

Additional Science A (Twenty First Century)

General Certificate of Secondary Education **J631**

Mark Schemes for the Units

June 2009

J631/MS/R/09

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by Examiners. It does not indicate the details of the discussions which took place at an Examiners' meeting before marking commenced.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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

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Guidance for Examiners

Rationale within any mark scheme takes precedence over the following guidance.

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

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

E.g. mark scheme shows 'work done in lifting / (change in) gravitational potential energy'
(1)

work done = 0 marks
work done lifting = 1 mark
change in potential energy = 0 marks
gravitational potential energy = 1 mark

5. If a candidate alters his/her response, examiners should accept the alteration.
6. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.
7. The list principle:
If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, e.g. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

8. Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.

If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses.

Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

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

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).

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

A215/01 Modules B4, C4, P4 Foundation Tier

Question		Expected Answers	Marks	Rationale						
1	a	<div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> ... temperature remains steady <input checked="" type="checkbox"/> (1) </div>	1	if more than one response is given, then no mark						
	b		2	all three lines correct for 2 marks one or two lines correct = 1 mark 0 lines correct = 0 marks more than one line from any response = 0 for that response						
	c	i	hot dry skin (1) rapid pulse rate (1)	2	more than two responses, deduct one mark for each incorrect response candidate cannot score less than 0 marks					
		ii	<div style="text-align: center;"> <table border="1" style="display: inline-table;"> <tr> <td>C</td> <td>B</td> <td>D</td> <td>A</td> <td style="background-color: #cccccc;">E</td> </tr> </table> </div>	C	B	D	A	E	2	C before B before D = 1 mark D before A = 1 mark
C	B	D	A	E						
Total			7							

Question		Expected Answers				Marks	Rationale																				
2	a	homeostasis (1)				1	if more than one response is given, then no mark																				
	b	<table border="1"> <thead> <tr> <th>chemical</th> <th>all ...</th> <th>some ...</th> <th>none ...</th> </tr> </thead> <tbody> <tr> <td>water</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>sugar</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>salt</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>urea</td> <td></td> <td></td> <td>✓</td> </tr> </tbody> </table>				chemical	all ...	some ...	none ...	water		✓		sugar	✓			salt		✓		urea			✓	4	only one tick in each row more than one tick per row = 0 for that row accept 'some reabsorbed' instead of 'none reabsorbed' for urea (middle column) (right column)
chemical	all ...	some ...	none ...																								
water		✓																									
sugar	✓																										
salt		✓																									
urea			✓																								
	c	i	oxygen / carbon dioxide (1)			1	allow nitrogen or carbon monoxide accept correct symbols accept any combination of the correct gases																				
		ii	osmosis (1)			1																					
		Total				7																					

Question		Expected Answers	Marks	Rationale	
3	a	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 10px;">silve</div> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 10px;">A</div> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 10px;">Ag</div> </div> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 10px;">iodin</div> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 10px;">g</div> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 10px;">gI</div> </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 10px;"></div> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 10px;">I</div> </div> </div>	1	both lines must be correct for the mark more than one line from either element = 0	
	b	i	silver iodide → silver + iodine	1	silver and iodine in either order on the right silver iodide and iodine must be correct
		ii	$\text{AgI} \rightarrow \text{Ag} + \text{I}$ <div style="display: flex; flex-direction: column; align-items: center; margin-left: 10px;"> <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>	1	more than 1 tick scores 0 marks
	c	i	53 (1)	1	if more than one response is given, then no mark
		ii	It gains 1 electron <div style="display: flex; flex-direction: column; align-items: center; margin-left: 10px;"> <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>	1	more than 1 tick scores 0 marks
	d		Br_2 (1)	1	if more than one response is given, then no mark
Total			6		

Question		Expected Answers	Marks	Rationale
4	a	<div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> study the spectrum of the light <input checked="" type="checkbox"/> (1) <input type="checkbox"/> </div>	1	more than 1 tick scores 0 marks
	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: 5px; width: 40%;">sodium chloride</div> <div style="border: 1px solid black; padding: 5px; width: 10%; text-align: center;">KCl</div> </div> <div style="display: flex; justify-content: space-between; width: 100%; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 40%;"></div> <div style="border: 1px solid black; padding: 5px; width: 10%; text-align: center;">NaCl</div> </div> <div style="display: flex; justify-content: space-between; width: 100%; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 40%;">potassium chloride</div> <div style="border: 1px solid black; padding: 5px; width: 10%;"></div> </div> <div style="display: flex; justify-content: space-between; width: 100%; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 40%;"></div> <div style="border: 1px solid black; padding: 5px; width: 10%;"></div> </div> <div style="display: flex; justify-content: space-between; width: 100%; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 40%;"></div> <div style="border: 1px solid black; padding: 5px; width: 10%;"></div> </div> </div>	2	1 mark for each correct line more than one line from either compound = 0 for that compound
Total			3	

Question		Expected Answers	Marks	Rationale
5	a	<div style="text-align: center;"> <input type="checkbox"/> ... a metal. <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> </div>	1	more than 1 tick scores 0 marks
	b	Li (1) Na (1)	2	1 for each correctly ringed answer more than two responses ringed, deduct one mark for each incorrect ring candidate cannot score less than 0 marks
	c	39 °C (1)	1	more than 1 response scores 0 marks accept correct answer in table if no response on the answer line
	d	Liz (1)	1	if more than one response is given, then no mark
Total			6	
6	a	$0.5 \times 65 \times 12 \times 12 \text{ J}$ (1)	1	if more than one response is given, then no mark
	b	force stays the same work	1	all three correct = 1 mark less than three correct = 0 marks
	c	5000 J (1)	1	if more than one response is given, then no mark
	d	C (1)	1	accept any clear indication of correct response if more than one response is given, then no mark
Total			4	

Question		Expected Answers	Marks	Rationale
7	a	$\frac{2.0}{4.0} = 0.5 \text{ m/s}$ (1)	1	if more than one response is given, then no mark
	b	<div style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> ...same size as the weight <input checked="" type="checkbox"/> (1) </div>	1	if more than one tick is given, then no mark
	c	B (1)	1	if more than one response is given, then no mark accept B ringed on the graph if no response on the answer line
	d	gravitational potential kinetic heating	2	all three correct = 2 marks one or two correct = 1 mark none correct = 0 marks
Total			5	
8	a	<div style="text-align: center;"> <input type="checkbox"/> C (1) <input type="checkbox"/> B (1) <input type="checkbox"/> E (1) </div>	3	1 mark for each correct row
	b	$2000 \times 10 \text{ kg m/s}$ (1)	1	if more than one response is given, then no mark
	c	reduces Alan's momentum slowly <input checked="" type="checkbox"/> (1) <div style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> </div>	1	if more than one tick is given, then no mark
Total			5	

A215/02 Modules B4, C4, P4 Higher Tier

Question		Expected Answers	Marks	Rationale																					
1	a	<table border="1"> <tr> <td>C</td> <td>B</td> <td>D</td> <td>A</td> <td>E</td> </tr> </table>	C	B	D	A	E	2	C before B before D = 1 mark D before A = 1 mark																
C	B	D	A	E																					
	b	i	oxygen / carbon dioxide (1)	1	allow nitrogen or carbon monoxide accept correct symbols accept any combination of the correct gases																				
		ii	osmosis (1)	1																					
	c	i	pituitary gland (1)	1	accept any clear indication of response if more than one response is given, then no mark																				
		ii	<table border="1"> <thead> <tr> <th>change</th> <th>more ADH produced</th> <th>less ADH produced</th> <th>no change in ADH</th> </tr> </thead> <tbody> <tr> <td>ecstasy</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>fluid</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>alcohol</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>salt</td> <td>✓</td> <td></td> <td></td> </tr> </tbody> </table>	change	more ADH produced	less ADH produced	no change in ADH	ecstasy	✓			fluid	✓			alcohol		✓		salt	✓			3	all 4 lines correct = 3 marks 3 lines correct = 2 marks 1 or 2 lines correct = 1 mark more than one box in each row ticked loses the mark
change	more ADH produced	less ADH produced	no change in ADH																						
ecstasy	✓																								
fluid	✓																								
alcohol		✓																							
salt	✓																								
Total			8																						

Question			Expected Answers	Marks	Rationale
2	a	i	active (1)	1	
		ii	<p style="text-align: center;"> <input type="checkbox"/> The enzyme changes shape. <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> </p>	1	more than 1 tick scores 0 marks
	b	i	graph B (1)	1	more than 1 tick scores 0 marks
		ii	B (1) C (1)	2	accept in either order one mark for each correctly identified statement accept any clear indication of response e.g. circling letters or ticking statements
Total				5	

Question		Expected Answers	Marks	Rationale
3	a	$\text{AgI} \rightarrow \text{Ag} + \text{I}$ <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	more than 1 tick scores 0 marks
	b	i 53 (1)	1	if more than one response is given, then no mark
		ii <p>It gains 1 electron <input checked="" type="checkbox"/> (1)</p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	more than 1 tick scores 0 marks
		iii 2, 8, 18, 18, 8 (1)	1	all correct for the mark
		iv <p style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> 2.8.18.7 <input checked="" type="checkbox"/> (1) <input type="checkbox"/></p>	1	more than 1 tick scores 0 marks
	c	Owen (1)	1	
Total			6	

Question		Expected Answers	Marks	Rationale
4	a	any value between 15 and 30 °C (1)	1	accept answers written in the table
	b	<div style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> ... room temperature gets any hotter <input checked="" type="checkbox"/> (1) <input type="checkbox"/> </div>	1	more than 1 tick scores 0 marks
	c	2, 2 (1)	1	both boxes correct for the mark
Total			3	

Question		Expected Answers	Marks	Rationale
5	a	Analyse the spectrum ... <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	more than 1 tick scores 0 marks
	b	<div style="display: flex; align-items: flex-start;"> <div style="margin-right: 20px;"> <input type="text" value="Liquid and solid ..."/> <input type="text"/> <input type="text"/> <input type="text"/> </div> <div style="margin-right: 20px;"> <input type="text"/> <input type="text"/> <input type="text" value="... liquid only"/> </div> </div>	2	1 mark for the right hand box 1 mark for the left hand box more than one line scores 0 marks
	c	i	1	N^{3-} (1) if more than one response is given, then no mark
		ii	2	6, 2 (1) one mark for each correct response NB correct response must be in correct box
Total			6	

Question		Expected Answers	Marks	Rationale
6	a	$0.5 \times 65 \times 12 \times 12 \text{ J}$ (1)	1	if more than one response is given, then no mark
	b	force stays the same work	1	all three correct = 1 mark less than three correct = 0 marks
	c	5000 J (1)	1	if more than one response is given, then no mark
	d	C (1)	1	accept any clear indication of correct response if more than one response is given, then no mark
Total			4	

7	a	0.5 m/s (1)	1	if more than one response is given, then no mark
	b	<div style="text-align: right; margin-right: 20px;"> <input type="checkbox"/> <input type="checkbox"/> ...has a constant speed <input checked="" type="checkbox"/> (1) <input type="checkbox"/> </div>	1	one tick in the third box down more than 1 tick scores 0 marks
	c	B (1)	1	if more than one response is given, then no mark
	d	i 200 J (1)	1	if more than one response is given, then no mark
		ii 6.3 m/s (1)	1	if more than one response is given, then no mark
Total			5	

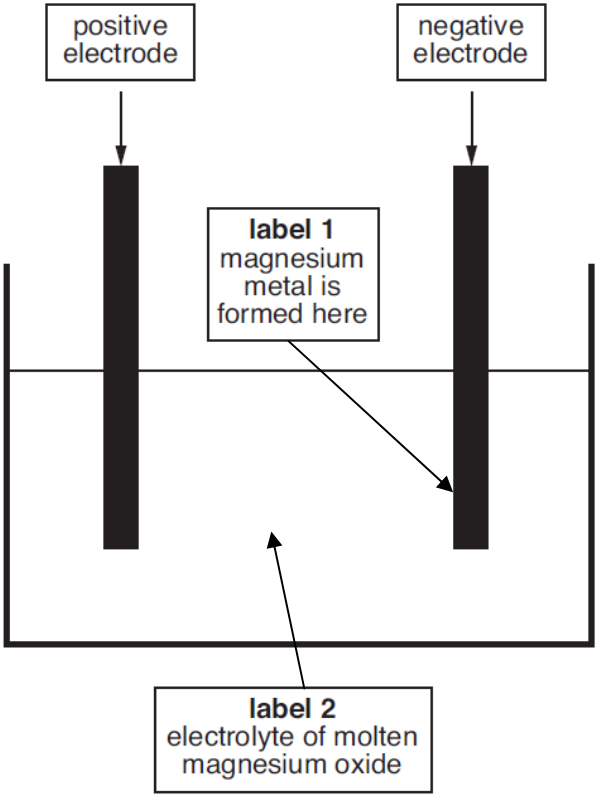
Question		Expected Answers	Marks	Rationale
8	a	E (1)	1	if more than one response is given, then no mark
	b	<p>...cancel each other out <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p>...right angles to road surface <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p>	1	both correct for the mark
	c	10 m/s (1)	1	if more than one response is given, then no mark
	d	kinetic momentum force	2	all three correct = 2 marks two correct = 1 mark one or none correct = 0 marks
Total			5	

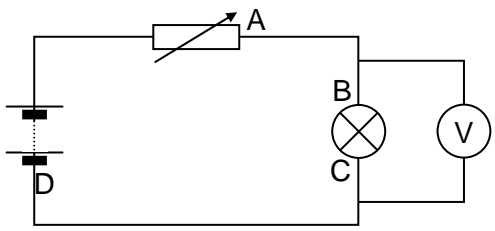
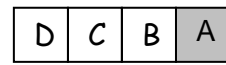
A216/01 Modules B5, C5, P5 Foundation Tier

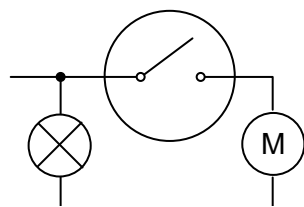
Question			Expected Answers	Marks	Rationale
1	a	i		2	all four correct = 2 marks two or three correct = 1 mark accept clear indications of correct links if more than 1 line coming from each box, ignore these lines
	a	ii	carbon dioxide (1)	1	accept any recognisable spelling or formula
	b		small molecules	1	<u>both</u> correct for one mark
	c		Jim (1)	1	
Total				5	

Question			Expected Answers	Marks	Rationale
2	a		A (1)	1	if no letter on line, look for clear indication on diagram
	b	i	quartz (1)	1	accept any unambiguous indication
		ii	<div style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> It has a high melting point. <input checked="" type="checkbox"/> (1) It does not dissolve in water. <input checked="" type="checkbox"/> (1) <input type="checkbox"/> </div>	2	all five boxes correct = 2 marks four boxes correct = 1 mark
Total				4	

Question		Expected Answers	Marks	Rationale
3	a	silicon	1	if no letter on line, look for clear indication on diagram
	b	i solid: either MgCO_3 or MgO gas: CO_2	1	both lines correct = 1 mark numbers within a formula, e.g. MgCO_3 , must be correct, though they do not need to be subscripted do not accept formulae where incorrect case has been used e.g. MGO, Co_2 if state symbols are included, they must be the correct letters i.e. $\text{MgCO}_3(\text{s})$, $\text{MgO}(\text{s})$, $\text{CO}_2(\text{g})$ if more than one answer on a line, both must be correct accept names instead of formulae solid: magnesium carbonate, magnesium oxide gas: carbon dioxide
		ii reduces (1)	1	if the answer line is blank, look at the list in case the correct word is indicated
	c	The magnesium is too reactive. <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	if more than one box ticked, 0 marks

Question	Expected Answers	Marks	Rationale
<p>3 d</p>	 <p>arrow 1 into the liquid to negative electrode (1) arrow 2 to anywhere in the liquid (1)</p>	<p>2</p>	<p>arrow from label 1 must go into the liquid and must touch electrode if arrow from label 2 touches electrode, no mark if more than one arrow drawn for a particular label, all must be correct</p>
Total		6	

Question	Expected Answers	Marks	Rationale
4 a		1	look for V in a circle with the two lines coming out of it connected to either side of the lamp (one line to join the circuit anywhere between points A & B one line to join the circuit anywhere between points C & D) the circle with a V can be to the left of the lamp look for clear intention of a voltmeter with leads coming out of it candidates should demonstrate an understanding of how to wire in a voltmeter rather than how to use the precise circuit symbols
b	Alan (1)	1	if the answer line is blank, look at the list in case the correct word is indicated
c i		1	
ii	increases stays the same	1	both correct = 1 mark
Total		4	

5 a	iron (1)	1	if the answer line is blank, look at the list in case the correct word is indicated
b	230 V (1)	1	accept any unambiguous indication
c	voltage magnetic voltage alternating	2	all four correct = 2 marks two or three correct = 1 mark less than two correct = 0 marks accept any clear indication e.g. crossed out incorrect word
d		1	
Total		5	

Question		Expected Answers	Marks	Rationale
6	a	<div style="display: flex; justify-content: space-around; border: 1px solid black; padding: 5px;"> A C D B </div>	1	all three needed for 1 mark
	b	<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="display: flex; justify-content: space-between; width: 100%;"> <div style="border: 1px solid black; padding: 5px; width: 45%;">Joe now has ...</div> <div style="border: 1px solid black; padding: 5px; width: 45%;">... opposite charges.</div> </div> <div style="display: flex; justify-content: space-between; width: 100%; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 45%;">The electrons ...</div> <div style="border: 1px solid black; padding: 5px; width: 45%;">... positive charge.</div> </div> <div style="display: flex; justify-content: space-between; width: 100%; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 45%;">Joe and the floor ...</div> <div style="border: 1px solid black; padding: 5px; width: 45%;">... negative charge.</div> </div> </div>	2	all three lines correct = 2 marks two or one line correct = 1 mark accept clear indications of correct links
	c	<div style="text-align: center; margin-bottom: 10px;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <p>... electrons which can move freely. <input checked="" type="checkbox"/> (1)</p>	1	one tick in the last box = 1 mark if more than one box ticked, 0 marks
Total			4	

Question			Expected Answers	Marks	Rationale
7	a	i	B	1	accept nucleus do not accept indications on diagram (unless question part is identified)
		ii	A	1	accept cytoplasm do not accept indications on diagram (unless question part is identified)
	b		<div style="text-align: right; margin-right: 20px;"> <input type="checkbox"/> <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> </div> two strands twisted into a double helix	1	if more than one box ticked, 0 marks
Total				3	

Question		Expected Answers		Marks	Rationale																								
8	a	<table border="1"> <thead> <tr> <th>cell growth</th> <th>mitosis</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>C</td> </tr> <tr> <td>B</td> <td>D</td> </tr> <tr> <td>E</td> <td></td> </tr> </tbody> </table>	cell growth	mitosis	A	C	B	D	E			3	all 5 correct = 3 marks 3 or 4 correct = 2 marks 1 or 2 correct = 1 mark if a letter appears in both columns, ignore both																
cell growth	mitosis																												
A	C																												
B	D																												
E																													
	b	<table border="1"> <thead> <tr> <th>statement</th> <th>true for mitosis</th> <th>true for meiosis</th> <th>true for both</th> </tr> </thead> <tbody> <tr> <td>number of chromosomes ...</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>daughter cells ...</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>can produce gametes</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>the number of cells increases</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>daughter cells are identical ...</td> <td>✓</td> <td></td> <td></td> </tr> </tbody> </table>	statement	true for mitosis	true for meiosis	true for both	number of chromosomes ...		✓		daughter cells ...	✓			can produce gametes		✓		the number of cells increases			✓	daughter cells are identical ...	✓				4	all 5 rows correct = 4 marks 4 rows correct = 3 marks 3 rows correct = 2 marks 2 rows correct = 1 mark 1 row correct = 0 marks if fourth row has a tick in right hand box, ignore other ticks in that row If fourth row has no tick in right hand box, accept ticks in both the other boxes for this row
statement	true for mitosis	true for meiosis	true for both																										
number of chromosomes ...		✓																											
daughter cells ...	✓																												
can produce gametes		✓																											
the number of cells increases			✓																										
daughter cells are identical ...	✓																												
		Total		7																									

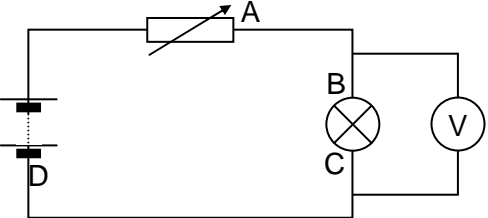
Question		Expected Answers	Marks	Rationale
9	a	<div style="text-align: right;"><input type="checkbox"/></div> <p>The features of the new plant are known. <input checked="" type="checkbox"/> (1)</p> <div style="text-align: right;"><input type="checkbox"/></div> <div style="text-align: right;"><input type="checkbox"/></div>	1	if more than one box ticked, 0 marks
	b	unspecialised cells (1)	1	accept any unambiguous indication
	c	i <div style="text-align: right;"><input type="checkbox"/></div> <p>Hormones <input checked="" type="checkbox"/> (1)</p> <div style="text-align: right;"><input type="checkbox"/></div>	1	if more than one box ticked, 0 marks
		ii <div style="text-align: right;"><input type="checkbox"/></div> <p>... unspecialised cells in the plant. <input checked="" type="checkbox"/> (1)</p> <div style="text-align: right;"><input type="checkbox"/></div> <div style="text-align: right;"><input type="checkbox"/></div>	1	if more than one box ticked, 0 marks
Total			4	

A216/02 Modules B5, C5, P5 Higher Tier

Question		Expected Answers	Marks	Rationale					
1	a	Jim (1)	1						
	b	covalent shared strong the electrons in between	2	all four correct = 2 marks three correct = 1 mark less than three correct = 0 marks					
	c	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>B</td> <td>E</td> <td>C</td> <td>A</td> <td>D</td> </tr> </table>	B	E	C	A	D	2	all five correct = 2 marks three or four correct = 1 mark
B	E	C	A	D					
	d	<div style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> </div> a molecule of cysteine contains fewer ... (1)	1						
Total			6						

Question		Expected Answers	Marks	Rationale
2	a	quartz (1)	1	accept any unambiguous indication
	b	<div style="text-align: right; margin-right: 20px;"> <input type="checkbox"/> <input type="checkbox"/> It has a high melting point. <input checked="" type="checkbox"/> (1) It does not dissolve in water. <input checked="" type="checkbox"/> (1) <input type="checkbox"/> </div>	2	one mark for each correct tick if more than two ticks deduct one mark for each additional tick candidate cannot score less than 0 marks
Total			3	

Question		Expected Answers	Marks	Rationale
3	a	2 2	1	both correct = 1 mark
	b	<p>Magnesium is too reactive to be ... <input type="checkbox"/> (1)</p> <p style="text-align: center;"><input checked="" type="checkbox"/></p> <p style="text-align: center;"><input type="checkbox"/></p> <p style="text-align: center;"><input type="checkbox"/></p> <p style="text-align: center;"><input type="checkbox"/></p> <p style="text-align: center;"><input type="checkbox"/></p> <p style="text-align: center;"><input type="checkbox"/></p> <p style="text-align: center;"><input type="checkbox"/></p> <p>Carbon is not reactive enough. <input checked="" type="checkbox"/> (1)</p>	2	one mark for each correct tick if more than two ticks deduct one mark for each additional tick candidate cannot score less than 0 marks
	c	ions lose molecules	2	three correct = 2 marks two correct = 1 mark 1 correct = 0 marks
Total			5	

Question		Expected Answers	Marks	Rationale
4	a		1	look for V in a circle with the two lines coming out of it connected to either side of the lamp (one line to join the circuit anywhere between points A & B one line to join the circuit anywhere between points C & D) the circle with a V can be to the left of the lamp look for clear intention of a voltmeter with leads coming out of it candidates should demonstrate an understanding of how to wire in a voltmeter rather than how to use the precise circuit symbols
	b	Alan (1)	1	if the answer line is blank, look at the list in case the correct word is indicated
	c	i	1	
		<div style="border: 1px solid black; display: inline-block; padding: 2px;"> D C B A </div>		
		ii	1	both correct = 1 mark
Total			4	

Question		Expected Answers	Marks	Rationale								
5	a	copper insulator iron ring	1	all correct = 1 mark								
	b	$\frac{4.6}{230} \times 460 = 9 (1)$	1									
	c	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>D</td> <td>B</td> <td>C</td> <td>E</td> <td>A</td> </tr> </table> <p>D <u>immediately</u> before B B <u>immediately</u> before C C <u>immediately</u> before E E <u>immediately</u> before A</p>	D	B	C	E	A	2	all four correct = 2 marks two or three correct = 1 mark less than two correct = 0 marks			
D	B	C	E	A								
	d	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>open</td> <td>0</td> <td>0</td> <td></td> </tr> <tr> <td>closed</td> <td></td> <td>0.5</td> <td></td> </tr> </table>	open	0	0		closed		0.5		1	all three correct = 1 mark
open	0	0										
closed		0.5										
Total			5									

Question		Expected Answers	Marks	Rationale
6	a	rubbed electrons ensulators	2	all three correct = 2 marks two correct = 1 mark one correct = 0 marks
	b	<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="width: 60%;"> <p>The floor has become positively ...</p> <p>Joe now repels other objects ...</p> </div> <div style="width: 35%; text-align: center;"> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> </div> </div>	1	all correct = 1 mark both ticks required for the mark
	c	<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>The flow of ...</p> <p>The insulators ...</p> <p>The conductors ...</p> </div> <div style="width: 65%;"> <p>... a voltage in ...</p> <p>... no electrons ...</p> <p>... plastic ...</p> <p>... lots of ...</p> <p>... an electric ...</p> </div> </div>	2	lines from all three left hand boxes correct = 2 marks lines from two left hand boxes correct = 1 mark line from only one left hand box correct = 0 marks
Total			5	

Question		Expected Answers				Marks	Rationale																								
7	a	organelles chromosomes separate two				3	all four correct = 3 marks three correct = 2 marks two correct = 1 mark one correct = 0 marks																								
	b	<table border="1"> <thead> <tr> <th>statement</th> <th>true for mitosis</th> <th>true for meiosis</th> <th>true for both</th> </tr> </thead> <tbody> <tr> <td>number of chromosomes ...</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>daughter cells ...</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>can produce gametes</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>the number of cells increases</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>daughter cells are identical ...</td> <td>✓</td> <td></td> <td></td> </tr> </tbody> </table>				statement	true for mitosis	true for meiosis	true for both	number of chromosomes ...		✓		daughter cells ...	✓			can produce gametes		✓		the number of cells increases			✓	daughter cells are identical ...	✓			4	all 5 rows correct = 4 marks 4 rows correct = 3 marks 3 rows correct = 2 marks 2 rows correct = 1 mark 1 row correct = 0 marks if fourth row has a tick in right hand box, ignore other ticks in that row if fourth row has no tick in right hand box, accept ticks in both the other boxes for this row
statement	true for mitosis	true for meiosis	true for both																												
number of chromosomes ...		✓																													
daughter cells ...	✓																														
can produce gametes		✓																													
the number of cells increases			✓																												
daughter cells are identical ...	✓																														
		Total				7																									

Question		Expected Answers	Marks	Rationale
8	a	<p style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> The gene for haemoglobin is not active. <input checked="" type="checkbox"/> (1) <input type="checkbox"/> </p>	1	
	b	B, D, F in any order	2	all three correct = 2 marks 2 correct = 1 mark 1 correct = 0 marks accept any unambiguous indication of choice
Total			3	
9	a	auxins (1) unspecialised (1) organ (1)	3	one mark for each correct answer
	b	<p style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> The side furthest from the light has ... <input checked="" type="checkbox"/> (1) <input type="checkbox"/> </p>	1	
Total			4	

A217/01 Modules B6, C6, P6 Foundation Tier

Question		Expected Answers	Marks	Rationale							
1	a	Bess (1)	1	accept any unambiguous correct response e.g. circle around the head of Bess or a tick in her speech bubble							
	b	X-rays have a high frequency. <input type="checkbox"/> <input checked="" type="checkbox"/> (1) <input type="checkbox"/>	1	accept any unambiguous correct response e.g. X but without ticks, shaded box more than one response = 0 marks							
	c	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="background-color: #cccccc;">radio</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;">infra- red</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;">ultra- violet</td> <td style="background-color: #cccccc;">X-ray</td> <td style="background-color: #cccccc;">gamma</td> </tr> </table>	radio		infra- red		ultra- violet	X-ray	gamma	1	accept any unambiguous correct response more than one response = 0 marks
radio		infra- red		ultra- violet	X-ray	gamma					
	d	speed (1) wavelength (1)	2	must be in the correct order							
Total			5								

Question		Expected Answers	Marks	Rationale
2	a	frequency (1)	1	accept any unambiguous correct response e.g. highlighted in a clear way more than one response = 0 marks
	b	A (1)	1	accept any unambiguous correct response e.g. circle around A only more than one response = 0 marks
	c	receiver decreases noise	2	accept any unambiguous correct response all three correct = 2 marks any two correct = 1 mark 1 or 0 correct = 0 marks
	d	<div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> ... at right angles ... <input checked="" type="checkbox"/> (1) </div>	1	accept any unambiguous correct response e.g. X but without ticks, shaded box more than one response = 0 marks
Total			5	

Question		Expected Answers	Marks	Rationale
3	a	<div style="text-align: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px; background-color: #cccccc;">A</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px; background-color: #cccccc;">B</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;">D</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;">C</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;">E</div> </div>	2	look for the correct pairs: B immediately before D; D immediately before C; C immediately before E; all three correct pairs = 2 marks one or two correct pairs = 1 mark look for the letters first, ignoring any words if no letters, then look for terms written on dominoes: wavelength amplitude speed ignore any definitions below the terms
	b	<div style="text-align: center;"> <input style="width: 20px; height: 20px; margin: 2px;" type="checkbox"/> <input style="width: 20px; height: 20px; margin: 2px;" type="checkbox"/> <input style="width: 20px; height: 20px; margin: 2px;" type="checkbox"/> change the medium ... <input checked="" style="width: 20px; height: 20px; margin: 2px;" type="checkbox"/> (1) </div>	1	accept any unambiguous correct response e.g. X but without ticks, shaded box more than one response = 0 marks
	c	energy (1)	1	accept any unambiguous correct response e.g. underlined, ticked or highlighted in another clear way more than one response = 0 marks
Total			4	

Question		Expected Answers	Marks	Rationale
4	a	a stimulus; a receptor; a sensory neuron; a motor neuron; an effector;	4	all five correct responses = 4 marks four correct responses = 3 marks three correct responses = 2 marks two correct responses = 1 mark accept any unambiguous correct response
	b	<div style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> (1) </div> Dark conditions are more favourable ...	1	accept any unambiguous correct response e.g. X but without ticks, shaded box more than one response = 0 marks
	c	EITHER a complex response <input checked="" type="checkbox"/> OR a simple reflex <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	accept either correct response accept both correct responses accept any unambiguous correct response e.g. X but without ticks, shaded box
Total			6	

Question		Expected Answers	Marks	Rationale				
5	a	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin: 5px;">nucleus</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">axon</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">fatty sheath</div> </div>	3	each correct response = 1 mark accept phonetic spelling and any other clear response accept 'fatty' or 'sheath' = fatty sheath				
	b	<div style="text-align: right; margin-right: 20px;"> <input style="width: 30px; height: 20px; border: 1px solid black;" type="checkbox"/> <input style="width: 30px; height: 20px; border: 1px solid black;" type="checkbox"/> <input checked="" style="width: 30px; height: 20px; border: 1px solid black;" type="checkbox"/> (1) </div> It transmits an electrical impulse.	1	accept any unambiguous correct response e.g. X but without ticks, shaded box more than one response = 0 marks				
Total			4					
6	a		2	correct pattern of lines = 2 marks one mistake = 1 mark two mistakes = 0 marks a mistake is <ul style="list-style-type: none"> • a line in the wrong place • a missing line • an extra line 				
	b	<div style="text-align: center; margin-bottom: 10px;"> <table border="1" style="border-collapse: collapse; width: 100px;"> <tr> <td style="width: 25px; height: 20px; background-color: #cccccc;">C</td> <td style="width: 25px; height: 20px;">A</td> <td style="width: 25px; height: 20px;">B</td> <td style="width: 25px; height: 20px;">D</td> </tr> </table> </div> A before B (1) B before D (1)	C	A	B	D	2	both stages correct = 2 marks one stage correct = 1 mark
C	A	B	D					
Total			4					

Question		Expected Answers	Marks	Rationale								
7	a	<table border="1"> <thead> <tr> <th>area</th> <th>total % sales</th> </tr> </thead> <tbody> <tr> <td>pharmaceuticals</td> <td>24</td> </tr> <tr> <td>petrochemicals & bulk</td> <td>38</td> </tr> <tr> <td>fine chemicals</td> <td>38</td> </tr> </tbody> </table>	area	total % sales	pharmaceuticals	24	petrochemicals & bulk	38	fine chemicals	38	2	all three correct = 2 marks any two correct = 1 mark less than two correct = 0 marks if no responses in table, look at pie chart for responses
	area	total % sales										
pharmaceuticals	24											
petrochemicals & bulk	38											
fine chemicals	38											
b	$450 \times \frac{24}{100} \quad (1)$	1	accept any unambiguous correct response e.g. underlined or ticked or highlighted in any other clear way									
Total			3									
8	a	E330/E334 E260/E513 E507	2	all three correct = 2 marks any two correct = 1 mark accept an answer with two correct responses on the same dotted line do not accept an answer with one correct and one incorrect response (E number or name of chemical) on the same dotted line accept correct names of acids instead of E-numbers								
	b	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">alkali</div> <div style="border: 1px solid black; padding: 2px 10px;">water</div> <div style="border: 1px solid black; padding: 2px 10px;">salt</div> </div>	1	all three required for the mark accept any unambiguous response eg. phonetic spelling								
Total			3									

Question			Expected Answers	Marks	Rationale
9	a		Kate (1)	1	accept any unambiguous correct response e.g. circle around the head of Kate or a tick in her speech bubble
	b	i	B (1)	1	accept any unambiguous correct response e.g. underlined, ticked, indicated on the graph or highlighted in another clear way more than one response = 0 marks
		ii	C (1)	1	accept any unambiguous correct response e.g. underlined, ticked, indicated on the graph or highlighted in another clear way more than one response = 0 marks
		iii	0.8g (1)	1	accept any unambiguous correct response e.g. underlined, ticked, indicated on the graph or highlighted in another clear way more than one response = 0 marks
Total				4	

Question		Expected Answers	Marks	Rationale	
10	a		2	<p>all correct = 2 marks one or two mistakes = 1 mark a mistake is</p> <ul style="list-style-type: none"> • a line in the wrong place • a missing line • an extra line 	
	b	i	D (1)	1	accept any clear correct answer, e.g. phenolphthalein (accept phonetic spelling), 8 to 10
		ii	25.0 <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	
Total			4		

A217/02 Modules B6, C6, P6 Higher Tier

Question		Expected Answers	Marks	Rationale					
1	a	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>A</td></tr> <tr><td>B</td></tr> <tr><td>D</td></tr> <tr><td>C</td></tr> <tr><td>E</td></tr> </table>	A	B	D	C	E	2	look for the correct pairs: B immediately before D; D immediately before C; C immediately before E; all three correct pairs = 2 marks one or two correct pairs = 1 mark look for the letters first, ignoring any words if no letters, then look for terms written on dominoes: wavelength amplitude speed ignore any definitions below the terms
A									
B									
D									
C									
E									
	b	<table style="margin-left: auto; margin-right: auto;"> <tr><td><input type="checkbox"/></td></tr> <tr><td><input type="checkbox"/></td></tr> <tr><td><input type="checkbox"/></td></tr> <tr><td><input checked="" type="checkbox"/> (1)</td></tr> </table> <p style="margin-left: 20px;">change the medium ...</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> (1)	1		
<input type="checkbox"/>									
<input type="checkbox"/>									
<input type="checkbox"/>									
<input checked="" type="checkbox"/> (1)									
	c	energy (1)	1						
Total			4						

Question		Expected Answers	Marks	Rationale
2	a	<p>A — amplitude digital ... B — frequency digital ... C — amplitude analogue ... frequency analogue ...</p>	2	correct pattern of lines = 2 marks one or two mistakes = 1 mark a mistake is <ul style="list-style-type: none"> • a line in the wrong place • a missing line • an extra line
	b	<p>E A G B D C F</p> <p>first and second correct (1) last three correct (1)</p>	2	AG correct for 1 mark BDC correct for 1 mark
	c	<p style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> </p> <p>The digital pattern is recognisable... (1)</p>	1	
Total			5	

Question		Expected Answers	Marks	Rationale
3	a	Bess (1)	1	
	b	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 5px; width: 150px; height: 20px;"></div> <div style="border: 1px solid black; padding: 5px; width: 150px; height: 20px;"></div> <div style="border: 1px solid black; padding: 5px; width: 150px; height: 20px;"></div> </div> <p style="text-align: center;">X-rays have a very high frequency. <input checked="" type="checkbox"/> (1)</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 5px; width: 150px; height: 20px;"></div> <div style="border: 1px solid black; padding: 5px; width: 150px; height: 20px;"></div> </div>	1	
	c	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 5px; width: 100px; height: 40px; text-align: center;">energy per second</div> <div style="font-size: 24px; margin: 0 10px;">=</div> <div style="border: 1px solid black; padding: 5px; width: 100px; height: 40px; text-align: center;">energy per photon</div> <div style="font-size: 24px; margin: 0 10px;">×</div> <div style="border: 1px solid black; padding: 5px; width: 100px; height: 40px; text-align: center;">photons per second</div> </div>	2	first box correct = 1 mark second and third boxes correct (any order) = 1 mark
	d	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; padding: 5px; width: 150px; height: 30px; margin-bottom: 10px;">... always have the same ...</div> <div style="border: 1px solid black; padding: 5px; width: 100px; height: 30px; margin-bottom: 10px;">... speed.</div> <div style="border: 1px solid black; padding: 5px; width: 150px; height: 30px; margin-bottom: 10px;">... different values ...</div> <div style="border: 1px solid black; padding: 5px; width: 100px; height: 30px;">... amplitude.</div> <div style="border: 1px solid black; padding: 5px; width: 100px; height: 30px;">... wavelength.</div> </div>	1	both links correct for 1 mark
Total			5	

Question		Expected Answers	Marks	Rationale
4	a	<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="width: 60%;"> <p>... involuntary.</p> <p>... a simple reflex.</p> </div> <div style="width: 35%; text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> </div> </div>	1	both ticks required for 1 mark
	b	motor neuron sensory neuron spinal cord synapse	2	correct pattern of rings = 2 marks one or two mistakes = 1 mark a mistake is <ul style="list-style-type: none"> • a ring in the wrong place • a missing ring • an extra ring accept any unambiguous correct response e.g. a ring around more than one term
	c	<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="width: 60%;"> <p>His brain has modified his reflex response.</p> </div> <div style="width: 35%; text-align: center;"> <input type="checkbox"/> <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> </div> </div>	1	
Total			4	

Question		Gd	Expected Answers	Marks	Rationale
5	a	DD CC	a stimulus a receptor a sensory neuron a motor neuron an effector	4	all five correct = 4 marks four correct = 3 marks three correct = 2 marks two correct = 1 mark accept any unambiguous correct response
	b	CC		2	correct pattern of lines on left for 1 mark correct pattern of lines on right for 1 mark
Total				6	
6	a	C	C (1)	1	accept any unambiguous correct response
	b	i	B Sarah (1)	1	
		ii	B Peter (1)	1	
	c	B	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="width: 60%;"> <p>storing information</p> <p>retrieving information</p> </div> <div style="width: 30%; text-align: center;"> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> </div> </div>	1	both ticks required for 1 mark
Total				4	

Question		Expected Answers	Marks	Rationale	
7	a		2	<p>correct pattern of lines = 2 marks one or two mistakes = 1 mark a mistake is</p> <ul style="list-style-type: none"> • a line in the wrong place • a missing line • an extra line 	
	b	i	D (1)	1	accept any clear, correct answer, e.g. phenolphthalein (accept phonetic spelling), 8 to 10
		ii	<p>25.0 <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	1	
Total			4		

Question			Expected Answers	Marks	Rationale
8	a		calcium sulfate (1)	1	accept sulphate reject sulphide look for both calcium and sulfate in that order
	b	i	(B) D E	1	need both for 1 mark
		ii	<div style="text-align: center;"> <input type="checkbox"/> C to D <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> </div>	1	
	c	i	44 (1)	1	
		ii	100 (1)	1	accept 100 g
		iii	$\text{CaCO}_3 + 2\text{HCl} \longrightarrow \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$	2	1 mark for CO ₂ and H ₂ O on the right hand side of arrow, in any order, with any number in front of them 2 nd mark if all the rest is correct look for correct use of capitals, lower case, numbers as subscripts, as shown in Expected Answer

Question			Expected Answers	Marks	Rationale
8	d	i	<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="width: 80%;"> <p>B Particles collide more frequently ...</p> <p>D Particles collide with the same ...</p> <p>F Acid particles are closer ...</p> </div> <div style="width: 15%; text-align: center;"> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> </div> </div>	2	<p>correct pattern of ticks = 2 marks</p> <p>one or two mistakes for = 1 mark</p> <p>a mistake is</p> <ul style="list-style-type: none"> • a tick in the wrong place • a missing tick • an extra tick
		ii	B F	1	need both for 1 mark, in any order
Total				10	

A218/01 Ideas in Context Foundation Tier



Question		Expected Answers	Marks	Rationale
1	a	<p>any two from: (feel) ill ulcers coma death (muscle) cramps</p>	1	<p>two correct answers required</p> <p>ignore stomach cramps, diarrhoea, stomach becomes acidic</p>
	b	<p>i when concentration <u>increases</u> rate <u>increases</u> / when concentration <u>increases</u> time <u>decreases</u> / when concentration <u>decreases</u> rate <u>decreases</u> / when concentration <u>decreases</u> time <u>increases</u> (1)</p>	1	<p>not just 'rate increases'</p> <p>allow 'faster' for rate increase / 'slower' for rate decrease</p>
		<p>ii because temperature affects rate of reaction/ because temperature affects the results / because temperature affects the time (taken) (1)</p>	1	<p>accept more <u>reliable/valid</u> results</p> <p>ignore 'fair test', 'accurate results', 'temperature is a variable'</p> <p>not 'to see if the temperature affects the rate'</p> <p>ignore references to reaction taking in or giving out heat</p>
		<p>iii fairness / reliability argument (1)</p>	1	<p>e.g. 'fair test', 'to make it fair', 'to make results accurate/correct'</p> <p>accept 'affects the rate of reaction'</p>
	c	<p>i rises/goes up (1)</p>	1	<p>accept quantitative answer</p> <p>ignore 'it changes', 'becomes less acidic', 'becomes neutral'</p>
		<p>ii pH paper / universal indicator (1)</p>	1	<p>not litmus</p> <p>accept pH indicator, pH stick</p> <p>ignore pH meter, pH colour card, pH scale</p> <p>ignore [unspecified] 'indicator' or 'indicator paper'</p>

Question			Expected Answers	Marks	Rationale
1	c	iii	water (1) CO ₂ (1)	2	accept hydrogen oxide ignore if formula of water given instead of name, or name of CO ₂ given instead of formula only penalise Co if the O is clearly less than half the height of C don't penalise poor subscripts, do penalise if superscripts
		iv	gas made / carbon dioxide made (1)	1	accept answers based on the idea that an [appropriate] reaction has occurred. Ignore causality eg allow 'to <i>show</i> that it is reacting'
	d	i	corrosive (1)	1	ignore irritant, harmful
		ii	goggles / avoid skin contact idea e.g. gloves / wash off splashes (1)	1	accept one idea
	e		soluble / dissolves (1) passes through stomach wall / can enter blood (1)	2	accept reverse argument
			Total	13	

Question		Expected Answers	Marks	Rationale
2	a	any two from: (external) temperature; exercise (level); (intake of) fluid; (intake of) salts;	2	accept any two of the correct answers in any order ignore references to alcohol
	b	less water / dehydrated	1	accept any clear reference to 'not enough water in the body' / owtte do not allow contradictory answers e.g. 'there is more water so it dehydrates'
	c	i any two from: salt(s); urea; sugar;	2	accept alcohol ignore water, poisons, references to urine
		ii too big / ORA (1)	1	
		iii idea that (sugar is) reabsorbed (back into the blood)	1	accept 'the sugar goes back into the blood' not 'sugar is not there in the first place'
	d	i any two from: particles or molecules move; from high to low concentration; (urea) concentration high in blood / (urea) concentration low in dialysis fluid; QWC – correct spelling of first two technical terms (1)	3	do not accept 'urea' for particle accept 'molecules pass through membrane' accept 'molecules diffuse through membrane' ignore 'molecules diffuse' alone ignore 'a substance moves' or 'it moves' accept 'concentration low on dialysis fluid side' / ORA
2	d	ii allow small molecules through / allows urea or sugar or salt or water through (1) does not allow large particles through / does not allow red cells through (1)	2	allow 'filter' as AW for 'pass through' 'allows <u>only</u> small molecules through' = 2 marks

Question		Expected Answers	Marks	Rationale
2	e	4 (hours) \times 6 (treatments) (1) 24 (1)	2	correct numerical answer gains both marks if wrong, but the working should clearly lead to the correct answer, allow 1 mark no ECF from incorrect working ignore any mention of 12 (the lower treatment time) and look for evidence that the 24 was calculated as well
Total			14	

3	a	amplitude: any indication which is greater than or equal to 1.5 squares high and goes from the mid line to top of a peak/ bottom of a trough (1) wavelength: any horizontal indication which is greater than 3 squares and less than 4.5 squares long (1)	2	axes labelled 'amplitude' and 'wavelength' not enough	
	b	i	red top ray and blue bottom ray (1)	1	accept violet in place of blue
		ii	change in speed (1)	1	ignore 'refraction'
	c		interference (1)	1	
	d	i	photon(s) (1)	1	accept quanta or quantum ignore quantum mechanics
		ii	(wave) speed (in a vacuum) (1)	1	accept transverse / all photons / 300 000 000 m/s accept poorly worded statements that include 300 000 000 m/s so long as units included
		iii	any two from: gamma; X-ray; ultraviolet / UV; infrared / IR; microwave; radio;	2	ignore 'TV waves'



Question		Expected Answers	Marks	Rationale
3	e	<p>any three from:</p> <p>transverse: (oscillates) at right angles (to direction of motion) / up and down / side to side; diagram of transverse wave clearly identified;</p>  <p>longitudinal: oscillates/vibrates (or similar idea) in direction of wave motion / backwards and forwards; diagram of longitudinal wave clearly identified;</p> 	3	<p>allow one mark if diagrams or explanation reversed or not clearly identified or if both diagrams correct but not clearly identified</p> <p>ignore reference to 'pulses' ignore references to 'side to side' if in a longitudinal context</p>
3	f	<p>speed different / EM speed faster / EM waves travel at speed of light / 300 000 000 m/s / / EM can travel through vacuum or space / sound needs medium / EM transverse / sound longitudinal / some EM waves are ionising (1)</p>	1	<p>'they' or 'it' or unspecified' waves' means EM waves allow 'light' for EM waves throughout ignore references to frequency / wavelength / energy / photons ignore incorrect responses unless they contradict the correct response</p>
		Total	13	

A218/02 Ideas in Context Higher Tier

Question			Expected Answers	Marks	Rationale
1	a	i	when concentration <u>increases</u> rate <u>increases</u> / when concentration <u>increases</u> time <u>decreases</u> / when concentration <u>decreases</u> rate <u>decreases</u> / when concentration <u>decreases</u> time <u>increases</u> (1)	1	not just 'rate increases' allow 'faster' for rate increase / 'slower' for rate decrease
		ii	increased <u>rate</u> of collisions / higher <u>frequency</u> of collisions / more <u>chance</u> of collisions / collide more <u>often</u> (1) more particles per unit volume / particles closer together / particles have less room (1)	2	allow 'faster collisions' 'more collisions' alone is not enough allow reverse argument
		iii	because temperature affects rate of reaction / because temperature affects the results / gas production / because temperature affects the time (taken) (1)	1	accept: more reliable / valid results ignore 'fair test', 'accurate', 'temperature is a variable' not 'to see if the temperature affects the rate' ignore references to reaction taking in or giving out heat
	b		balancing mark: 2HCl (1) calcium chloride (1) carbon dioxide and CO_2 and water and H_2O (1)	3	if any numbers are given in front of CO_2 or H_2O , do not allow first marking point, but allow third marking point not calcium chlor <u>ine</u> symbols must be shown using correct capital or lower case letter: e.g. Cl must have lower case 'l' - do not accept L do not accept h_2O O must be half height of C or H or higher e.g. Co_2 does not score numbers in formulae must be clear subscripts or smaller than letters e.g. CO2 does not score.
	c		an acid and an alkali / a hydrogen <u>ion</u> and hydroxide <u>ion</u> (1) form water (1)	2	ignore symbols or formulae, look for words
	d		CO_3^{2-} (1) NaHCO_3 (1)	2	apply same rules about sizes of letters and subscripts as in (b) charge on ion must be superscripted allow CO_3^{-2} or CO_3^{--} for carbonate

Question		Expected Answers	Marks	Rationale
1	e	soluble / dissolves (1) passes through stomach wall / can enter blood (1)	2	allow reverse argument
Total			13	
2	a	i any two from: particles or molecules move; from high to low concentration; (urea) concentration high in blood / (urea) concentration low in dialysis fluid; QWC – correct spelling of first two technical terms (1)	2 1	do not accept 'urea' for particle accept 'molecules pass through membrane' accept 'molecules diffuse through membrane' ignore 'molecules diffuse' alone ignore 'a substance moves' or 'it moves' accept 'concentration low on dialysis fluid side' / ORA
		ii allow small molecules through / allows urea or sugar or salt or water through (1) does not allow large particles through / does not allow red cells through (1)	2	allow 'filter' as AW for 'pass through' 'allows <u>only</u> small molecules through' = 2 marks
		iii faster diffusion / more urea removed / urea removed faster / maintains concentration gradient (1)	1	'it increases' alone is not enough for mark 'it is easier' is not enough for mark
	b	5000/60 000 000 (1) (x 100 =) 0.0083 / 0.008	2	ignore '5000/60 million' correct numerical answer gains both marks
	c	any 2 from: affects osmosis; affects movement of substances in and out (of cell); affects cell reactions / cell activity / cell function / enzymes; changes concentration in the cell / cell contents become more dilute or more concentrated; cells shrink/expand/burst;	2	ignore dehydration answers should imply cells not references to the body or body organs 'cell doesn't work' is not enough for mark

Question		Expected Answers	Marks	Rationale
2	d	(alcohol results in) more urine produced / owtte (1) urine is more dilute / owtte (1) less ADH produced (1)	3	ignore 'stops' ADH being produced
	e	internal environment is maintained / owtte / body temperature maintained / water levels maintained / levels or concentrations of water or salt or sugar maintained / pH maintained (1)	1	accept 'kept constant / controlled / balanced' for 'maintained' ignore 'correct' or 'right' accept ' <u>in</u> the body' as AW for internal environment, but ignore 'the body' alone ignore references to urea
Total			14	

3	a	<p>any three from:</p> <p>transverse: (oscillates) at right angles (to direction of motion) / up and down / side to side; diagram of transverse wave clearly identified;</p>  <p>longitudinal: oscillates/vibrates (or similar idea) in direction of wave motion / backwards and forwards; diagram of longitudinal wave clearly identified;</p> 	3	<p>allow one mark if diagrams or explanation reversed or not clearly identified or if both diagrams correct but not clearly identified</p> <p>ignore reference to 'pulses' ignore references to 'side to side' if in a longitudinal context</p>
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Question		Expected Answers	Marks	Rationale
3	b	speed different / EM speed faster / EM waves travel at speed of light / 300 000 000 m/s / EM can travel through vacuum or space / sound needs medium / EM transverse / sound longitudinal / some EM waves are ionising (1)	1	'they' or 'it' or unspecified' waves' means EM waves allow 'light' for EM waves throughout ignore references to frequency / wavelength / energy / photons ignore incorrect responses unless they contradict the correct response
	c	any two from: frequency; wavelength; correct direction e.g. frequency increase from red to blue / wavelength increases from blue to red; refraction; correct direction e.g. red light refracts less than blue light; speed in a <u>prism</u> / <u>glass</u> / <u>water</u> ; correct direction e.g. red light faster speed than blue light;	2	ignore references to energy, diffraction or position in spectrum not 'travel at different speeds' alone
	d	how many photons / more photons (per second) (1) photons have <u>different</u> energy values (1)	2	allow reverse arguments accept energy depends on frequency (1)
	e	$300\,000\,000 \div 1.5$ (1) $= 200\,000\,000$ (1) Hz/Hertz/ per second / cycles per second/ waves per second / s^{-1} (1)	3	correct numerical answer = 2 marks must have capital H in Hertz or Hz
	f	wavelength changes / increases / decreases (1) frequency no change (1)	2	
Total			13	

Grade Thresholds

General Certificate of Secondary Education
Additional Science A (Specification Code J631)
June 2009 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	25	21	17	14	11	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A215/02	Raw	42	35	30	24	18	14	12	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	25	22	19	16	13	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A216/02	Raw	42	31	26	20	14	10	8	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	25	21	17	14	11	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A217/02	Raw	42	35	30	24	18	11	7	N/A	N/A	0
	UMS	50	45	40	35	30	25	23	N/A	N/A	0
A218/01	Raw	40	N/A	N/A	N/A	23	18	14	10	6	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A218/02	Raw	40	27	23	16	10	7	5	N/A	N/A	0
	UMS	50	45	40	35	30	25	23	N/A	N/A	0
A220	Raw	40	33	31	28	25	21	18	15	12	0
	UMS	100	90	80	70	60	50	40	30	20	0

A220 (Coursework) - The grade thresholds have been determined on the basis of the work that was presented for award in June 2009. The threshold marks will not necessarily be the same in subsequent awards.

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

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

	A*	A	B	C	D	E	F	G	U	Total No. of Cands
J631	5.6	18.8	43.7	73.9	90.6	97.0	99.3	99.9	100	66 391

66 565 candidates were entered for aggregation this series.

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.

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