

Additional Science A

General Certificate of Secondary Education

Unit **A215/02**: Modules B4, C4, P4

Mark Scheme for January 2013

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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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Annotations

Used in the detailed Mark Scheme:

Annotation	Meaning
/	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	credit alternative wording / or words to that effect
ORA	or reverse argument

Available in scoris to annotate scripts:

	indicate uncertainty or ambiguity
	benefit of doubt
	contradiction
	incorrect response
	error carried forward
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	no benefit of doubt

	reject
	correct response
	draw attention to particular part of candidate's response
	information omitted

Subject-specific Marking Instructions

- a. Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).
- b. 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 the third and fourth boxes are required for the mark:

✘
✘

*This would be worth
1 mark.*

✓
✘

*This would be worth
0 marks.*

✘
✘
✓
✓

*This would be worth
1 mark.*

- c. 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.

d. Marking method for tick-box questions:

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 and other markings. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses. Credit should be given according to the instructions given in the guidance column for the question. 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 cities in England:

Edinburgh	<input type="checkbox"/>
Manchester	<input type="checkbox"/>
Paris	<input type="checkbox"/>
Southampton	<input type="checkbox"/>

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

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

e. For answers marked by levels of response:

i. **Read through the whole answer from start to finish**

ii. **Decide the level that best fits** the answer – match the quality of the answer to the closest level descriptor

iii. **To determine the mark within the level**, consider the following:

Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

iv. Use the **L1**, **L2**, **L3** annotations in Scoris to show your decision; do not use ticks.

Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

Question		Answer	Marks	Guidance
1	(a)	DAECFB	2	D before A, A before E, E before C, C before F, all four correct = 1 mark two correct = 1 mark accept any clear indication of response eg numbers at the side of the letters in the question
	(b)	dilate increases increases vasodilation	2	all four correct = 2 marks two correct = 1 mark
Total			4	

Question		Answer	Marks	Guidance
2	(a)	ADH	1	accept aldosterone or antidiuretic hormone
	(b)	alcohol suppresses ADH production (1) produces greater volume/more dilute urine (1)	2	
Total			3	

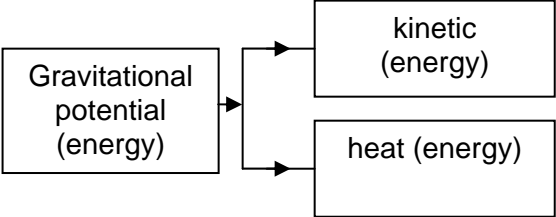
Question		Answer	Marks	Guidance
3	(a)	<p>any three from: other chemical/starch/substrate is the wrong shape/has to be right shape; to fit together; mention of active site; mention of lock and key model;</p>	3	accept 'enzyme needs to be right shape'
	(b) (i)	D	1	if left blank check for indication on the diagram
	(ii)	The frequency of collisions increases.	1	
	(c)		2	1 mark for each correct line
		Total	7	

Question		Answer	Marks	Guidance																								
4	(a)	<table border="0" style="width: 100%; text-align: center;"> <tr> <td>symbol</td> <td></td> <td>electron arrangement</td> </tr> <tr> <td><input type="text" value="Na"/></td> <td></td> <td><input type="text" value="2.8.0"/></td> </tr> <tr> <td><input type="text" value="Na<sup>+</sup>"/></td> <td></td> <td><input type="text" value="2.8.1"/></td> </tr> <tr> <td><input type="text" value="Cl<sup>-</sup>"/></td> <td></td> <td><input type="text" value="2.8.7"/></td> </tr> <tr> <td><input type="text" value="Cl"/></td> <td></td> <td><input type="text" value="2.8.8"/></td> </tr> </table>	symbol		electron arrangement	<input type="text" value="Na"/>		<input type="text" value="2.8.0"/>	<input type="text" value="Na<sup>+</sup>"/>		<input type="text" value="2.8.1"/>	<input type="text" value="Cl<sup>-</sup>"/>		<input type="text" value="2.8.7"/>	<input type="text" value="Cl"/>		<input type="text" value="2.8.8"/>	2	including the given line 4 lines correct = 2 marks 3 or 2 lines correct = 1 mark									
symbol		electron arrangement																										
<input type="text" value="Na"/>		<input type="text" value="2.8.0"/>																										
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<input type="text" value="Cl"/>		<input type="text" value="2.8.8"/>																										
	(b)	<table border="0" style="width: 100%; text-align: center;"> <tr> <td>start</td> <td>middle</td> <td>end</td> </tr> <tr> <td><input type="text"/></td> <td></td> <td><input type="text" value="randomly"/></td> </tr> <tr> <td>or</td> <td></td> <td>or</td> </tr> <tr> <td><input type="text" value="ions stay as ions"/></td> <td><input type="text"/></td> <td><input type="text"/></td> </tr> <tr> <td>or</td> <td>or</td> <td>or</td> </tr> <tr> <td><input type="text"/></td> <td><input type="text" value="move apart"/></td> <td><input type="text"/></td> </tr> <tr> <td>or</td> <td></td> <td>or</td> </tr> <tr> <td><input type="text"/></td> <td></td> <td><input type="text"/></td> </tr> </table>	start	middle	end	<input type="text"/>		<input type="text" value="randomly"/>	or		or	<input type="text" value="ions stay as ions"/>	<input type="text"/>	<input type="text"/>	or	or	or	<input type="text"/>	<input type="text" value="move apart"/>	<input type="text"/>	or		or	<input type="text"/>		<input type="text"/>	2	left hand side correct = 1 mark right hand side correct = 1 mark
start	middle	end																										
<input type="text"/>		<input type="text" value="randomly"/>																										
or		or																										
<input type="text" value="ions stay as ions"/>	<input type="text"/>	<input type="text"/>																										
or	or	or																										
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or		or																										
<input type="text"/>		<input type="text"/>																										
	(c)	circles all approximately the same size they should be grouped together positive circles may only touch negative, and vice versa	1	there must be at least four more circles; any extra circles must be correct credit any <u>correct</u> pattern of four circles, including chains ignore small gaps between circles accept variation in circle size so long as it doesn't look intentional																								
	(d)	conductivity measurement (1) of melt/solution (in water) (1)	2	credit any implication of conductivity a diagram is acceptable																								
Total			7																									

Question		Answer	Marks	Guidance												
5	(a)	<table border="1"> <thead> <tr> <th>element</th> <th>colour</th> <th>state</th> </tr> </thead> <tbody> <tr> <td>chlorine</td> <td>green</td> <td>gas</td> </tr> <tr> <td>bromine</td> <td>red/brown</td> <td>liquid</td> </tr> <tr> <td>iodine</td> <td>dark grey</td> <td>solid</td> </tr> </tbody> </table>	element	colour	state	chlorine	green	gas	bromine	red/brown	liquid	iodine	dark grey	solid	2	<p>all colours correct = 1 mark accept bromine colour as red, brown or red/brown</p> <p>all states correct = 1 mark accept g for gas accept l for liquid</p>
element	colour	state														
chlorine	green	gas														
bromine	red/brown	liquid														
iodine	dark grey	solid														
	(b)	<p>level of response (3 marks) can relate the different electron arrangements to ion formation—sodium loses (an electron) <u>and</u> chlorine gains (an electron), together with (2 marks) can state the electron arrangements—Group 1 have 1 outer electron and Group 7 have 7 outer electrons/one missing outer electron, together with (1 mark) realises that it is due to different (electron arrangements in) <u>outer</u> shells</p>	3	<p>saying only 'sodium loses an electron and chlorine gains an electron' with no further response scores 1 mark</p> <p>a candidate who does not specify that the electrons are in the <u>outer</u> shell can still get the other two marks</p>												
	(c)	2, Cl ₂ , 2	2	<p>all correct = 2 marks 1 or 2 correct = 1 mark</p>												
Total			7													

Question		Answer	Marks	Guidance
6	(a)	reaction force	1	
	(b)	<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="border: 1px solid black; padding: 2px; width: 150px;">friction force is...</div> <div style="border: 1px solid black; padding: 2px; width: 150px;">...dissipated</div> </div> <div style="display: flex; justify-content: space-around; align-items: flex-start; margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; width: 150px;">work done by Jared is...</div> <div style="border: 1px solid black; padding: 2px; width: 150px;">..equal to Jared's weight.</div> </div> <div style="display: flex; justify-content: space-around; align-items: flex-start; margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; width: 150px;">total reaction force is...</div> <div style="border: 1px solid black; padding: 2px; width: 150px;">...enough to stop feet slipping.</div> </div>	2	all correct = 2 marks two or one correct line(s) = 1 mark
	(c)	4N	1	
Total			4	

Question		Answer	Marks	Guidance
7	(a)	$\frac{1}{2} \times 50 \times 9^2$	1	
	(b)	any three from: GPE decreases ; because height (above ground) decreases ; KE increases ; as GPE is converted to KE/energy is conserved ;	3	credit "change in GPE not equal to increase in KE because some energy is transferred as heat"
Total			4	

Question		Answer	Marks	Guidance
8	(a)	 <pre> graph LR A[Gravitational potential (energy)] --> B[kinetic (energy)] A --> C[heat (energy)] </pre>	1	allow kinetic and heat energy either way round all 3 required for 1 mark allow GPE for gravitational potential energy
	(b)	$6700 \div 650$	1	any clear indication of correct response = 1 mark more than one response = 0 marks
Total			2	

Question		Answer	Marks	Guidance
9	(a)	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> A C B </div>	1	all three correct for the mark
	(b)	0.25s	1	
	(c)	The friction on the ball from the ground Work done on the moving ball <div style="display: inline-block; vertical-align: middle; margin-left: 20px;"> <div style="border: 1px solid black; width: 20px; height: 20px; display: flex; align-items: center; justify-content: center;"> </div> <div style="border: 1px solid black; width: 20px; height: 20px; display: flex; align-items: center; justify-content: center;">✓</div> <div style="border: 1px solid black; width: 20px; height: 20px; display: flex; align-items: center; justify-content: center;"> </div> <div style="border: 1px solid black; width: 20px; height: 20px; display: flex; align-items: center; justify-content: center;">✓</div> </div>	2	correct pattern for 2 marks one mistake for 1 mark a mistake is <ul style="list-style-type: none"> • a tick in the wrong place • a missing tick • an extra tick
Total			4	

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

OCR Customer Contact Centre

Education and Learning

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

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Facsimile: 01223 552553

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