OCR
RECOGNISING ACHIEVEMENT

GCSE

Additional Science A

Twenty First Century Science Suite

General Certificate of Secondary Education **J631**

Mark Schemes for the Units

January 2010

J631/MS/R/10J

Oxford Cambridge and RSA Examinations

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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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GCSE Twenty First Century Additional Science A (J631)

MARK SCHEMES FOR THE UNITS

Guidance for Examiners

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

1 Mark strictly to the mark scheme.

2 Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.

3 Accept any clear, unambiguous response which is correct, 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 Annotations:
The following annotations are available on SCORIS.

✓ = correct response
× = incorrect response
bod = benefit of the doubt
nbod = benefit of the doubt **<u>not</u>** given
ECF = error carried forward
^ = information omitted
I = ignore
R = reject

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

7 Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

E.g.
For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.
☐	☐	✓
☐	☐	✓
✓	✓	☐
✓	✓	☐
☐	☐	☐
This would be worth 0 marks.	This would be worth one mark.	This would be worth one mark.

8 The list principle:
If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, 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.

9 Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.
If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, 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.

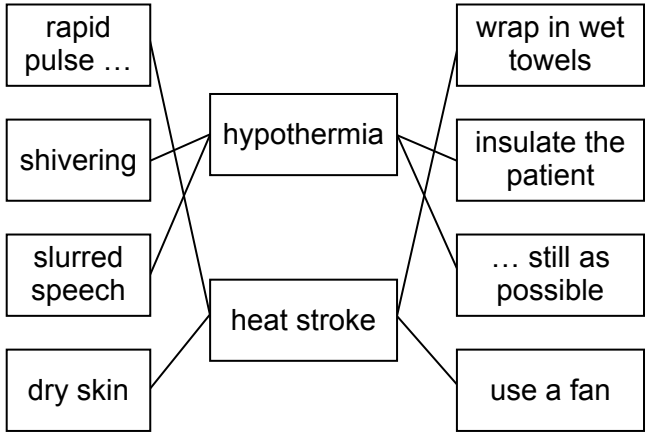
E.g. If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third <u>should be blank</u> (or have indication of choice crossed out).

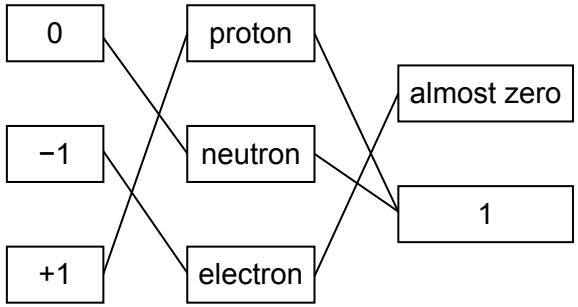
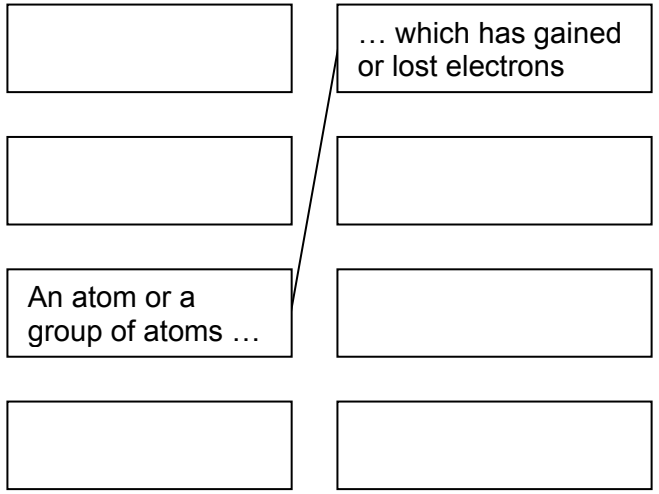
Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	×	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	×		✓		✓	✓		✓	
Score:	**2**	**2**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**NR**

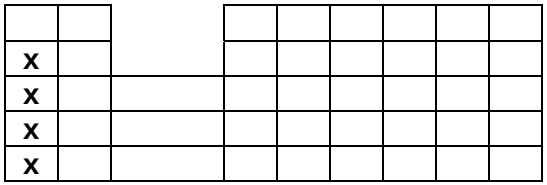
A215/01 Modules B4, C4, P4 Foundation Tier

Question			Expected Answers	Marks	Additional Guidance
1	a			[4]	all eight lines correct = 4 marks six or seven lines correct = 3 marks four or five lines correct = 2 marks two or three lines correct = 1 mark if there are two lines from a 'symptom' box then neither line is creditworthy if there are two lines to a 'treatment' box then neither line is creditworthy
	b	i	40°C (1)	[1]	
		ii	34°C (1)	[1]	
			Total	[6]	

Question			Expected Answers	Marks	Additional Guidance
2	a		partially permeable / semi-permeable	[1]	**accept** 'dialysis tubing / 'Visking tubing' **not** 'permeable' **ignore** 'mildly permeable' **ignore** 'cell membrane'
	b		only water moves ... ☑ (1) ☐ ☐	[1]	
	c		☐ add more glucose to solution A ☑ (1) ☐	[1]	
			Total	[3]	

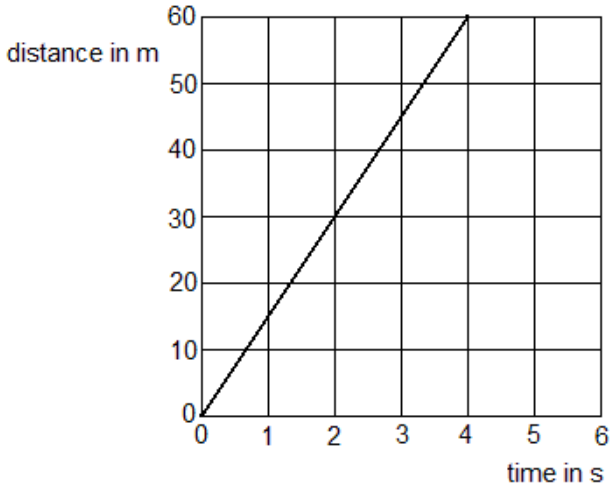
Question			Expected Answers	Marks	Additional Guidance
3	a		realises that the amount of gas produced is less than at 40°C (1) (because the enzyme is) denatured (1)	[2]	**accept** an answer of zero **accept** damaged/ stop working / destroyed / **not** killed award both marks independently
	b		realises that the reaction is between enzyme and hydrogen peroxide (not oxygen) (1) discusses inability to fit together (1) discusses difference in shape (of the enzyme/ lock and key) (1)	[3]	the terms 'lock' and 'key' do not have to be used (they are in the stem) **allow** 'enzyme will break down hydrogen peroxide' (from stem) assume that 'active site' means 'enzyme' unless contradicted **allow** the fit mark even if the wrong things are being fitted eg 'the two enzymes fit together' idea of fit must be unambiguous 'enzyme might not have the right lock / key for hydrogen peroxide' is not clear enough for 'fit' though it still gets 1 mark for 'reacts with peroxide' **allow** 'the key won't fit the lock' 'only catalase will fit hydrogen peroxide' = 2 marks (fit, reacts with peroxide) shape must be in terms of the enzyme/lock and key 'the key is the wrong shape to fit the lock' = 2 marks (BOD) **accept** diagrammatic answers which show these points **accept** reverse argument that only peroxide is the right shape to fit catalase
			Total	[5]	

Question			Expected Answers	Marks	Additional Guidance
4	a			[2]	all six lines correct = 2 marks three or more lines correct = 1 mark if there are two lines from a 'charge box then neither line is creditworthy if there are two lines from a 'particle' box to a 'relative mass' box then neither line is creditworthy
	b			[2]	only the correct starting box used = 1 mark only the correct end box used = 1 mark eg 2 lines from the correct starting box = 1 mark
			Total	[4]	

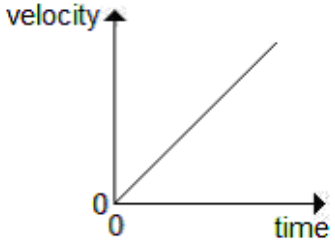
Question			Expected Answers	Marks	Additional Guidance
5	a		idea of reaction / reactivity / tarnish (1) (what it reacts with) – oxygen / air /water / moisture (1)	[2]	'sodium won't react with oil' = reactivity mark **ignore** reference to danger take reference to rusting as meaning 'tarnish' it is possible to get the second mark even when the first point is garbled eg 'so that protons and electrons in the air do not affect the experiment' = 1 mark 'sodium mixes with the air' = second mark only
	b			[1]	any two (or more) of the four boxes indicated
	c		**any two from:** floats; melts; gets smaller / disappears / dissolves; bubbles/fizzes/gas/smoke/steam; moves across the surface; catches fire / explodes / spits / sparks / pops;	[2]	if more than two observations, mark the first two non-neutral statements neutral – 'sodium hydroxide', idea of reaction, 'it will change colour' **accept** hydrogen for the bubbles mark **reject** incorrect gas named if flame colour given it must be correct (yellow) for the 'catches fire' mark

Question			Expected Answers	Marks	Additional Guidance
5	d		… burns with a yellow flame. ☐ ☐ ☐ ☑ (1)	[1]	
			Total	[6]	

6	a		 	[1]	both second and third boxes indicated to score the mark
	b		●● (1)	[1]	
	c		bromine + sodium → sodium bromide	[1]	**accept** bromine and sodium in either order **ignore any chemical symbols**
	d		Ions are in the solid at the start. — Ions then spread through the liquid.	[1]	
			Total	[4]	

Question			Expected Answers	Marks	Additional Guidance
7	a		opposite force eg counter force (1) equal magnitude to driving force (direction not stated) (1)	[2]	**accept** anything which gives the idea of an opposing force eg friction, resistance, air resistance, drag, antagonising force, 'force from the other side of the bus **ignore** 'reaction force' **accept** cancels out driving force / gives zero resultant force / forces are balanced **accept** 'equal force pushing it back' = 2
	b			[2]	for any credit to be awarded for either mark, the line must reach 2 seconds OR 30 m **accept** hand-drawn if clearly intended to be straight one straight line through the origin = 1 mark correct gradient (30m increase in 2s, 60m in 4s, accurate to 1/10th of a large square by eye) = 1 mark treat crosses as neutral neutral – line extends backwards past the origin a straight line which goes to at least 30m, 2 sec and then changes direction = 0 marks
			Total	[4]	

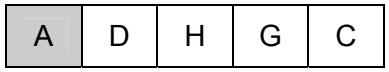
Question			Expected Answers	Marks	Additional Guidance
8	a		6000 x 12 (1)	[1]	
	b		backwards backwards opposite the same as	[2]	4 or 3 correct = 2 marks 2 correct = 1 mark 0 or 1 correct = 0 marks
	c		A (1)	[1]	**accept** any clear indication of response if letter not given look for an indication on the diagram
	d		… its speed and direction of motion. ☐ ✓ ☐ (1)	[1]	
			Total	[5]	

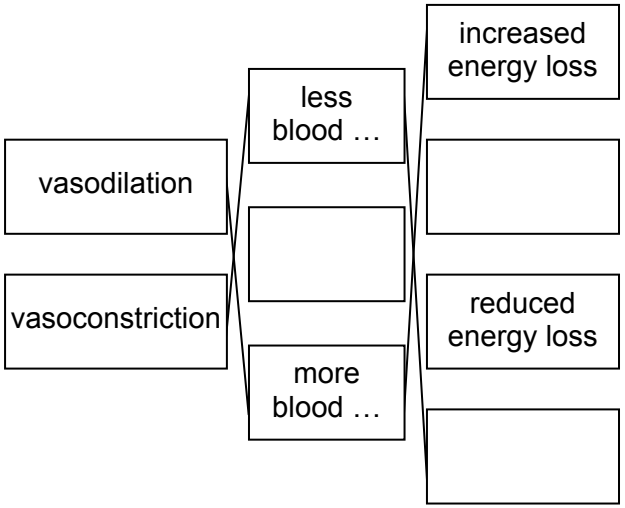
9	a		kinetic (1) gravitational potential (1)	[2]	**accept** 'gpe', 'gravitational' or 'potential' on its own
	b		Carlos (1)	[1]	**accept** any clear indication of response
	c		 (1)	[1]	**accept** any clear indication of response more than one graph indicated = 0 marks
	d		… energy is lost through heating. ☐ ✓ ☐ ☐ (1)	[1]	
			Total	[5]	

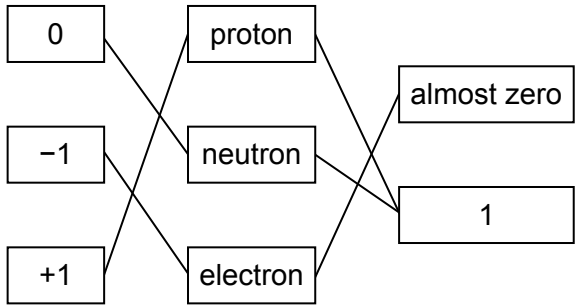
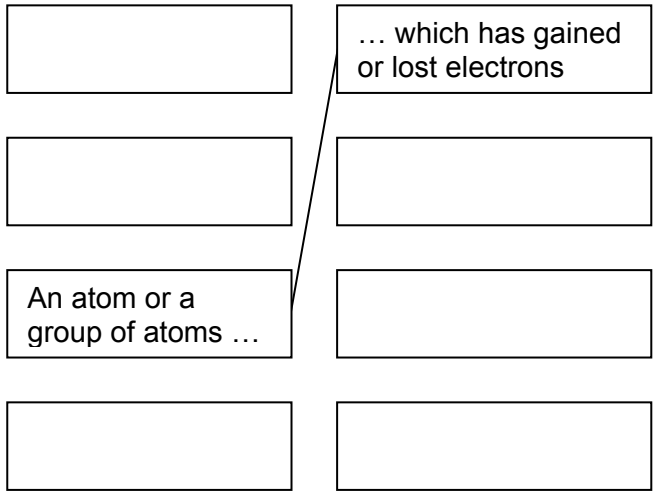
A215/02 Modules B4, C4, P4 Higher Tier

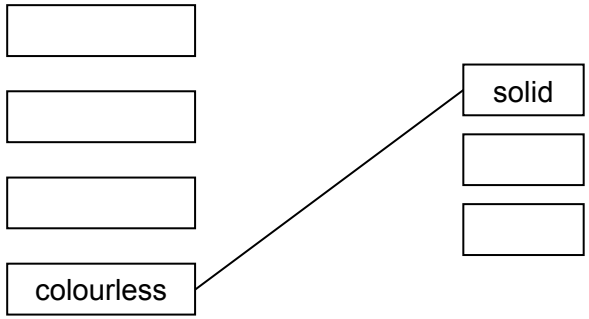
Question			Expected Answers	Marks	Additional Guidance
1	a		realises that the amount of gas produced is less than at 40°C (1)	[1]	**accept** an answer of zero look for the prediction in the table itself
	b		realises that the reaction is between enzyme and hydrogen peroxide (not oxygen) (1) discusses inability to fit together (1) discusses difference in shape (of the enzyme/ lock and key) (1)	[3]	the terms 'lock' and 'key' do not have to be used (they are in the stem) **allow** 'enzyme will break down hydrogen peroxide' (from stem) assume that 'active site' means 'enzyme' unless contradicted **allow** the fit mark even if the wrong things are being fitted eg 'the two enzymes fit together' idea of fit must be unambiguous 'enzyme might not have the right lock / key for hydrogen peroxide' is not clear enough for 'fit' though it still gets 1 mark for 'reacts with peroxide' **allow** 'the key won't fit the lock' 'only catalase will fit hydrogen peroxide' = 2 marks (fit, reacts with peroxide) shape must be in terms of the enzyme/lock and key 'the key is the wrong shape to fit the lock' = 2 marks (BOD) **accept** diagrammatic answers which show these points **accept** reverse argument that only peroxide is the right shape to fit catalase
	c	i	active site (1)	[1]	no other answer is acceptable

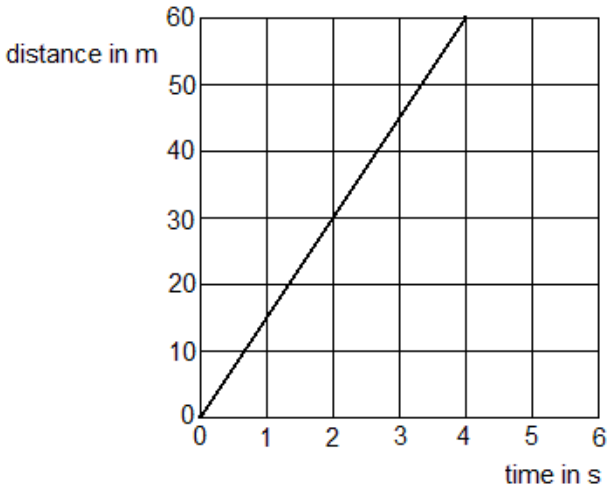
Question			Expected Answers	Marks	Additional Guidance
		ii	… shape of the enzyme is changed. ☐ ✓ (1) ☐ ☐ ☐	[1]	if more than one box is ticked score 0 **accept** any clear indication of correct response
			Total	[6]	

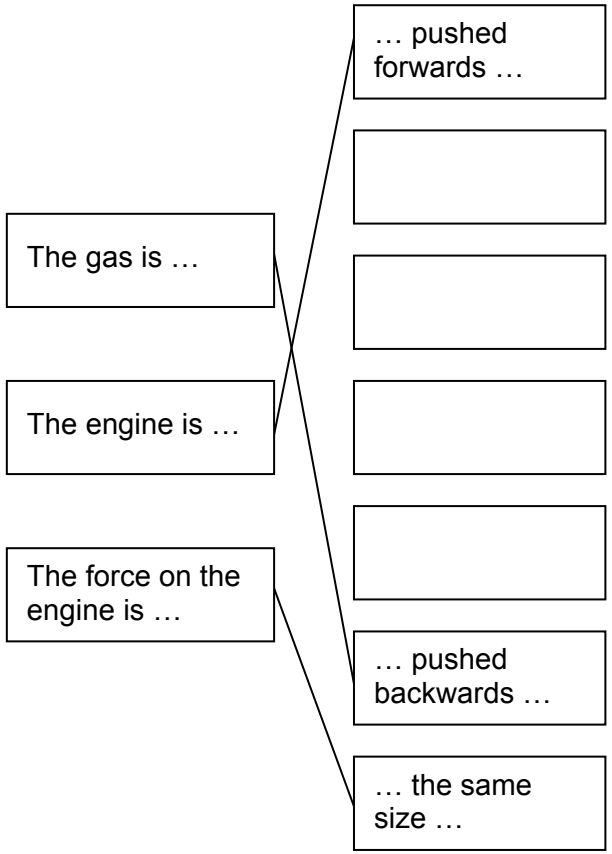
2	a			[3]	D anywhere before H = 1 mark H anywhere before G = 1 mark G anywhere before C = 1 mark if no credit gained from these, allow 1 mark for D in the first box
	b		**any two from:** breathing; sweating; faeces; crying;	[2]	**accept** respiration as an alternative to breathing **allow** menstruation **ignore** bleeding **allow** spitting/drooling/dribbling but references to salivation alone are not sufficient **allow** vomiting
			Total	[5]	

Question			Expected Answers	Marks	Additional Guidance
3	a		hypothalamus (1)	[1]	
	b			[2]	one mark for each correct side anything other than **two** lines on a side cannot score
			Total	[3]	

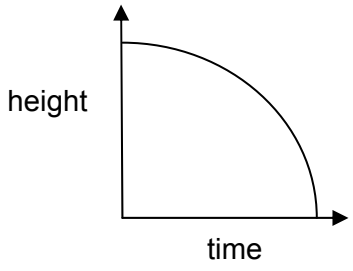
Question			Expected Answers	Marks	Additional Guidance
4	a			[2]	all six lines correct = 2 marks three or more lines correct = 1 mark if there are two lines from a 'charge box then neither line is creditworthy if there are two lines from a 'particle' box to a 'relative mass' box then neither line is creditworthy
	b			[2]	only the correct starting box used = 1 mark only the correct end box used = 1 mark eg 2 lines from the correct starting box = 1 mark
	c		Li^{+} S^{2-}	[1]	**accept** Li^{1+} Li^{+1} **accept** S^{-2} S^{--} charges must be indicated in superscript to the right of the letter **reject** LI instead of Li
	d		A and D (1)	[1]	**accept** in either order **accept** any clear indication of response, including writing the electron arrangements
			Total	[6]	

Question			Expected Answers	Marks	Additional Guidance
5	a			[1]	more than 1 line drawn = 0 marks
	b		**(**solid is made of) ions (1) ions separate/drift apart/move freely / (they) become spread through the water (molecules) / diffuse (1)	[2]	needs to state or imply the idea that the solid lattice already has ions eg solid has ionic bonding scores this mark atoms/molecules contradicts the first mark **allow** references to molecules/particles/atoms moving for the second mark - **not** elements or electrons reference to water molecules moving freely does not score this mark
	c	i	sodium hydroxide and hydrogen (1)	[1]	both required for the mark **accept** in either order if symbols are used they must be correct
		ii	$2Na + 2H_2O \rightarrow 2NaOH + H_2$	[3]	left hand side species correct (1) do **not** allow NA for Na right hand side species correct (1) do **not** allow NaHO for NaOH equation balanced (1) no ecf but allow balancing mark if NA or NaHO or NAHO are correctly balanced **ignore** state symbols eg aq
		iii	reaction gives out energy / reaction gets hot / exothermic(1)	[1]	
			Total	[8]	

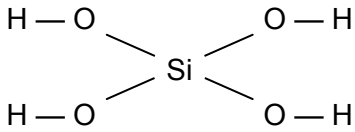
Question			Expected Answers	Marks	Additional Guidance
6	a		opposite force eg counter force (1) equal magnitude to driving force (direction not stated) (1)	[2]	**accept** anything which gives the idea of an opposing force eg friction, resistance, air resistance, drag, antagonising force, 'force from the other side of the bus **ignore** 'reaction force' **accept** cancels out driving force / gives zero resultant force / forces are balanced **accept** 'equal force pushing it back' = 2
	b			[2]	for any credit to be awarded for either mark, the line must reach 2 seconds OR 30 m **accept** hand-drawn if clearly intended to be straight one straight line through the origin = 1 mark correct gradient (30m increase in 2s, 60m in 4s, accurate to 1/10th of a large square by eye) = 1 mark treat crosses as neutral neutral – line extends backwards past the origin a straight line which goes to at least 30m, 2 sec and then changes direction = 0 marks
			Total	[4]	

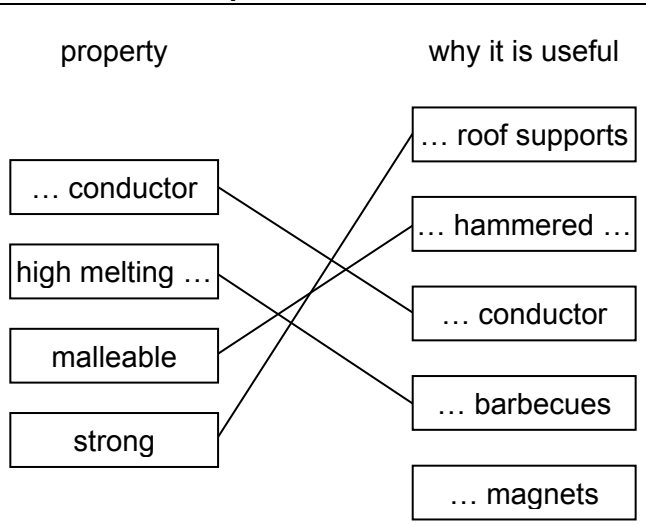
Question			Expected Answers	Marks	Additional Guidance
7	a		B (1)	[1]	**accept** any clear indication of response
	b		72 000 (1)	[1]	**accept** any clear indication of response
	c			[2]	3 lines correct = 2 marks 2 lines correct = 1 mark 1 or 0 lines correct = 0 marks if there is more than 1 line from any left hand box no credit can be given for that box

Question			Expected Answers	Marks	Additional Guidance
7	d		☐ ☐ ☐ The instantaneous speed … ☑ (1)	[1]	**accept** any clear indication of response more than 1 box ticked scores 0 marks
			Total	[5]	

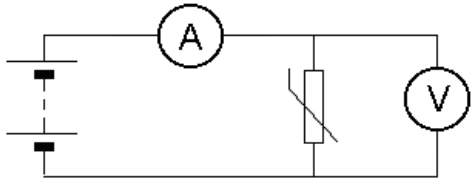
8	a		C (1)	[1]	**accept** any clear indication of response
	b		Carlos (1)	[1]	**accept** any clear indication of response **accept** 2240J
	c		 (1)	[1]	**accept** any clear indication of response
	d		☐ The reaction force … ☑ (1) As he hits the crash mat … ☑ (1) ☐ ☐	[2]	deduct 1 mark for every extra box ticked candidate cannot score less than zero marks
			Total	[5]	

A216/01 Modules B5, C5, P5 Foundation Tier

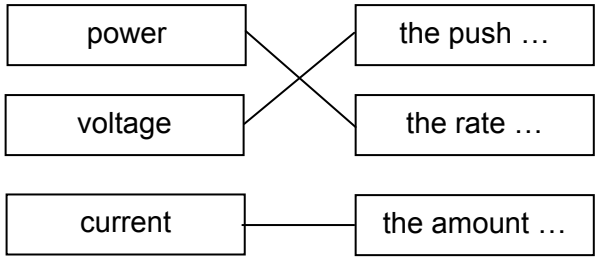
Question			Expected Answers	Marks	Additional Guidance
1	a		CO_2 (1)	[1]	if more than one choice, no marks
	b		 (1)	[1]	ring around middle choice if more than one choice, no marks
	c		… has a giant covalent structure. ☐ ☐ ☐ ☑ (1)	[1]	if more than one choice, no marks
			Total	[3]	

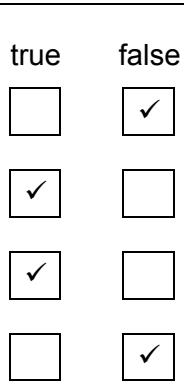
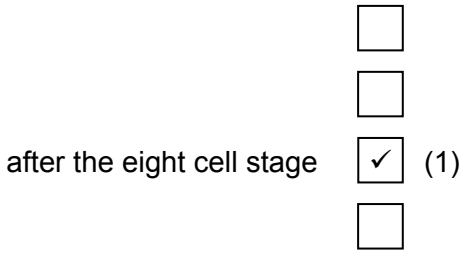
Question			Expected Answers	Marks	Additional Guidance
2	a			[3]	all four property boxes have one line going to the correct place = 3 marks only three of the property boxes have one line going to the correct place = 2 marks only two of the property boxes have one line going to the correct place = 1 mark only one of the property boxes has one line going to the correct place = 0 marks
	b		FeO (1)	[1]	if more than one choice, no marks
	c		D (1)	[1]	if more than one choice, no marks
	d	i	g (1)	[1]	
		ii	carbon not reactive (enough) / metals (too) reactive / owtte (1)	[1]	**accept** 'they are more reactive' as 'metals' is plural in the question **accept** 'it is not reactive' since this must refer to carbon
		iii	aluminium (1)	[1]	If more than one choice, no marks.
			Total	[8]	

3			**any three from:** indicates that ions are charged; (ions) can move; electrodes attract … ; … ions of opposite charge; (metal appears at) negative electrode/cathode; non-metal appears at other electrode;	[3]	**accept** an indication on the diagram for any of these points **accept** e.g. reference to opposites attracting
			Total	[3]	

Question			Expected Answers	Marks	Additional Guidance
4	a			[2]	ammeter: correct symbol (capital A in circle) in correct place = 1 mark voltmeter: correct symbol (capital V in circle) in correct place = 1 mark
	b		decreases increases	[1]	both required for mark
	c		charge amperes	[1]	both required for mark
			Total	[4]	

5	a		generator (1)	[1]	if more than one choice, no marks
	b		**any two from:** spin the magnet faster; use a stronger magnet; have more coils/turns (of wire); put some iron in the coil; move the magnet closer/inside the coil;	[2]	do **not** apply list principle - give marks for any valid different points **accept** 'spin it faster' or 'move it faster' is OK **not** 'bigger magnet' **not** 'coil(s) closer together' **allow** 'metal' for iron
	c		C (1)	[1]	if more than one choice, no marks
	d		There is now a current in the coil. ☑ (1) ☐ ☐	[1]	if more than one choice, no marks
			Total	[5]	

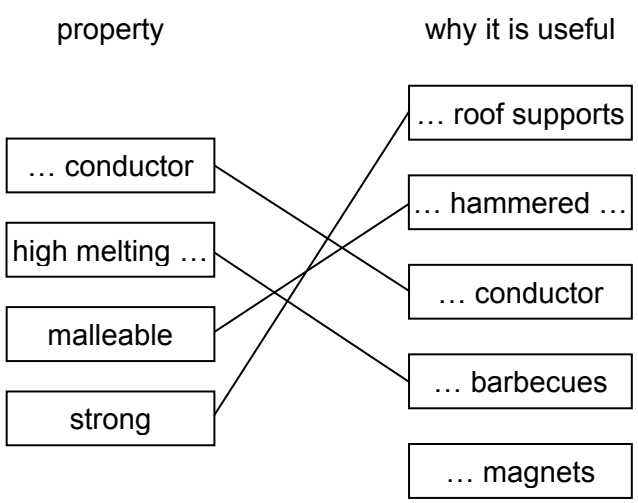
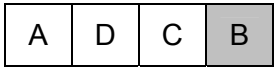
Question			Expected Answers	Marks	Additional Guidance
6	a		115 (1)	[1]	
	b			[2]	three lines correct = 2 marks one or two lines correct = 1 mark if more than one line from any left-hand box, **ignore** all lines from that box
	c		1.2 (1)	[1]	
	d		Alan (1)	[1]	if more than one choice, no marks
			Total	[5]	

Question			Expected Answers	Marks	Additional Guidance
7	a			[2]	four correct = 2 marks two or three correct = 1 mark
	b	i	body cell (1) mitosis (1) embryo (1)	[3]	
		ii		[1]	if more than one choice, no marks
			Total	[6]	

Question			Expected Answers	Marks	Additional Guidance
8	a		**any two from:** (all) cells have the same (set of) genes; idea that different genes do different jobs; idea that gene can be switched on/off; some (genes switched on);	**[2]**	answer must refer to genes **ignore** 'different cells have different genes' **ignore** incorrect context eg 'different cells have different genes which do different jobs' = 1 mark for 2nd marking point 'genes are switched on' = 1 mark 'some genes are switched on' = 2 marks 'some genes are switched off' = 2 marks 'the genes for making chlorophyll are switched on in the leaf not in the root' = 2 marks
	b		hormone/auxin/rooting powder (1) meristem/unspecialised (cells) (1)	**[2]**	**accept** plant it / put in a dish of compost/nutrient/water **ignore** unqualified 'powder' **ignore** 'stem cells' **ignore** 'cut it down the middle'
			Total	**[4]**	

9	a		nucleus (1)	**[1]**	
	b		cytoplasm/ribosome (1)	**[1]**	
	c		double two four	**[2]**	three correct = 2 marks one or two correct = 1 mark
			Total	**[4]**	

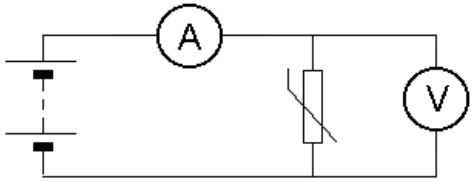
A216/02 Modules B5, C5, P5 Higher Tier

Question			Expected Answers	Marks	Additional Guidance
1	a			[3]	all four property boxes have one line going to the correct place = 3 marks only three of the property boxes have one line going to the correct place = 2 marks only two of the property boxes have one line going to the correct place = 1 mark only one of the property boxes has one line going to the correct place = 0 marks
	b		FeO (1)	[1]	
	c		 (1)	[1]	
	d		56g (1)	[1]	

Question			Expected Answers	Marks	Additional Guidance
1	e		**any two from:** (small) molecules; (molecules/particles - **not** atoms) far apart; weak forces (implied between carbon monoxide molecules **not** between atoms); strong forces (implied inside carbon monoxide); 'covalent' used correctly;	[2]	**accept** bonds 'loose' assume the candidate is discussing bonds holding atoms within the molecule unless stated otherwise one mark for each correct point which has not been contradicted **ignore** pairs of statements which are contradictory **ignore** incorrect statements which do not contradict a correct statement **allow** the word 'bond' for any interaction
	f		contains electrons ☑ contains positive ions ☑ ☐ ☐ ...electrons are free to move ☑ ☐	[2]	3 correct = 2 marks 2 correct = 1 mark 1 correct = 0 marks if more than three ticks, each extra tick cancels out one correct marking point

Question			Expected Answers	Marks	Additional Guidance
1	g		(electrolyte) is ionic / contains ions / charged particles(1) movement (of particles mentioned above) (1) (attracted to/move) towards the electrodes (1)	[3]	particles become charged = contradiction **reject** electrons/atoms/molecules/neutrons for first marking point only but allow 'protons' **allow** named examples eg sodium ions and chloride ions **allow** 'contains positive ions' or 'contains negative ions' **ignore** attraction for the 'movement' marking point **ignore** incorrect directions eg 'positive particles to anode' 'electrons move towards electrodes' = 2 marks 'ion free to move but stay in a regular pattern' = 1 for ions contradiction for movement
			Total	[13]	

Question			Expected Answers	Marks	Additional Guidance
2	a		chemically unreactive ✓ high melting point ✓ good thermal insulator ✓ ☐	[1]	
	b		electrostatic repulsion ☐ ☐ ☐ ☐ electrons and nuclei	[1]	there must be the one correct line only
			Total	[2]	

Question			Expected Answers	Marks	Additional Guidance
3	a			[2]	ammeter: correct symbol (capital A in circle) in correct place = 1 mark voltmeter: correct symbol (capital V in circle) in correct place = 1 mark
	b		decreases increases	[1]	both correct = 1 mark **accept** any unambiguous response
	c		charge amperes	[1]	both correct = 1 mark **accept** any unambiguous response
			Total	[4]	

Question			Expected Answers	Marks	Additional Guidance
4	a		**maximum of three marks made up of** **any two from:** any important property of the magnet eg polarity / distance (from coil) / direction of movement (but not direction of spin); reference to movement of magnet / change in magnetism, including 'spin' of the magnet; effect of speed of movement; the current /voltage/electrons change direction; **and any three from:** explains reversal of current/voltage (not just change) / links reversal of current to each half turn of the magnet; use of high level term – 'induction'; use of high level term - '(magnetic) field'	**[3]**	unspecified 'it' refers to the magnet **ignore** attraction and repulsion by or to the magnet **ignore** reference to the word 'charge' in connection with the magnet **ignore** reference to 'ends' of the magnet **reject** 'the coil makes the magnet move' (wrong causality) examples: 'different ends of the magnet have different charge' = 0 marks 'different ends of the magnet have different charged poles' = 1 mark 'moving magnet makes electric current' = 1 mark 'moving magnet makes electrons move backwards and forwards' = 2 marks (reversal not explained) 'as the magnet spins the coil of wire is attracted and repelled' = 2 marks 'as one pole of the magnet enters the coil, the direction of the current goes one way, as the opposite enters, the current is sent in the opposite direction' = 3 marks 'the current changes direction' = 1 mark 'the current changes direction for every half turn of the magnet' = 2 marks
	b		a.c. moving	**[1]**	**accept** any unambiguous response
	c		0.5 A (1)	**[1]**	
			Total	**[5]**	

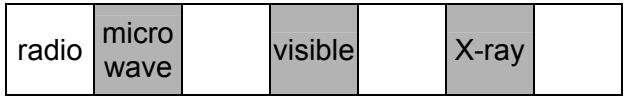
Question			Expected Answers	Marks	Additional Guidance
5	a		0.65 (2) if answer wrong look for working for maximum of 1 mark $\frac{150}{230}$ (1)	[2]	correct numerical answer with no working = 2 marks **accept** answers from 0.6 – 0.7 if no numerical working given **acccept** I=P/V (1) **ignore** P=IV
	b		5% (1)	[1]	
	c		a.c. is easier to generate than d.c. ☐ a.c. is easier to generate than d.c. ✓ ☐ ☐ … distributed more efficiently … ☐ … distributed more efficiently … ✓	[1]	
	d		current → increases resistance → decreases potential difference → stays the same	[1]	
			Total	[5]	

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>6</td><td>a</td><td></td><td><table><tr><th>base</th><th>% present</th></tr><tr><td>C</td><td>20</td></tr><tr><td>A</td><td>30</td></tr><tr><td>T</td><td>30</td></tr><tr><td>G</td><td>20</td></tr></table></td><td>[1]</td><td></td></tr>
<tr><td></td><td>b</td><td>i</td><td>amino acids (1)</td><td>[1]</td><td>if answer not on dotted line, look for a ringed word</td></tr>
<tr><td></td><td></td><td>ii</td><td>… are made in the cytoplasm. ✓ (1)
☐
☐
A copy of the gene caries … ✓ (1)
☐
☐</td><td>[2]</td><td>if more than two ticks, each extra tick cancels out one correct marking point</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[4]</td><td></td></tr>
</table>

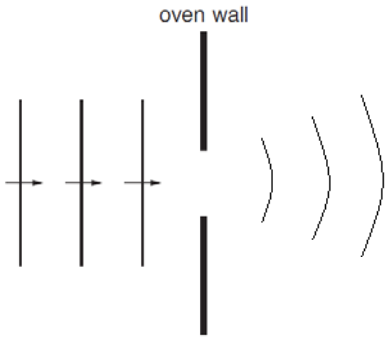
Question			Expected Answers	Marks	Additional Guidance
7	a		**any two from:** (all) cells have the same (set of) genes; idea that different genes do different jobs; idea that gene can be switched on/off; some (genes switched on);	**[2]**	answer must refer to genes **ignore** 'different cells have different genes' **ignore** incorrect context eg 'different cells have different genes which do different jobs' = 1 mark for 2nd marking point 'genes are switched on' = 1 mark 'some genes are switched on' = 2 marks 'some genes are switched off' = 2 marks 'the genes for making chlorophyll are switched on in the leaf not in the root' = 2 marks
	b		hormone/auxin/rooting powder (1) meristem/unspecialised (cells) (1)	**[2]**	**accept** plant it / put in a dish of compost/nutrient/water **ignore** unqualified 'powder' **ignore** 'stem cells' **ignore** 'cut it down the middle'
			Total	**[4]**	

8	a		B (1)	**[1]**	**accept** any unambiguous response
	b		E C A (2)	**[2]**	ACE in incorrect order = 1 mark any letters incorrect = 0 marks
	c		Amelia (1) Sam (1)	**[2]**	any order **accept** any unambiguous response **accept** 'A' and 'S'
			Total	**[5]**	

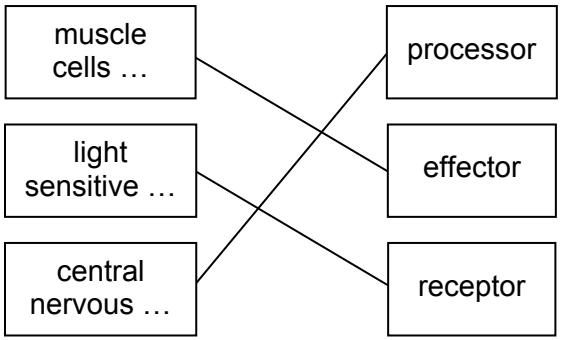
A217/01 Modules B6, C6, P6 Foundation Tier

Question			Expected Answers	Marks	Additional Guidance
1	a			[1]	**accept** any clear and unambiguous response
	b		transmitter (1) modulate (1) decreases (1)	[3]	
	c		It is easier to remove … ☐ ☐ ☑ (1) ☐	[1]	more than 1 response = 0 marks **accept** any other clear response eg underlined or ticked statements, crosses, shaded in boxes (if no other type of response shown in boxes)
			Total	[5]	

Question			Expected Answers	Marks	Additional Guidance
2	a		refracted (1) reflected (1)	[2]	one mark for each correct response more than 1 response for each dotted line = 0 marks (for line) **accept** any other clear response eg lines linking words to spaces **accept** phonetic spelling
	b		☐ ☐ The angle of refraction of … ☑ (1) ☐	[1]	more than 1 response = 0 marks **accept** any other clear response eg underlined or ticked statements, crosses, shaded in boxes (if no other type of response shown in boxes)
	c		Bess (1)	[1]	**accept** any other clear response eg lines linking words to spaces or tick at talking head
			Total	[4]	

Question			Expected Answers	Marks	Additional Guidance
3	a		(the energy) increases (1) (the speed) stays the same (1)	[2]	**accept** more energy = energy increases **reject** <u>use</u> more energy **reject** speed increases
	b			[1]	look for at least one wavefront on the right-hand side of the hole, curved as shown – must have at least one solid (not broken) line **ignore** incorrect spacing between wavefronts/ additional arrows
	c		**any two from:** food absorbs <u>microwaves</u>; because food contains water; plate does not absorb <u>microwaves</u>; because plate does not contain water; not enough time for <u>heat</u> to conduct from food to plate;	[2]	**ignore** references to heat (except final marking option) **ignore** references to energy (except heat energy, final marking point) **accept** photons = microwave **accept** moisture = water **accept** <u>microwave</u> passes straight through / reflected/bounced off
			Total	[5]	

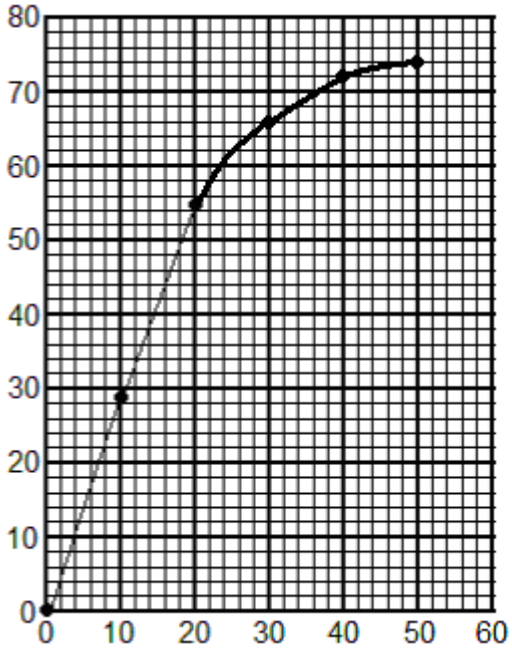
Question			Expected Answers	Marks	Additional Guidance
4	a		reflex sensory muscles motor	[3]	4 correct = 3 marks 3 correct = 2 marks 2 correct = 1 mark 1 or 0 correct = 0 marks **accept** any other clear response eg lines linking words to spaces **accept** phonetic spelling
	b		… pathways between the neurons. ☐ … pathways between the neurons. ☑ (1) … pathways between the neurons. ☐ … pathways between the neurons. ☐ … pathways between the neurons. ☐	[1]	more than 1 response = 0 marks **accept** any other clear response eg underlined or ticked statements, crosses, shaded in boxes (if no other type of response shown in boxes)
			Total	[4]	

Question			Expected Answers	Marks	Additional Guidance
5	a			[2]	3 correct lines = 2 marks 1 or 2 correct lines = 1 mark lines need not be straight
	b	i	**any two from:** startle; stepping; grasping/holding/gripping a person's finger; foot/toes curling;	[2]	**accept** descriptions of reflexes instead of names for full marks **accept** walking motion = stepping **ignore** rooting/sucking **accept** bending of toes = foot curling
		ii	gag / blink / knee jerk (1)	[1]	**reject** iris contraction/ pupil reflex **allow** description of reflexes instead of name for one mark **ignore** taking hand away from hot/sharp object, sucking, swimming
			Total	[5]	

6	a		cortex (1)	[1]	**accept** any clear and unambiguous response eg. underlined
	b		☐ ☐ ☐ MRI scans ☑ (1) electrical stimulation ☑ (1)	[2]	1 mark for each correct response more than 2 responses, deduct 1 mark for each additional response
			Total	[3]	

Question			Expected Answers	Marks	Additional Guidance
7			electrical synapses speeds up	[2]	3 correct = 2 marks 2 correct = 1 mark 1 or 0 correct = 0 marks
			Total	[2]	

8	a		Bubbles appear in the liquid. ☐ ✓ (1) ☐ ☐	[1]	more than 1 response = 0 marks **accept** any other clear response eg underlined or ticked statements, crosses, shaded in boxes (if no other type of response shown in boxes)
	b	i	☐ + ☐ → ☐ + water + carbon dioxide	[1]	2 correct responses = 1 mark **must** be in the correct order **accept** phonetic spelling **allow** hydrogen oxide for water **reject** carbon oxide
		ii	☐ Solid is left in the beaker. ☐ ✓ (1) ☐ ☐	[1]	more than 1 response = 0 marks **accept** any other clear response eg underlined or ticked statements, crosses, shaded in boxes (if no other type of response shown in boxes)
		iii	☐ ☐ evaporate some of the water ☐ ✓ (1) ☐	[1]	more than 1 response = 0 marks **accept** any other clear response eg underlined or ticked statements, crosses, shaded in boxes (if no other type of response shown in boxes)
			Total	[4]	

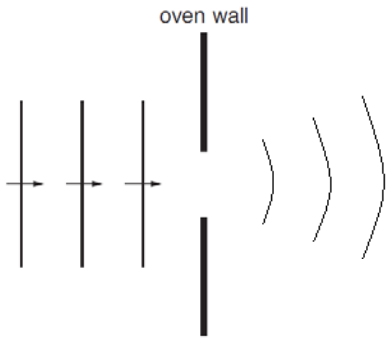
Question			Expected Answers	Marks	Additional Guidance
9	a		**any two from:** increase <u>concentration</u> of (hydrochloric) acid; raise temperature; decrease particle size / increase surface area of particles; add catalyst; stir/agitate;	[1]	2 correct responses = 1 mark **accept** chemical = acid **accept** stronger acid = increase concentration of acid **ignore** more acid / more carbonate **accept** heat / warm up = raise temperature
	b	i		[2]	points plotted within one square = 1 mark clear attempt to join points with a <u>smooth curve</u> = 1 mark **ignore** extended curve beyond final plot **allow** ecf from incorrectly plotted points for the correct curve = 1 mark max
		ii	acid <u>concentration</u> falls / copper carbonate runs out/used up / reactants used up (1)	[1]	**ignore** gas/CO_2 runs out/used up **ignore** less energy **ignore** less acid **accept** less (copper) carbonate/particles to react with **accept** no acid/carbonate left to react with = reactants used up
			Total	[4]	

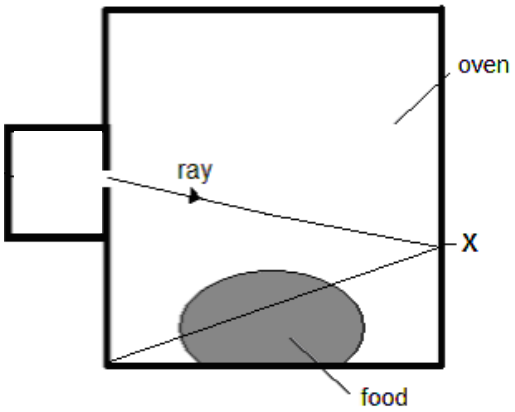
Question			Expected Answers	Marks	Additional Guidance
10	a	i	2 (1)	[1]	more than 1 response = 0 marks
		ii	3 (1)	[1]	more than 1 response = 0 marks
	b	i	how fast the reaction goes ☑ (1) ☐ ☐ ☐	[1]	more than 1 response = 0 marks **accept** any other clear response eg underlined or ticked statements, crosses, shaded in boxes (if no other type of response shown in boxes)
		ii	☐ ☐ Catalysts speed up a reaction. ☑ Catalysts are not used up … ☑	[1]	2 correct responses = 1 mark more than 2 responses = 0 marks **accept** any other clear response eg underlined or ticked statements, crosses, shaded in boxes (if no other type of response shown in boxes)
		iii	not enough … → reaction too fast safety valves … → reaction too fast tanks not … → reaction too slow	[2]	3 correct lines = 2 marks 1 or 2 correct lines = 1 mark
			Total	[6]	

A217/02 Modules B6, C6, P6 Higher Tier

Question			Expected Answers	Marks	Additional Guidance
1	a		modulates transmits decodes	[2]	all three correct = 2 marks any two correct = 1 mark
	b		**any three from:** digital uses pulses / binary / 1 & 0 / on & off; noise/interference added to signal; noise/interference reduces quality; pulses can be restored/recognised; noise/interference can be removed;	[3]	**accept** a picture of a digital wave  **accept** eg hiss / static / crackles / distortion as noise **accept** less clear as reduced quality
			Total	[5]	

2	a		refracted (1) reflected (1)	[2]	
	b		☐ ☐ The angle of refraction … ☑ (1) ☐	[1]	
	c		Bess (1)	[1]	
			Total	[4]	

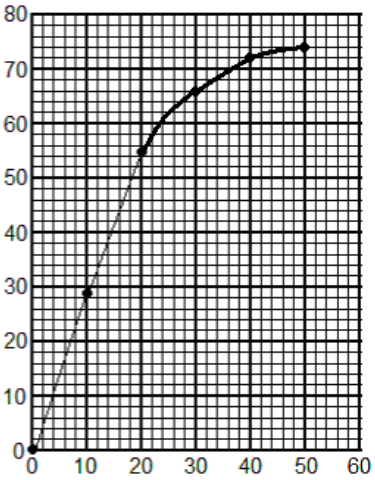
Question			Expected Answers	Marks	Additional Guidance
3	a		☐ ☐ ☐ … decreasing the wavelength … ✓ (1) … increasing the rate … ✓ (1)	[2]	correct pattern = 2 marks one mistake = 1 mark a mistake is • a tick in the wrong box • a missing tick • an extra tick
	b	i		[1]	look for at least one wavefront on the right-hand side of the hole, curved as shown – must have at least one solid (not broken) line **ignore** incorrect spacing between wavefronts/ additional arrows

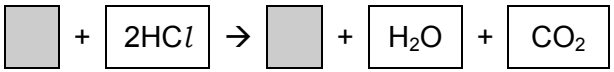
Question			Expected Answers	Marks	Additional Guidance
3	b	ii		[1]	look for a continuous straight line from the hole to X and then from X to the food - anywhere from grazing top of the food to where it meets the base of the food on the right does not have to go past the surface of the food must have no obvious gap or discontinuity from arrow head to the food **accept** one line width mismatch in reflection at X **ignore** rays reflected off surface of the food do **not** accept lines clearly drawn without a ruler
	c		absorb interfere	[1]	both required for mark
			Total	[5]	

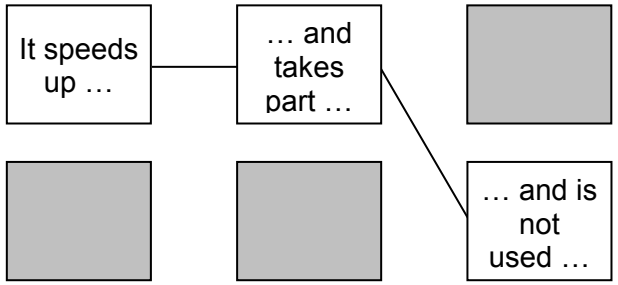
Question			Expected Answers	Marks	Additional Guidance
4	a	i	B (1)	[1]	**accept** response on the diagram
		ii	2 m/s (1)	[1]	
		iii	**any two from:** (electrically) insulate the nerve cell; prevent impulses getting into other cells; prevent impulses coming from other cells;	[2]	**not** to protect the cell / keep it warm **ignore** reference to speeding up the impulse
		iv	(hormone) secreting (cell) (1)	[1]	**accept** gland / glandular / hormone (cell) **ignore** name of the gland eg pituitary, adrenal
	b		peripheral synapse diffusion specific	[2]	all four correct = 2 marks any three correct = 1 mark
			Total	[7]	

5	a		reflex sensory muscles motor	[3]	all four correct = 3 marks three correct = 2 marks two correct = 1 mark
	b	i	… pathways between the neurons. ☐ ☑ (1) ☐ ☐ ☐	[1]	
		ii	through another neuron (to the motor neuron of the reflex arc) (1)	[1]	**accept** by using a different neuron pathway **accept** by creating a neuron pathway **not** a sensory neuron **accept** nerve if no mention of neurons then no marks
			Total	[5]	

Question			Expected Answers	Marks	Additional Guidance
6	a		cerebral cortex (1)	[1]	
	b		there is a pattern in the numbers (1)	[1]	**accept** valid description of the pattern eg all end in 58, first number goes 1, 2, 3 … **ignore** references to amount of information to remember
			Total	[2]	

7	a		**any three from:** increase <u>concentration</u> of (hydrochloric) acid; raise temperature; decrease particle size / increase surface area of particles; add catalyst; stir/agitate;	[2]	any three correct = 2 marks any two correct = 1 mark **accept** heat warm up = raise temperature **ignore** more acid / more carbonate mark the first three responses only
	b	i		[2]	points plotted within one square = 1 mark clear attempt to join points with a <u>smooth curve</u> = 1 mark **ignore** extended curve beyond final plot **allow** ecf from incorrectly plotted points for the correct curve = 1 mark max
		ii	acid <u>concentration</u> falls / copper carbonate runs out/used up / reactants used up (1)	[1]	**ignore** gas/CO_2 runs out/used up **ignore** less energy **ignore** less acid **accept** less (copper) carbonate/particles to react with **accept** no acid/carbonate left to react with = reactants used up
			Total	[5]	

Question			Expected Answers	Marks	Additional Guidance
8	a			[3]	second box has HCl (with correct use of capitals and no subscripts) = 1 mark last two boxes have H_2O and CO_2 in any order (with correct capitals and subscripts) = 1 mark second box has 2 in front of formula (whether right or wrong) and none of the other boxes have numbers in front of formula = 1 mark
	b		hydrogen ions (1)	[1]	
	c			[2]	correct pattern = 2 marks first box B and last box either A or D = 1 mark (**ignore** the other boxes)
	d		59 (1)	[1]	
			Total	[7]	

Question			Expected Answers	Marks	Additional Guidance
9	a			[1]	correct pattern of lines = 1 mark
	b		… produced per second. ☐ ☐ ☑ ☐ (1)	[1]	
			Total	[2]	

Grade Thresholds

General Certificate of Secondary Education
GCSE Twenty First Century Additional Science A (J631)
January 2010 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
A215/01	Raw	42				23	19	15	11	7	0
	UMS	34				30	25	20	15	10	0
A215/02	Raw	42	28	23	18	13	9	7			0
	UMS	50	45	40	35	30	25	20			0
A216/01	Raw	42				23	19	15	11	7	0
	UMS	34				30	25	20	15	10	0
A216/02	Raw	42	29	24	19	14	10	8			0
	UMS	50	45	40	35	30	25	20			0
A217/01	Raw	42				23	18	14	10	6	0
	UMS	34				30	25	20	15	10	0
A217/02	Raw	42	32	27	20	14	10	8			0
	UMS	50	45	40	35	30	25	20			0

Specification Aggregation Results

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

	Maximum Mark	A*	A	B	C	D	E	F	G	U
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	0.0	0.0	0.0	26.7	93.3	93.3	100.0	100.0	100.0	15

332 candidates were entered for aggregation this series.

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums/index.html

Statistics are correct at the time of publication.

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