

Additional Science A

General Certificate of Secondary Education

Unit **A217/02**: Modules B6, C6, P6 (Higher Tier)

Mark Scheme for January 2011

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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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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, eg 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

eg 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.

The example below illustrates how to apply this principle to an objective question.
eg for a one mark question, where ticks in boxes 3 and 4 are required for the mark

Put ticks (✓) in
the two correct
boxes.

✓
ABC

*This would be
worth zero marks.*

Put ticks (✓) in
the two correct
boxes.

ABC
ABC

*This would be
worth one mark.*

Put ticks (✓) in
the two correct
boxes.

ABC
ABC
✓
✓

*This would be
worth one mark.*

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, eg 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, eg shading or crosses.

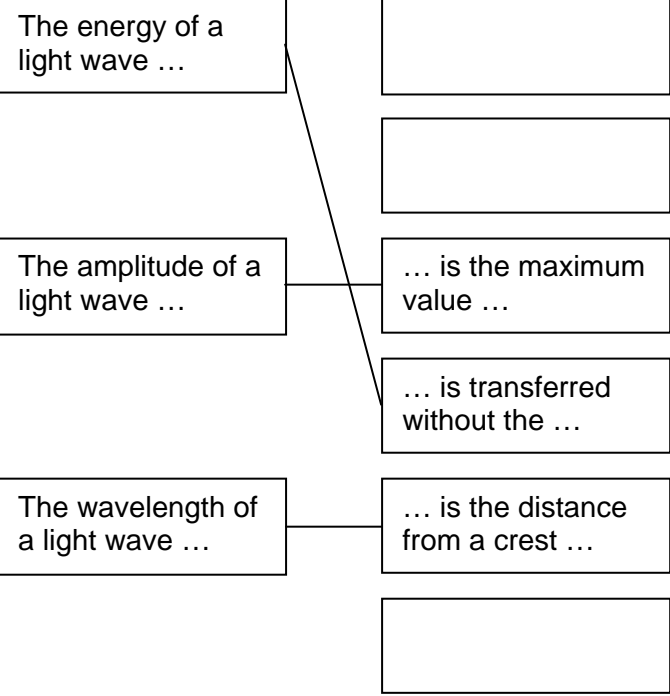
Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

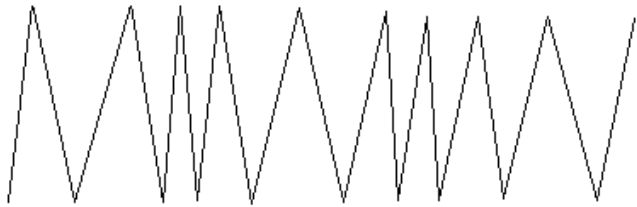
eg if a question requires candidates to identify a city in England, then in the boxes

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	Expected Answers	Marks	Additional Guidance
1 (a)	 <p>The energy of a light wave ...</p> <p>The amplitude of a light wave ...</p> <p>The wavelength of a light wave ...</p> <p>... is the maximum value ...</p> <p>... is transferred without the ...</p> <p>... is the distance from a crest ...</p>	[2]	All correct = 2 marks One or two correct = 1 mark Ignore any left hand box with more than line.
(b)	emits refracts wavelength reflects	[3]	All four correct for 3 marks. Three correct for 2 marks. Two correct for 1 mark.
(c)	A intensity = photon energy × photon rate	[1]	
Total		[6]	

Question	Expected Answers	Marks	Additional Guidance
2 (a)		[1]	Look for a wave form of fixed amplitude whose frequency changes as time increases from left to right. Must include at least one cycle of modulation.
(b)	<p>Any three from:</p> <ul style="list-style-type: none"> • (Digital code/ pulses) has two values/1 and 0/on and off; • Original sound recreated/regenerated/reformed/remade, from pattern of 1 and 0 at receiver; • Noise/distortion/interference is picked up between transmitter and receiver/ when it travels; • Gets rid of noise/interference 	[3]	<p>Accept binary.</p> <p>Accept coding/pulses can be recognised/seen/read/interpreted above noise (at receiver)</p> <p>Ignore carry more information per second/faster. Ignore no loss of quality unqualified. Ignore frequency or amplitude changes. Ignore amplifies sound but not noise.</p>
	Total	[4]	

Question			Expected Answers	Marks	Additional Guidance
3	(a)	(i)	diffraction (1)	[1]	
		(ii)	Light has a wave nature. (1) <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> The size of the hole ... (1) <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	[2]	
	(b)		A (1)	[1]	
Total				[4]	

Question	Expected Answers	Marks	Additional Guidance								
4 (a)	<p>Any three from:</p> <ul style="list-style-type: none"> • (Chemical/transmitter moves) by diffusion; • Binds/joins/attaches/fits in to receptors; • On the membrane of (neuron) B; • Receptors only bind to specific chemicals/transmitters; 	[3]	<p>Do not accept electrical impulses diffusing.</p> <p>Ignore breakdown of chemical/return of chemical to A 'after impulse in B'.</p>								
(b)	<table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border: 1px solid black; height: 40px;"></td> <td style="width: 50%; border: 1px solid black; height: 40px;"></td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">reduces serotonin removal by ...</td> <td style="border: 1px solid black; height: 40px;"></td> </tr> <tr> <td style="border: 1px solid black; height: 40px;"></td> <td style="border: 1px solid black; padding: 5px;">increases ... in synapse</td> </tr> <tr> <td style="border: 1px solid black; height: 40px;"></td> <td style="border: 1px solid black; height: 40px;"></td> </tr> </table>			reduces serotonin removal by ...			increases ... in synapse			[2]	<p>1 mark for LHS. 1 mark for RHS.</p> <p>More than 1 line = 0 marks</p>
reduces serotonin removal by ...											
	increases ... in synapse										
Total		[5]									

Question	Expected Answers	Marks	Additional Guidance
5 (a)	Any suitable example (1) Way it helps survival (1)	[2]	<p>Mark both sections together.</p> <p>Second mark can only be awarded in the light of the stated response. A wrong response may still get the second mark.</p> <p>The question is asking for the response. Second mark is for the reason that helps survival.</p> <p>Reflex the wrong way round [bright light makes pupil expand]; con for the first marking point.</p> <p>No ecf.</p> <p>Bright light makes pupil expand = 0 marks Protects eye from bright light = 1 mark</p>
	(b) sensory motor voluntary	[2]	<p>Three correct = 2 marks One or two correct = 1 mark</p>
	(c) A secondary stimulus is ... <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> The final response has no ... <input checked="" type="checkbox"/> <input type="checkbox"/>	[1]	All boxes correct for 1 mark.

Question		Expected Answers	Marks	Additional Guidance
	(d)	primary secondary conditioned	[2]	Three correct = 2 marks One or two correct = 1 mark
		Total	[7]	
6		<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="width: 80%;"> <p>New experiences cause new... <input type="checkbox"/></p> <p>Repetition makes new pathways... <input checked="" type="checkbox"/> (1)</p> <p><input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> </div> <div style="width: 15%; text-align: right;"> <p>(1)</p> <p>(1)</p> </div> </div>	[2]	<p>Correct pattern for [2] marks. One mistake for [1] mark.</p> <p>A mistake is:</p> <ul style="list-style-type: none"> • a tick in the wrong box • an extra tick
		Total	[2]	

Question	Expected Answers	Marks	Additional Guidance
7 (a)	<p><u>Major points</u> (one mark each):</p> <p>[add acid until indicator] changes colour / reference to colour change</p> <p>measure [total amount of acid] run in / [acid] measurement at end</p> <p><u>Minor points</u> (one mark for any one of the following to a maximum of 2):</p> <p>measure burette reading at start [add acid] slowly/drop by drop swirl/stir/mix [the flask contents] repeat the titration</p>	<p>[2]</p> <p>[2]</p>	<p>Accept any reference to colour change, eg 'acid changes colour'.</p> <p>Ignore the precise colour of the indicator, eg 'when indicator turns green' gets the mark for 'turns'.</p> <p>'Neutralises' is insufficient for colour change.</p> <p>Acid must ultimately be tied to the idea of end point, not just measure every ten seconds.</p> <p>Ignore references to time.</p>
(b)	<p style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> </p> <p>The sodium hydroxide contained (1)</p>	[1]	

Question	Expected Answers	Marks	Additional Guidance
(c) (i)	<p>correct formulae (1) $\text{H}_2\text{SO}_4 + \text{NaOH}$</p> <p>correct balancing (1)</p> <div style="border: 1px solid black; padding: 5px; display: inline-block;"> $\text{H}_2\text{SO}_4 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$ </div>	<p>[1]</p> <p>[1]</p>	<p>Either order. Capitals and lower case must be correct.</p> <p>Accept poor subscripts so long as the top of the number comes clearly below the middle of the preceding letter.</p>
(ii)	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$ </div>	[1]	Reactants in either order.
Total		[8]	

Question		Expected Answers	Marks	Additional Guidance				
8	(a)	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; border-radius: 50%; padding: 5px; text-align: center;">citric acid</div> <div>ethanoic acid</div> <div>hydrogen chloride</div> <div>sulfuric acid</div> </div>	[1]					
	(b)	<table border="1" style="margin: auto;"> <tr> <td style="padding: 2px 5px;">B</td> <td style="padding: 2px 5px;">D</td> <td style="padding: 2px 5px;">C</td> <td style="padding: 2px 5px; background-color: #cccccc;">A</td> </tr> </table>	B	D	C	A	[2]	B in first position = 1 mark C in last position = 1 mark If letter is repeated, deduct 1 mark. If same letter is written 3 times = 0 marks.
B	D	C	A					
	(c)	magnesium chloride $MgCl_2$	[1] [1]	Do not allow chlorine. Do not allow formula with charges. Capitals and lower case must be correct. Accept poor subscripts so long as the top of the number comes clearly below the middle of the preceding letter.				
	(d)	magnesium oxide (1) <div style="float: right; margin-right: 20px;"> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>	[1]					
Total			[6]					

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