

Twenty First Century Science

General Certificate of Secondary Education

Science A J630, Biology A J633, Chemistry A J634, Physics A J635

Mark Schemes for the Units

June 2007

J630, J633, J634, J635/MS/R/07

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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.

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MARK SCHEMES FOR THE UNITS

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Guidance for Examiners

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. Each separate marking point is indicated by a semicolon (;) at the end of that marking point.
4. Abbreviations, annotations and conventions used in the detailed Mark Scheme:

ORA = or reverse argument

NOT = point that is not given credit

AW/owtte = alternative wording/or words to that effect: allow any expression that is clearly equivalent

/ = Alternative and acceptable answers for the same marking point

point = point must be present to gain the mark

(description) = description which need not be present to gain the mark

E.g. mark scheme shows 'work done in lifting / (change in) gravitational potential energy'

work done = 0 marks

work done lifting = 1 mark

change in potential energy = 0 marks

gravitational potential energy = 1 mark

5. If a candidate alters his/her response, examiners should accept the alteration.
6. The list principle: if a list of responses greater than the number requested is given, you 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, i.e. 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.
7. Marking method for tick boxes:
If there is a set of boxes, some of which should be ticked and others left empty, then you need to judge the entire set of boxes.

E.g. If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out). For a two-mark question, the rationale would be:

All boxes are indicated scores 0 marks.

All boxes blank scores 0 marks.

All four boxes correct scores 2 marks.

Three boxes correct scores 1 mark.

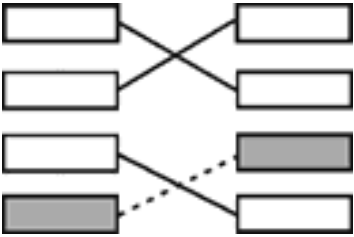
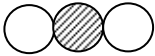
Two boxes correct scores 1 mark.

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

**Mark Scheme A211/01
June 2007**

Question		Expected Answers	Rationale	Marks											
4	1	a	<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="border: 1px solid black; padding: 5px; margin: 5px;">crust</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">core</div> </div> <div style="margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; display: inline-block;">mantle</div> </div>	One correct word in correct box = 1 Allow any clear indication of correct response, eg line from box to word in the list below, number in box and corresponding number next to work on list. Allow 'inner core' or 'outer core' for 'core'.	3										
		b	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td style="width: 80%;"></td><td style="width: 20%;"></td></tr> <tr><td>Earthquakes</td><td style="text-align: center;">✓</td></tr> <tr><td>Volcanoes</td><td style="text-align: center;">✓</td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>			Earthquakes	✓	Volcanoes	✓					Two correct responses = 2 marks One correct response = 1 mark If more than two responses, each incorrect response cancels out a correct one.	2
	Earthquakes	✓													
Volcanoes	✓														
Total				5											
2	a	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td style="width: 80%;">distance light travels in one year</td><td style="width: 20%; text-align: center;">✓</td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>	distance light travels in one year	✓					Any clear indication of correct response = 1 mark More than one response = 0 marks	1					
distance light travels in one year	✓														
	b	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td style="width: 80%;"></td><td style="width: 20%;"></td></tr> <tr><td>Measure parallax</td><td style="text-align: center;">✓</td></tr> <tr><td> </td><td> </td></tr> </table>			Measure parallax	✓			Any clear indication of correct response = 1 mark More than one response = 0 marks	1					
Measure parallax	✓														
	c		Look at the links as they leave the left-hand boxes. If any left-hand box has more than one link, count those links as incorrect. Three links correct scores 3 marks. Two links correct scores 2 marks. One link correct scores 1 mark.	3											
Total				5											

Question		Expected Answers	Rationale	Marks										
3	a	(C) B D A	B before D (1 mark); D before A (1 mark) If any letter (including C) is repeated, 0 marks.	2										
	b	<table border="1"> <tr><td></td><td></td></tr> <tr><td>hydrogen</td><td>✓</td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> </table>			hydrogen	✓					Any clear indication of correct response = 1 mark More than one response = 0 marks	1		
hydrogen	✓													
	c	(nuclear) fusion	NOT fission, NOT just 'nuclear' Accept phonetically correct spelling of 'fusion'.	1										
Total				4										
4	a	hydrogen; oxygen	1 mark each. Must be in the correct order (hydrogen on first line, oxygen on second). Accept H or H ₂ for hydrogen, O or O ₂ for oxygen. More than one answer on a line = 0 marks for that line.	2										
	b	<table border="1"> <tr><td></td><td></td></tr> <tr><td>Buses mean less traffic</td><td>✓</td></tr> <tr><td>Less noise</td><td>✓</td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> </table>			Buses mean less traffic	✓	Less noise	✓					Two correct responses = 2 marks One correct response = 1 mark If more than two responses, each incorrect response cancels out a correct one.	2
Buses mean less traffic	✓													
Less noise	✓													
	c	<table border="1"> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td>Energy less</td><td>✓</td></tr> </table>					Energy less	✓	Any clear indication of correct response = 1 mark More than one response = 0 marks	1				
Energy less	✓													
Total				5										

Question		Expected Answers	Rationale	Marks						
5	a	Barry; Tom;	1 mark each, either order. If there are more than two names, each extra name loses 1 mark.	2						
	b	Barry	More than one name = 0 marks.	1						
	c	i 17	Accept seventeen. If no response, look at graph on whole-page view and give mark if central point is correctly labelled 17.	1						
		ii 12 th December	Allow 12 or twelve; or fuller date eg 12/12/05. If no response, look at graph and give mark if correct date is indicated eg by circling 12 on x-axis.	1						
		iii <table border="1" data-bbox="353 550 792 657"> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td>No correlation</td><td>✓</td></tr> </table>					No correlation	✓	Any clear indication of correct response = 1 mark More than one response = 0 marks	1
No correlation	✓									
Total				6						
6	a		Do not count the dotted line Look at the links as they leave the left-hand boxes. If any left-hand box has more than one link, count those links as incorrect. Three links correct scores 2 marks. One or two links correct scores 1 mark. Accept non-straight lines.	2						
	b		Three atoms (circles) must be joined but can be any size and arranged in any configuration and in any order. Only one must be shaded or labelled S.	1						
Total				3						

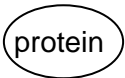
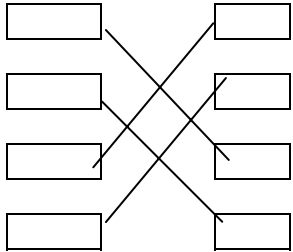
Question			Expected Answers	Rationale	Marks								
7	a	i	asexual	Do not allow sexual . More than one word= 0 marks.	1								
		ii	clones	Accept 'clone.' More than one word= 0 marks.	1								
		iii	environmental	Accept 'environment.' More than one word = 0 marks.	1								
	b	i	sexual	Do not accept asexual More than one word = 0 marks.	1								
		ii	X and Y	Must be in the correct order (X on first line, Y on second). BOTH are needed for the mark. More than one letter in either space = 0 marks	1								
Total					5								
8	a		<table border="1"> <tr> <td>Children of mothers with breast cancer at higher risk</td> <td>✓</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table>	Children of mothers with breast cancer at higher risk	✓					Any clear indication of correct response = 1 mark More than one response = 0 marks.	1		
Children of mothers with breast cancer at higher risk	✓												
	b		<table border="1"> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>A section of DNA..</td> <td>✓</td> </tr> </table>							A section of DNA..	✓	Any clear indication of correct response = 1 mark More than one response = 0 marks.	1
A section of DNA..	✓												
	c		<table border="1"> <tr> <td>in favour</td> <td>worried</td> <td>neither</td> </tr> <tr> <td>Gerry</td> <td>Selina Cathy</td> <td>Jacob</td> </tr> </table>	in favour	worried	neither	Gerry	Selina Cathy	Jacob	Do not count any name appearing in more than one column. Names can be in any order. All four correct = 3 marks three or two correct = 2 marks one correct = 1 mark	3		
in favour	worried	neither											
Gerry	Selina Cathy	Jacob											
Total					5								

Question		Expected Answers		Rationale	Marks										
9	a	<table border="1"> <thead> <tr> <th>Individual</th> <th>Alleles</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>(Aa)</td> </tr> <tr> <td>2</td> <td>aa</td> </tr> <tr> <td>3</td> <td>aa</td> </tr> <tr> <td>4</td> <td>Aa</td> </tr> </tbody> </table>	Individual	Alleles	1	(Aa)	2	aa	3	aa	4	Aa		Mark each box independently. 1 mark for each correct box (first box already given). Last box may be Aa or aA.	3
Individual	Alleles														
1	(Aa)														
2	aa														
3	aa														
4	Aa														
	b	DNA		Accept dna, deoxyribonucleic acid for DNA Accept gene, genes or alleles. Do not accept 'dominant alleles' or 'recessive alleles' alone, however can accept 'dominant alleles' <u>and</u> 'recessive alleles' together. If more than one response is given, any incorrect response cancels out a correct response.	1										
				Total	4										

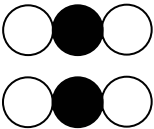

**Mark Scheme A211/02
June 2007**

Question		Expected Answers	Rationale	Marks										
1	a	(C) B D A	B before D (1 mark); D before A (1 mark) If any letter (including C) is repeated, 0 marks.	2										
	b	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td>hydrogen</td><td>✓</td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>					hydrogen	✓					Any clear indication of correct response = 1 mark More than one response = 0 marks	1
hydrogen	✓													
	c	(nuclear) fusion	NOT fission, NOT just 'nuclear' Accept phonetically correct spelling of 'fusion'.	1										
	d	5 thousand million years <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table>			✓			Any clear indication of correct response = 1 mark More than one response = 0 marks	1					
✓														
Total				5										
2	a	Mantle	Accept upper mantle	1										
	b	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td style="text-align: center;">5m</td></tr> </table>	5m	Accept any clear marking of the third answer to indicate choice. Accept '5m' written. Accept '500cm' written.	1									
5m														
	c	Chain of mountains Pattern of magnetic stripes <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td> </td></tr> <tr><td>D</td></tr> <tr><td>D</td></tr> <tr><td> </td></tr> </table>		D	D		Two correct responses = 2 marks One correct response = 1 mark If more than two responses, each incorrect response cancels out a correct one.	2						
D														
D														
Total				4										

Question			Expected Answers	Rationale	Marks												
3	a	i	<table border="1"> <tr><td></td><td></td></tr> <tr><td>there is life on Earth</td><td>✓</td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> </table>			there is life on Earth	✓					Any clear indication of correct response = 1 mark More than one response = 0 marks	1				
there is life on Earth	✓																
	a	ii	<table border="1"> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td>the scientists working on problem will never collect enough data</td><td>✓</td></tr> <tr><td>some factors .. can only be estimated</td><td>✓</td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> </table>					the scientists working on problem will never collect enough data	✓	some factors .. can only be estimated	✓					Two correct responses = 2 marks One correct response = 1 mark If more than two responses, each incorrect response cancels out a correct one.	2
the scientists working on problem will never collect enough data	✓																
some factors .. can only be estimated	✓																
	b		<table border="1"> <tr><td>currently no evidence .. existence of alien life</td><td>✓</td></tr> <tr><td>there are planets outside of our solar system</td><td>✓</td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> </table>	currently no evidence .. existence of alien life	✓	there are planets outside of our solar system	✓					Two correct responses = 2 marks One correct response = 1 mark If more than two responses, each incorrect response cancels out a correct one.	2				
currently no evidence .. existence of alien life	✓																
there are planets outside of our solar system	✓																
Total					5												

Question		Expected Answers	Rationale	Marks										
4	a	<table border="1"> <thead> <tr> <th>Individual</th> <th>Alleles</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>(Aa)</td> </tr> <tr> <td>2</td> <td>aa</td> </tr> <tr> <td>3</td> <td>aa</td> </tr> <tr> <td>4</td> <td>Aa</td> </tr> </tbody> </table>	Individual	Alleles	1	(Aa)	2	aa	3	aa	4	Aa	Mark each box independently. 1 mark for each correct box (first box already given). Last box may be Aa or aA	3
Individual	Alleles													
1	(Aa)													
2	aa													
3	aa													
4	Aa													
	b	50% ✓		1										
	c	DNA	Accept dna, deoxyribonucleic acid for DNA Accept gene, genes or alleles. Do not accept 'dominant alleles' or 'recessive alleles' alone, however can accept 'dominant alleles' <u>and</u> 'recessive alleles' together. If more than one response is given, any incorrect response cancels out a correct response.	1										
	d		Any clear indication of 'protein' as their choice.	1										
Total				6										
5	a	environmental factors <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table>		✓			Any clear indication of correct response = 1 mark More than one response = 0 marks	1						
✓														
	b		Look at the links as they leave the left-hand boxes. If any left-hand box has more than one link, count those links as incorrect. All four links correct scores 3 marks. Three links correct scores 2 marks. Two links correct scores 2 marks. One link correct scores 1 mark.	3										
Total				4										

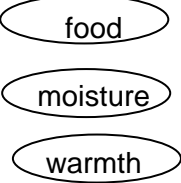
Question		Expected Answers	Rationale	Marks						
6	a	B and F	Answers can be in either order. Both must be correct to award the mark.	1						
	b	E		1						
	c	A and D and G	Answers can be in any order. All must be correct to award 2 marks . Any two out of three correct, award 1 mark . One correct, award 0 marks . If more than three responses, each incorrect response cancels out a correct one.	2						
Total				4						
7	a	Barry; Tom;	1 mark each, either order. If there are more than two names, each extra name loses 1 mark.	2						
	b	Barry	More than one name = 0 marks.	1						
	c	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="width: 150px; height: 15px;"></td> <td style="width: 20px; height: 15px;"></td> </tr> <tr> <td style="width: 150px; height: 15px;"></td> <td style="width: 20px; height: 15px;"></td> </tr> <tr> <td style="width: 150px; height: 15px;">No correlation</td> <td style="width: 20px; height: 15px; text-align: center;">✓</td> </tr> </table>					No correlation	✓	Any clear indication of correct response = 1 mark More than one response = 0 marks.	1
No correlation	✓									
Total				4						

Question		Expected Answers	Rationale	Marks						
8	a	Hydrocarbons		1						
	b	i	C	Accept 'carbon in the petrol reacts with a limited supply of oxygen from the air'. 1						
	b	ii	D	Accept 'nitrogen and oxygen in the air react with each other'. 1						
	c		 <p>a single molecule drawn like this (dark circle with a clear circle either side, clear circles must not be touching each other. Circles need not be in a straight line) = award 1 mark</p> <p>Two molecules the same (each molecule must consist of 1 dark circle and 2 clear circles) award 1 mark.</p>	2						
	d	<table border="1" data-bbox="322 683 987 826"> <tr> <td>some CO₂ is used by plants in photosynthesis</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>some carbon dioxide dissolves in the oceans</td> <td><input checked="" type="checkbox"/></td> </tr> </table>	some CO ₂ is used by plants in photosynthesis	<input checked="" type="checkbox"/>		<input type="checkbox"/>	some carbon dioxide dissolves in the oceans	<input checked="" type="checkbox"/>	Both boxes need to be correctly identified to get the mark	1
some CO ₂ is used by plants in photosynthesis	<input checked="" type="checkbox"/>									
	<input type="checkbox"/>									
some carbon dioxide dissolves in the oceans	<input checked="" type="checkbox"/>									
Total				6						
9	a	113	Accept 567/5 (indication of 567 divided by 5). Alternatively accept 113.4 Accept 116 or 116.25 (if 102 is disregarded as an outlier) eg (465/4)	1						
	b	102 to 125	both correct for 1 mark	1						
	c	<p>ranges old and new do not overlap <input checked="" type="checkbox"/></p> <p>mean of new outside range for the old fuel <input checked="" type="checkbox"/></p>	<p>Two correct responses = 2 marks One correct response = 1 mark</p> <p>If more than two responses, each incorrect response cancels out a correct one.</p>	2						
Total				4						

**Mark Scheme A212/01
June 2007**

Question			Expected Answers	Rationale	Marks								
1	a	i	(lighter)	Accept any clear mark on correct word. See note 8. More than one response = 0 marks	1								
		ii	(rust)	Accept any clear mark on correct word. See note 8. More than one response = 0 marks	1								
	b		<table border="1" style="width: 100%;"> <tr> <td>the energy used in making the plastic</td> <td style="text-align: center;">✓</td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td>the disposal of the plastic after it is used</td> <td style="text-align: center;">✓</td> </tr> </table>	the energy used in making the plastic	✓					the disposal of the plastic after it is used	✓	One mark for each correct answer. If three ticks mark these responses and deduct 1 mark. If four ticks 0 marks.	2
the energy used in making the plastic	✓												
the disposal of the plastic after it is used	✓												
	c		<table border="1" style="width: 100%;"> <tr> <td>make plastics from plants</td> <td style="text-align: center;">✓</td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td>only use plastics that can be easily recycled</td> <td style="text-align: center;">✓</td> </tr> <tr> <td> </td> <td> </td> </tr> </table>	make plastics from plants	✓			only use plastics that can be easily recycled	✓			One mark for each correct answer. If three ticks mark these responses and deduct 1 mark. If four ticks 0 marks.	2
make plastics from plants	✓												
only use plastics that can be easily recycled	✓												
Total					6								
2	a		C / to make sure the results are reliable	More than one response = 0 marks.	1								
	b		A / The line could have been thinner than usual. D / There was a mistake in counting the number of masses	One mark for each correct answer in EITHER order. If three answers given. Mark the answers and deduct 1 mark. If four answers 0 marks.	2								
	c		(11)	Accept any clear mark on correct number. More than one response = 0 marks	1								
Total					4								

Question		Expected Answers	Rationale	Marks										
3	a	cotton	Two or more responses from cotton, polyester, elastene = 0 marks DON'T accept 67% alone.	1										
	b	(B) D A E C	D before A (1 mark); A before E (1 mark); E before C (1 mark) If any letter is used twice. Ignore the second.	3										
Total				4										
4	a	i visible/light/visible light/ultraviolet/uv/gamma/ gamma rays/infra red/x-rays	One mark for any correct answer. See note9.	1										
		ii infra red / x-rays	One mark for any correct answer.	1										
Total				2										
5	a	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%; height: 20px;"></td> <td style="width: 20%;"></td> </tr> <tr> <td>stay out of the sun</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>put sunscreen on regularly</td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="height: 20px;"></td> <td></td> </tr> <tr> <td style="height: 20px;"></td> <td></td> </tr> </table>			stay out of the sun	✓	put sunscreen on regularly	✓					One mark for each correct answer. If three boxes ticked mark these responses and deduct one mark. If four or five boxes ticked 0 marks	2
stay out of the sun	✓													
put sunscreen on regularly	✓													
	b	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%; height: 20px;"></td> <td style="width: 20%;"></td> </tr> <tr> <td>ultraviolet</td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="height: 20px;"></td> <td></td> </tr> <tr> <td style="height: 20px;"></td> <td></td> </tr> </table>			ultraviolet	✓					A tick in any other box = 0 marks	1		
ultraviolet	✓													
	c	ozone layer / ozone / O ₃	One mark for any correct answer.	1										
	d	i Aran Tony	One mark for each correct answer in EITHER order. If three names given mark answers and deduct 1 mark. 4 names given = 0	1 1										
		ii Sara	More than one response = 0 marks	1										
Total				7										

Question		Expected Answers	Rationale	Marks								
6	a	Andrew	More than one response = 0 marks	1								
	b	Kate Gemma	One mark for each correct answer in EITHER order. If three names given mark answers and deduct 1 mark. 4 or 5 names given = 0	2								
	c	Tom	More than one response = 0 marks	1								
	d	<table border="1"> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td>You cannot make accurate assumptions based on a single case</td><td>✓</td></tr> <tr><td></td><td></td></tr> </table>					You cannot make accurate assumptions based on a single case	✓			A tick in any other box = 0 marks	1
You cannot make accurate assumptions based on a single case	✓											
Total				5								
7	a	<div style="text-align: center;">  <p>food</p> <p>moisture</p> <p>warmth</p> </div>	Judge entire set of six words: first, second and sixth should have rings around them. One mark for each correct answer. If four words ringed mark these responses and deduct one mark. If five words ringed mark these responses and deduct two marks. If six words ringed 0 marks	3								
	b	i	8 / eight	1								
		ii	64 / sixty four	1								
Total				5								

Question		Expected Answers	Rationale	Marks										
8	a	<table border="1"> <tr><td></td><td></td></tr> <tr><td>Do you smoke?</td><td>✓</td></tr> <tr><td>Do you exercise regularly</td><td>✓</td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> </table>			Do you smoke?	✓	Do you exercise regularly	✓					One mark for each correct answer. If three boxes ticked mark these responses and deduct one mark. If four or five boxes ticked 0 marks	2
Do you smoke?	✓													
Do you exercise regularly	✓													
	b	<table border="1"> <tr><td></td><td></td></tr> <tr><td>Fewer men are smoking.</td><td>✓</td></tr> <tr><td>Better drugs are used after heart attacks</td><td>✓</td></tr> <tr><td></td><td></td></tr> </table>			Fewer men are smoking.	✓	Better drugs are used after heart attacks	✓			One mark for each correct answer. If three boxes are ticked mark these responses and deduct 1 mark. If four boxes are ticked = 0 marks	2		
Fewer men are smoking.	✓													
Better drugs are used after heart attacks	✓													
	c	<table border="1"> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td>They have less fat in their diet</td><td>✓</td></tr> <tr><td></td><td></td></tr> </table>					They have less fat in their diet	✓			A tick in any other box = 0 marks	1		
They have less fat in their diet	✓													
Total				5										
9	a	microorganisms; immune system; antibodies	All three right = 2 marks Two or one right = 1 mark	2										
	b	<table border="1"> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td>Vaccines may have serious side effects</td><td>✓</td></tr> <tr><td></td><td></td></tr> <tr><td>New vaccines may be no better than existing treatments</td><td>✓</td></tr> </table>					Vaccines may have serious side effects	✓			New vaccines may be no better than existing treatments	✓	One mark for each correct answer. If three boxes ticked mark these responses and deduct one mark. If four or five boxes ticked 0 marks	2
Vaccines may have serious side effects	✓													
New vaccines may be no better than existing treatments	✓													
Total				4										

Mark Scheme A212/02
June 2007

Question		Expected Answers		Rationale	Marks																				
1	a	C/ to make sure the results are reliable		More than one response = 0 marks.	1																				
	b	A / The line could have been thinner than usual. D / There was a mistake in counting the number of masses		One mark for each correct answer in EITHER order. If three answers given. Mark the answers and deduct 1 mark. If four answers 0 marks.	2																				
	c	<div style="border: 1px solid black; border-radius: 50%; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center; margin: 0 auto;">11</div>		Accept any clear mark on correct number. More than one response = 0 marks	1																				
Total					4																				
2	a	Ahmed David Rosie		Any order: 3 right = 2 marks 2 right = 1 mark	2																				
	b	i	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Corn is renewable</td> <td style="width: 20%; text-align: center;">✓</td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td>Polymer can be recycled</td> <td style="text-align: center;">✓</td> </tr> </table>	Corn is renewable	✓					Polymer can be recycled	✓	One mark per correct answer. If more than two boxes are ticked, deduct a mark for each incorrect answer down to a minimum of zero marks.	1 1												
Corn is renewable	✓																								
Polymer can be recycled	✓																								
		ii	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;"> </td> <td style="width: 20%;"> </td> </tr> <tr> <td>Making polymer</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>Melting and shaping</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>Transporting</td> <td style="text-align: center;">✓</td> </tr> </table>			Making polymer	✓	Melting and shaping	✓	Transporting	✓	3 right = 2 marks 2 right = 1 mark If 4 boxes ticked = 1 mark	2												
Making polymer	✓																								
Melting and shaping	✓																								
Transporting	✓																								
Total					6																				
3	a	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 20%;">Polythene</td> <td style="width: 10%;"> </td> <td style="width: 20%;">X linking</td> <td style="width: 10%;"> </td> <td style="width: 20%;">slide</td> </tr> <tr> <td>Vulc</td> <td> </td> <td>ch length</td> <td> </td> <td>tangle</td> </tr> <tr> <td>PVC</td> <td> </td> <td>crystallin</td> <td> </td> <td>lger fo</td> </tr> <tr> <td>hdpe</td> <td> </td> <td>plasticis</td> <td> </td> <td>fit</td> </tr> </table>		Polythene	 	X linking	 	slide	Vulc	 	ch length	 	tangle	PVC	 	crystallin	 	lger fo	hdpe	 	plasticis	 	fit	2 Marks for each complete side correct. 1 mark for 1 or 2 lines correct on each side. Mark lines from left to middle, then from middle to right. Two lines FROM one box is wrong. Don't mark the line dotted in the mark scheme.	4
Polythene	 	X linking	 	slide																					
Vulc	 	ch length	 	tangle																					
PVC	 	crystallin	 	lger fo																					
hdpe	 	plasticis	 	fit																					
Total					4																				

Question		Expected Answers	Rationale	Marks										
4	a	Kate Gemma	One mark for each correct answer in EITHER order. If three names given mark answers and deduct 1 mark. 4 or 5 names given = 0	1 1										
	b	Tom	More than one response = 0 marks	1										
	c	<table border="1"> <tr><td></td><td></td></tr> <tr><td>water vapour</td><td>✓</td></tr> <tr><td></td><td></td></tr> <tr><td>methane</td><td>✓</td></tr> <tr><td></td><td></td></tr> </table>			water vapour	✓			methane	✓			One mark per correct answer. If more than two boxes are ticked, deduct a mark for each incorrect answer down to a minimum of zero marks.	1 1
water vapour	✓													
methane	✓													
	d	<table border="1"> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td>Cannot make accurate assumptions</td><td>✓</td></tr> <tr><td></td><td></td></tr> </table>					Cannot make accurate assumptions	✓			A tick in any other box is zero.	1		
Cannot make accurate assumptions	✓													
Total				6										
5	a	Ring around 2 nd statement – Benefit outweighs risk.	Any other statement gets zero marks.	1										
	b	Selects only 'never use' on left Connects only to 'risk + no need to use' on right		1 1										
				3										

Question		Expected Answers	Rationale	Marks
6	a	<input type="checkbox"/>	One mark per correct answer. If more than two boxes are ticked, deduct a mark for each incorrect answer down to a minimum of zero marks.	1
		Cook on low power for a longer time <input checked="" type="checkbox"/>		1
<input type="checkbox"/>				
Cook on high power for a shorter time <input checked="" type="checkbox"/>				
	b	<input type="checkbox"/>	Tick in any other box is zero marks.	1
		<input type="checkbox"/>		
		<input type="checkbox"/>		
		To reflect microwaves <input checked="" type="checkbox"/>		
	c	power output - photons per second <input checked="" type="checkbox"/>	One mark per correct answer. If more than two boxes are ticked, deduct a mark for each incorrect answer down to a minimum of zero marks.	1
		<input type="checkbox"/>		1
		The intensity decreases - power is spread <input checked="" type="checkbox"/>		
		<input type="checkbox"/>		
Total				5
7	a	<input type="checkbox"/>	One mark for each correct answer. If three boxes are ticked mark these responses and deduct 1 mark. If four boxes are ticked = 0 marks	1
		Fewer men smoking <input checked="" type="checkbox"/>		1
Better drugs <input checked="" type="checkbox"/>				
<input type="checkbox"/>				
	b	<input type="checkbox"/>	Tick in any other box is zero marks	1
		<input type="checkbox"/>		
		Less fat in diet <input checked="" type="checkbox"/>		
		<input type="checkbox"/>		
Total				3

Question		Expected Answers				Rationale	Marks																						
8	a					If more than three boxes are ticked, deduct a mark for each incorrect answer down to a minimum of zero marks.	1 1 1																						
		Changes to cells, not cancers			✓																								
		Women all aged 16-23			✓																								
		Undetected side effects			✓																								
		b	i	Placebo				1																					
			ii	<table border="1"> <tr><td colspan="2"></td><td></td></tr> <tr><td colspan="2">No alternative treatment</td><td>✓</td></tr> <tr><td colspan="2"></td><td></td></tr> <tr><td colspan="2">Both groups benefit from medical checks</td><td>✓</td></tr> </table>							No alternative treatment		✓				Both groups benefit from medical checks		✓	Both ticks (and no others) needed for mark	1								
No alternative treatment		✓																											
Both groups benefit from medical checks		✓																											
			iii	<table border="1"> <thead> <tr> <th></th> <th>Doctor only</th> <th>Patient only</th> <th>Both</th> <th>Neither</th> </tr> </thead> <tbody> <tr> <td>Open</td> <td></td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>Blind</td> <td>✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Double-blind</td> <td></td> <td></td> <td></td> <td>✓</td> </tr> </tbody> </table>					Doctor only	Patient only	Both	Neither	Open			✓		Blind	✓				Double-blind				✓	One mark for each correct row	3
	Doctor only	Patient only	Both	Neither																									
Open			✓																										
Blind	✓																												
Double-blind				✓																									
		c	i	Sorrel Thomas				Any order, If extra names are given then mark the first 2	1 1																				
			ii	Polly, Sarah, Marcus				All 3 correct for 1 mark	1																				
						Total	11																						

**Mark Scheme A213/01
June 2007**

Question			Expected Answers	Rationale	Marks																
1	a	i	fossils	Ignore any misspelling in a written response providing that the candidate's meaning is clear and unambiguous.	1																
		ii	DNA		1																
	b	i	3	Accept "three" or any correct and clear unambiguous response.	1																
		ii	4	Accept "four" or any correct and clear unambiguous response.	1																
Total					4																
2	a		imagination	Accept evidence	1																
	b		predictions		1																
	c		evidence		1																
Total					3																
3	a		A	Accept "a"	1																
	b				2																
Total					3																
4	a		50	Accept fifty	1																
	b		Different numbers... released <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td><input type="checkbox"/></td></tr> <tr><td><input checked="" type="checkbox"/></td></tr> <tr><td><input type="checkbox"/></td></tr> <tr><td><input type="checkbox"/></td></tr> </table>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Only one answer is allowed. No mark is awarded if there are two or more ticks. Accept crosses or other clear indications of choice.	1											
<input type="checkbox"/>																					
<input checked="" type="checkbox"/>																					
<input type="checkbox"/>																					
<input type="checkbox"/>																					
c	<table border="1"> <thead> <tr> <th>cause</th> <th>direct</th> <th>indirect</th> <th>natural</th> </tr> </thead> <tbody> <tr> <td>hunting</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>expansion</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>evolution</td> <td></td> <td></td> <td>✓</td> </tr> </tbody> </table>			cause	direct	indirect	natural	hunting	✓			expansion		✓		evolution			✓	Each row should have only one tick (or other indication of choice). Do not credit any row with more than one tick or other clear indication of choice. Three rows correct scores 2 marks. One or two rows correct scores 1 mark.	2
	cause	direct	indirect	natural																	
	hunting	✓																			
	expansion		✓																		
evolution			✓																		
Total					4																

Question		Expected Answers	Rationale	Marks
5	a	Increase Decrease		1 1
	b	Rotate crops <input type="checkbox"/> Spread manure <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	One mark per correct choice. There should be only two choices. If there are three choices, award one mark if two of them are correct. All other possibilities of more than two choices get no marks.	2
	c	D; A; D;	All 3 correct = 2 marks 1 or 2 correct = 1 mark	2
Total				6
6			All 3 correct = 2 marks 2 or 1 correct = 1 mark If the left hand box has two, or more, lines from it then count both as incorrect.	2
Total				2

Question		Expected Answers	Rationale	Marks																		
7	a	Type 2;	Allow 2 on its own	1																		
	b	... and prevent diabetes <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> </table>		✓			1															
✓																						
	c	15 (%)	Allow fifteen.	1																		
	d	<table border="1" style="display: inline-table; vertical-align: middle;"> <thead> <tr> <th></th> <th>true</th> <th>false</th> </tr> </thead> <tbody> <tr> <td>Sarah</td> <td></td> <td>✓</td> </tr> <tr> <td>Martin</td> <td>✓</td> <td></td> </tr> <tr> <td>Anna</td> <td>✓</td> <td></td> </tr> <tr> <td>Jane</td> <td></td> <td>✓</td> </tr> <tr> <td>Joe</td> <td>✓</td> <td></td> </tr> </tbody> </table>		true	false	Sarah		✓	Martin	✓		Anna	✓		Jane		✓	Joe	✓		All five rows correct scores 3 marks. Four rows correct scores 2 marks. Two or three rows correct scores 1 mark. Only one row correct scores no marks All boxes indicated scores 0 marks. All boxes blank is NR.	3
	true	false																				
Sarah		✓																				
Martin	✓																					
Anna	✓																					
Jane		✓																				
Joe	✓																					
Total				6																		
8	a	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 60px;">C</td> <td style="width: 20px; background-color: #cccccc;"></td> <td style="width: 40px;">D</td> <td style="width: 40px;">E</td> <td style="width: 40px;">B</td> </tr> </table>	C		D	E	B	All correct = 3 2 or 3 correct = 2 1 correct = 1 Accept written answers eg "fuel" for answer 1.	3													
C		D	E	B																		
	b	Carbon Dioxide	Accept: carbon monoxide, CO ₂ , CO2, CO Do not accept Carbon	1																		
	c	Wind power <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> </table> Wave power <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> </table>		✓			✓		One mark per correct choice. There should be only two choices. If there are three choices, award one mark if two of them are correct. All other possibilities of more than two choices get no marks.	1 1												
✓																						
✓																						
Total				6																		

Question		Expected Answers	Rationale	Marks
9	a	<p>It kills the cell <input type="checkbox"/></p> <p>The cell becomes cancerous <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	<p>One mark per correct choice. There should be only two choices.</p> <p>If there are three choices, award one mark if two of them are correct.</p> <p>All other possibilities of more than two choices get no marks.</p>	<p>1</p> <p>1</p>
	b	i	<p>... shielded from the radiation <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	<p>1</p>
		ii	<p>... as a result of the treatment <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	<p>1</p>
Total				4

Question		Expected Answers	Rationale	Marks
10	a	<p>sheet of paper <input type="checkbox"/></p> <p style="padding-left: 100px;">✓</p> <p>few cm of air <input type="checkbox"/></p> <p style="padding-left: 100px;">✓</p>	<p>One mark per correct choice. There should be only two choices. If there are three choices, award one mark if two of them are correct. All other possibilities of more than two choices get no marks</p>	<p>1</p> <p>1</p>
	b	<p>i</p> <p style="padding-left: 100px;"><input type="checkbox"/></p> <p style="padding-left: 100px;"><input type="checkbox"/></p> <p style="padding-left: 100px;"><input type="checkbox"/></p> <p style="padding-left: 100px;">✓</p> <p>less than $\frac{1}{4}$</p> <p>ii</p> <p>time taken for $\frac{1}{2}$ to decay <input type="checkbox"/></p> <p style="padding-left: 100px;">✓</p> <p style="padding-left: 100px;"><input type="checkbox"/></p>	<p>Only one answer is allowed. No mark is awarded if there are two or more ticks.</p> <p>Only one answer is allowed. No mark is awarded if there are two or more ticks.</p>	<p>1</p> <p>1</p>
Total				4

**Mark Scheme A213/02
June 2007**

Question		Expected Answers	Rationale	Marks																
1	a	50	Accept fifty	1																
	b	Different numbers... released <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> </table>			✓		Only one answer is allowed. No mark is awarded if there are two or more ticks. Accept crosses or other clear indications of choice.	1												
✓																				
	c	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>cause</th> <th>direct</th> <th>indirect</th> <th>natural</th> </tr> </thead> <tbody> <tr> <td>hunting</td> <td>✓</td> <td> </td> <td> </td> </tr> <tr> <td>expansion</td> <td> </td> <td>✓</td> <td> </td> </tr> <tr> <td>evolution</td> <td> </td> <td> </td> <td>✓</td> </tr> </tbody> </table>	cause	direct	indirect	natural	hunting	✓			expansion		✓		evolution			✓	Each row should have only one tick (or other indication of choice). Do not credit any row with more than one tick or other clear indication of choice. Three rows correct scores 2 marks. One or two rows correct scores 1 mark.	2
cause	direct	indirect	natural																	
hunting	✓																			
expansion		✓																		
evolution			✓																	
Total				4																
2	a	Only genetic variation... passed on. <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table>		✓			Only one answer is allowed. No mark is awarded if there are two or more ticks. Accept crosses or other clear indications of choice.	1												
✓																				
	b	natural selection	Ignore any reference to 'survival of the fittest' or 'evolution'; treat these as neutral which do not affect the marking.	1																
	c	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>observation</th> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>Giraffes reach high leaves</td> <td>✓</td> <td> </td> </tr> <tr> <td>Male giraffes up to 1m taller...</td> <td> </td> <td>✓</td> </tr> <tr> <td>Dead male giraffes...</td> <td> </td> <td>✓</td> </tr> <tr> <td>In drought conditions...</td> <td> </td> <td>✓</td> </tr> </tbody> </table>	observation	A	B	Giraffes reach high leaves	✓		Male giraffes up to 1m taller...		✓	Dead male giraffes...		✓	In drought conditions...		✓	Only one box should be indicated in each row. All four boxes correct scores 3 marks. Three boxes correct scores 2 marks. Two boxes correct scores 1 mark. One box correct scores 0 marks. All boxes indicated scores 0 marks. All boxes blank is NR.	3	
observation	A	B																		
Giraffes reach high leaves	✓																			
Male giraffes up to 1m taller...		✓																		
Dead male giraffes...		✓																		
In drought conditions...		✓																		
Total				5																

Question		Expected Answers	Rationale	Marks																		
3	a	F	If more than one letter chosen, no marks. Allow writing out response from table in space. Allow credit for clear indication of choice eg arrow from last row of table to question or labelling last row of table (a) or circling F in question itself.	1																		
	b	A and D	One mark each. Answers may be in either order. If there are three choices, award one mark if two of them are correct. All other possibilities of more than two choices get no marks	2																		
	c	E and B	One mark each. Answers may be in either order. If there are three choices, award one mark if two of them are correct. All other possibilities of more than two choices get no marks	2																		
Total				5																		
4	a	15 (%)	Allow fifteen.	1																		
	b	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>true</th> <th>false</th> </tr> </thead> <tbody> <tr> <td>Sarah</td> <td></td> <td>✓</td> </tr> <tr> <td>Martin</td> <td>✓</td> <td></td> </tr> <tr> <td>Anna</td> <td>✓</td> <td></td> </tr> <tr> <td>Jane</td> <td></td> <td>✓</td> </tr> <tr> <td>Joe</td> <td>✓</td> <td></td> </tr> </tbody> </table>		true	false	Sarah		✓	Martin	✓		Anna	✓		Jane		✓	Joe	✓		All five rows correct scores 3 marks. Four rows correct scores 2 marks. Two or three rows correct scores 1 mark. All boxes indicated scores 0 marks. All boxes blank is NR.	3
	true	false																				
Sarah		✓																				
Martin	✓																					
Anna	✓																					
Jane		✓																				
Joe	✓																					
Total				4																		
5	a	Polymers; Sugars;	If more than one chosen for this space, 0 marks. If more than one chosen for this space, 0 marks.	1 1																		
	b	C; A;	If more than one chosen for this space, 0 marks. If more than one chosen for this space, 0 marks.	1 1																		
Total				4																		

Question		Expected Answers		Rationale	Marks												
6		<table border="1"> <thead> <tr> <th>description ...</th> <th>letter</th> </tr> </thead> <tbody> <tr> <td>Excretion</td> <td>D</td> </tr> <tr> <td>Bacteria in soil</td> <td>A</td> </tr> <tr> <td>Growing plants</td> <td>E</td> </tr> <tr> <td>Animals eat</td> <td>I</td> </tr> <tr> <td>Nitrates broken down</td> <td>B</td> </tr> </tbody> </table>	description ...	letter	Excretion	D	Bacteria in soil	A	Growing plants	E	Animals eat	I	Nitrates broken down	B		<p>Ignore the 4th row in the table (Animals eat plants: C) as it is given.</p> <p>All four boxes correct scores 3 marks. Three boxes correct scores 2 marks. Two boxes correct scores 1 mark. No mark is awarded if only one box is correct.</p>	3
description ...	letter																
Excretion	D																
Bacteria in soil	A																
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Nitrates broken down	B																
				Total	3												
7		<table border="1"> <thead> <tr> <th>advantage</th> <th>disadvantage</th> </tr> </thead> <tbody> <tr> <td>Chris</td> <td>Lucy</td> </tr> <tr> <td>Anna</td> <td>James</td> </tr> <tr> <td></td> <td>Peter</td> </tr> </tbody> </table>	advantage	disadvantage	Chris	Lucy	Anna	James		Peter		<p>Do not count any name appearing in both columns. Names can appear in any order.</p> <p>All 5 correct = 3 marks 4 correct = 2 marks 3 correct = 1 mark 2 or fewer correct = 0 marks</p>	3				
advantage	disadvantage																
Chris	Lucy																
Anna	James																
	Peter																
				Total	3												

Question		Expected Answers	Rationale	Marks
8	a	<p>sheet of paper <input type="checkbox"/></p> <p style="margin-left: 100px;"><input checked="" type="checkbox"/></p> <p>few cm of air <input type="checkbox"/></p> <p style="margin-left: 100px;"><input checked="" type="checkbox"/></p>	<p>One mark per correct choice. There should be only two choices. If there are three choices, award one mark if two of them are correct. All other possibilities of more than two choices get no marks</p>	<p>1</p> <p>1</p>
	b	<p>i</p> <p style="margin-left: 100px;"><input type="checkbox"/></p> <p style="margin-left: 100px;"><input type="checkbox"/></p> <p style="margin-left: 100px;"><input type="checkbox"/></p> <p style="margin-left: 100px;"><input checked="" type="checkbox"/></p> <p>less than $\frac{1}{4}$</p> <p>ii</p> <p>time taken for $\frac{1}{2}$ to decay <input type="checkbox"/></p> <p style="margin-left: 100px;"><input checked="" type="checkbox"/></p> <p style="margin-left: 100px;"><input type="checkbox"/></p>	<p>Only one answer is allowed. No mark is awarded if there are two or more ticks.</p> <p>Only one answer is allowed. No mark is awarded if there are two or more ticks.</p>	<p>1</p> <p>1</p>
		<p>iii</p> <p style="margin-left: 100px;"><input type="checkbox"/></p> <p style="margin-left: 100px;"><input type="checkbox"/></p> <p style="margin-left: 100px;"><input checked="" type="checkbox"/></p> <p style="margin-left: 100px;"><input type="checkbox"/></p> <p style="margin-left: 100px;"><input type="checkbox"/></p> <p>15g</p>	<p>Only one answer is allowed. No mark is awarded if there are two or more ticks.</p>	<p>1</p>
Total				5

9	a	C and E	Both choices, in either order, are needed for the mark. No extra choices allowed.	1					
	b	<p style="text-align: center;">kills cell becomes cancerous</p> <table style="margin-left: auto; margin-right: auto;"> <tr><td style="border: 1px solid black; width: 20px; height: 20px;"></td></tr> <tr><td style="border: 1px solid black; width: 20px; height: 20px; text-align: center;">✓</td></tr> <tr><td style="border: 1px solid black; width: 20px; height: 20px; text-align: center;">✓</td></tr> <tr><td style="border: 1px solid black; width: 20px; height: 20px;"></td></tr> <tr><td style="border: 1px solid black; width: 20px; height: 20px;"></td></tr> </table>		✓	✓			One mark per correct choice. There should be only two choices. If there are three choices, award one mark if two of them are correct. All other possibilities of more than two choices get no marks	1 1
✓									
✓									
	c	sieverts or Sv	Allow sv, SV, sV and any unambiguous spelling of sievert(s) Allow sub-multiples such as millisieverts (mSv) or microsieverts (μ Sv)	1					
Total				4					
10		unstable neutron two neutron(s) fission	If no response in the gaps, check if there has been any selection indicated on the list. More than one response in any space loses the mark for that response.	5					
Total				5					

Mark Scheme A214/01
June 2007

Question		Expected Answers	Rationale	Marks	
1	a	Shows alarm is working/if it stops there is a problem; annoying/get used to it so ignore it;	owtte. Accept it changes if there is a problem. Change = stop or tone owtte. Ignore distracting	1 1	
	b	i	carbon/CO ₂ emissions/global warming/climate change; limited/finite resource/non-renewable	ignore pollution accept named pollutant: SO ₂ , NO _x , CO, acid rain accept becoming more expensive example accept there will be coal and oil left to use	1 1
		ii	solar/wind/tidal/hydro/geothermal/wave/hydrogen	do not accept anything nuclear accept named examples eg windmill, wind turbine dam is insufficient	1
	c	i	distance from source time/duration of exposure thickness of barriers/armoured pipes; type of radiation emitted activity of radioactive material	The two factors need not be in the areas marked '1' and '2', but can be freely written in the space. Apply the list principle for candidates who give more than two factors. Leakage is neutral Each factor must be related to sludge pipe, so do not accept protective clothing or thick leaded windows	Any 2
		ii	distance – larger distance, smaller dose; time – less time, smaller dose; barrier – thicker barrier, smaller dose type of radiation – different penetrating properties activity – increased activity increases dose	Mark is for the explanation, not the factor. Needs stated or implied comparison. Mark independently from part (i). Can accept ideas here not acceptable in (i) eg leakage owtte	Any 1
		iii	leaded windows; remote mechanical arm; shielded chambers closed/scrubbed/sealed flasks/ stainless steel urns; concrete barriers/ 3 m plug; buried; heavily armoured pipe	NOT protective clothing safety badges, alarm system – treat as neutral in a list. Apply the list principle for candidates who give more than two factors. Only accept safety factors listed in article	Any 2
	d		$\frac{1}{2}$	accept any clear unambiguous identification two or more responses =0	1
	e	i	April	accept any clear unambiguous identification two or more responses =0	1
		ii	John	accept any clear unambiguous identification two or more responses =0	1
				Total	13

Question			Expected Answers	Rationale	Marks
2	a	i	(Other scientists) could not replicate experiments/get the same results	Repeat = replicate	1
		ii	Money/ fame	accept examples of these eg attention, justifying funding, enhances reputation	1
		iii	Explanation of validation; explain '100% tight';	eg checked/repeated/more scrutiny/reliable/above suspicion/avoiding scandal eg all correct/ no errors/ all right/accurate/do not accept 'more than 100% correct'	2
	b	i	two named body cells	BOTH NEEDED FOR 1 MARK. Examples: bone, skin, muscle, egg and sperm, heart, brain DO NOT ACCEPT stem cells	1
		ii	not specialised/no special job.	Allow they can become any (type of cell) DO NOT ACCEPT reproduction/can produce more cells	1
		iii	They may cure diseases.	Accept named disease or condition, for example diabetes Accept curing genetic disorders/incurable disease Accept help people with disease DO NOT ACCEPT implication of regrowth of limbs	1
	c	i	Nazmeen and Gordan	BOTH NEEDED FOR 1 MARK accept any clear unambiguous identification	1
		ii	Nazmeen	accept any clear unambiguous identification	1
		iii	Tom; (Monster) tumours/cancer	accept any clear unambiguous identification accept a description of tumour or cancer eg uncontrollable cells ignore different cell types	2
	d	i	Same genes/chromosomes/DNA / no rejection/ would be accepted (by the body)	'same characteristics' is neutral 'body would recognise' is neutral	1
		ii	cells are/become specialised	ORA eg 'are unspecialised [owtte] until then'	1
Total					13

Question			Expected Answers	Rationale	Marks
3	a	i	to make them taste sweet(er)	Ignore flavour/better	1
		ii	it is sweeter; less is needed; less energy/calories (in food)	Any 2 MUST BE comparison	2
	b		describes pattern of risk; relates to correct named variables, ie relative risk and BMI	Ignore x-axis variable eg 'risk goes up with age' ✓ it=risk eg 'it goes up' ✓ eg 'risk increases as <u>BMI</u> goes up' ✓✓ accept 'more overweigh' or 'more obese' for BMI, but not just overweight / obese	2
	c		thirst / excessive production of urine / weight loss; blindness / gangrene / kidney disease / nerve damage / coma / death	Accept 'going to the toilet more often'	1 1
	d	i	Fructose occurs naturally/is natural / aspartame is artificial/man-made/un-natural/has side-effects	Accept 'fructose from fruit/honey' Accept named side-effect of aspartame 'It' = fructose	1
		ii	it may make you obese/feel hungry/reduces ability 'burn' fat		1
	e	i	(it was carried out) on <u>rats</u> /not on humans; timescale too short;	Either point. Allow eg 'Rats can't tell you when they're hungry' 'only one group' owtte is not creditworthy as sample size is not defined	1
	f		Reference to 40 (mg /kg); Use of 40 mg (/kg) together with EITHER body weight OR contents of a drink can; QWC: A clear ordered answer – A logical sequence of at least two statements, clearly understood on first reading;	NOT just '14 cans' owtte Correct outline of calculation using ADI and can contents is acceptable for 2 marks QWC may be awarded for incorrect science, but the response must be an attempt to answer the question	2 1
	g		the section tells you about the advantages and/or disadvantage of eating fructose/gives a lot of information about fructose/says why we should or should not eat fructose	The title links to the content of the passage eg 'It tells you about fructose' NOT 'It makes you think about eating fructose' It is not sufficient to say that the title means you should read the passage	1
Total					14

**Mark Scheme A214/02
June 2007**

Question		Expected Answers	Rationale	Marks	
1	a	ALARA means reducing risk to acceptable level; No – because alarm does not alter the risk	Owtte can paraphrase eg 'keep risk to a minimum', 'as low as reasonably possible' allow Yes if argue evacuation reduces risk	1 1	
	b	i	distance from source; time/duration of exposure; thickness of armoured pipes; type of radiation emitted; activity of radioactive material;	The two factors need not be in the areas marked '1' and '2', but can be freely written in the space. Apply the list principle for candidates who give more than two factors. Leakage is neutral Each factor must be related to sludge pipe, eg not protective clothing, thick windows.	Any 2
		ii	distance – larger distance, smaller dose/ time – less time, smaller dose/ barrier – thicker barrier, smaller dose/ type of radiation – different penetrating properties/ activity – increased activity increases dose	Mark is for the explanation, not the factor. Needs stated or implied comparison. Mark independently from part (i). Can accept ideas here not acceptable in (i) eg leakage owtte	any 1
		iii	Thick/lead windows; remote mechanical arm; shielded chambers; closed/scrubbed/sealed flasks/ stainless steel urns; concrete barriers/ 3 m plug; buried; heavily armoured pipe;	NOT protective clothing safety badges, alarm system – treat as neutral in a list. Apply the list principle for candidates who give more than two factors. Only accept safety factors listed in article	any 2
	c	halving never reaches zero/still measurable activity/never completely goes/graph plot never reaches axis; indication of use of half-life concept eg by repeated halving	Owtte Correct fraction $1/1024(1/2^{10})$ gets both marks	1 1	
	d	different activities/type of radiation/penetration; relating different risk/danger/harm to different types of waste;	accept examples eg 'emit different amounts of radiation' a bald statement comparing risks as 'high level is more of a risk than intermediate' without any other details scores a maximum of 1 mark	1 1	

Question			Expected Answers	Rationale	Marks	
1	e		one reason for using method;	Method chosen must be for one of space, subduction or geologically inactive burial.	1	
			one reason against using method;	eg We can send waste into space and so reduces the danger to us, but there might be accidents which spread radioactive waste over a wide area, so we should not take the risk (= 3 marks)	1	
			clear differentiation between can and should;		1	
					Total	14
2	a	i	(Other scientists) could not replicate experiments/get the same results	Repeat = replicate	1	
		ii	Journals; Conferences/lectures//symposia/seminars	NOT just 'publish' or just 'newspapers' NOT peer review. Journal implied by eg (scientific) article/paper, could be within a newspaper or website; allow email, blog	1 1	
		iii	Explanation of validation; explain '100% tight';	eg checked/repeated/more scrutiny/reliable/above suspicion/avoid scandal eg all correct/ no errors/ all right/accurate/NOT 'more than 100% correct'	2	
		iv	May not be a willing donor/ pressured into it/coercion	owtte	1	
		v	Limited number of eggs available; Limited resources for treatment; Open to abuse (selling/coercion/exploitation);	eg number of donors, not everyone wants to donate eg financial/manpower/time resources of NHS eg richer patients may buy their treatment	any 2	
	b	i	Public disapproval; Ethical/religious reasons; Could be used for the wrong reasons/open to abuse;	eg scientists 'playing God' eg designer babies, human cloning accept one of these reasons plus development of the idea for 2 marks	any 2	
		ii	Broader composition of group; Regulatory function;	To reflect views of wider society/ specific advice eg law, religion, politics. Group of just scientists need some checking/may be biased in favour of scientific development	1	
		i	Same genes/chromosomes/DNA / no rejection/ would be accepted (by the body);	'same characteristics' is neutral 'body would recognise' is neutral	1	
		ii	cells are/become specialised	ORA eg 'are unspecialised [owtte] until then'	1	
					Total	13

Question			Expected Answers	Rationale	Marks
3	a	i	the data is only about women /aged 30 to 55 /no idea of sample size		1
		ii	sample not representative of the whole population; obese people reluctant to participate in sampling; definition of obesity is open to interpretation/BMI not necessarily a direct measure of obesity;	Could be regional/social/ethnicity/lifestyle variation not allowed for eg muscle and fat are different Other valid scientific/social reason(s) acceptable. accept reason plus detail for 2 marks	any 2
	b	i	(it was carried out) on <u>rats</u> /not on humans; timescale too short;	Either point. Allow eg 'Rats can't tell you when they're hungry' 'only one group' owtte is not creditworthy as sample size is not defined	1
		ii	link is 'fat burning'; validity of data; comparison of results; use of numerical data from bar chart	Allow 'using fat'. eg equal amounts of fructose/glucose or equal times of exercise eg those who had eaten fructose burned fewer calories of fat (than those who had eaten glucose) Effect on arteries/heart attack is neutral.	1 Any 2
	c		Reference to 40 (mg /kg); Use of 40 (mg /kg) together with EITHER body weight OR contents of a drink can; QWC: A clear ordered answer - A logical sequence of at least two statements, clearly understood on first reading;	NOT just '14 cans' owtte Correct outline of calculation using ADI and can contents is acceptable for 2 marks. QWC may be awarded for incorrect science, but the response must be an attempt to answer the question	1 1 1
	d		<u>sucrose</u> (no mark) has been used for centuries; not known to have serious side effects eg brain tumours; from natural sources; <u>fructose</u> (no mark) ill effects not proven in humans; (sweeter, so) less needed so reduces energy intake; from natural sources; <u>aspartame</u> (no mark) (so sweet that) very little needs to be added; has virtually no energy content; unlikely to reach ADI;	no mark for choice Accept any reverse arguments. A valid comparison of all the health issues/side effects from all three sweeteners will be two marks as the same issue is being treated more than once. If the comparison were between two sweeteners on the same issue then it would be one mark.	any 3
Total					13

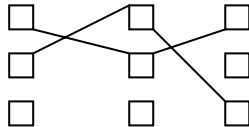
**Mark Scheme A221/01
June 2007**

Question		Expected Answers	Rationale	Marks									
1	a	nucleus;		1									
	b	DNA; alleles; chromosomes; proteins;	If more than one response per line, then line scores zero.	1 1 1 1									
	c	i 2 nd box One chromosome from each pair;	If more than one box is ticked then score is zero.	1									
		ii 1 st box ; 3 rd box; 5 th box ;	1 mark for each correct statement chosen. If more than three boxes are ticked then each incorrect box loses one mark from the total for the question. The candidate cannot score less than zero.	1 1 1									
Total				9									
2	a	1 st box Food not digested properly; 4 th box Frequent chest infections;	If more than two boxes are ticked then each incorrect box loses one mark from the total for the question. Candidates cannot score less than zero.	1 1									
	b	From both parents;	If two or more responses are 'ringed' then score is zero. Allow any clear positive response such as underlining or shading etc.	1									
	c	i Correct gametes; Correct combinations in offspring;	<table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>F</td> <td>f</td> </tr> <tr> <td>F</td> <td>FF</td> <td>Ff</td> </tr> <tr> <td>f</td> <td>Ff</td> <td>ff</td> </tr> </table> <p>Allow Ff OR fF Upper or lower case F and f must be clearly identifiable</p>		F	f	F	FF	Ff	f	Ff	ff	1 1
	F	f											
F	FF	Ff											
f	Ff	ff											
		ii ff offspring circled;	<table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>F</td> <td>f</td> </tr> <tr> <td>F</td> <td>FF</td> <td>Ff</td> </tr> <tr> <td>f</td> <td>Ff</td> <td>ff</td> </tr> </table> <p>If ff is clearly circled even if in wrong box then mark as correct.</p>		F	f	F	FF	Ff	f	Ff	ff	1
	F	f											
F	FF	Ff											
f	Ff	ff											
Total				6									

Question		Expected Answers	Rationale	Marks																		
3	a	Skin to Provides a physical barrier; Stomach to Produce acid; Tears to Contain chemicals that destroy micro-organisms;	All 3 correct = 2 marks 1 or 2 correct = 1 mark	2																		
	b	Digest; antibodies;	If more than one response per line, then line scores zero.	1 1																		
	c	A before D; D before C;		1 1																		
Total				6																		
4	a	diet low in salt; Regular exercise programme; Stop smoking;	If more than three boxes are ticked then each incorrect box loses one mark from the total for the question. The candidate cannot score less than zero.	1 1 1																		
	b	They must not have serious side effects; They must be effective;	If more than two boxes are ticked then each incorrect box loses one mark from the total for the question. The candidate cannot score less than zero.	1 1																		
Total				5																		
5	a	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>data</th> <th>explanation</th> <th>neither</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">✓</td> </tr> </tbody> </table>	data	explanation	neither	✓			✓				✓			✓				✓	One mark per line. More than one tick in each line scores zero for that line. Allow any clear indication of correct answer e.g. cross or shading in etc. or written next to the statement.	1 1 1 1 1
data	explanation	neither																				
✓																						
✓																						
	✓																					
	✓																					
		✓																				
	b	i	1 st box ticked;	Limited food If more than one box is ticked then score is zero.	1																	
		ii	Small brain size; small body size;	If more than two answers are underlined then each incorrect line loses one mark from the total for the question. The candidate cannot score less than zero.	1 1																	
Total				8																		

Question			Expected Answers	Rationale	Marks
6			Eye = Receptor; Optic nerve = neuron; Brain sends =neuron; Muscles in eye = effector;	If more than one word 'ringed' per box then box scores zero. Allow any other clearly identified correct response eg crossing out wrong words.	1 1 1 1
				Total	4
7	a	i	Ring round 'increased';	If more than one word is 'ringed' then scores zero.	1
		ii	Ring round 'England';	If more than one word is 'ringed' then scores zero.	1
	b		1 st box; 3 rd box;	If more than two boxes are ticked then each incorrect box loses one mark from the total for the question. The candidate cannot score less than zero.	1 1
				Total	4

**Mark Scheme A221/02
June 2007**

Question			Expected Answers	Rationale	Marks
1	a	i	Correct gametes; Correct combinations in offspring;	$\begin{array}{ccc} & F & f \\ F & FF & Ff \\ f & Ff & ff \end{array}$ Allow Ff OR fF Upper or lower case F and f must be clearly identifiable	2
		ii	ff offspring circled;	$\begin{array}{ccc} & F & f \\ F & FF & Ff \\ f & Ff & \textcircled{ff} \end{array}$ If ff is clearly circled even if in wrong box then mark as correct.	1
	b		Adopt joined to Child will not have cystic fibrosis and Child will not be genetically related; In vitro joined to Child genetically related and process is expensive. 	LHS correct =1 RHS correct = 1	1 1
Total					5
2	a		Digest; antibodies		1 1
	b		B before A A before D D before C		1 1 1
	c	i	B. Flu virus can change; C. Each antibody only works for one virus	If more than two letters are circled then each incorrect letter loses one mark from the total for the question. The candidate cannot score less than zero. Allow letters circled in the question if not clear in the statements.	1 1
		ii	A C D for B E against	All correct for 3 4 or 3 correct for 2 marks 2 or 1 correct for 1 mark. If a letter appears on both sides mark as incorrect.	1 1 1
Total					10

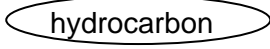





Question		Expected Answers	Rationale	Marks																		
3	a	3 rd box No serious side effects; 4 th box Must be effective against the disease	If more than two boxes are ticked then each incorrect box loses one mark from the total for the question. The candidate cannot score less than zero.	1 1																		
	b	i	1 st Patients divided randomly: 3 rd One group given drug other given harmless substitute 6 th neither doctors nor patients know which in each group.	1 1 1																		
		ii	3 rd People taking placebo may get worse; 5 th All patient have right to best treatment.	2																		
Total				7																		
4	a	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>data</th> <th>explanation</th> <th>neither</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">✓</td> </tr> </tbody> </table>	data	explanation	neither	✓			✓				✓			✓				✓	One mark per line. More than one tick in each line scores zero for that line. Allow any clear indication of correct answer eg cross or shading in etc. or written next to the statement.	1 1 1 1 1
data	explanation	neither																				
✓																						
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	✓																					
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		✓																				
	b	i	1 st box ticked	Limited food	1																	
		ii	1b, 2a, 3a, 4b, 5a	All 5 correct 3 marks 3or 4 correct 2 marks 2 correct for 1 mark Only one correct scores zero	3																	
Total				9																		
5			Electrical impulses; Fast, short time; Chemicals; Slow, long time	one mark for each correct line	1 1 1 1																	
Total				4																		

Question			Expected Answers	Rationale	Marks
6	a	i	5.8 %	Any clear indication of the correct answer eg tick, cross, shading etc. Ignore obviously crossed out work unless it is the only answer given.	1
		ii	1 st Wales, number of places increased 2.5 times; 3 rd Scotland number of places increased about 1.5 times.	If more than two boxes are ticked then each incorrect box loses one mark from the total for the question. The candidate cannot score less than zero.	1 1
	b	i	2 nd box Rivers became polluted; 4 th box animals introduced- competition	If more than two boxes are ticked then each incorrect box loses one mark from the total for the question. The candidate cannot score less than zero.	1 1
		ii	1 st box Provide new materials. 3 rd box Provide new medicines.	If more than two boxes are ticked then each incorrect box loses one mark from the total for the question. The candidate cannot score less than zero.	1 1
Total					7

**Mark Scheme A321/01
June 2007**

Question			Expected Answers	Rationale	Marks								
1	a	i	<div style="display: flex; justify-content: space-around;"> cars lorries </div>	Judge entire set of five words: first and fourth should have rings around them (see note8) One mark for each correct answer. If three words ringed mark these responses and deduct one mark. If four or five words ringed 0 marks.	2								
		ii	<table border="1" style="width: 100%;"> <tr><td> </td><td> </td></tr> <tr><td>Carbon dioxide decreased more than nitrogen dioxide and particulates</td><td style="text-align: center;">✓</td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>			Carbon dioxide decreased more than nitrogen dioxide and particulates	✓					Judge entire set of four boxes: second should have a tick (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out). All boxes are indicated scores 0 marks. All boxes blank is NR. All four boxes correct scores 1 mark. Three or less boxes correct scores 0 marks.	1
Carbon dioxide decreased more than nitrogen dioxide and particulates	✓												
		iii	cars / lorries; decreased	One mark for each correct answer	2								
		iv	<table border="1" style="width: 100%;"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td>Buses and taxis carry more people in each vehicle than cars</td><td style="text-align: center;">✓</td></tr> <tr><td> </td><td> </td></tr> </table>					Buses and taxis carry more people in each vehicle than cars	✓			Judge entire set of four boxes: third should have a tick (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out). All boxes are indicated scores 0 marks. All boxes blank is NR. All four boxes correct scores 1 mark. Three or less boxes correct scores 0 marks.	1
Buses and taxis carry more people in each vehicle than cars	✓												

Question		Expected Answers	Rationale	Marks								
1	b	<table border="1"> <tr> <td></td> <td></td> </tr> <tr> <td>They both dissolve in rain water</td> <td>✓</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table>			They both dissolve in rain water	✓					<p>Judge entire set of four boxes: second should have a tick (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks. All boxes blank is NR. All four boxes correct scores 1 mark. Three or less boxes correct scores 0 marks.</p>	1
They both dissolve in rain water	✓											
	c	<table border="1"> <tr> <td>nitrogen</td> <td>78</td> </tr> <tr> <td>oxygen</td> <td>21</td> </tr> <tr> <td>argon</td> <td>1</td> </tr> </table>	nitrogen	78	oxygen	21	argon	1	<p>All three correct = 2 marks Two or one correct = 1 mark</p>	2		
nitrogen	78											
oxygen	21											
argon	1											
			Total	9								

Question		Expected Answers	Rationale	Marks								
2	a	<div style="text-align: center;">  </div>	Accept any clear mark on correct word. More than one response = 0 marks	1								
	b	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; justify-content: space-between; width: 100%;"> <div style="border: 1px solid black; padding: 2px;">carbon</div> <div style="border: 1px solid black; padding: 2px;">carbon dioxide</div> </div> <div style="margin: 5px 0;">  </div> <div style="margin: 5px 0;">  </div> </div>	<p>There should be one line from carbon to carbon dioxide. This scores 1 mark. More than one line from carbon scores 0.</p> <p>There should be one line from hydrogen to water. This scores 1 mark. More than one line from hydrogen scores 0.</p>	2								
	c	i	<div style="text-align: center;">  </div> <p>Circles MUST touch. There must be two clear circles and one shaded. Allow letters in circles like this:  Allow lines connecting circles like this:  Circles can be at any angle and in any order whether shading and/or letters used.</p>	1								
		ii	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="height: 20px;"></td><td style="width: 50px;"></td></tr> <tr><td style="height: 20px;"></td><td></td></tr> <tr><td style="height: 20px;"></td><td></td></tr> <tr><td style="height: 20px;">People could use less electricity by switching off appliances when they are not being used</td><td style="text-align: center; vertical-align: middle;">✓</td></tr> </table> <p>A tick in any other box = 0 marks</p>							People could use less electricity by switching off appliances when they are not being used	✓	1
People could use less electricity by switching off appliances when they are not being used	✓											
Total				5								

Question		Expected Answers	Rationale	Marks								
3	a	<table border="1"> <tr> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td></td> <td style="text-align: center;">✓</td> </tr> </table>	✓			✓		✓		✓	<p>Judge each row of two boxes.</p> <p>The first row should have a tick (or other clear indication of choice) in the first box and the second box <u>should be blank</u> (or have indication of choice crossed out).</p> <p>Each of the second, third and fourth rows should have a tick (or other clear indication of choice) in the second box and the first box <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks.</p> <p>All boxes blank is NR.</p> <p>Consider whether each row is correct.</p> <p>The wrong box indicated in the row, two boxes indicated in the row or two blank boxes in the row is incorrect.</p> <p>Four rows correct scores 3 marks.</p> <p>Three rows correct scores 2 marks.</p> <p>Two rows correct scores 1 mark.</p> <p>One or no rows correct scores 0 marks.</p>	3
✓												
	✓											
	✓											
	✓											
	b	<table border="1"> <tr> <td style="text-align: center;">fat</td> <td style="text-align: center;">sugar</td> </tr> </table>	fat	sugar	<p>Judge entire set of five words: first and fourth should have rings around them.</p> <p>One mark for each correct answer.</p> <p>If three words ringed mark these responses and deduct one mark.</p> <p>If four or five words ringed 0 marks.</p>	2						
fat	sugar											
	c	heart disease / strokes / kidney disease / amputations / blindness	<p>One mark for each correct example.</p> <p>Allow words that have been written within sentences eg People with diabetes suffer from <u>strokes</u>.</p>	2								
	d	<table border="1"> <tr> <td></td> <td></td> </tr> <tr> <td>Most people will not get diabetes.</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>Most people are not aware of how serious diabetes is.</td> <td style="text-align: center;">✓</td> </tr> </table>			Most people will not get diabetes.	✓	Most people are not aware of how serious diabetes is.	✓	<p>Judge entire set of five boxes: third and fifth should have ticks (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks.</p> <p>All boxes blank is NR.</p> <p>All five boxes correct scores 2 marks.</p> <p>Four or three boxes correct scores 1 mark.</p> <p>Two or less boxes correct scores 0 marks.</p>	2		
Most people will not get diabetes.	✓											
Most people are not aware of how serious diabetes is.	✓											
			Total	9								

Question			Expected Answers	Rationale	Marks								
4	a	i	<table border="1"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td>to stop microbes growing on the product</td><td>✓</td></tr> </table>							to stop microbes growing on the product	✓	A tick in any other box = 0 marks	1
to stop microbes growing on the product	✓												
		ii		Judge entire set of six words: first and fourth should have rings around them. One mark for each correct answer. If three words ringed mark these responses and deduct one mark. If four, five or six words ringed 0 marks.	2								
	b	i	<table border="1"> <tr> <td>Additives with an E number have passed a safety test,</td> <td>✓</td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td>Additives with an E number are approved for use in the UK Europe</td> <td>✓</td> </tr> <tr> <td> </td> <td> </td> </tr> </table>	Additives with an E number have passed a safety test,	✓			Additives with an E number are approved for use in the UK Europe	✓			Judge entire set of four boxes: first and third should have a tick (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out). All boxes are indicated scores 0 marks. All boxes blank is NR. All four boxes correct scores 1 mark. Three or less boxes correct scores 0 marks.	1
Additives with an E number have passed a safety test,	✓												
Additives with an E number are approved for use in the UK Europe	✓												
		ii		Judge entire set of four substances: third and fourth should have rings around them (or other clear indication of choice) and others <u>should not be indicated</u> (or have indication of choice crossed out). 1 mark for both correct words ringed. 0 marks for any other answer.									
				Total	5								

Question			Expected Answers	Rationale	Marks								
5	a	i	<div style="border: 1px solid black; border-radius: 50%; width: 100px; height: 40px; display: flex; align-items: center; justify-content: center;"> outlier </div>	Accept any clear mark on correct word. See note 8. More than one response = 0 marks	1								
		ii	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="height: 20px;"></td><td style="width: 50px;"></td></tr> <tr><td style="height: 20px;"></td><td></td></tr> <tr><td style="height: 20px;">It is much higher than all of the other results.</td><td style="text-align: center;">✓</td></tr> <tr><td style="height: 20px;"></td><td></td></tr> </table>					It is much higher than all of the other results.	✓			A tick in any other box = 0 marks	1
It is much higher than all of the other results.	✓												
		iii	<div style="border: 1px solid black; border-radius: 50%; width: 60px; height: 40px; display: flex; align-items: center; justify-content: center;"> 240 </div>	Accept any clear mark on correct number. More than one response = 0 marks	1								
		iv	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="height: 20px;">Measurements can vary due to human error</td><td style="width: 50px; text-align: center;">✓</td></tr> <tr><td style="height: 20px;"></td><td></td></tr> <tr><td style="height: 20px;"></td><td></td></tr> <tr><td style="height: 20px;">There may be small variations between different samples of the material</td><td style="text-align: center;">✓</td></tr> </table>	Measurements can vary due to human error	✓					There may be small variations between different samples of the material	✓	One mark for each correct answer.	2
Measurements can vary due to human error	✓												
There may be small variations between different samples of the material	✓												

Question			Expected Answers	Rationale	Marks												
5	b	i	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>non-biodegradable</td> <td>biodegradable</td> <td>✓</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>made from crude oil</td> <td>made from trees</td> <td>✓</td> </tr> </table>				non-biodegradable	biodegradable	✓				made from crude oil	made from trees	✓	Judge entire set of five boxes: second and fifth should have ticks (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out). All boxes are indicated scores 0 marks. All boxes blank is NR. All five boxes correct scores 2 marks. Four or three boxes correct scores 1 mark. Two or less boxes correct scores 0 marks.	
non-biodegradable	biodegradable	✓															
made from crude oil	made from trees	✓															
ii	softer	If no response on the dotted line check if the word softer has been ringed or indicated in another way. Give 1 mark if it has.	1														
Total					8												
6	a		PVC ; nylon	One mark for each correct answer. Answers in any order. If 3 fibres given including both PVC and Nylon = 1 mark If 3 fibres given that do not include both PVC and Nylon = 0 marks If 4 or more fibres given = 0 marks.	2												
	b	i	Wool	If answer gives more than one fibre. 0 marks given	1												
		ii	(high / good) heat insulation/heat insulate	Allow answer if included in a sentence. eg It is a good choice because it insulates heat. If more than one property given in answer. 0 marks	1												
	c		<table border="1"> <tr> <td></td> <td></td> </tr> <tr> <td>Cotton will absorb a lot of sweat</td> <td>✓</td> </tr> <tr> <td></td> <td></td> </tr> </table>			Cotton will absorb a lot of sweat	✓			A tick in any other box = 0 marks	1						
Cotton will absorb a lot of sweat	✓																
	d		<table border="1"> <tr> <td></td> <td></td> </tr> <tr> <td>Silk is more comfortable next to the skin</td> <td>✓</td> </tr> <tr> <td></td> <td></td> </tr> </table>			Silk is more comfortable next to the skin	✓			A tick in any other box = 0 marks	1						
Silk is more comfortable next to the skin	✓																
Total					6												

**Mark Scheme A321/02
June 2007**

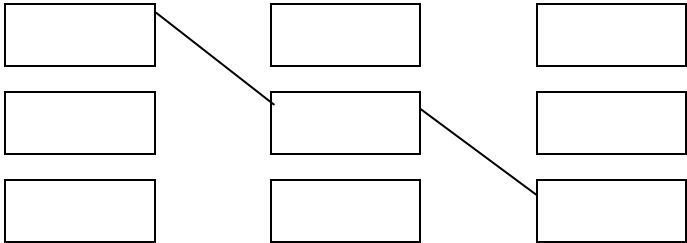
Question		Expected Answers	Rationale	Marks															
1	a	<table border="1"> <thead> <tr> <th>statement</th> <th>type 1 diabetes</th> <th>type 2 diabetes</th> </tr> </thead> <tbody> <tr> <td>controlled by insulin injections</td> <td>✓</td> <td></td> </tr> <tr> <td>controlled by diet and exercise</td> <td></td> <td>✓</td> </tr> <tr> <td>usually occurs in people over 50</td> <td></td> <td>✓</td> </tr> <tr> <td>the body no longer responds to its own insulin</td> <td></td> <td>✓</td> </tr> </tbody> </table>	statement	type 1 diabetes	type 2 diabetes	controlled by insulin injections	✓		controlled by diet and exercise		✓	usually occurs in people over 50		✓	the body no longer responds to its own insulin		✓	<p>Judge each row of two boxes.</p> <p>The first row should have a tick (or other clear indication of choice) in the first box and the second box <u>should be blank</u> (or have indication of choice crossed out).</p> <p>Each of the second, third and fourth rows should have a tick (or other clear indication of choice) in the second box and the first box <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks.</p> <p>All boxes blank is NR.</p> <p>Consider whether each row is correct.</p> <p>The wrong box indicated in the row, two boxes indicated in the row or two blank boxes in the row is incorrect.</p> <p>Four rows correct scores 3 marks.</p> <p>Three rows correct scores 2 marks.</p> <p>Two rows correct scores 1 mark.</p> <p>One or no rows correct scores 0 marks.</p>	3
statement	type 1 diabetes	type 2 diabetes																	
controlled by insulin injections	✓																		
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	b	i	<table border="1"> <tbody> <tr> <td>The consequences of contracting diabetes.</td> <td>✓</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>The different treatments for type 1 and type 2 diabetes.</td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>The percentage of people with type 2 diabetes compared with type 1.</td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>The chance of diabetes occurring in people with a high fat and sugar diet.</td> <td>✓</td> </tr> </tbody> </table>	The consequences of contracting diabetes.	✓			The different treatments for type 1 and type 2 diabetes.				The percentage of people with type 2 diabetes compared with type 1.				The chance of diabetes occurring in people with a high fat and sugar diet.	✓	<p>Judge entire set of four boxes: the first and fourth should have a tick (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks.</p> <p>All boxes blank is NR.</p> <p>All four boxes correct scores 1 mark.</p> <p>Three or less boxes correct scores 0 marks.</p>	1
The consequences of contracting diabetes.	✓																		
The different treatments for type 1 and type 2 diabetes.																			
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The chance of diabetes occurring in people with a high fat and sugar diet.	✓																		





Question			Expected Answers	Rationale	Marks																		
1	b	ii	<table border="1"> <tr> <td>Most people are not overweight.</td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>Diabetes is not a serious illness.</td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>Most people will not get diabetes.</td> <td>✓</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>Poor diet does not cause diabetes.</td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>Most people are not aware of how serious diabetes is.</td> <td>✓</td> </tr> </table>	Most people are not overweight.				Diabetes is not a serious illness.				Most people will not get diabetes.	✓			Poor diet does not cause diabetes.				Most people are not aware of how serious diabetes is.	✓	<p>Judge entire set of five boxes: third and fifth should have ticks (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks. All boxes blank is NR. All five boxes correct scores 2 marks. Four or three boxes correct scores 1 mark. Two or less boxes correct scores 0 marks.</p>	2
Most people are not overweight.																							
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					6																		

Question		Expected Answers	Rationale	Marks									
2	a	<p style="text-align: center;"> vegetable oil water </p>	<p>Judge entire set of six substances: fifth and sixth should have rings around them (or other clear indication of choice) and others <u>should not be indicated</u> (or have indication of choice crossed out).</p> <p>All substances are indicated scores 0 marks. All substances without indication is NR. All six substances correct scores 2 marks.</p> <p>If only one substances circled, then Five substances correct scores 1 mark. Four or less substances correct scores 0 marks.</p> <p>If two substances circled, then Five or four substances correct scores 1 mark. Three or less substances correct scores 0 marks.</p>	2									
66	b	i	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Additives with an E number have passed a safety test.</td> <td style="text-align: center; width: 20px;">✓</td> </tr> <tr> <td style="padding: 2px;">Additives with an E number have been used for many years.</td> <td></td> </tr> <tr> <td style="padding: 2px;">Additives with an E number are approved for use in the UK and Europe.</td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="padding: 2px;">Additives with an E number cause problems for people with food allergies.</td> <td></td> </tr> </table>	Additives with an E number have passed a safety test.	✓	Additives with an E number have been used for many years.		Additives with an E number are approved for use in the UK and Europe.	✓	Additives with an E number cause problems for people with food allergies.		<p>Judge entire set of four boxes: first and third should have a tick (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks. All boxes blank is NR. All four boxes correct scores 1 mark. Three or less boxes correct scores 0 marks.</p>	1
		Additives with an E number have passed a safety test.	✓										
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		Additives with an E number are approved for use in the UK and Europe.	✓										
Additives with an E number cause problems for people with food allergies.													
ii	<p style="text-align: center;"> synthetic fertiliser weedkiller </p>	<p>Judge entire set of four substances: third and fourth should have rings around them (or other clear indication of choice) and others <u>should not be indicated</u> (or have indication of choice crossed out).</p> <p>All substances are indicated scores 0 marks. All substances without indication is NR. All four substances correct scores 1 mark. Three or less substances correct scores 0 marks.</p>	1										

Question			Expected Answers	Rationale	Marks										
2	c	i	<table border="1"> <tr> <td></td> <td></td> </tr> <tr> <td>For the same quantity of nutrients, manure is heavier and bulkier to transport.</td> <td>✓</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>It is not possible to produce enough manure to give the quantity of nutrients provided by synthetic fertilisers</td> <td>✓</td> </tr> </table>			For the same quantity of nutrients, manure is heavier and bulkier to transport.	✓			It is not possible to produce enough manure to give the quantity of nutrients provided by synthetic fertilisers	✓	<p>Judge entire set of four boxes: second and fourth should have a tick (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks. All boxes blank is NR. All four boxes correct scores 1 mark. Three or less boxes correct scores 0 marks.</p>	1		
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It is not possible to produce enough manure to give the quantity of nutrients provided by synthetic fertilisers	✓														
		ii	<table border="1"> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>People in the UK have plenty of food available and many more are becoming interested in eating food that is good for health.</td> <td>✓</td> </tr> <tr> <td>People in developing countries may have food shortages and are more interested in getting enough food than whether it is organically grown.</td> <td>✓</td> </tr> </table>							People in the UK have plenty of food available and many more are becoming interested in eating food that is good for health.	✓	People in developing countries may have food shortages and are more interested in getting enough food than whether it is organically grown.	✓	<p>Judge entire set of five boxes: fourth and fifth should have ticks (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks. All boxes blank is NR. All five boxes correct scores 2 marks. Four or three boxes correct scores 1 mark. Two or less boxes correct scores 0 marks.</p>	2
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					7										

Question			Expected Answers	Rationale	Marks												
3	a	i	<table border="1"> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td>The number of cars decreased more than the number of lorries.</td><td>✓</td></tr> <tr><td></td><td></td></tr> <tr><td>The number of cars and lorries decreased and the number of buses increased.</td><td>✓</td></tr> <tr><td></td><td></td></tr> </table>					The number of cars decreased more than the number of lorries.	✓			The number of cars and lorries decreased and the number of buses increased.	✓			<p>Judge entire set of six boxes: third and fifth should have ticks (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks. All boxes blank is NR. All six boxes correct scores 2 marks. Four or five boxes correct scores 1 mark. Three or less boxes correct scores 0 marks.</p>	2
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The number of cars and lorries decreased and the number of buses increased.	✓																
ii	<table border="1"> <tr><td></td><td></td></tr> <tr><td>Carbon dioxide decreased more than nitrogen dioxide and particulates.</td><td>✓</td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> </table>			Carbon dioxide decreased more than nitrogen dioxide and particulates.	✓					<p>Judge entire set of four boxes: second should have a tick (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks. All boxes blank is NR. All four boxes correct scores 1 mark. Three or less boxes correct scores 0 marks.</p>	1						
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iii	<table border="1"> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td>There is a correlation between the decrease in distance travelled by cars and reduction in air pollution.</td><td>✓</td></tr> </table>							There is a correlation between the decrease in distance travelled by cars and reduction in air pollution.	✓	<p>Judge entire set of four boxes: fourth should have a tick (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks. All boxes blank is NR. All four boxes correct scores 1 mark. Three or less boxes correct scores 0 marks.</p>	1						
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Question			Expected Answers	Rationale	Marks								
3	a	iv	<table border="1"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td>Buses and taxis carry more people in each vehicle than cars.</td><td>✓</td></tr> <tr><td> </td><td> </td></tr> </table>					Buses and taxis carry more people in each vehicle than cars.	✓			<p>Judge entire set of four boxes: third should have a tick (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks.</p> <p>All boxes blank is NR.</p> <p>All four boxes correct scores 1 mark.</p> <p>Three or less boxes correct scores 0 marks.</p>	1
Buses and taxis carry more people in each vehicle than cars.	✓												
	b			<p>Judge each column separately.</p> <p>A line from the top box in the first column to any box in middle column is correct.</p> <p>A line from (ie left to right) the middle box in the second column to any box in the third column is correct.</p> <p>A line from any box in the middle column to the bottom box in the third column is correct.</p> <p>No other boxes should have lines from or to them.</p> <p>Lines need not be straight.</p> <p>Lines need not touch the boxes, but a line half way between two boxes is incorrect.</p> <p>Ignore lines that have been drawn and then crossed out.</p> <p>Lines to or from more than one box in a column is an incorrect choice for that column.</p> <p>The correct box chosen in each of the three columns scores 3 marks.</p> <p>The correct box chosen in each of two columns scores 2 marks.</p> <p>The correct box chosen in one column scores 1 mark.</p> <p>An incorrect box chosen in each of the three columns scores 0 marks.</p> <p>No lines drawn is NR.</p>	3								


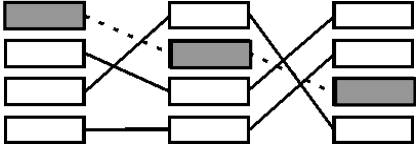
Question		Expected Answers	Rationale	Marks								
3	c	<table border="1"> <tr> <td></td> <td></td> </tr> <tr> <td>They both dissolve in rain water.</td> <td>✓</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table>			They both dissolve in rain water.	✓					<p>Judge entire set of four boxes: second should have a tick (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks.</p> <p>All boxes blank is NR.</p> <p>All four boxes correct scores 1 mark.</p> <p>Three or less boxes correct scores 0 marks.</p>	1
They both dissolve in rain water.	✓											
				9								
4	a	hydrocarbon / hydrocarbons / hydrocarbon molecule / hydrocarbon compound / hydrocarbon chain	NOT hydrocarbon atom	1								
	b	<p>carbon dioxide / CO₂;</p> <p>water / water vapour / steam / hydrogen oxide / H₂O</p>	<p>One mark for each correct name, in either order.</p> <p><u>NOT</u> CO₂ / CO² / Co₂ / carbon dioxides / carbon monoxide / carbon / particulate(s) / soot</p> <p><u>NOT</u> H₂O / H²O / h₂O / h₂o / hydrogen dioxide</p>	2								
	c	<p>one  on right;</p> <p>a second  on right / figure 2 in front of their correct diagram for carbon dioxide on right;</p> <p>a second  on left / figure 2 in front of existing diagram for carbon monoxide on the left</p>	<p>Non Shaded circle(s) must touch shaded circle to get mark.</p> <p>For  , the three circles need not be linear but the two non-shaded circles must not touch.</p> <p>Accept circle with c inside it for shaded circle.</p> <p>Accept circle with o inside it for non-shaded circle.</p> <p>If the candidate has drawn any extra diagrams to the three given in the marking scheme a maximum of 2 marks only can be awarded.</p>	3								
				6								

Question			Expected Answers	Rationale	Marks										
5	a	i	(an) outlier / anomalous / anomaly	<u>NOT</u> 'different'.	1										
		ii	240	No other answer acceptable.	1										
	b	i	<table border="1"> <tr> <td>All of the results fit into a narrow range.</td> <td>✓</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table>	All of the results fit into a narrow range.	✓							<p>Judge entire set of four boxes: first should have a tick (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks. All boxes blank is NR. All four boxes correct scores 1 mark. Three or less boxes correct scores 0 marks.</p>	1		
All of the results fit into a narrow range.	✓														
		ii	<table border="1"> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>To make sure that the type of poly(ethene) was the only variable likely to affect the outcome.</td> <td>✓</td> </tr> </table>							To make sure that the type of poly(ethene) was the only variable likely to affect the outcome.	✓	<p>Judge entire set of four boxes: fourth should have a tick (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks. All boxes blank is NR. All four boxes correct scores 1 mark. Three or less boxes correct scores 0 marks.</p>	1		
To make sure that the type of poly(ethene) was the only variable likely to affect the outcome.	✓														
		iii	<table border="1"> <tr> <td>The ranges for the two types of poly(ethene) do not overlap.</td> <td>✓</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>The mean for the second type of poly(ethene) does not lie within the range for the first type of poly(ethene).</td> <td>✓</td> </tr> </table>	The ranges for the two types of poly(ethene) do not overlap.	✓							The mean for the second type of poly(ethene) does not lie within the range for the first type of poly(ethene).	✓	<p>Judge entire set of five boxes: first and fifth should have ticks (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks. All boxes blank is NR. All five boxes correct scores 2 marks. Four or three boxes correct scores 1 mark. Two or less boxes correct scores 0 marks.</p>	2
The ranges for the two types of poly(ethene) do not overlap.	✓														
The mean for the second type of poly(ethene) does not lie within the range for the first type of poly(ethene).	✓														

Question			Expected Answers			Rationale	Marks																		
5	c	i	<table border="1"> <tr> <td>Paper is made from trees.</td> <td></td> <td>✓</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>When a tree is cut down another can be planted to replace it.</td> <td></td> <td>✓</td> </tr> </table>			Paper is made from trees.		✓													When a tree is cut down another can be planted to replace it.		✓	<p>Judge entire set of six boxes: first and sixth should have ticks (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks. All boxes blank is NR. All six boxes correct scores 1 mark. Five or less boxes correct scores 0 marks.</p>	1
Paper is made from trees.		✓																							
When a tree is cut down another can be planted to replace it.		✓																							
		ii	<table border="1"> <thead> <tr> <th>poly(ethene)</th> <th>paper</th> <th>tick (✓) two rows</th> </tr> </thead> <tbody> <tr> <td>used for the past 50 years</td> <td>used for hundreds of years</td> <td></td> </tr> <tr> <td>non-biodegradable</td> <td>biodegradable</td> <td>✓</td> </tr> <tr> <td>stretches when pulled hard</td> <td>breaks when pulled hard</td> <td></td> </tr> <tr> <td>transparent</td> <td>opaque</td> <td></td> </tr> <tr> <td>made from crude oil</td> <td>made from trees</td> <td>✓</td> </tr> </tbody> </table>			poly(ethene)	paper	tick (✓) two rows	used for the past 50 years	used for hundreds of years		non-biodegradable	biodegradable	✓	stretches when pulled hard	breaks when pulled hard		transparent	opaque		made from crude oil	made from trees	✓	<p>Judge entire set of five boxes: second and fifth should have ticks (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks. All boxes blank is NR. All five boxes correct scores 2 marks. Four or three boxes correct scores 1 mark. Two or less boxes correct scores 0 marks.</p>	2
poly(ethene)	paper	tick (✓) two rows																							
used for the past 50 years	used for hundreds of years																								
non-biodegradable	biodegradable	✓																							
stretches when pulled hard	breaks when pulled hard																								
transparent	opaque																								
made from crude oil	made from trees	✓																							
							9																		

Question		Expected Answers	Rationale	Marks									
6	a		<p>Mark each set of three joined boxes from left to right independently.</p> <p>tights – nylon – high stretchiness underwear – cotton – high water absorbance jumper – wool – high heat insulation</p> <p>All three sets of three boxes correct scores 2 marks. Two or one sets of three boxes correct scores 1 mark. No sets of boxes correct scores 0 marks. Lines need not be straight and need not touch the boxes.. A line that is half way between two boxes is incorrect.</p>	2									
73	b	i	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="height: 20px;"></td><td style="width: 20px;"></td></tr> <tr><td style="height: 20px;"></td><td></td></tr> <tr><td style="height: 20px;"></td><td></td></tr> <tr><td style="height: 20px;">Plasticizer molecules reduce the forces of attraction between polymer chains.</td><td style="text-align: center;">✓</td></tr> </table>							Plasticizer molecules reduce the forces of attraction between polymer chains.	✓	<p>Judge entire set of four boxes: fourth should have a tick (or other clear indication of choice) and others <u>should be blank</u> (or have indication of choice crossed out).</p> <p>All boxes are indicated scores 0 marks. All boxes blank is NR. All four boxes correct scores 1 mark. Three or less boxes correct scores 0 marks.</p>	1
Plasticizer molecules reduce the forces of attraction between polymer chains.	✓												
		ii	<p>Increased chain length / decreased chain length / longer chain / shorter chain;</p> <p>increased crystallinity / decreased crystallinity / more crystalline / less crystalline;</p> <p>(more/less) cross-linking / (more/less) cross linked</p>	<p>Accept any two correct answers for one mark each.</p> <p>Comparison needed for answers based on chain length or crystallinity</p> <p><u>NOT</u> branched / more/less branched / crystalline / crystallise / more/less molecules / vulcanisation / join up</p>	2								
				5									

**Mark Scheme A331/01
June 2007**

Question	Expected Answers	Rationale	Marks
1	 <p>crust— mantle— core</p>	<p>2 marks for all three correct. 1 mark for one or two correct.</p>	2
Total			2
2		<p>Do not count the dotted lines between greyed boxes as they are given. Mark each side independently. Accept non-straight lines.</p> <p><u>Left hand side</u> 2 marks for all three lines correct. 1 mark for one or two lines correct.</p> <p><u>Right hand side</u> 2 marks for all three lines correct. 1 mark for one or two lines correct.</p> <p>If any box has more than one line leaving it, then ignore all lines from that box.</p>	4
Total			4
3	<p>Light travels much faster... <input type="checkbox"/></p> <p>Galaxies are very great... <input checked="" type="checkbox"/></p> <p>Light travels through space... <input checked="" type="checkbox"/></p> <p>The Earth goes once around... <input type="checkbox"/></p>	<p>2 marks for both second box & third box correct and no other ticks. 1 mark for second box or third box correct and <u>at least</u> two blanks.</p>	2
Total			2

Question		Expected Answers	Rationale	Marks								
4	a	Star A gives out less light... <input checked="" type="checkbox"/> Star A gives out more light... <input type="checkbox"/> Star A and star B give out... <input type="checkbox"/>	No extra ticks allowed.	1								
	b	Star B moves towards ... <input type="checkbox"/> As the Earth moves ... <input checked="" type="checkbox"/> The earth's axis is tilted ... <input type="checkbox"/>	No extra ticks allowed.	1								
	c	light pollution planets	Words must be in the order given. 1 mark for each correct response. If more than one word is written in a gap and none crossed out, give no marks for that choice.	3								
Total				5								
5			Look at lines leaving left-hand boxes. 2 marks for all three links correct: 1 mark for one or two links correct. If any box has more than one line leaving or arriving at it, then ignore all those lines.	2								
Total				2								
6	a	Adams test 4 (80 Bq/m ³)		1								
	b	<table border="1"> <tr> <td>Clark has least</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Davies has significantly more</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Brown and Davies have similar</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Adams and Brown exactly same</td> <td><input type="checkbox"/></td> </tr> </table>	Clark has least	<input checked="" type="checkbox"/>	Davies has significantly more	<input type="checkbox"/>	Brown and Davies have similar	<input checked="" type="checkbox"/>	Adams and Brown exactly same	<input type="checkbox"/>	2 marks for both first box & third box correct and no other ticks. 1 mark for first box or third box correct and <u>at least</u> two blanks.	2
Clark has least	<input checked="" type="checkbox"/>											
Davies has significantly more	<input type="checkbox"/>											
Brown and Davies have similar	<input checked="" type="checkbox"/>											
Adams and Brown exactly same	<input type="checkbox"/>											
	c	<table border="1"> <tr> <td>small risk</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Identical risk</td> <td><input type="checkbox"/></td> </tr> <tr> <td>No risk</td> <td><input type="checkbox"/></td> </tr> </table>	small risk	<input checked="" type="checkbox"/>	Identical risk	<input type="checkbox"/>	No risk	<input type="checkbox"/>	No extra ticks allowed	1		
small risk	<input checked="" type="checkbox"/>											
Identical risk	<input type="checkbox"/>											
No risk	<input type="checkbox"/>											
Total				4								

Question		Expected Answers	Rationale	Marks						
7	a		<p>Look at lines leaving left-hand boxes. (Same pattern as question 5) 2 marks for all three links correct: 1 mark for one or two links correct. If any box has more than one line leaving or arriving at it, then ignore all those lines.</p>	2						
	b	reactor turbine generator transformer	<p>3 marks for all correct 2 marks for three correct. 1 mark for one or two correct. Allow clear indication eg lines from words in the list to boxes on the diagram.</p>	3						
	c	ionising cancer dose	<p>Words must be in the order given. 1 mark for each correct response. If more than one word is written in a gap and none crossed out, give no marks for that choice.</p>	3						
Total				8						
Question		Expected Answers	Rationale	Marks						
8	a	<table border="1"> <tr> <td>Warms Earth's surface</td> <td>B</td> </tr> <tr> <td>Absorbed by ozone</td> <td>A</td> </tr> <tr> <td>Produces greenhouse effect</td> <td>C</td> </tr> </table>	Warms Earth's surface	B	Absorbed by ozone	A	Produces greenhouse effect	C	<p>1 mark for each correct response. If more than one letter is written in a gap and none crossed out, give no marks for that choice. Allow clear indication eg lines from letters on the diagram to boxes on the table.</p>	3
Warms Earth's surface	B									
Absorbed by ozone	A									
Produces greenhouse effect	C									
	b	<p>Sea levels go down <input type="checkbox"/></p> <p>Weather could become same <input type="checkbox"/></p> <p>Some places impossible to grow food <input checked="" type="checkbox"/></p>	No extra ticks allowed.	1						
Total				4						

Question		Expected Answers	Rationale	Marks												
9	a	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>(D)</td> <td>C</td> <td>A</td> <td>B</td> <td>E</td> </tr> </table>	(D)	C	A	B	E	<p>1 mark for C before A; 1 mark for A before B; 1 mark for B before E. eg CABE = 3, CBAE = 2, BCEA = 2, EABC = 1.</p>	3							
(D)	C	A	B	E												
	b		<p>Look at lines leaving left-hand boxes. (Same pattern as questions 5 & 7a) 2 marks for all three links correct: 1 mark for one or two links correct. If any box has more than one line leaving or arriving at it, then ignore all those lines.</p>	2												
Total				5												
10	a	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Adults less at risk</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>Mobiles completely safe</td> <td></td> </tr> <tr> <td>Children have thinner skulls</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>Radiation causes cancer</td> <td></td> </tr> <tr> <td>Health risks from mobiles</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>Children's brains more likely to be affected</td> <td style="text-align: center;">✓</td> </tr> </table>	Adults less at risk	✓	Mobiles completely safe		Children have thinner skulls	✓	Radiation causes cancer		Health risks from mobiles	✓	Children's brains more likely to be affected	✓	<p>2 marks for correct four ticks & two blanks. 1 mark for two or three ticks correct and <u>at least</u> two blanks.</p> <p>Allow any clear indication of choice.</p>	2
Adults less at risk	✓															
Mobiles completely safe																
Children have thinner skulls	✓															
Radiation causes cancer																
Health risks from mobiles	✓															
Children's brains more likely to be affected	✓															
	b	i	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Abul</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>Beth</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>Clive</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>David</td> <td></td> </tr> </table>	Abul	✓	Beth	✓	Clive	✓	David		<p>David must be blank for any marks. 2 marks for all three correct. 1 mark for any two of Abul, Beth & Clive correct.</p>	2			
Abul	✓															
Beth	✓															
Clive	✓															
David																
	b	ii	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Abul</td> <td></td> </tr> <tr> <td>Beth</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>Clive</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>David</td> <td></td> </tr> </table>	Abul		Beth	✓	Clive	✓	David		<p>2 marks for both Beth & Clive correct and no other ticks. 1 mark for Beth <i>or</i> Clive correct and <u>at least</u> two blanks.</p>	2			
Abul																
Beth	✓															
Clive	✓															
David																
Total				6												

**Mark Scheme A331/02
June 2007**

Question		Expected Answers		Rationale	Marks	
1	a		Adults less at risk	<input checked="" type="checkbox"/>	<p>2 marks for correct four ticks & two blanks. 1 mark for two or three ticks correct and <u>at least</u> two blanks.</p> <p>Allow any clear indication of choice.</p>	2
			Mobiles completely safe	<input type="checkbox"/>		
			Children have thinner skulls	<input checked="" type="checkbox"/>		
			Radiation causes cancer	<input type="checkbox"/>		
			Health risks from mobiles	<input checked="" type="checkbox"/>		
		Children's brains more likely to be affected	<input checked="" type="checkbox"/>			
	b	i	Abul <input checked="" type="checkbox"/> Beth <input checked="" type="checkbox"/> Clive <input checked="" type="checkbox"/> David <input type="checkbox"/>	David must be blank for any marks. 2 marks for all three correct. 1 mark for any two of Abul, Beth & Clive correct.	2	
		ii	Abul <input type="checkbox"/> Beth <input checked="" type="checkbox"/> Clive <input checked="" type="checkbox"/> David <input type="checkbox"/>	2 marks for both Beth & Clive correct and no other ticks. 1 mark for Beth or Clive correct and <u>at least</u> two blanks.	2	
Total					6	
2	a		reversible changes in ozone	D	<p>1 mark for each correct answer.</p>	4
			energy for photosynthesis	C		
			Ionising radiation	D		
			Communication with satallites...	A		
b			tree rings...	<input checked="" type="checkbox"/>	<p>2 marks for correct three ticks and two blanks. 1 mark for one or two correct ticks and <u>at least</u> two blanks.</p>	2
			burning forests...	<input type="checkbox"/>		
			computer climate models ...	<input type="checkbox"/>		
			deep ice from Antarctic ...	<input checked="" type="checkbox"/>		
			average temperature ...	<input checked="" type="checkbox"/>		
Total					6	

Question		Expected Answers		Rationale	Marks
3	a	Photons spread ...	<input checked="" type="checkbox"/>	2 marks for both top box & bottom box correct and no other ticks. 1 mark for top box or bottom box correct and <u>at least</u> two blanks. (Note: If three boxes ticked including the two correct boxes 1 mark scored.)	2
		Infrared breaks molecules...	<input type="checkbox"/>		
		Photons travel further...	<input type="checkbox"/>		
		Infrared less energy than uv...	<input type="checkbox"/>		
		Intensity depends on number of photons	<input checked="" type="checkbox"/>		
	b	less energy	<input type="checkbox"/>	No extra ticks allowed.	1
		spread out	<input checked="" type="checkbox"/>		
		more energy	<input type="checkbox"/>		
Total					3
4	a	Adams test 4 (80 Bq / m ³)			1
	b	Clark has least	<input checked="" type="checkbox"/>	2 marks for both first box & third box correct and no other ticks. 1 mark for first box or third box correct and <u>at least</u> two blanks.	2
		Davies has significantly more	<input type="checkbox"/>		
		Brown and Davies have similar	<input checked="" type="checkbox"/>		
		Adams and Brown exactly same	<input type="checkbox"/>		
	c	small risk	<input checked="" type="checkbox"/>		1
		Identical risk	<input type="checkbox"/>		
		No risk	<input type="checkbox"/>		
Total					4

Question		Expected Answers				Rationale	Marks	
5	a	Electricity is generated			C	4 marks for five correct 3 marks for four correct 2 marks for three correct 1 mark for two correct 0 marks for one or none correct	4	
		Voltage is changed			D			
		Nuclear fission			A			
		Radioactive waste			A			
		High pressure steam turns turbines			B			
	b	No carbon dioxide expensive	✓			Mark each row separately. 1 mark for each row No extra ticks allowed. Lose mark in row of extra tick	3	
		Change in nuclei			✓			
	c	i	A			1 mark for bottom 3 boxes ticked.	1	
			B	✓				
			C	✓				
			D	✓				
		ii	A			No extra ticks allowed	1	
			B					
			C					
			D	✓				
Total							9	
6	a	Star A gives out less light...		✓		No extra ticks allowed.	1	
		Star A gives out more light...						
		Star A and star B give out...						
	b	Star B moves towards ...				No extra ticks allowed.	1	
		As the Earth moves ...	✓					
		The earth's axis is tilted ...						
	c	i	D				No incorrect choices allowed	1
		ii	A C E				3 marks for correct three correct and two not ringed. 2 mark for two correct and <u>at least</u> two not ringed. 1 mark for one correct and <u>at least</u> two not ringed.	3
Total							6	

Question		Expected Answers					Rationale	Marks	
7	a	(B)	C	E	D	F	(A)	1 mark for C anywhere before E 1 mark for E anywhere before D 1 mark for D anywhere before F	3
	b	fossils		E				1 mark for each correct answer	3
		Movement of continents		D or B					
		Sea floor spreading		F					
	c	10 cm (second number)					No incorrect choices allowed		1
	d	Movement in mantle		✓				No extra ticks allowed.	1
		Magnetic field reversal							
		Solidification of magma							
							Total	8	

**General Certificate of Secondary Education
Twenty First Century Science (Specification Codes J630, J633, J634, J635)
June 2007 Assessment Series**

Unit Threshold Marks

	<i>Unit</i>	Maximum Mark	a*	a	b	c	d	e	f	g	u
A211/01	Raw	42	n/a	n/a	n/a	33	28	24	20	16	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A211/02	Raw	42	35	30	25	20	15	12	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a
A212/01	Raw	42	n/a	n/a	n/a	33	28	24	20	16	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A212/02	Raw	42	37	33	28	24	19	16	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a
A213/01	Raw	42	n/a	n/a	n/a	31	27	23	19	15	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A213/02	Raw	42	37	31	25	20	16	14	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a
A214/01	Raw	40	n/a	n/a	n/a	22	17	12	8	4	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A214/02	Raw	40	25	20	15	10	5	2	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a
A219/01	Raw	40	35	30	25	21	17	13	10	7	0
	UMS	100	90	80	70	60	50	40	30	20	0
A221/01	Raw	42	n/a	n/a	n/a	33	29	25	21	17	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A221/02	Raw	42	41	38	33	29	24	21	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a
A321/01	Raw	42	n/a	n/a	n/a	30	25	20	16	12	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A321/02	Raw	42	36	31	25	20	13	9	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a
A331/01	Raw	42	n/a	n/a	n/a	32	28	24	20	16	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A331/02	Raw	42	35	30	25	21	15	12	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a

Specification Aggregation Results

Overall threshold marks in UMS (i.e. 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
J633	Not Aggregating in June 2007									
J634										
J635										

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	0.6	8.1	26.6	49.8	70.4	84.3	92.9	97.0	100	13632

For a description of how UMS marks are calculated see;
http://www.ocr.org.uk/exam_system/understand_ums.html

Statistics are correct at the time of publication

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