

## **Science A**

General Certificate of Secondary Education

Unit **A143/01**: Unit 3: Modules B3, C3, P3 (Foundation Tier)

## **Mark Scheme for June 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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## 1. 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:

	correct response
	incorrect response
	benefit of doubt
	no benefit of doubt
	error carried forward
	indicate level awarded for a question marked by level of response
	information omitted
	contradiction
	reject

	indicate uncertainty or ambiguity
	draw attention to particular part of candidate's response

## 2. 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 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	✓	✗	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	✗		✓		✓	✓		✓	
<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)		230 V	1	
	(b)		1650 (2)	2	otherwise look for 110x15 (1)
	(c)		400p or £4 (2)	2	otherwise look for 2x8x25 (1) allow £400 (1)
			<b>Total</b>	<b>5</b>	

Question			Answer	Marks	Guidance																								
2	(a)		<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td>coal</td><td>✓</td><td>(1)</td></tr> <tr><td></td><td></td><td></td></tr> <tr><td>nuclear</td><td>✓</td><td>(1)</td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> </table>							coal	✓	(1)				nuclear	✓	(1)										2	
coal	✓	(1)																											
nuclear	✓	(1)																											
	(b)		<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td>using resources no faster than produced</td><td>✓</td><td>(1)</td></tr> </table>													using resources no faster than produced	✓	(1)	1										
using resources no faster than produced	✓	(1)																											
			<b>Total</b>	<b>3</b>																									

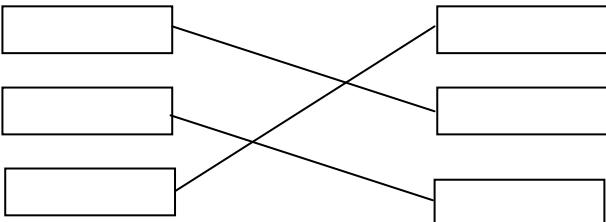
Question		Answer	Marks	Guidance
3	(a)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> furnace (1)      turbine (1)      generator (1)	3	
	(b)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> does not produce CO <sub>2</sub> <input checked="" type="checkbox"/> (1)	1	
	(c)	any two plausible statements	2	e.g. suitable reference to hills [not essential, eg tidal power] suitable reference to water / rain / sea  'not enough space' must be explained adequately eg "a large area of farmland would have to be flooded" <b>ignore</b> 'not enough space to build'  <b>ignore</b> cost / poverty / lack of resources / unqualified statements about weather / unqualified landscape
		Total	6	

Question		Answer	Marks	Guidance
4		<p><b>Level 3 (5–6 marks)</b></p> <p>Correctly compares across two rows AND realises that increased fuel costs will make insulation more worthwhile.</p> <p>Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b></p> <p>Compares across two rows. Reference to fuel costs missing or incorrect OR compares across 1 row and reference to fuel costs correct.</p> <p>Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b></p> <p>Discusses one row only OR discusses a column OR discusses fuel costs. Any mention of fuel costs or payback time is probably incorrect.</p> <p>Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b></p> <p>Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>This question is targeted at grades up to C.</b></p> <p><b>Indicative scientific points at level 3 may include:</b></p> <ul style="list-style-type: none"> <li>• realises that a rise in fuel cost will make savings, but may have difficulty in articulating this idea.</li> <li>• explanation of effect of insulation in terms of reduced heat loss <b>so</b> less fuel used / cost savings.</li> </ul> <p><b>Indicative scientific points at level 2 may include:</b></p> <ul style="list-style-type: none"> <li>• may confuse payback time with lifetime</li> <li>• Comparison may have some inaccuracies.</li> </ul> <p><b>Indicative scientific points at level 1 may include:</b></p> <ul style="list-style-type: none"> <li>• partial use of data, eg just one column, or just one row</li> <li>• discussion of fuel cost and nothing else correct</li> </ul> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
		<b>Total</b>	<b>6</b>	

Question			Answer	Marks	Guidance												
5	a	i	3–3.5 [million]	1													
		(ii)	decrease AND fewer bees / reduced pollination (1)	1	<b>allow</b> “less fruit produced, so less for bees to eat” <b>ignore</b> erroneous causality												
		(iii)	sudden [decrease in population] (1)	1	any implication of the change in gradient. eg ‘big drop’ <b>ignore</b> “decrease in population”												
		(iv)	<b>any two plausible statements</b> efforts have been made to conserve bees more bee colonies imported bees become resistant / adapted efforts have been made to get rid of the mite (1)	2	<b>allow</b> any reasonable suggestion  <b>allow</b> mites died / not killing the bees so much												
	(b)	(i)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td>Donna</td><td>✓</td><td>(1)</td></tr> </table>										Donna	✓	(1)	1	
Donna	✓	(1)															
		(ii)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td></td><td></td><td></td></tr> <tr><td>Bernie</td><td>✓</td><td></td></tr> <tr><td>Cheryl</td><td>✓</td><td></td></tr> <tr><td></td><td></td><td></td></tr> </table>				Bernie	✓		Cheryl	✓					1	both needed for the mark
Bernie	✓																
Cheryl	✓																
		(c)	idea of monoculture eg ‘only one crop’ (1)  idea of reduced biodiversity – eg ‘not as many flowers/insects’ / fewer hedgerows / less wildlife / more pesticide use (1)	2	<b>allow</b> ‘reduced microorganisms’												
			<b>Total</b>	<b>9</b>													

Question			Answer					Marks	Guidance																									
6	(a)	(i)	<table border="1"> <tr> <td>leathery skin.....</td> <td>physical</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>strong claws.....</td> <td>physical</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>gland produces....</td> <td>both</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>Streamlined</td> <td>physical</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>huddles....</td> <td>behavioural</td> <td></td> <td>✓</td> <td></td> </tr> </table>					leathery skin.....	physical	✓			strong claws.....	physical	✓			gland produces....	both			✓	Streamlined	physical	✓			huddles....	behavioural		✓		3	5 rows correct = (3) 4 rows correct = (2) 3 rows correct = (1) 2 rows correct = (0)
leathery skin.....	physical	✓																																
strong claws.....	physical	✓																																
gland produces....	both			✓																														
Streamlined	physical	✓																																
huddles....	behavioural		✓																															
		(ii)	<p>Candidates may use one of two approaches in their answer. If they use both, both should be assessed and the higher of the two marks awarded.</p> <p><b>Approach 1</b></p> <p><b>Level 3 (5–6 marks)</b> Demonstrates clear understanding by implying variation in penguins, links survival to variation/feature/environment. Links survival to breeding. Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> Implies variation in penguins, discusses survival and breeding without emphasising differences or environment – eg 'healthy offspring'. Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> The candidate discusses one of the indicative points about evolution Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>					6	<p><b>Approach 1</b></p> <p><b>This question is targeted at grades up to C.</b></p> <p><b>Ignore the terms 'evolve', 'adapted', and 'environment' [stem]</b></p> <p><b>Indicative scientific points include:</b></p> <ul style="list-style-type: none"> <li>there is variation in the penguins [may be implied by words such as fittest / strongest / weakest]</li> <li>some of this is due to genetic differences/mutations</li> <li>penguins compete for resources</li> <li>only some organisms survive/survival of the fittest idea</li> <li>these organisms are more likely to reproduce</li> <li>passing on the beneficial characteristic to offspring.</li> </ul> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>																									

Question		Answer	Marks	Guidance
	(ii)	<p><b>Approach 2</b></p> <p><b>Level 3 (5–6 marks)</b> Discusses at least three adaptations. If they come from part a] <b>at least</b> two of them are explained using ideas not given in the question. If the adaptations did not come from part a], they may not be correct. Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> Gives at least two adaptations from part a], each with explanation. Explanations may be taken from the question itself. Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> Gives one adaptation and attempts a simple reason. Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>Approach 2</b></p> <p><b>This question is targeted at grades up to C.</b></p> <p><b>Indicative scientific points from part a] include:</b></p> <p><b>From the question</b></p> <ul style="list-style-type: none"> <li>leathery skin on feet <b>to protect from rocks</b></li> <li>strong claws <b>to grip rocks</b></li> <li>oil glands to spread on feathers.</li> <li>streamlined</li> <li>huddling in groups <b>for warmth</b></li> </ul> <p><b>Further detail not from the question</b></p> <ul style="list-style-type: none"> <li>links streamlined body shape to swimming / feeding</li> <li>links beak shape to feeding</li> <li>links warmth to anything other than huddling eg layer of body fat / 'feathers keep them warm'</li> <li>explains why oil on feathers might help</li> <li>webbed feet plus reason</li> <li>eggs on feet to keep them warm/incubate</li> </ul> <p>Ignore "thick fur to keep them warm"</p> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
	(b)	<p><b>any two plausible suggestions</b> reduction in food / more competition new predator disease increased temperatures / global warming / climate change presence of humans specified pollution ice melting / loss of habitat</p>	2	<p><b>ignore</b> general statements such as 'environmental damage' or 'species become endangered' 'change in weather'</p>
		<b>Total</b>	11	

Question		Answer			Marks	Guidance															
7	(a)				2	all 3 lines correct = 2 marks 2 or 1 line correct = 1 mark															
	(b)	<table border="1" data-bbox="370 484 1044 674"> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td>Water flowing over a sandy beach.</td><td>✓</td><td></td></tr> </table>															Water flowing over a sandy beach.	✓		1	tick in any other box = 0
Water flowing over a sandy beach.	✓																				
	(c)	<p>discusses <i>movement</i> [eg drift / move / split / spread / collide] of anything suitable [continents, land, sea floor, convection currents] (1)</p> <p>discusses plates or tectonics (1)</p>			2	<p><b>ignore</b> reference to 'rocks' moving</p> <p><b>ignore</b> references to the fossil record matching across continents</p>															
		<b>Total</b>			<b>5</b>																

Question		Answer	Marks	Guidance
8	(a)	dissolving	1	<b>allow</b> words including solution <b>allow</b> heating / pumping <b>ignore</b> 'evaporating' as the salt is not evaporated
	(b)	<b>any two plausible suggestions eg</b> collapse of houses/roads/ landslides; loss of farmland; risk to utility supply; risk to people; disrupts mining	2	<b>ignore</b> general statements such as 'environmental damage' or 'species become endangered' or 'uneven ground' 'cracks' /'holes in the ground'
	(c)	<b>any plausible suggestion eg</b> employment / there before industry / economic / may assess risk as low / collapses rare	1	<b>ignore</b> pleasant environment economic argument must be qualified 'cheaper' not enough, 'cheaper housing' (1)
		<b>Total</b>	<b>4</b>	

Question		Answer	Marks	Guidance
9	(a)	<p><b>Level 3 (5–6 marks)</b> At least three observations from the graph AND a statement that chlorine kills the microbes. Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> At least 2 observations from the graph. Ideally some attempt to say how chlorine does this. Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> One observation from the graph OR about the effect of chlorine on the water / disease. Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>This question is targeted at grades up to E</b></p> <p><b>Indicative scientific points may include:</b></p> <ul style="list-style-type: none"> <li>• 25–30 deaths [per 100,000] per year before chlorine added</li> <li>• deaths reduced</li> <li>• description of drop eg gradient</li> <li>• description of drop eg year</li> <li>• graph fluctuates</li> <li>• graph to zero / typhoid eliminated</li> <li>• by 1950</li> <li>• chlorine kills typhoid microbes [accept chlorine kills the typhoid disease] ['chlorine treats the water' is from the stem]</li> <li>• not all water supplies chlorinated immediately</li> <li>• typhoid infection may be passed on by other mechanisms.</li> </ul> <p>"Them" or "it" unspecified refers to typhoid deaths. Ignore discussion of dangers of chlorine.</p> <p>'Chlorine cleans the water' is very weak, but just acceptable</p> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>

Question			Answer			Marks	Guidance																					
	(b)	(i)	<table border="1"> <tr> <td>1895</td><td>1925</td><td></td></tr> <tr> <td>30</td><td>7</td><td></td></tr> </table>			1895	1925		30	7		1																
1895	1925																											
30	7																											
		(ii)	<p>[Matt] because <b>any two from</b>            big fall [in deaths] / fall goes to zero;            fall bigger than variation / general trend down bigger than variation;            suitable discussion of correlation;</p>			2	mark for explanation only  if Julie is specified (0)																					
	(c)		<table border="1"> <tr><td></td><td></td><td></td></tr> <tr><td>The risk from...</td><td>✓</td><td>(1)</td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td>The benefit of adding...</td><td>✓</td><td>(1)</td></tr> </table>						The risk from...	✓	(1)													The benefit of adding...	✓	(1)	2	if 3 ticks deduct 1 mark 4 or 5 ticks = 0
The risk from...	✓	(1)																										
The benefit of adding...	✓	(1)																										
			<b>Total</b>			<b>11</b>																						

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