

# **Additional Science A**

General Certificate of Secondary Education

Unit **A215/01**: 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
<b>not/reject</b>	answers which are not worthy of credit
<b>ignore</b>	statements which are irrelevant - applies to neutral answers
<b>allow/accept</b>	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:*

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

*This would be worth  
1 mark.*

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

*This would be worth  
0 marks.*

<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

*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		✓		✓	✓		✓	
<b>Score:</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>NR</b>

## 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)	<p>He will sweat less <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p>He will start to shiver <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	2	1 mark for each correct choice more than 2 choices, each extra choice loses 1 mark
	(b)	<p>...core body temperature is below 35°C <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	1	
	(c)	confusion (1) drowsiness (1) slurred speech (1)	3	1 mark for each choice <b>allow</b> any clear indication of correct choice more than 3 choices, then each extra choice loses 1 mark
<b>Total</b>			<b>6</b>	

Question		Answer	Marks	Guidance
2	(a)	C; B; A	2	all correct = 2 marks 2 or 1 correct = 1 mark
	(b)	partially permeable	1	
	(c)	osmosis	1	
	(d)	Sugar has moved into the potato. <input type="checkbox"/> Water has moved into the potato. <input checked="" type="checkbox"/> Sugar has moved out of the potato. <input type="checkbox"/>	1	
<b>Total</b>			<b>5</b>	



Question		Answer	Marks	Guidance
3		<p><i>any three from:</i></p> <ul style="list-style-type: none"> <li>the other chemical/starch is the wrong shape/has to be the right shape;</li> <li>to fit together;</li> <li>mention of active site;</li> <li>mention of lock and key model</li> </ul>	3	<b>accept</b> enzyme needs to be the right shape
<b>Total</b>			<b>3</b>	

Question		Answer	Marks	Guidance
4		<p><i>any four from:</i></p> <p>discusses colour [of light] links colour to element identity</p> <p>implies that [colour] has a pattern/can be broken down into components</p> <p>gives the correct colour for at least one of the elements gives the correct colour for a second element</p>	4	<p>the expected answers are what we will accept as a level EFG response</p> <p>also give credit for any of the more advanced ideas below</p> <p>spectrum lines idea that pattern is characteristic</p>
<b>Total</b>			<b>4</b>	

Question		Answer	Marks	Guidance										
5	(a)	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">symbol</th> <th style="width: 50%; text-align: center;">electron arrangement</th> </tr> </thead> <tbody> <tr> <td style="border: 1px solid black; text-align: center; padding: 5px;">Na</td> <td style="border: 1px solid black; text-align: center; padding: 5px;">2.8.0</td> </tr> <tr> <td style="border: 1px solid black; text-align: center; padding: 5px;">Na<sup>+</sup></td> <td style="border: 1px solid black; text-align: center; padding: 5px;">2.8.1</td> </tr> <tr> <td style="border: 1px solid black; text-align: center; padding: 5px;">Cl<sup>-</sup></td> <td style="border: 1px solid black; text-align: center; padding: 5px;">2.8.7</td> </tr> <tr> <td style="border: 1px solid black; text-align: center; padding: 5px;">Cl</td> <td style="border: 1px solid black; text-align: center; padding: 5px;">2.8.8</td> </tr> </tbody> </table>	symbol	electron arrangement	Na	2.8.0	Na <sup>+</sup>	2.8.1	Cl <sup>-</sup>	2.8.7	Cl	2.8.8	2	including the given line 4 lines correct = 2 marks 3 or 2 lines correct = 1 mark
symbol	electron arrangement													
Na	2.8.0													
Na <sup>+</sup>	2.8.1													
Cl <sup>-</sup>	2.8.7													
Cl	2.8.8													
	(b)	<p>...the particles stay as ions</p> <table style="margin-left: auto; margin-right: auto;"> <tr><td style="border: 1px solid black; text-align: center;">✓</td><td style="padding: 0 5px;">(1)</td></tr> <tr><td style="border: 1px solid black; height: 20px;"></td><td></td></tr> <tr><td style="border: 1px solid black; height: 20px;"></td><td></td></tr> <tr><td style="border: 1px solid black; height: 20px;"></td><td></td></tr> </table>	✓	(1)							1			
✓	(1)													
		<p>...move randomly through the solution</p> <table style="margin-left: auto; margin-right: auto;"> <tr><td style="border: 1px solid black; height: 20px;"></td><td></td></tr> <tr><td style="border: 1px solid black; text-align: center;">✓</td><td style="padding: 0 5px;">(1)</td></tr> <tr><td style="border: 1px solid black; height: 20px;"></td><td></td></tr> </table>			✓	(1)			1					
✓	(1)													
	(c)	<p>circles all approximately the same size they should be grouped together positive circles may only touch negative, and vice versa</p>	1	there must be at least four more circles; any extra circles must be correct <b>credit</b> any <u>correct</u> pattern of four circles, including chains <b>ignore</b> small gaps between circles <b>accept</b> variation in circle size so long as it doesn't look intentional										
<b>Total</b>			<b>5</b>											

Question		Answer	Marks	Guidance							
6	(a)	<table border="1"> <tr> <td><b>symbol</b></td> </tr> <tr> <td>Li</td> </tr> <tr> <td>Na</td> </tr> <tr> <td>K</td> </tr> </table>	<b>symbol</b>	Li	Na	K	1	the 'L' in Li must be a capital, the i must be lower case, so look for the dot the 'K' must be a capital, not just a large lower case letter (k), so look for absence of loop			
<b>symbol</b>											
Li											
Na											
K											
	(b) (i)	<table border="0"> <tr> <td style="border: 1px solid black; padding: 5px;">lithium</td> <td rowspan="3" style="vertical-align: middle;"> </td> <td style="border: 1px solid black; padding: 5px;">floats, melts, moves rapidly, bursts into flames</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">sodium</td> <td style="border: 1px solid black; padding: 5px;">floats, remains solid, moves slowly</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">potassium</td> <td style="border: 1px solid black; padding: 5px;">floats, melts, moves rapidly, fizzes</td> </tr> </table>	lithium		floats, melts, moves rapidly, bursts into flames	sodium	floats, remains solid, moves slowly	potassium	floats, melts, moves rapidly, fizzes	2	all three elements joined correctly = 2 marks two or one elements joined correctly = 1 mark
lithium		floats, melts, moves rapidly, bursts into flames									
sodium		floats, remains solid, moves slowly									
potassium		floats, melts, moves rapidly, fizzes									
	(ii)	<p>sodium hydroxide and hydrogen</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> </table> <p>(1)</p>			✓		1				
✓											
	(c)	NaCl (1)	1	do <b>not</b> penalise poor element symbols look for N, a, C and l in correct order (upper or lower case) with no numbers as superscripts or subscripts <b>accept</b> Na + Cl = NaCl							
	(d)	francium (1)	1	<b>accept</b> Fr as symbol for francium <b>accept</b> 'the bottom one'							
<b>Total</b>			<b>6</b>								

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	<b>credit</b> "change in GPE not equal to change in KE because some energy is transferred as heat"
<b>Total</b>			<b>4</b>	

Question		Answer	Marks	Guidance
8	(a)	B (1)	1	if answer line left blank, check for indication on diagram
	(b)	speeds up at start of journey/slows down at end of journey/stops at some point in journey (1) speed would be below 90 kph for part of journey so must be above at other times (to keep average at 90 kph) (1)	2	look for any sensible reason why the speed at some point is below 90 kph (1)  look for idea of higher than average speed at some point to compensate for lower speed at other times (1)
	(c)	Alice (1)	1	
	(d)	+20 m (1)	1	
<b>Total</b>			<b>5</b>	

Question			Answer	Marks	Guidance
9	(a)		weight	1	
	(b)		his kinetic energy is lost through heating	1	
	(c)	(i)	reaction	1	
		(ii)	The upward force is the same as the downward force	1	
			<b>Total</b>	<b>4</b>	

