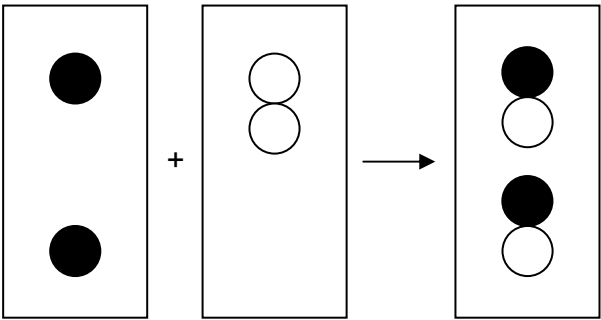
Question		Expected Answers	Marks	Additional Guidance																									
6	a	<div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> radioactive waste <input checked="" type="checkbox"/> (1) </div>	[1]	tick in any other box = 0 marks																									
	b	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 20%;"></th> <th style="text-align: center; width: 15%;">claim</th> <th style="text-align: center; width: 15%;">Charles William Lyell Buckland</th> <th style="text-align: center; width: 15%;">both</th> <th style="text-align: center; width: 15%;">neither</th> </tr> </thead> <tbody> <tr> <td>The Earth ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Some rocks ...</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>The valleys ...</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>The rocks ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		claim	Charles William Lyell Buckland	both	neither	The Earth ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Some rocks ...	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The valleys ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The rocks ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[4]	one mark for each correct row
	claim	Charles William Lyell Buckland	both	neither																									
The Earth ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																									
Some rocks ...	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>																									
The valleys ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																									
The rocks ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																									
		Total	[5]																										

Question	Expected Answers	Marks	Additional Guidance
7	any four from: low probability of large asteroids colliding (1) because they are more likely to hit another planet (1) consequences very severe (1) local effects eg shock wave, explosive impact (1) impact in ocean - tsunamis (1) impact on land - global effects eg forest fires, dust clouds, earthquakes, volcanoes, craters (1) global consequences, eg block out Sun (1) idea of (cooler) climate change (1) Idea of extinction (1) risk = probability x consequences (1)	[4]	
	Total	[4]	

A211/02 Modules B1, C1, P1 Higher Tier

Question		Expected Answers	Marks	Additional Guidance
1	a	non-specialised/unspecialised /undifferentiated/pluripotent (1) specialised/differentiated (1)	[2]	accept 'cells without a job'
	b	 <pre> graph TD A[donor nucleus] --> C[] B[skin patient] --> C C --> D[patient] style C fill:#ccc </pre>	[2]	all three boxes correct = 2 marks two boxes correct = 1 mark
	c	any three from: expensive (1) not yet successful (1) unknown risks/reference to potential danger (1) reduces concentration on other possible treatments/cures (1)	[3]	marks are for arguments one argument and further detail can gain 2 marks for one argument
		Total	[7]	

Question		Expected Answers	Marks	Additional Guidance
2	a	<p>description</p> <p>... in a similar way to cystic fibrosis.</p> <p>Parents can be carriers of PKU.</p> <p>... caused by a recessive allele.</p>	[2]	<p>choice of only top description box = 1 mark any line from the top left box indicates the candidate's choice then look at the right hand boxes to award second mark</p> <p>both top and bottom 'explanation' boxes selected = 1 mark no extra boxes allowed</p>
	b	<p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p>a protein <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p>	[1]	tick in any other box = 0 marks
	c	2 1	[1]	<p>accept 'two'</p> <p>accept 'one' or 'a'</p> <p>both required in correct order for the mark</p>

Question		Expected Answers	Marks	Additional Guidance																				
2	d	who insurers/employers why may need to pay out too much in event of illness etc/may miss a lot of work or work below standard	[1]	allow any reasonable identifiable group or organisation who may discriminate eg landlord, mortgage lender, potential spouse, business partner, combined with the justification of the discrimination do not credit justifications based on faulty science, eg 'I may catch their genetic disease' need both 'who' and correctly matched 'why' for the mark																				
Total			[5]																					
3		X, Y (1) Y, testes (1)	[2]	X or Y in either order 'female' or 'male' are not accepted here accept 'SRY' accept 'male sex organs'																				
Total			[2]																					
4	a		[2]	one mark for any correctly drawn carbon monoxide molecule (one white circle and one black circle touching) 1 mark for balancing eg must have <u>2</u> carbon atoms in left hand box and <u>2</u> carbon and <u>2</u> oxygen atoms in the right hand box balancing mark should be awarded independently																				
	b	i	[3]	one mark for each correct row more than one tick in a row scores 0 marks																				
		<table border="1"> <thead> <tr> <th>claim</th> <th>Jane Jordan</th> <th>Mike Morris</th> <th>both of them</th> <th>neither of them</th> </tr> </thead> <tbody> <tr> <td>Air quality ...</td> <td style="text-align: center;">✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Small-scale ...</td> <td></td> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> <tr> <td>Nuclear fuel ...</td> <td></td> <td></td> <td></td> <td style="text-align: center;">✓</td> </tr> </tbody> </table>	claim	Jane Jordan	Mike Morris	both of them	neither of them	Air quality ...	✓				Small-scale ...		✓			Nuclear fuel ...				✓		
claim	Jane Jordan	Mike Morris	both of them	neither of them																				
Air quality ...	✓																							
Small-scale ...		✓																						
Nuclear fuel ...				✓																				

Question			Expected Answers	Marks	Additional Guidance
4	b	ii	<div style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> More electricity is made for each ... <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> </div>	[1]	tick in any other box = 0 marks
	c		any two from: sulfur atoms are in <u>coal</u> (1) idea that combustion of sulfur produces sulfur dioxide (1) idea of removing sulfur before burning (1) burn/use fuel with lower sulfur content (1) idea of removing sulfur dioxide from flue gas/scrubbing flue gas (1) qualification of any point eg use of calcium oxide/alkali/production of gypsum (1)	[2]	ignore any reference to alternative energy ignore any reference to catalytic converters this mark is for the comparison of sulfur content
			Total	[8]	

Question			Expected Answers	Marks	Additional Guidance
5	a	i	<p style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> It is very different from the other values. <input checked="" type="checkbox"/> (1) <input type="checkbox"/> </p>	[1]	tick in any other box = 0 marks
		ii	202 to 206 (1)	[1]	allow numbers in reverse order both numbers must be given
		iii	204 (1)	[1]	accept any clear indication of this choice
	b		<p style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> because these factors change the ... <input checked="" type="checkbox"/> (1) </p>	[1]	tick in any other box = 0 marks
	c		no real difference (1) ranges overlap / mean of first set of values within range of second set / mean of second set of values within range of first set (1)	[2]	
			Total	[6]	

Question		Expected Answers	Marks	Additional Guidance
6		<p>any four from: low probability of large asteroids colliding (1) because they are more likely to hit another planet (1) consequences very severe (1) local effects eg shock wave, explosive impact (1) impact in ocean - tsunamis (1) impact on land - global effects eg forest fires, dust clouds, earthquakes, volcanoes, craters (1) global consequences, eg block out Sun (1) idea of (cooler) climate change (1) Idea of extinction (1) risk = probability x consequences (1)</p>	[4]	
		Total	[4]	
7	a	<p>Apart from the Sun, the nearest ... <input checked="" type="checkbox"/></p> <p style="text-align: right;"><input type="checkbox"/></p> <p style="text-align: right;"><input type="checkbox"/></p> <p style="text-align: right;"><input type="checkbox"/></p> <p style="text-align: right;"><input type="checkbox"/></p> <p>The fastest speed recorded for ... <input checked="" type="checkbox"/></p>	[1]	both ticks needed for one mark
	b	i		
		<p style="text-align: right;"><input type="checkbox"/></p> <p>Professor Cameron <input checked="" type="checkbox"/></p> <p>Doctor Fraser <input checked="" type="checkbox"/></p> <p style="text-align: right;"><input type="checkbox"/></p>	[1]	both ticks needed for one mark

Question			Expected Answers	Marks	Additional Guidance
7	b	ii	<input type="checkbox"/> Professor Cameron <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/>	[1]	Tick in any other box = 0
	c			[3]	four correct = 3 marks three correct = 2 marks two or one correct = 1 mark ignore any left-hand box with more than one line drawn from it
			Total	[6]	

Question		Expected Answers	Marks	Additional Guidance
8	a	<p>No other scientist had made similar ... <input checked="" type="checkbox"/> (1)</p> <p>Catastrophism explained many ... <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	[2]	
	b	<p><input type="checkbox"/></p> <p>Seafloor spreading moves continents ... <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p>Rocks show that the Earth's magnetic ... <input checked="" type="checkbox"/> (1)</p>	[2]	
		Total	[4]	

A212/01 Modules B2, C2, P2 Foundation Tier

Question		Expected Answers				Marks	Additional Guidance	
1	a		fibre	from living plants	from living animals	synthetic materials	[3] all four lines correct = 3 marks three lines correct = 2 marks two lines correct = 1 mark more than one tick on any one line negates that line	
			cotton	✓				
			nylon			✓		
			PVC			✓		
			wool		✓			
	b	i	wool (1)				[1]	more than one answer = 0 marks
		ii	<div style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ... comfortable and absorbs sweat. <input checked="" type="checkbox"/> (1) </div>				[1]	more than one box ticked = 0 marks
		iii	<div style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ...absorbs very little water. <input checked="" type="checkbox"/> (1) </div>				[1]	more than one box ticked = 0 marks
		Total				[6]		

Question			Expected Answers	Marks	Additional Guidance															
2	a	i	5.8 (m) (1)	[1]																
		ii	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 20%; text-align: center;">true</th> <th style="width: 20%; text-align: center;">false</th> </tr> </thead> <tbody> <tr> <td>The record doubled ...</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>The record increased ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>The biggest increase ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>The record improved ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		true	false	The record doubled ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The record increased ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The biggest increase ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The record improved ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	[2]	<p>all four correct = 2 marks three or two correct = 1 mark one correct = 0</p> <p>more than one tick on any one line negates that line</p>
	true	false																		
The record doubled ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>																		
The record increased ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																		
The biggest increase ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																		
The record improved ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																		
	b	i	<p>any three from: make results reliable; check for/identify outliers; re-do/eliminate any outliers; find a mean/average/best estimate (of true value);</p>	[3]	<p>ignore accuracy/fair test/ get the right results/get the correct answer accept wrong reading/odd result/faulty /anomalous result ignore so they do not make a mistake/get a different result</p>															
		ii	<p>any two from: errors in reading measurements / errors in measuring ; force/weight not in middle of pole; position of supports changes; pole may not return to original position when force removed/pole does not go back;</p>	[2]	<p>ignore reference to time /speed of settling ignore human error on its own accept force/weight not in the same place</p>															
			Total	[8]																

Question		Expected Answers	Marks	Additional Guidance
3	a	infrared <input type="checkbox"/> B (1) ultraviolet <input type="checkbox"/> C (1)	[2]	
	b*	... an ionising radiation. <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> ... more energy than light photons. <input checked="" type="checkbox"/> (1)	[2]	one mark for each correct tick three boxes ticked deduct one mark four boxes ticked = 0 marks
	c	any two from: wear mask/eye protections/goggles; regular eye checks; safety regulations about use of arc welding; inspect workplace to ensure safe practice; reference to idea of not working for too long taking regular breaks/AW;	[2]	ignore wear gloves /safety equipment/right equipment
		Total	[6]	

Question			Expected Answers	Marks	Additional Guidance
4	a	i	C (1)	[1]	
		ii	A, B (1)	[1]	both needed in either order for one mark
		iii	C (1)	[1]	
	b		<p>Stop burning forests ... <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p>Cut back on the use of fossil ... <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	[2]	one mark for each correct tick three ticks deduct one mark four or five ticks = 0 marks
			Total	[5]	

Question		Expected Answers	Marks	Additional Guidance
5	a	<p>Some low-lying lands ... <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p>Some crops will no longer ... <input checked="" type="checkbox"/></p>	[1]	both ticks needed for one mark tick in any other box = 0 marks
	b	link/connection/relationship between CO ₂ and temperature OR between carbon dioxide and global warming (1) (explaining correlation) eg both go up (together) (1)	[2]	answer must relate to a link not a cause
		Total	[3]	
6	a	skin (1) stomach acid (1)	[2]	one mark for each correct barrier circled three barriers circled deduct one mark four barriers circled = 0 marks
	b	<p>reproduce rapidly <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p>damage cells <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	[2]	one mark for each correct tick three ticks deduct one mark four or five ticks = 0 marks
		Total	[4]	

Question		Expected Answers	Marks	Additional Guidance
7	a	<div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> ... the chance of heart disease. <input checked="" type="checkbox"/> (1) </div>	[1]	more than one box ticked = 0 marks
	b	peer reviewed journals (1) work has been verified/proved/repeated/checked by other scientists/experts (working in the same area) (1)	[2]	mark independently
Total			[3]	

8	a		[2]	one mark for each correct line any other lines between sections = 0 marks for that section
---	---	--	-----	---

Question		Expected Answers	Marks	Additional Guidance															
8	b	<table border="1"> <tr> <td></td> <td>safety only</td> <td>effectiveness only</td> <td>both</td> <td></td> </tr> <tr> <td>healthy</td> <td>✓</td> <td></td> <td></td> <td>(1)</td> </tr> <tr> <td>with illness</td> <td></td> <td></td> <td>✓</td> <td>(1)</td> </tr> </table>		safety only	effectiveness only	both		healthy	✓			(1)	with illness			✓	(1)	[2]	one mark for each correct line more than one tick in any line = 0 marks
	safety only	effectiveness only	both																
healthy	✓			(1)															
with illness			✓	(1)															
	c	i	<p style="text-align: right;"><input type="checkbox"/></p> <p>... are not killed by antibiotics <input checked="" type="checkbox"/> (1)</p> <p style="text-align: right;"><input type="checkbox"/></p>	[1]	more than one box ticked = 0 marks														
		ii	<p>any two from: always finish a course of antibiotics; only take antibiotics when necessary; regularly change the antibiotic being used (in the population); use combination of antibiotics;</p>	[2]	<p>ignore reference to stronger antibiotic</p> <p>accept AW eg stop taking too many antibiotics/do not use for a cold/do not use all the time</p> <p>accept use a different antibiotic</p>														
		Total		[7]															

A212/02 Modules B2, C2, P2 Higher Tier

Question		Expected Answers	Marks	Additional Guidance													
1	a		[3]	mark each line from clothing to fibre to property one mark for each correct line across ignore any line from PVC to a property													
	b	i	D (1)	[1]													
		ii	<input type="checkbox"/> <input type="checkbox"/> It reduces the attraction ... <input checked="" type="checkbox"/> (1) <input type="checkbox"/>	[1]													
	c		<table border="1"> <tbody> <tr> <td>... made from crude oil.</td> <td></td> <td>✓</td> </tr> <tr> <td>... high energy requirement ...</td> <td></td> <td>✓</td> </tr> <tr> <td>... will not rot ...</td> <td></td> <td>✓</td> </tr> <tr> <td>... can be broken down ...</td> <td>✓</td> <td></td> </tr> </tbody> </table>	... made from crude oil.		✓	... high energy requirement ...		✓	... will not rot ...		✓	... can be broken down ...	✓		[2]	all four rows correct = 2 marks three or two rows correct = 1 mark one or zero rows correct = 0 marks
... made from crude oil.		✓															
... high energy requirement ...		✓															
... will not rot ...		✓															
... can be broken down ...	✓																
			Total	[7]													

Question		Expected Answers	Marks	Additional Guidance
2	a	<p style="text-align: right;"><input type="checkbox"/></p> <p style="text-align: right;">The most rapid increase ... <input checked="" type="checkbox"/> (1)</p> <p style="text-align: right;"><input type="checkbox"/></p> <p style="text-align: right;">The average increase ... <input checked="" type="checkbox"/> (1)</p>	[2]	one mark for each correct tick three boxes ticked deduct 1 mark four boxes ticked = 0 marks
	b	i*	[3]	<p>ignore accuracy/fair test/get the right results/get the correct answer</p> <p>accept wrong reading/odd result/faulty/anomalous result</p> <p>ignore so they do not make a mistake/get a different result</p>
		ii	[1]	<p>ignore reference to time/speed of settling</p> <p>ignore human error on its own</p> <p>accept force/weight not in the same place</p>
2	c	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; width: 100px; height: 30px; margin-right: 20px;"></div> <div style="border: 1px solid black; padding: 5px; margin-right: 20px;">The ranges overlap.</div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-right: 20px;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-right: 20px;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-right: 20px;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-right: 20px;"></div> </div> <p style="margin-left: 20px;">There is not a real difference ...</p>	[1]	one correct line = 1 mark more than one line = 0 marks
Total			[7]	

Question		Expected Answers				Marks	Additional Guidance
3	a	radio waves	IR	UV	gamma rays	[1]	all correct = 1 mark allow words infrared ultra violet IR or UV written in wrong box = 0
	b*	<p>... an ionising radiation. <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p>... more energy than light photons. <input checked="" type="checkbox"/> (1)</p>				[2]	one mark for each correct tick three boxes ticked deduct one mark four boxes ticked = 0 marks
	c	<p><u>As Low As Reasonably Achievable</u> (1)</p> <p>plus any two from: reduces the (health) risk/increases safety; use of mask/protective clothing/PPE; limit time spent working; train workforce in safe practice; monitor/enforce safe practice; regular eye checks; screen arc from sight of all but welder;</p>				[3]	one mark for each of up to two applications do not allow prevent/stop risks accept 'make sure people know what they are doing' for train workforce
		Total				[6]	

Question			Expected Answers	Marks	Additional Guidance
4	a	i	A, B (1)	[1]	both answers in any order (and no others) needed for the mark
		ii	C (1)	[1]	
	b		<p>Stop burning forests ... <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p>Cut back on the use of fossil ... <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	[2]	one mark for each correct tick three ticks deduct one mark four or five ticks = 0 marks
			Total	[4]	

Question		Expected Answers	Marks	Additional Guidance
5	a	<p style="text-align: right;">Ada Siu Han</p> <p>Sea levels may rise a lot. <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/></p> <p>Some areas will have ... <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/></p> <p>The weather will be very ... <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/></p> <p>Changes in sea ... <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	[3]	<p>all four lines correct = 3 marks three lines correct = 2 marks two lines correct = 1 mark more than one tick on any line makes that line incorrect</p>
	b	<p>any two from: used data to show a correlation between CO₂ levels and global warming/increasing temperature;</p> <p>data fluctuates wildly/shows large variation / readings from different places not comparable/vary / not possible to take enough readings to describe it all / a long time needed to process the data / other variables involved in rising CO₂ levels;</p> <p>computer (models) used to process data / (computers) can try out very many years-worth of data in a short time;</p>	[2]	<p>do not allow correlation with human activity</p> <p>this mark is for difficulties handling the large amount of data produced by weather readings</p> <p>this mark is for explaining how difficulties were overcome</p>
		Total	[5]	

Question		Expected Answers	Marks	Additional Guidance
6	a	any two from: skin; stomach acid; (chemicals in) sweat; (chemicals in) tears;	[2]	
	b	512 (1)	[1]	
Total			[3]	

7	a	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; text-align: center;">... eating chocolate and ...</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">... an increase in heart disease.</div> </div> <p style="text-align: center;">or</p> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; text-align: center;">... eating the chemicals in cocoa and ...</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">... an increase in diabetes.</div> </div> <p style="text-align: center;">or</p> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; text-align: center;">... age and ...</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">... a decrease in heart disease.</div> </div>	[1]	one correct line = 1 mark more than one line drawn = 0 marks
	b	verified/checked/evaluated/repeated by other scientists (1) increases the reliability/spot mistakes/noticing fake data/removes possibility of bias reporting of results (1)	[2]	do not allow looked at/compared by other scientists
Total			[3]	

Question		Expected Answers	Marks	Additional Guidance									
8	a	<table border="1"> <tr> <td>small number of disease ...</td> <td>more red blood cells produced</td> <td>already had the disease</td> </tr> <tr> <td>a dose of antibiotics</td> <td>white blood cells destroy ...</td> <td>antibodies present before ...</td> </tr> <tr> <td>dead disease-causing ...</td> <td>... make antibodies against ...</td> <td>... micro-organisms infecting ...</td> </tr> </table>	small number of disease ...	more red blood cells produced	already had the disease	a dose of antibiotics	white blood cells destroy ...	antibodies present before ...	dead disease-causing make antibodies against micro-organisms infecting ...	[2]	one mark for each correct line any other lines between sections = 0 marks for that section
small number of disease ...	more red blood cells produced	already had the disease											
a dose of antibiotics	white blood cells destroy ...	antibodies present before ...											
dead disease-causing make antibodies against micro-organisms infecting ...											
	b	i	[2]	one mark for each correct line more than one tick in any line = 0 marks									
		ii	[2]										

	safety only	effectiveness only	both	
healthy	✓			(1)
with illness			✓	(1)

(double blind means:)
neither researcher/doctor or participant/patient knows who is receiving the drug/medicine under test (1)
(placebos are rarely used as:)
it is unethical not to give patients treatment / gives false hope / cannot cure them (1)

Question		Expected Answers	Marks	Additional Guidance
8	c	increased use of antibiotics ... <input checked="" type="checkbox"/> random changes in genes ... <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	[1]	both ticks = 1 mark tick in any other box = 0 marks
		Total	[7]	

A213/01 Modules B3, C3, P3 Foundation Tier

Question		Expected Answers	Marks	Additional Guidance
1	a	<input type="checkbox"/> <input type="checkbox"/> Marion <input checked="" type="checkbox"/> (1) Rohit <input checked="" type="checkbox"/> (1)	[2]	
	b	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Rohit <input checked="" type="checkbox"/> (1)	[1]	
	c	<input type="checkbox"/> <input type="checkbox"/> Marion <input checked="" type="checkbox"/> (1) <input type="checkbox"/>	[1]	
Total			[4]	

Question		Expected Answers	Marks	Additional Guidance																
2	a	<p>The diagram shows four boxes on the left labeled A, B, a greyed-out box, and D. On the right are three text boxes: "... heat exchanger which boils a liquid into vapour ...", "The vapour goes into a turbine.", and "A generator is turned to make electricity.", followed by a greyed-out box. Solid lines connect A to the heat exchanger, B to the turbine, and D to the generator. A dashed line connects the greyed-out box to the generator text box.</p>	[2]	three links correct = 2 marks one or two links correct = 1 mark																
	b	i	<table border="0"> <thead> <tr> <th></th> <th>true</th> <th>false</th> </tr> </thead> <tbody> <tr> <td>Nuclear power stations ...</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Coal power stations ...</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Using gas instead of coal ...</td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Gas power stations ...</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </tbody> </table>		true	false	Nuclear power stations ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Coal power stations ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Using gas instead of coal ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Gas power stations ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	[3]	ignore any rows with two ticks or with no ticks all rows correct = 3 marks three rows correct = 2 marks two rows correct = 1 mark one row correct = 0 marks
	true	false																		
Nuclear power stations ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																		
Coal power stations ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																		
Using gas instead of coal ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>																		
Gas power stations ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																		

Question			Expected Answers	Marks	Additional Guidance
2	b	ii	<div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> ... details about building ... <input checked="" type="checkbox"/> (1) <input type="checkbox"/> </div>	[1]	
			Total	[6]	

3	a		any two from: treatment of cancer; sterilising surgical instruments; sterilising food;	[2]	any other valid application for ionising radiation (including X-rays and UV) can be given eg gamma /CT scan, X-ray photo for broken bones 'describe' must have enough detail to infer the process involved
	b	i	appropriate job (eg worker at nuclear power station/reprocessing plant, hospital radiographer, or other job clearly involving radioactivity) stated or described (1)	[1]	allow 'nuclear' power station even if no job described likely job areas are: radiography, nuclear medicine, nuclear research/teaching, weapons research/manufacture, materials testing, tracers to find leaks/spread of material
		ii	statement of any one precautionary measure eg protective clothing, remote handling, regular monitoring of dose, not getting too close to sources (1)	[1]	
			Total	[4]	

Question		Expected Answers	Marks	Additional Guidance
4	a	imagination (1) predictions (1)	[2]	must be in the order given
	b	i	[1]	
		<div style="text-align: right;"> <input type="checkbox"/> <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> </div> Chickens evolved from dinosaurs.		
		ii	[1]	
		<div style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> (1) </div> Three proteins ...		
Total			[4]	

Question		Expected Answers	Marks	Additional Guidance
5	a	<div style="text-align: right;"><input type="checkbox"/></div> <div style="text-align: right;">rapid environmental change <input checked="" type="checkbox"/> (1)</div> <div style="text-align: right;">the arrival of a new disease <input checked="" type="checkbox"/> (1)</div> <div style="text-align: right;"><input type="checkbox"/></div>	[2]	two correct choices and two blanks = 2 marks one correct choice and at least two blanks = 1 mark no other combination gains any marks
	b	variation: links the term to differences in colour (1) selection: accept any indication of choice of black males by females (1) competition: two groups of males competing to mate with females (1) effect: number of black squirrels increases (1)	[4]	one mark for each point indicated accept ideas of mutation accept straight quote from article accept grey squirrels die out
		Total	[6]	

Question		Expected Answers	Marks	Additional Guidance
6	a		[2]	4 correct lines = 2 marks 2 or 3 correct lines = 1 mark if more than 2 lines from either of the left-hand boxes no marks should be awarded
	b		[2]	all three links correct = 2 marks one or two links correct = 1 mark if either left-hand box has more than one link coming from it ignore all links from that box
		Total	[4]	

Question			Expected Answers	Marks	Additional Guidance
7	a	i	Chris and Jack (1)	[1]	both answers for one mark no extra names allowed
		ii	Jack (1)	[1]	no extra names allowed
		iii	Susie and Tanya (1)	[1]	both answers for one mark no extra names allowed
	b		<div style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> The colourings may make ... <input checked="" type="checkbox"/> (1) <input type="checkbox"/> </div>	[1]	
			Total	[4]	

Question	Expected Answers	Marks	Additional Guidance
8		[3]	<p>all four links correct = 3 marks two or three links correct = 2 marks one link correct = 1 mark</p> <p>if any left-hand box has more than one link coming from it ignore all links from that box</p>
	Total	[3]	

Question		Expected Answers	Marks	Additional Guidance															
9	a	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 10%; text-align: center;">true</th> <th style="width: 10%; text-align: center;">false</th> </tr> </thead> <tbody> <tr> <td>... produce less food ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>... use pesticides ...</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>... have smaller fields ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>... rotate crops ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		true	false	... produce less food ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	... use pesticides ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>	... have smaller fields ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	... rotate crops ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	[3]	<p>all four rows correct = 3 marks three rows correct = 2 marks two or one row correct = 1 mark</p> <p>ignore any rows with two ticks or with no ticks</p>
	true	false																	
... produce less food ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																	
... use pesticides ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>																	
... have smaller fields ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																	
... rotate crops ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																	
	b	i	[2]	fertiliser alone = no mark															
		intensive: synthetic/manufactured/made from oil/non-renewable fertiliser (1)																	
		organic: manure/green manure/planting leguminous crops/ compost/ natural (1)																	
		ii	[2]	trend must note the continual decrease															
		description: crop becomes less each year (progressively) (1)																	
		explanation: nitrogen in soil gets less (each year) and crops need nitrogen (1)																	
		Total	[7]																

A213/02 Modules B3, C3, P3 Higher Tier

Question		Expected Answers	Marks	Additional Guidance															
1	a	proton (1)	[1]																
	b	A and C (1)	[1]	both needed for the mark (in either order)															
		Total	[2]																
2	a	<div style="border: 1px solid black; display: inline-block; padding: 2px;"> <input type="checkbox"/> Y X W </div> (1)	[1]	accept H instead of Y and C instead of W															
	b	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 10%; text-align: center;">true</th> <th style="width: 10%; text-align: center;">false</th> </tr> </thead> <tbody> <tr> <td>Nuclear power stations ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Coal power stations ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Using gas instead of coal ...</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Gas power stations ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		true	false	Nuclear power stations ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Coal power stations ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Using gas instead of coal ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Gas power stations ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	[3]	all rows correct = 3 marks three rows correct = 2 marks two rows correct = 1 mark one row correct scores = 0 marks ignore any rows with two ticks or with no ticks
	true	false																	
Nuclear power stations ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																	
Coal power stations ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																	
Using gas instead of coal ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>																	
Gas power stations ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																	
		<table style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 80%;"></td> <td style="width: 10%; text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td style="width: 80%;"></td> <td style="width: 10%; text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>... details about building ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/> (1)</td> </tr> <tr> <td style="width: 80%;"></td> <td style="width: 10%; text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		<input type="checkbox"/>		<input type="checkbox"/>	... details about building ...	<input checked="" type="checkbox"/> (1)		<input type="checkbox"/>	[1]	no extra ticks allowed							
	<input type="checkbox"/>																		
	<input type="checkbox"/>																		
... details about building ...	<input checked="" type="checkbox"/> (1)																		
	<input type="checkbox"/>																		

Question		Expected Answers	Marks	Additional Guidance
2	c	<p>any two from: (stray/random) neutron heads for uranium atom/nucleus; neutron hits nucleus; nucleus/atom (becomes) unstable; <u>nucleus</u> splits/divides/breaks up (into two big/similar pieces); several neutrons released; energy released;</p>	[2]	<p>accept labelled diagrams</p> <p>does not need to be tied to fission process</p>
Total			[7]	

3	a	i	<p style="text-align: center;"><input type="checkbox"/></p> <p style="text-align: center;"><input type="checkbox"/></p> <p style="text-align: center;"><input type="checkbox"/></p> <p>Marion <input checked="" type="checkbox"/> (1)</p> <p style="text-align: center;"><input type="checkbox"/></p>	[1]	no extra ticks allowed
		ii	<p>Brian <input checked="" type="checkbox"/></p> <p style="text-align: center;"><input type="checkbox"/></p> <p>Hilary <input checked="" type="checkbox"/></p> <p style="text-align: center;"><input type="checkbox"/></p> <p>Rohit <input checked="" type="checkbox"/></p>	[1]	all three ticks and no others needed for the mark

Question			Expected Answers	Marks	Additional Guidance
3	a	iii	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input type="checkbox"/> Eric </div> <div style="text-align: center;"> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Rohit </div> </div>	[1]	both ticks and no others needed for the mark
	b		2000 (counts/second) (2) one-mark responses: if candidates have no answer or do not get 2000, look for an indication that they have realised that 72 000 years is 3 half-lives or that the (halving) process is repeated 3 times (1)	[2]	answer of 2000 (counts per second) = 2 marks (ignore any working) indication of relating the half-life to 72 000 years, eg 72 000 years = 3 half-lives / 72 000 years = 3 × 24 000 years (1) halving 16 000 repeatedly (1) four stages linked by three arrows (1)
			Total	[5]	

Question			Expected Answers	Marks	Additional Guidance
4	a	i	birds evolved from dinosaurs (1)	[1]	
		ii	<p>observation increases decreases neither</p> <p>Seven proteins ... <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/></p> <p>Three proteins ... <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>Two proteins ... <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/></p>	[1]	three correct indications of choice and the other six boxes blank for this mark
	b	i	imagination (1)	[1]	allow synonyms or paraphrases eg creativity, insight, intuition, thinking outside the box, innovation, (new) ideas also allow aspects of training eg knowledge, not evidence, data, measurements or the like
		ii	predictions (1)	[1]	allow synonyms or paraphrases eg saying what you expect to happen allow theory here also (predictions are an aspect of a theory) not hypothesis, model, new ideas must imply predictions as part of the idea
			Total	[4]	

Question		Expected Answers	Marks	Additional Guidance	
5	a	<div style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> the extinction of a predator ... <input checked="" type="checkbox"/> (1) </div>	[1]	no extra ticks allowed	
	b	variation: links the term to differences in colour (1) selection: any indication of choice by females (1) competition: two groups of males competing for females (1) effect: number of black squirrels increases (1)	[4]	one mark for each point indicated accept ideas of mutation accept straight quote from article accept grey squirrels die out	
	c	i	mutation(s)	[1]	accept mutate, mutating, etc
		ii	sex (cell)/gamete	[1]	allow egg <u>and</u> sperm/ pollen <u>and</u> ovule/reproductive cell
			Total	[7]	

Question			Expected Answers	Marks	Additional Guidance
6	a	i	hormonal/hormones/endocrine (1)	[1]	
		ii		[1]	three or four correct links = 1 mark do not allow more than two lines from either left hand box
	b		in first box (coordinator): brain (and spinal cord)/CNS/central nervous system in second box (effector): (leg) muscle	[1]	both boxes must be correct for the mark. allow cerebrum/cerebral cortex for brain not leg or foot
			Total	[3]	

Question			Expected Answers	Marks	Additional Guidance
7	a	i	Chris and Jack (1)	[1]	both answers for one mark no extra names allowed
		ii	Jack (1)	[1]	no extra names allowed
		iii	Susie and Tanya (1)	[1]	both answers for 1 mark no extra names allowed.
	b	i	<div style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> ... make some children hyperactive. <input checked="" type="checkbox"/> (1) <input type="checkbox"/> </div>	[1]	no extra ticks allowed
		ii	(artificial) colourings removed to reduce risk to a minimum (because risk is unknown and consequence could be serious) (1)	[1]	can quote 'better safe than sorry' or similar but must link to removing colourings
			Total	[5]	

Question			Expected Answers	Marks	Additional Guidance
8	a	i	<p>The number of pests ... <input checked="" type="checkbox"/></p> <p>Some crops, such as beans ... <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	[1]	two correct choices and three blanks for the mark
		ii	<p><input type="checkbox"/></p> <p>... pests with natural predators. <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p>... chemicals from renewable sources. <input checked="" type="checkbox"/> (1)</p>	[1]	two correct choices and three blanks for the mark
	b		<p>any three from: (role of) bacteria/decomposers; nitrification: ammonia/excretory products to nitrogen compounds eg nitrate; nitrogen fixing: N₂ from air (into ammonia, etc.) into soil; action of lightning on atmospheric nitrogen; denitrification: (nitrates/nitrogen compounds) in soil converted back into atmospheric N₂;</p>	[3]	<p>processes need not be named, but if named should be correct</p> <p>nitrification not from air</p>
			Total	[5]	

Question			Expected Answers	Marks	Additional Guidance
9	a	i	carbon and hydrogen and oxygen (1)	[1]	all three correct in any order for the mark allow symbols (H, C, O, any order) if correct but must be capitals
		ii	glucose	[1]	accept fructose, lactose, monosaccharides reject 'sugar' but allow 'simple sugar'
	b		proteins proteins liver urea urine	[2]	all five correct words = 2 marks three or four correct words = 1 mark
			Total	[4]	

Grade Thresholds

General Certificate of Secondary Education
GCSE Twenty First Century Science A (J630)
January 2010 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
A211/01	Raw	42				26	21	16	12	8	0
	UMS	34				30	25	20	15	10	0
A211/02	Raw	42	27	22	17	13	11	10			0
	UMS	50	45	40	35	30	25	20			0
A212/01	Raw	42				24	20	16	13	10	0
	UMS	34				30	25	20	15	10	0
A212/02	Raw	42	32	27	21	15	12	10			0
	UMS	50	45	40	35	30	25	20			0
A213/01	Raw	42				28	24	20	16	12	0
	UMS	34				30	25	20	15	10	0
A213/02	Raw	42	29	24	18	13	10	8			0
	UMS	50	45	40	35	30	25	20			0

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A*	A	B	C	D	E	F	G	U
J630	300	270	240	210	180	150	120	90	60	0

The cumulative percentage of candidates awarded each grade was as follows:

	A*	A	B	C	D	E	F	G	U	Total No. of Cands
J630	2.5	18.9	56.6	78.6	96.9	98.7	100.0	100.0	100.0	159

940 candidates were entered for aggregation this series.

For a description of how UMS marks are calculated see:

<http://www.ocr.org.uk/learners/ums/index.html>

Statistics are correct at the time of publication.

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

OCR Customer Contact Centre

14 – 19 Qualifications (General)

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

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 2010

