

Additional Science A

General Certificate of Secondary Education

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

Mark Scheme for January 2012

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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
words	underlined words must be present in answer to score a mark
ecf	error carried forward
AW/owtte	alternative wording
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

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

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

This would be worth 1 mark.

Put ticks (✓) in the two correct boxes.

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

This would be worth 0 marks.

Put ticks (✓) in the two correct boxes.

<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 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

Question		Answer	Marks	Guidance
1	(a)	<p>any three from: one or two marks from:</p> <ul style="list-style-type: none"> uses the term diffusion (for either process) uses osmosis in context of movement of water only <p>and max two marks out of the three for:</p> <ul style="list-style-type: none"> oxygen/water moves from high to low concentration. [ignore oxygen moves from low to high concn unless it contradicts the previous] mentions partially/semi permeable membrane in context of osmosis only osmosis direction 	3	<p>only penalise incorrect statements if they CON another statement, otherwise ignore ignore irrelevant statements</p> <p>membrane – accept ‘little holes’</p> <p>assume osmosis explanation refers to the water molecules unless in the context of a solution accept ‘high to low concentrations’ ie refers to water concn accept ‘low to high solution concn’ – refers to solution accept ‘dilute to high [concn]’ – ‘dilute’ refers to solution</p> <p>“Both processes are diffusion, substances move from high to low concentration” = 2 ‘move along the concentration gradient’ not enough, direction not clear.</p>
	(b)	more concentrated homeostasis	1	both needed for the mark
Total			4	

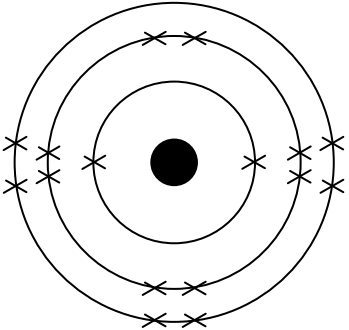
Question		Answer	Marks	Guidance								
2	(a)	<table border="1"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td>... between effectors and receptors reverses any changes that take place.</td><td>✓</td></tr> <tr><td> </td><td> </td></tr> </table>					... between effectors and receptors reverses any changes that take place.	✓			1	
... between effectors and receptors reverses any changes that take place.	✓											
	(b)	<table border="1"> <tr><td>... cancel each other out.</td><td> </td></tr> <tr><td>... allow a sensitive response to a stimulus.</td><td>✓</td></tr> <tr><td>... use more energy.</td><td> </td></tr> <tr><td>... prevent a steady state.</td><td> </td></tr> </table>	... cancel each other out.		... allow a sensitive response to a stimulus.	✓	... use more energy.		... prevent a steady state.		1	
... cancel each other out.												
... allow a sensitive response to a stimulus.	✓											
... use more energy.												
... prevent a steady state.												
	(c)	C A F	2	C anywhere before A = 1 mark A anywhere before F = 1 mark Cats Are Fast								
Total			4									

Question			Answer	Marks	Guidance
3		AB	Harry (1) Philippa (1)	2	accept in either order one mark for each
Total				2	

Question			Answer	Marks	Guidance																			
4	(a)		pituitary blood concentrated	2	all three correct = 2 marks one or two correct = 1 marks																			
	(b)		<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2">drug</th> <th colspan="2">effect on ADH secretion</th> <th colspan="2">effect on urine volume</th> </tr> <tr> <th>increase</th> <th>decrease</th> <th>increase</th> <th>decrease</th> </tr> </thead> <tbody> <tr> <td>alcohol</td> <td></td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>Ecstasy</td> <td>✓</td> <td></td> <td></td> <td>✓</td> </tr> </tbody> </table>	drug	effect on ADH secretion		effect on urine volume		increase	decrease	increase	decrease	alcohol		✓	✓		Ecstasy	✓			✓	2	1 mark for each correct row
drug	effect on ADH secretion		effect on urine volume																					
	increase	decrease	increase	decrease																				
alcohol		✓	✓																					
Ecstasy	✓			✓																				
Total				4																				

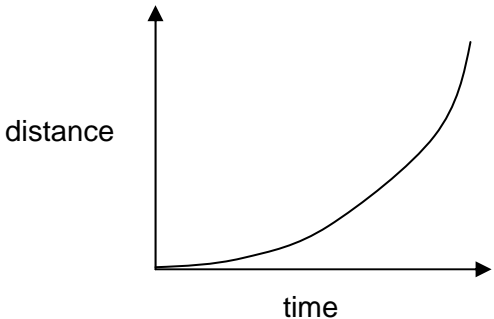
Question			Answer	Marks	Guidance
5			any three from: spectrum/spectroscopy; lines/ wavelengths/ frequencies; pattern/position (of lines); idea that spectrum/pattern [of lines] is characteristic/different OR match/compare [spectrum with known samples];	3	ignore light, colour eg line spectrum = 2 eg pattern of lines = 2 ignore “characteristic colour” or “combination of light”
Total				3	

Question		Answer	Marks	Guidance												
6	(a)	<table border="1"> <thead> <tr> <th>name</th> <th>colour</th> <th>state</th> </tr> </thead> <tbody> <tr> <td>bromine</td> <td>red/brown</td> <td>liquid</td> </tr> <tr> <td>chlorine</td> <td>green / green-yellow</td> <td>gas</td> </tr> <tr> <td>iodine</td> <td>grey/black</td> <td>solid</td> </tr> </tbody> </table>	name	colour	state	bromine	red/brown	liquid	chlorine	green / green-yellow	gas	iodine	grey/black	solid	3	all 6 boxes correct = 3 marks 4 or 5 boxes correct = 2 marks 2 or 3 boxes correct = 1 mark accept state symbols <i>l</i> <i>g</i> <i>s</i> ignore any other colours eg chlorine is green/yellow is OK
name	colour	state														
bromine	red/brown	liquid														
chlorine	green / green-yellow	gas														
iodine	grey/black	solid														
	(b)	$2\text{Na} + \text{Br}_2 \rightarrow 2\text{NaBr}$	2	all correct and balanced (2) accept BrNa instead of NaBr if not all correct, one mark maximum for either: $2\text{Na} + \text{Br}_2$ only on LHS (1) or: NaBr only on RHS, but with any number in front (1)												
	(c)	700-760 (1)	1													
	(d)	<table border="1"> <tbody> <tr> <td>it gains an electron</td> <td></td> </tr> <tr> <td>it loses an electron</td> <td>✓</td> </tr> <tr> <td>it gains a proton</td> <td></td> </tr> <tr> <td>it loses a proton</td> <td></td> </tr> </tbody> </table>	it gains an electron		it loses an electron	✓	it gains a proton		it loses a proton		1					
it gains an electron																
it loses an electron	✓															
it gains a proton																
it loses a proton																
Total			7													

Question		Answer	Marks	Guidance								
7	(a)	<table border="1"> <tr> <td>number of protons</td> <td>✓</td> </tr> <tr> <td>number of neutrons</td> <td></td> </tr> <tr> <td>relative atomic mass</td> <td></td> </tr> <tr> <td>size of the atom</td> <td></td> </tr> </table>	number of protons	✓	number of neutrons		relative atomic mass		size of the atom		1	
number of protons	✓											
number of neutrons												
relative atomic mass												
size of the atom												
	(b)		1	<p>6 in the outer shell, in any arrangement 8 in the middle shell, any arrangement</p> <p>accept dots, or 'e', instead of crosses, but candidate must use the same symbol for all the electrons</p>								
	(c)	Na ₂ S (1)	1									
	(d)	<table border="1"> <tr> <td>The ion has one electron more than the atom.</td> <td>✓</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table>	The ion has one electron more than the atom.	✓							1	
The ion has one electron more than the atom.	✓											
Total			4									

Question		Answer	Marks	Guidance
8	(a)		1	
		It increases the time for which forces act on Jack. ✓		
	(b)	7.5 (m/s) (1)	1	
	(c)	force (1) work (1)	2	
Total			4	

Question		Answer	Marks	Guidance								
9	(a)	12 to 15 30 55	1	all three for 1 mark								
	(b)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Air resistance reduces his momentum. ✓</td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table>	Air resistance reduces his momentum. ✓								1	
Air resistance reduces his momentum. ✓												
	(c)	<p>any three from: gravitational energy/PE/GPE decreases/is converted; at a constant rate; [energy] transferred to heat [Jim's] kinetic energy remains constant;</p>	3	<p>both the name [PE/GPE/grav E] and the idea of decrease/conversion are needed</p> <p>NB "Dropping at steady speed" = stem</p>								
Total			5									

Question		Answer	Marks	Guidance
10	(a)	10 000 kg m/s	1	
	(b)	<p>any three from:</p> <p>one or two marks from: gas has momentum momentum conserved</p> <p>a maximum of two marks from: links the gas/engine/rocket to a force/push forces equal [& opposite] OR mentions interaction/ /reaction pair links momentum [increase] to increase in speed/velocity</p>	3	<p>ignore references to air resistance/ friction</p> <p>the mark is not for the description of the rocket's increase in speed, but for realising that momentum increases because the rocket increases in speed.</p> <p>'movement increase' not enough for speed increase</p>
	(c)		1	<p>make sure graph starts at approximately 0,0</p> <p>the mark is for a convex curve – it does not have to be regular accept if it ends in a vertical line</p>
Total			5	

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