

**Additional Science A
Twenty First Century Science**

General Certificate of Secondary Education **J631**

Mark Schemes for the Units

January 2008

J631/MS/R/08J

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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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Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

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Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

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GCSE Additional Science A Twenty First Century (J631)

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 (1) at the end of that marking point.
- 4 Abbreviations, annotations and conventions used in the detailed Mark Scheme:

/	=	alternative and acceptable answers for the same marking point
(1)	=	separates marking points
not	=	answers which are not worthy of credit
reject	=	answers which are not worthy of credit
ignore	=	statements which are irrelevant
allow	=	answers that can be accepted
()	=	words which are not essential to gain credit
<u> </u>	=	underlined words must be present in answer to score a mark
ecf	=	error carried forward
AW / owtte	=	alternative wording
ora	=	or reverse argument

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 Annotations: the following annotations are available on SCORIS.

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

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

8 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.

Eg 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

A215/01 Modules B4, C4, P4 Foundation

Question		Expected Answers	Marks	Rationale
1	a	elements change colour of flame	<input type="checkbox"/> (1)	2 one mark per correct tick deduct one mark for each incorrect tick if more than two ticks used
		element turns flame same colour	<input checked="" type="checkbox"/> (1)	
	b	line spectrum (1)	1	
Total			3	

2	a	i	B (1)	1	
		ii	A (1)	1	
	b	G (1) H (1)	2		
Total			4		

3	a	between 80 and 160 (1) [predicted = 122, actual = 98]	1	
		b	between 300 and 800 (1) [predicted = 424, actual = 760]	1
	c	difficult to measure high boiling point	<input type="checkbox"/> <input checked="" type="checkbox"/> (1)	1 two ticks = 0
	d	KCl (1)	1	the 'K' and 'C' must be upper case, the 'l' in Cl must be lower case answers such as K + Cl = KCl, mark the answer to the right of the equals sign only.
Total			4	

Question		Expected Answers	Marks	Rationale									
4		chlorine bromine iodine	<table border="1"> <tr> <td>state</td> <td>colour</td> </tr> <tr> <td>gas</td> <td>green</td> </tr> <tr> <td>liquid</td> <td>red/brown</td> </tr> <tr> <td>solid</td> <td>grey</td> </tr> </table>	state	colour	gas	green	liquid	red/brown	solid	grey	3	6 correct (3) 4 or 5 correct (2) 2 or 3 correct (1) for red/brown allow one or both from the pair
	state			colour									
	gas			green									
	liquid			red/brown									
solid	grey												
Total			3										

5	a	forwards (1)	1							
	b	1 kN (1)	1							
	c	momentum kinetic energy	<table border="1"> <tr><td></td></tr> <tr><td></td></tr> <tr><td>✓ (1)</td></tr> <tr><td>✓ (1)</td></tr> <tr><td></td></tr> </table>			✓ (1)	✓ (1)		2	
✓ (1)										
✓ (1)										
Total			4							

6	a	$\frac{3000}{400}$ (1)	1							
	b	stopped at traffic lights steady top speed slowing down at the end	<table border="1"> <tr><td>D</td></tr> <tr><td>C</td></tr> <tr><td>F</td></tr> </table>	D	C	F	2	3 correct (2) 1 or 2 correct (1)		
D										
C										
F										
	c	<table border="1"> <tr> <td>brakes</td> <td>applies a counter force</td> </tr> <tr> <td>seatbelt</td> <td>transfers kinetic energy</td> </tr> <tr> <td>momentum</td> <td>reduced by friction</td> </tr> </table>	brakes	applies a counter force	seatbelt	transfers kinetic energy	momentum	reduced by friction	2	3 correct (2) 1 or 2 correct (1)
brakes	applies a counter force									
seatbelt	transfers kinetic energy									
momentum	reduced by friction									
Total			5							

Question		Expected Answers	Marks	Rationale			
7	a	weight (1) gravitational potential energy (1) kinetic energy (1)	3	allow GPE for gravitational potential energy			
	b	$\frac{20}{4}$ (20×4) $\frac{4}{20}$	1				
	c	transfers energy from the brick <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td></tr><tr><td> </td></tr><tr><td>✓</td></tr></table> (1)			✓	1	
✓							
Total			5				

8	a	a dilute solution <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td></tr><tr><td>✓</td></tr><tr><td> </td></tr></table> (1)		✓		1		
✓								
	b	stop glucose molecules passing <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td></tr><tr><td>✓</td></tr><tr><td> </td></tr></table> (1)		✓		1		
✓								
	c	move mostly from side B to side A <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> (1)		✓			1	
✓								
	d	equally between side A and side B <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> (1)			✓		1	
✓								
Total			4					

Question		Expected Answers	Marks	Rationale				
9	a	proteins (1)	1					
	b	can make reactions go faster <input type="checkbox"/> true will only work in test tubes <input type="checkbox"/> false stop working at very high temp <input type="checkbox"/> true work best at one particular temp <input type="checkbox"/> true	2	4 correct (2) 3 correct (1)				
	c	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>C</td> <td>D</td> <td>B</td> <td>A</td> </tr> </table> D before B (1) B before A (1)	C	D	B	A	2	
C	D	B	A					
Total			5					

10	a	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>water into</td> <td>water out of</td> </tr> <tr> <td>drinks</td> <td>breathing</td> </tr> <tr> <td>food</td> <td>faeces</td> </tr> <tr> <td>respiration</td> <td>sweating</td> </tr> </table>	water into	water out of	drinks	breathing	food	faeces	respiration	sweating	3	6 correct (3) 4 or 5 correct (2) 3 correct (1) 1 or 2 correct (0) any word which appears in both columns cancels itself out.
water into	water out of											
drinks	breathing											
food	faeces											
respiration	sweating											
	b	kidneys produce more urine <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></table> (1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1						
<input type="checkbox"/>												
<input checked="" type="checkbox"/>												
<input type="checkbox"/>												
	c	<table style="display: inline-table; vertical-align: middle;"> <tr> <td><input type="text"/></td> <td>less dilute</td> </tr> <tr> <td>smaller</td> <td><input type="text"/></td> </tr> <tr> <td><input type="text"/></td> <td><input type="text"/></td> </tr> </table>	<input type="text"/>	less dilute	smaller	<input type="text"/>	<input type="text"/>	<input type="text"/>	1	more than one line = 0		
<input type="text"/>	less dilute											
smaller	<input type="text"/>											
<input type="text"/>	<input type="text"/>											
Total			5									

Paper Total			42	
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A215/02 Modules B4, C4, P4 Higher

Question		Expected Answers	Marks	Rationale				
1	a	any value from 80 to 160 for [1]	1	no units (°C) required				
	b	any value from 300 to 800 for [1]	1	no units (°C) required				
	c	difficult to measure high point <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> (1)			✓		1	any clear indication of correct response for (1) e.g. cross in box, circling correct statement ...
✓								
	d	KCl (1)	1	K and C must appear to be uppercase and the 'l' must appear to be lower case for [1] K + Cl → KCl for [1] - ignore anything to the left of → or =.				
Total			4					

2	a	D (1)	1					
	b	molten lithium chloride conducts <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> (1)			✓		1	any clear indication of correct response for (1) e.g. cross in box, circling correct statement ...
✓								
	c	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>2</td></tr></table> <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>2</td></tr></table> (2)	2	2	2	each correct box for (1)		
2								
2								
	d	g, s, s (1)	1	must all appear to be lower case, so G, s, s for (0)]				
Total			5					

Question	Expected Answers	Marks	Rationale				
3	different places, different colours <div style="display: inline-block; vertical-align: middle;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table> (1) </div>		✓			1	any clear indication of correct response for (1) e.g. cross in box, circling correct statement ...
✓							
Total		1					

4	PO_4^{3-} (1)	1	any clear indication of correct response for (1)] e.g. underlining ...
Total		1	

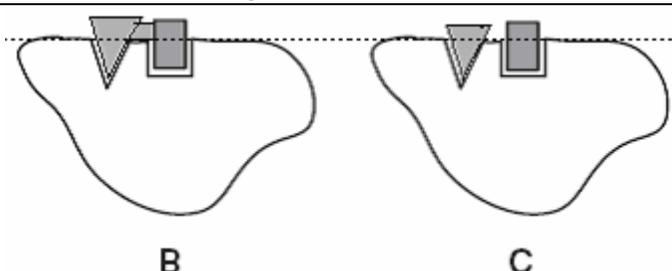
5	a	B (1)	1	
	b	E (1)	1	
	c	B, A, D (1)	1	in any order, all three for [1]
Total		3		

6	a	forwards (1)	1						
	b	1 kN (1)	1	no error carried forward from 6 (a).					
	c	momentum kinetic energy <div style="display: inline-block; vertical-align: middle; margin-left: 10px;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> </table> (1) (1) </div>			✓	✓		2	correct pattern of responses for (2)] one mistake for (1) e.g. a third tick, second tick in the wrong place, missing tick ...
✓									
✓									
Total		4							

Question		Expected Answers	Marks	Rationale				
7	a	<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">speed</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">friction</div> <div style="border: 1px solid black; padding: 2px;">velocity</div> </div> <div style="display: flex; flex-direction: column; align-items: flex-start; margin-left: 20px;"> <div style="border: 1px solid black; width: 150px; height: 20px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">distance moved by an object in each second</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">how fast and what direction</div> <div style="border: 1px solid black; padding: 2px;">counter force arising</div> </div>	1	correct pattern of three lines for (1) any additional lines for (0)]				
	b	<u>50 000</u> (1) 3600	1	any clear indication of correct response for (1) e.g. underlining ...				
	c	i graph A (1)	1					
		ii 300 N (1)	1	NOT to be confused with 900 N from 8(b)				
	d	increases the time to slow down <table border="1" style="display: inline-table; vertical-align: middle; margin-left: 10px;"> <tr><td style="width: 30px; height: 15px;"></td></tr> <tr><td style="width: 30px; height: 15px;"></td></tr> <tr><td style="width: 30px; height: 15px; text-align: center;">✓</td></tr> <tr><td style="width: 30px; height: 15px;"></td></tr> </table> (1)			✓		1	any clear indication of correct response for (1) e.g. cross in box, circling correct statement ...
✓								
Total			5					

Question		Expected Answers	Marks	Rationale				
8	a	weight (1) kinetic energy (1)	2	has to be in this order				
	b	900 J (1)	1					
	c	$\sqrt{\frac{1000}{\frac{1}{2} \times 2}}$	1	any clear indication of correct response for (1) e.g. underlining ...				
	d	air resistance dissipates energy <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> (1)		✓			1	any clear indication of correct response for (1) e.g. cross in box, circling correct statement ...
✓								
Total			5					

Question		Expected Answers	Marks	Rationale				
9	a	a dilute solution <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td></tr><tr><td>✓</td></tr><tr><td> </td></tr></table> (1)		✓		1	any clear indication of correct response for (1) e.g. cross in box, circling correct statement ...	
✓								
	b	stop glucose molecules passing <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td></tr><tr><td>✓</td></tr><tr><td> </td></tr></table> (1)		✓		1	any clear indication of correct response for (1) e.g. cross in box, circling correct statement ...	
✓								
	c	move mostly from side B to side A <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> (1)		✓			1	any clear indication of correct response for (1) e.g. cross in box, circling correct statement ...
✓								
	d	equally between side A and side B <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> (1)			✓		1	any clear indication of correct response for (1) e.g. cross in box, circling correct statement ...
✓								
Total			4					

Question		Expected Answers	Marks	Rationale				
10	a	 <p style="text-align: center;">B C</p>	2	<p>B: some part of the molecule below the dotted line and the bond is intact for [1]</p> <p>C: some part of the molecule below the dotted line and the bond is broken for [1]</p>				
	b	lock and key model (1)	1					
	c	Tony Aminah	2	each correct name, in any order for (1)				
	d	<p>pH of mixture</p> <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> <p>(1)</p>			✓		1	any clear indication of correct response for (1) e.g. cross in box, circling correct statement ...
✓								
Total			6					

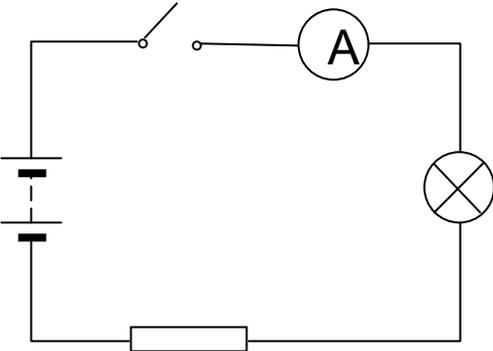
Question		Expected Answers	Marks	Rationale
11	a	pituitary gland (1)	1	any clear indication of correct response for (1) e.g. underlining ...
	b		2	correct start box for (1) correct end box for (1) more than one line for (0)
	c		1	correct start and end box for (1) more than one line for (0)
		Total	4	
		Paper Total	42	

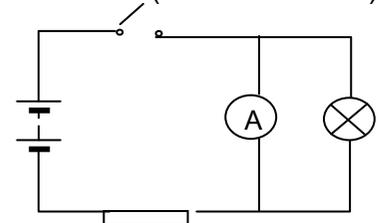
A216/01 Modules B5, C5, P5 Foundation

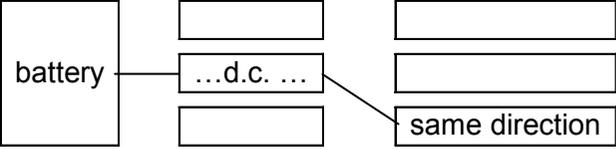
Question		Expected Answers	Marks	Rationale												
1	a	number had stayed the same <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓</td></tr> </table>			✓	1	if more than one response = 0 marks									
✓																
	b	increases	1	if more than one response = 0 marks												
	c	new cells produced are gametes new cells produced are identical four new cells produced identical to the parent cell <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>false</td></tr> <tr><td>true</td></tr> <tr><td>false</td></tr> <tr><td>true</td></tr> </table>	false	true	false	true	2	allow F and T in this case, accept ✓ = true and X = false 4 correct (2) 3 / 2 correct (1) 1 correct (0)								
false																
true																
false																
true																
Total			4													
2	a	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>(A)</td><td>D</td><td>C</td><td>B</td></tr> </table> D anywhere before C (1) C anywhere before B (1)	(A)	D	C	B	2	i.e. DBC = (1) BDC = (1) CDB = (1) CBD = (1)								
(A)	D	C	B													
	b	Jenny (1) Anna (1)	2	apply list principle (see item 7 in Guidance for Examiners above)												
	c	pair up in same way three different types of bases in different gametes always same identical in new cells double helix structure <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>T</td><td>F</td></tr> <tr><td>✓</td><td> </td></tr> <tr><td> </td><td>✓</td></tr> <tr><td> </td><td>✓</td></tr> <tr><td>✓</td><td> </td></tr> <tr><td>✓</td><td> </td></tr> </table>	T	F	✓			✓		✓	✓		✓		3	4 or 5 correct (3) 2 or 3 correct (2) 1 correct (1)
T	F															
✓																
	✓															
	✓															
✓																
✓																
Total			7													

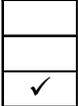
Question		Expected Answers	Marks	Rationale					
3	a	towards the light <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> </table>		✓		1	if more than one response = 0 marks		
✓									
	b	i hormones	1	if more than one response = 0 marks					
		ii root (1) unspecialised (1)	2	must be in correct order					
		Total	4						
4	a	iron - 5% section aluminium - 10% section silicon - 25% section	2	3 correct (2) 1 / 2 correct (1)					
	b	oxygen	1						
		Total	3						
5		small percentage of copper demand for large amounts <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> <tr><td> </td></tr> </table>	✓	✓				2	more than 2 ticks, use list principle
✓									
✓									
		Total	2						
6	a	3	1	if more than one response = 0 marks					
	b	carbon hydrogen oxygen	2	3 correct (2) 2 correct (1) more than 3 answers, use list principle					
	c	C ₃ H ₆ O ₃ (1)	1	If more than one response = 0 marks					
		Total	4						

Question			Expected Answers	Marks	Rationale																		
7	a	i	8	1	if more than one response = 0 marks																		
		ii	<table border="1"> <tr> <td></td> <td>first stage</td> <td>second stage</td> </tr> <tr> <td>route A</td> <td>3</td> <td>2</td> </tr> <tr> <td>route B</td> <td>6</td> <td>9</td> </tr> </table> <p style="text-align: center;">OR</p> <table border="1"> <tr> <td></td> <td>first stage</td> <td>second stage</td> </tr> <tr> <td>route A</td> <td>6</td> <td>9</td> </tr> <tr> <td>route B</td> <td>3</td> <td>2</td> </tr> </table>		first stage	second stage	route A	3	2	route B	6	9		first stage	second stage	route A	6	9	route B	3	2	1	all correct for one mark
	first stage	second stage																					
route A	3	2																					
route B	6	9																					
	first stage	second stage																					
route A	6	9																					
route B	3	2																					
	b	i	fat and carbohydrate	1	allow any order 'hydrocarbon' is incorrect																		
		ii	carbon hydrogen oxygen nitrogen	1	all four needed for (1) allow any order allow correct symbols: C H O and N																		
			Total	4																			

Question			Expected Answers	Marks	Rationale
8	a	i	an insulator <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	if more than one response = 0 marks
		ii	charge <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	if more than one response = 0 marks
	b			1	circuit must be completed with an ammeter shown as a circle containing a capital A ignore line through ammeter any gaps in circuit = 0 circuit must be a single path as shown (ie a series circuit) ammeter can go anywhere along this single path parallel circuits (as shown below) are incorrect
	c		without the resistor in parallel with the lamp in series with the lamp <input type="checkbox"/> true <input type="checkbox"/> true <input type="checkbox"/> false	1	all correct for (1) allow F and T in this case, accept ✓ = true and X = false
Total				4	



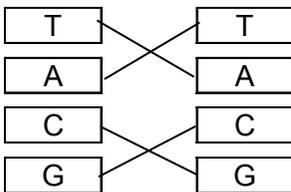
Question		Expected Answers	Marks	Rationale
9	a	generator	1	if more than one response = 0 marks
	b	0.0 (1) +0.5 (1)	2	must be in correct order must have '+' 0.5V i.e. '0.5V' is incorrect
	c		2	more than one line drawn on each side is incorrect
Total			5	

10	a	temperature	1	if more than one response = 0 marks
	b	voltage (1) energy (1)	2	must be in correct order
	c	4V	1	if more than one response = 0 marks
	d	less potential difference 	1	if more than one response = 0 marks
Total			5	

Paper Total			42	
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A216/02 Modules B5, C5, P5 Higher

Question		Expected Answers	Marks	Rationale					
1	a	number had stayed the same <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓</td></tr> </table>			✓	1	if more than one response = 0 marks		
✓									
	b	increases	1	if more than one response = 0 marks allow any other clear response eg. underline or ✓					
	c	i	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>false</td></tr> <tr><td>true</td></tr> <tr><td>false</td></tr> <tr><td>true</td></tr> </table>	false	true	false	true	2	allow F and T in this case, accept ✓ = true and X = false 4 correct (2) 3 / 2 correct (1) 1 correct (0)
false									
true									
false									
true									
		ii	zygote	1	if more than one response = 0 marks allow any other clear response eg. underline or ✓				
Total			5						

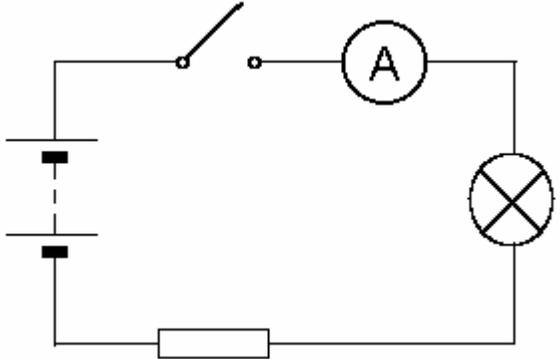
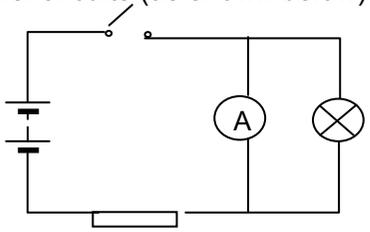
Question		Expected Answers	Marks	Rationale
2	a	2	1	if more than one response = 0 marks allow any other clear response eg. underline or ✓
	b	64	1	if more than one response = 0 marks allow any other clear response eg. underline or ✓
	c	Ruth	1	if more than one response = 0 marks allow any other clear response eg. underline or ✓
	d		1	all correct for one mark
		Total	4	

Question		Expected Answers	Marks	Rationale								
3	a	<p>used to form gametes replace damaged tissues close match to cells in patient</p> <table border="1"> <tr> <td>T</td> <td>F</td> </tr> <tr> <td></td> <td>✓</td> </tr> <tr> <td>✓</td> <td></td> </tr> <tr> <td>✓</td> <td></td> </tr> </table>	T	F		✓	✓		✓		1	<p>all correct for one mark</p> <p>allow a clear response eg. X or shading etc.</p> <p>ignore X if combination of ✓ and X used</p>
T	F											
	✓											
✓												
✓												
	b	<p>they are unspecialised they grow rapidly</p>	1	<p>both correct for one mark</p> <p>more than 2 responses = 0 marks</p> <p>allow any other clear response eg. underline or ✓</p>								
	c	8 cells	1	<p>more than 2 responses = 0 marks</p> <p>allow any other clear response eg. underline or ✓</p>								
	d	Jemima Lucy	2	<p>2 correct responses = 2 marks 1 correct response = 1 mark</p> <p>allow either order for responses</p> <p>if no responses on dotted lines, look for a clear response on the diagram eg. ✓, ring or shading</p>								
		Total	5									

Question			Expected Answers	Marks	Rationale																		
4	a	i	8	1	if more than one response = 0 marks																		
		ii	<table border="1"> <tr> <td></td> <td>first stage</td> <td>second stage</td> </tr> <tr> <td>route A</td> <td>3</td> <td>2</td> </tr> <tr> <td>route B</td> <td>6</td> <td>9</td> </tr> </table> <p style="text-align: center;">OR</p> <table border="1"> <tr> <td></td> <td>first stage</td> <td>second stage</td> </tr> <tr> <td>route A</td> <td>6</td> <td>9</td> </tr> <tr> <td>route B</td> <td>3</td> <td>2</td> </tr> </table>		first stage	second stage	route A	3	2	route B	6	9		first stage	second stage	route A	6	9	route B	3	2	1	all correct for one mark
	first stage	second stage																					
route A	3	2																					
route B	6	9																					
	first stage	second stage																					
route A	6	9																					
route B	3	2																					
	b	i	fat and carbohydrate	1	both correct = 1 mark allow any order 'hydrocarbon' is incorrect																		
		ii	carbon hydrogen oxygen nitrogen	1	all four needed for (1) allow any order allow correct symbols: C H O and N																		
			Total	4																			
5	a		MgBr ₂	1	if more than one response = 0 marks allow any other clear response eg. underline or ✓																		
	b		Na ₂ SO ₄	1	if more than one response = 0 marks allow any other clear response eg. underline or ✓																		
			Total	2																			

Question		Expected Answers	Marks	Rationale												
6	a	varying amounts of minerals metals can be extracted they are pure compounds <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>T</td> <td>F</td> </tr> <tr> <td>✓</td> <td></td> </tr> <tr> <td>✓</td> <td></td> </tr> <tr> <td></td> <td>✓</td> </tr> </table>	T	F	✓		✓			✓	1	all correct for one mark allow a clear response eg. X or shading etc. ignore X if combination of ✓ and X used				
T	F															
✓																
✓																
	✓															
	b	ions produced when ore melts ions present in solid ore ion in solid move to electrodes negative ions move towards anode metals are discharged positive ions move towards cathode ions in liquid move to the electrodes <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td></td> <td>✓</td> </tr> <tr> <td>✓</td> <td></td> </tr> <tr> <td></td> <td>✓</td> </tr> <tr> <td>✓</td> <td></td> </tr> <tr> <td>✓</td> <td></td> </tr> <tr> <td>✓</td> <td></td> </tr> </table>		✓	✓			✓	✓		✓		✓		3	7 correct = 3 marks 5 or 6 correct = 2 marks 3 or 4 correct = 1 mark 2 correct or less = 0 marks allow a clear response eg. X or shading etc. ignore X if combination of ✓ and X used if more than 7 ticks – deduct 1 mark for each additional tick
	✓															
✓																
	✓															
✓																
✓																
✓																
	c	52.9 tonnes	1	if more than one response = 0 marks allow any other clear response eg. underline or ✓												
		Total	5													

Question		Expected Answers	Marks	Rationale
7	a	C	1	if more than one response = 0 marks if no response on dotted line, look for a clear response on the list in the question eg. ✓, ring or shading
	b	A, B and C	1	all 3 correct for one mark if more than 3 responses = 0 marks if no responses on dotted line, look for a clear response on the diagram eg. ✓, ring or shading
		Total	2	
8		C	1	if more than one response = 0 marks if no response on dotted line, look for a clear response on the list in the question eg. ✓, ring or shading
		Total	1	

Question			Expected Answers	Marks	Rationale				
9	a	i	an insulator <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>		✓			1	if more than one response = 0 marks allow a clear response eg. X or shading etc.
✓									
		ii	charge <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>	✓				1	if more than one response = 0 marks allow a clear response eg. X or shading etc.
✓									
	b			1	circuit must be completed with an ammeter shown as a circle containing a capital A ignore line through ammeter any gaps in circuit = 0 circuit must be a single path as shown (ie a series circuit) ammeter can go anywhere along this single path parallel circuits (as shown below) are incorrect				
									
	c		without the resistor <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>true</td></tr> <tr><td>true</td></tr> <tr><td>false</td></tr> </table> in parallel with the lamp in series with the lamp	true	true	false	1	all correct = 1 mark allow F and T in this case, accept ✓ = true and X = false	
true									
true									
false									
Total				4					

Question		Expected Answers	Marks	Rationale						
10	a	electromagnetic induction	1	if more than one response = 0 marks allow a clear response eg. X or shading etc.						
	b	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>(F)</td> <td>B</td> <td>A</td> <td>D</td> <td>C</td> <td>(E)</td> </tr> </table>	(F)	B	A	D	C	(E)	3	B somewhere before A = 1 mark A somewhere before D = 1 mark D somewhere before C = 1 mark
(F)	B	A	D	C	(E)					
	c	$12 \times \frac{5}{9}$	1	if more than one response = 0 marks allow a clear response eg. X or shading etc.						
		Total	5							

Question		Expected Answers	Marks	Rationale									
11	a	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="padding: 2px 10px;">B</td> <td style="padding: 2px 10px;">C</td> <td style="padding: 2px 10px;">A</td> </tr> </table>	B	C	A	2	B somewhere before C = 1 mark C somewhere before A = 1 mark						
B	C	A											
	b	<table style="border-collapse: collapse; margin-left: 20px;"> <tr> <td style="border: 1px solid black; padding: 5px; width: 60px;">current</td> <td style="border: none; padding: 0 10px;">—</td> <td style="border: 1px solid black; width: 150px; height: 30px;"></td> </tr> <tr> <td></td> <td style="border: none; padding: 0 10px;">—</td> <td style="border: 1px solid black; padding: 5px;">flow into next component</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px; margin-top: 10px;">voltages</td> <td style="border: none; padding: 0 10px;">—</td> <td style="border: 1px solid black; padding: 5px;">transfer energy gained</td> </tr> </table>	current	—			—	flow into next component	voltages	—	transfer energy gained	2	one mark for each correct link more than 2 lines – deduct 1 mark for each additional line
current	—												
	—	flow into next component											
voltages	—	transfer energy gained											
	c	$6 - (0.08 \times 45)$	1	if more than one response = 0 marks allow a clear response eg. X or shading etc.									
Total			5										
Paper Total			42										

A217/01 Modules B6, C6, P6 Foundation

Question			Expected Answers	Marks	Rationale						
1	a	i	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px; background-color: black;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table>							1	must indicate infrared or i.r. in correct place
	a	ii	A (1)	1	any unambiguous correct response						
	b		A (1)	1	any unambiguous correct response						
	c		modulated (1) digital (1)	2	in the correct order any unambiguous correct response						
Total				5							

2	a			3	4 correct (3) 2 or 3 correct (2) 1 correct (1)
	b		B (1)	1	any unambiguous correct response
Total				4	

Question		Expected Answers	Marks	Rationale
3	a	energy (1)	1	
	b i	680 x 0.5 (1)	1	
	b ii	doesn't change (1) increases (1)	2	in the correct order allow stays the same for doesn't change
	c		1	both correct for one mark
Total			5	
4	a		2	left-hand side only top box indicated for [1] - allow more than one line to the box right-hand side only middle box indicated for [1] - allow more than one line to the box
	b		2	
Total			4	

Question			Expected Answers	Marks	Rationale								
5	a	i	sulfuric acid (1)	1	any unambiguous correct response								
	a	ii	MgSO ₄ (1)	1	any unambiguous correct response								
	b		very fast <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>A</td></tr><tr><td>B</td></tr><tr><td>C</td></tr></table> very slow stopped	A	B	C	2	3 correct (2) 1 or 2 correct (1)					
A													
B													
C													
	c		some water is made <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>T</td></tr><tr><td>F</td></tr><tr><td>T</td></tr><tr><td>T</td></tr><tr><td>F</td></tr><tr><td>F</td></tr><tr><td>T</td></tr></table> water reacts with hydrogen hydrogen reacts with oxygen oxygen reacts with hydrogen one hydrogen reacts with one oxygen one hydrogen reacts with two oxygen two hydrogen react with one oxygen	T	F	T	T	F	F	T	3	7 correct (3) 5 or 6 correct (2) 3 or 4 correct (1) TF, TT, FF, T	
T													
F													
T													
T													
F													
F													
T													
Total				7									
6			<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>(A)</td><td>(B)</td><td>(C)</td><td>(D)</td><td>G</td><td>F</td><td>H</td><td>E</td></tr></table> G before F (1) F before H (1) H before E (1)	(A)	(B)	(C)	(D)	G	F	H	E	3	
(A)	(B)	(C)	(D)	G	F	H	E						
Total				3									
7	a		45% (1)	1									
	b		attracted to shade <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td></tr><tr><td>✓</td></tr><tr><td> </td></tr></table> (1) dry out easily <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td></tr><tr><td>✓</td></tr><tr><td> </td></tr></table> (1)		✓			✓		2	correct pattern of ticks (2) one mistake (1)		
✓													
✓													
	c		involuntary (1)	1	any unambiguous correct response								
Total				4									

Question	Expected Answers	Marks	Rationale
8	memory (1) intelligence (1)	2	either order
	Total	2	

9	a	<table border="1"> <tr> <td></td> <td>letter</td> <td></td> </tr> <tr> <td>axon</td> <td>C</td> <td>(1)</td> </tr> <tr> <td>cell nucleus</td> <td>D</td> <td>(1)</td> </tr> <tr> <td>fatty sheath</td> <td>B</td> <td>(1)</td> </tr> </table>		letter		axon	C	(1)	cell nucleus	D	(1)	fatty sheath	B	(1)	3	
	letter															
axon	C	(1)														
cell nucleus	D	(1)														
fatty sheath	B	(1)														
	b	to insulate the axon <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>✓</td></tr><tr><td></td></tr></table> (1) allow nerve impulse to travel faster <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>✓</td></tr><tr><td></td></tr></table> (1)	✓		✓		2	correct pattern of ticks (2) one mistake (1)								
✓																
✓																
	c	<table border="1"> <tr> <td>effector</td> <td>brings about a change in the body</td> </tr> <tr> <td>motor neuron</td> <td>carries the impulse away from the receptor</td> </tr> <tr> <td>receptor</td> <td>carries the impulse towards the effector</td> </tr> <tr> <td>sensory neuron</td> <td>detects a specific stimulus</td> </tr> </table>	effector	brings about a change in the body	motor neuron	carries the impulse away from the receptor	receptor	carries the impulse towards the effector	sensory neuron	detects a specific stimulus	3	4 correct (3) 3 or 2 correct (2) 1 correct (1)				
effector	brings about a change in the body															
motor neuron	carries the impulse away from the receptor															
receptor	carries the impulse towards the effector															
sensory neuron	detects a specific stimulus															
	Total		8													

	Paper Total	42	
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A217/02 Modules B6, C6, P6 Higher

Question		Expected Answers	Marks	Rationale
1	a		3	4 correct (3) 3 or 2 correct (2) 1 correct (1)
	b	B (1)	1	
Total			4	

Question		Expected Answers	Marks	Rationale					
2	a	intensity photons energy (I. P. E.)	2	3 correct (2) 1 or 2 correct (1) ignore mis-spellings					
	b	<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">pulse represents</div> <div style="border: 1px solid black; width: 100px; height: 20px; margin-left: 10px;"></div> </div> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">beam transfers</div> <div style="border: 1px solid black; width: 100px; height: 20px; margin-left: 10px;"></div> </div> <div style="margin-left: 100px;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">a 1 in the code</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">a digital code</div> </div> </div>	1						
	c	i	refraction (1)	1					
		ii	speeds up moving from plastic <table border="1" style="display: inline-table; vertical-align: middle; margin-left: 10px;"> <tr><td style="width: 20px; height: 15px;"></td></tr> <tr><td style="width: 20px; height: 15px;"></td></tr> <tr><td style="width: 20px; height: 15px; text-align: center;">✓</td></tr> <tr><td style="width: 20px; height: 15px;"></td></tr> </table> (1)			✓		1	
✓									
Total			5						

Question			Expected Answers	Marks	Rationale
3	a	i	340 (1) 680	1	
		ii	energy flow in same direction increases in amplitude right angles to the wave's direction	1	
	b	i	middle diagram (1) 	1	
		ii	analogue amplitude random amplified	2	4 correct (2) 3 correct (1)
Total				5	
4	a		<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="border: 1px solid black; padding: 5px; width: 150px;">copper + oxygen → copper oxide</div> <div style="border: 1px solid black; width: 100px; height: 40px;"></div> <div style="border: 1px solid black; padding: 5px; width: 150px;">copper oxide + sulphuric acid</div> <div style="border: 1px solid black; width: 100px; height: 40px;"></div> </div>	2	left correct (1) right correct (1) LHS – only top box indicated, allow >1 line from the box RHS – only middle box indicated, allow >1 line to the box (mark the boxes rather than the line)
	b		<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">(C)</div> <div style="border: 1px solid black; padding: 2px 5px;">B</div> <div style="border: 1px solid black; padding: 2px 5px;">D</div> <div style="border: 1px solid black; padding: 2px 5px;">A</div> </div> B before D (1) D before A (1)	2	
Total				4	

Question			Expected Answers	Marks	Rationale
5	a	i	2 (1)	1	
		ii	120 (1)	1	allow 120 g If no total given allow '24+32+64' or '24+32+4x16'
		iii	15 (1)	1	
	b		25% (1)	1	
c	i		B (1)	1	
		ii	C (1)	1	
		iii	D (1)	1	
Total				7	

6	a		copper nitrate (1) Cu(NO ₃) ₂ (1)	2	no ECF
		b	MgCO ₃ + 2HCl → H ₂ O + MgCl ₂ + CO ₂ (1)	1	allow multiples of the correct answer
Total				3	

7	a		45% (1)	1					
		b	attracted to shade <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td></tr><tr><td>✓</td></tr><tr><td> </td></tr></table> (1) dry out easily <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		involuntary (1)	1					
Total				4					

Question	Expected Answers	Marks	Rationale					
8 a	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>(D)</td> <td>A</td> <td>B</td> <td>E</td> <td>C</td> </tr> </table> A before B (1) B before E (1) E before C (1)	(D)	A	B	E	C	3	
(D)	A	B	E	C				
b	increased amount of serotonin <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> </table> (1)		✓		1			
✓								
c	impulses only travel in one direction <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> </table> (1)		✓		1			
✓								
Total		5						

9 a	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="padding: 5px;">bell ringing</td> <td rowspan="3" style="border: none; padding: 0 10px;"> </td> <td style="padding: 5px;">primary stimulus</td> </tr> <tr> <td style="padding: 5px;">food given</td> <td style="padding: 5px;">response</td> </tr> <tr> <td style="padding: 5px;">dog salivating</td> <td style="padding: 5px;">secondary stimulus</td> </tr> </table>	bell ringing		primary stimulus	food given	response	dog salivating	secondary stimulus	1	all three correct for one mark
bell ringing		primary stimulus								
food given		response								
dog salivating		secondary stimulus								
b	cerebral cortex (1)	1								
c	caterpillars with warning colours <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> </table> (1) goldfish may swim to the front <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> (1)		✓					✓	2	correct pattern (2) one mistake (1)
✓										
✓										
d	Jim and Harry (1)	1								
Total		5								

Paper Total		42	
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Grade Thresholds

General Certificate of Secondary Education
 Additional Science A (Specification Code J631)
 January 2008 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
A215/01	Raw	42	N/A	N/A	N/A	26	22	18	15	12	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A215/02	Raw	42	33	28	22	17	12	9	N/A	N/A	0
	UMS	50	45	40	35	30	25	23	N/A	N/A	0
A216/01	Raw	42	N/A	N/A	N/A	28	25	22	19	16	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A216/02	Raw	42	33	29	24	20	16	14	N/A	N/A	0
	UMS	50	45	40	35	30	25	23	N/A	N/A	0
A217/01	Raw	42	N/A	N/A	N/A	28	24	21	18	15	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A217/02	Raw	42	35	31	26	21	16	13	N/A	N/A	0
	UMS	50	45	40	35	30	25	23	N/A	N/A	0

Specification Aggregation Results

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

	Maximum Mark	A*	A	B	C	D	E	F	G	U
J631	300	270	240	210	180	150	120	90	60	0

No candidates were entered for aggregation this series. First aggregation opportunity is in June 2008.

For a description of how UMS marks are calculated see:

http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

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

OCR Customer Contact Centre

14 – 19 Qualifications (General)

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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Head office
Telephone: 01223 552552
Facsimile: 01223 552553

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