

**Science A**

General Certificate of Secondary Education

Unit **A141/01**: Unit 1: Modules B1, C1, P1 (Foundation Tier)

# **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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**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		✓		✓	✓		✓	
<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:

- Read through the whole answer from start to finish**
- Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor
- 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

- 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.

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Question			Answer	Marks	Guidance																	
1	(a)		DNA (1) genes (1)	2																		
	(b)	(i)	<table><tr><td colspan="2" rowspan="2"></td><td colspan="2">individual P</td></tr><tr><td>d</td><td>d</td></tr><tr><td rowspan="2">individual Q</td><td>d</td><td>dd</td><td>dd</td></tr><tr><td>d</td><td>dd</td><td>dd</td></tr><tr><td colspan="2"></td><td>.....</td><td>.....</td></tr></table>			individual P		d	d	individual Q	d	dd	dd	d	dd	dd			.....	.....	1	
		individual P																				
		d	d																			
individual Q	d	dd	dd																			
	d	dd	dd																			
		.....	.....																			
		(ii)	<i>yes/she should because:</i> all offspring/S would be affected/have polydactyl (if condition was caused by a recessive allele) (1) must be caused by a dominant allele/D (1)	2	yes/she should does not score, marks are for the explanation. if candidate response begins “No, because .....” then must score 0 for the rest of the response																	
			<b>Total</b>	<b>5</b>																		

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Question		Answer	Marks	Guidance
2	(a)	D F E (1); (A) C G B (1);	2	
	(b)	<p><b>Level 3 (5–6 marks)</b>            Answer describes a range of viewpoints that might be held about testing fetuses, using the two examples. A balanced argument is presented in which the issues for and against one of the examples is considered. Some consideration may be made of the legal/regulatory issues.</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>            Answer describes some viewpoints that might be held about testing fetuses, with reference to at least one example. Some issues for and against the procedure are considered.</p> <p>Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b>            Answer describes a few viewpoints but it may not be balanced between pros and cons, nor refer to the examples. Answer may be simplistic.</p> <p>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 C</b></p> <p><b>Indicative Content:</b></p> <p>testing to find out if a fetus has a genetic disease:</p> <ul style="list-style-type: none"> <li>• can decide whether to have an abortion if fetus has a disease</li> <li>• arguments for and against abortion</li> <li>• ethical issues</li> <li>• prevents suffering of the baby</li> <li>• reduces stress on the family</li> <li>• reduces cost of care</li> <li>• reduces strain on the medical profession</li> <li>• reduces incidence of disease in population</li> <li>• allows parents to plan ahead for the care of the child.</li> </ul> <p>testing the sex of the fetus:</p> <ul style="list-style-type: none"> <li>• should not be allowed to select gender</li> <li>• consideration of whether there is an associated medical condition</li> <li>• possible imbalance of gender</li> <li>• ethical issues.</li> </ul>
Total			8	

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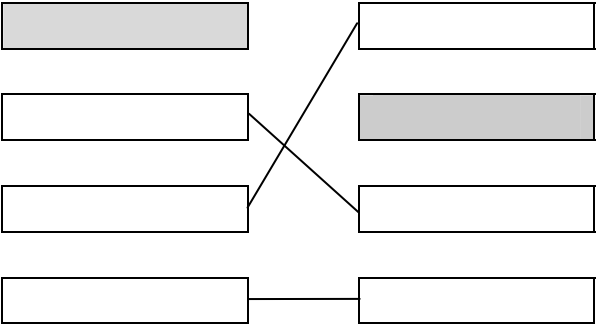
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Question			Answer	Marks	Guidance
3	(a)		<div> <div>individuals that have identical genes</div> <div> <input type="checkbox"/>  <input checked="" type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/> </div> </div>	1	
	(b)		bulbs / runners (1)	1	<b>allow</b> tubers/stolons/corms/rhizomes/asexual reproduction
	(c)	(i)	20.0–21.9 (1)	1	
		(ii)	as height increases, number of plants increases (1) and then decreases (1)	2	award 2 marks for normal distribution between number of plants and height of plants
		(iii)	<b>any two from:</b> <i>William because:</i> all plants were taken from same plant so must be clones (1) but exposed to different <u>environmental</u> factors which would affect their growth (1) example of an environmental factor, eg nutrients, water, light, carbon dioxide etc (1)	2	<b>allow</b> all plants have same DNA/genes  <b>accept</b> sunlight NOT sun <b>ignore</b> nutrition
			<b>Total</b>	<b>7</b>	

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Question			Answer	Marks	Guidance										
4	(a)	(i)		2	all 3 lines correct = 2 marks 2 or 1 line correct = 1 mark										
		(ii)	nitrogen and oxygen <u>from the air</u> ; (1) react at high temps of the engine; (1)	2	<b>accept</b> heat in the engine										
	(b)		<table><tr><td></td><td></td></tr><tr><td>Nitrogen dioxide reacts with oxygen ...</td><td>✓</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td>Rain washes acids out of the air.</td><td>✓</td></tr></table>			Nitrogen dioxide reacts with oxygen ...	✓					Rain washes acids out of the air.	✓	2	1 mark for each correct tick. if 3 ticks deduct 1 mark. 4 or 5 ticks = 0
Nitrogen dioxide reacts with oxygen ...	✓														
Rain washes acids out of the air.	✓														
			<b>Total</b>	<b>6</b>											

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Question			Answer	Marks	Guidance										
5	(a)		<table><tr><td></td><td></td></tr><tr><td>People drive further each year.</td><td>✓</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td>More cars are being driven.</td><td>✓</td></tr></table>			People drive further each year.	✓					More cars are being driven.	✓	2	1 mark for each correct tick. if 3 ticks deduct 1 mark. 4 or 5 ticks = 0
People drive further each year.	✓														
More cars are being driven.	✓														
	(b)		<b>any two from:</b> goes down; (1) goes from 1 to 0.4; (1) goes from 2020 to 2070 (1) flat until 2025; (1) flat from 2070; (1)	2	NB goes down from 1 to 0.4 scores 2 marks goes down from 2025 to 2070 scores 2 marks										
	(c)		pollution goes down (using electricity)/ORA (1) correct explanation using both graphs; (1)	2											
			<b>Total</b>	<b>6</b>											

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Question			Answer	Marks	Guidance
6	(a)		$100 - (48 + 2 + 47.5) = 2.5$ (1) (1)	2	correct answer without working = 2 marks answer may appear in the table
	(b)		<p><b>Level 3 (5–6 marks)</b> Correct changes in amounts of CO<sub>2</sub>, O<sub>2</sub> and water vapour. Changes in amounts of CO<sub>2</sub> and O<sub>2</sub> linked to photosynthesis and that of water vapour linked to cooling earth.</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> Correct changes in amounts of CO<sub>2</sub>, O<sub>2</sub> and water vapour can be stated or implied, and one linked to a correct reason, or correct changes to two of the gases and a reason given for both of them. The reason for the change can be stated or implied.</p> <p>Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> Correct changes in amounts of at least 2 of CO<sub>2</sub>, O<sub>2</sub> and water vapour with no link to reason, or one gas linked to a reason without specifying how it changed. Answer may be simplistic.</p> <p>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>Relevant points include:</b></p> <ul style="list-style-type: none"> <li>Carbon dioxide decreased because green plants photosynthesised</li> <li>Oxygen increased because green plants photosynthesised</li> <li>Water vapour decreased because (temperatures lowered and) water vapour condensed.</li> </ul> <p><b>Allow</b></p> <ul style="list-style-type: none"> <li>Carbon dioxide decreased because it dissolved in the oceans</li> <li>Carbon dioxide decreased because it was trapped as shells/sedimentary rocks.</li> <li>Carbon dioxide decreased because it was converted into fossil fuels</li> </ul>
			<b>Total</b>	<b>8</b>	

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Question			Answer	Marks	Guidance
7	(a)		A (1); B (1)	2	
	(b)	(i)	time of travel = 4 minutes	1	<b>allow</b> 3 to 5 minutes
		(ii)	distance = 420 km/minute $\times$ 4 minutes (1) = 1680 (km) (1)	2	include bi answer in Scoris zone ecf from bii: Accept 1680km on its own for 2 marks accept 28 km for (1)
		(iii)	Simeulue was much closer (to Thailand) (1); bigger (amplitude of) recording/higher reading (1)	2	any indication of attenuation or of energy spreading out gains the 2 <sup>nd</sup> mark <b>allow</b> stronger/larger/taller/more powerful <u>wave</u> NOT earthquake
			<b>Total</b>	<b>7</b>	

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Question			Answer	Marks	Guidance										
8	(a)		as distance goes up, speed goes up as well owtte	1	<b>accept</b> 'positive correlation (between distance and speed)'										
	(b)		EITHER (E) is (halfway) between B/18 000 and C/21 000 (1) OR (E) is 3 x galaxy A distance, 3×6500 (1) (because 900 is 3×300)  19 500 (km/s) (1);	2	<b>accept</b> 19 500 unjustified for (2) <b>accept</b> any value between 18 000 to 21 000 for (1)										
	(c)		<table><tr><td>The Milky Way ...</td><td>✓</td></tr><tr><td>The Universe contains ...</td><td></td></tr><tr><td>Some galaxies are ...</td><td></td></tr><tr><td>Distant galaxies are ...</td><td>✓</td></tr><tr><td>Spacecraft have been ...</td><td></td></tr></table>	The Milky Way ...	✓	The Universe contains ...		Some galaxies are ...		Distant galaxies are ...	✓	Spacecraft have been ...		2	deduct one mark for each extra tick.
The Milky Way ...	✓														
The Universe contains ...															
Some galaxies are ...															
Distant galaxies are ...	✓														
Spacecraft have been ...															
	(d)		<table><tr><td>their motion</td><td>✓</td></tr><tr><td>their shapes</td><td></td></tr><tr><td>their distances</td><td>✓</td></tr><tr><td>their temperatures</td><td></td></tr><tr><td>the number of stars ...</td><td></td></tr></table>	their motion	✓	their shapes		their distances	✓	their temperatures		the number of stars ...		2	deduct one mark for each extra tick.
their motion	✓														
their shapes															
their distances	✓														
their temperatures															
the number of stars ...															
			<b>Total</b>	<b>7</b>											

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Question			Answer	Marks	Guidance
9			<p><b>Level 3 (5–6 marks)</b> Complete mechanism for role of mantle in sea-floor spreading plus at least one consequence of sea-floor spreading.</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> Incomplete mechanism for role of mantle in sea-floor spreading plus a consequence, OR Complete mechanism of convection in the mantle without consequences.</p> <p>Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> Describes one consequence of sea-floor spreading, but mechanism is incorrect, unclear or missing.</p> <p>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>This question is targeted at grades up to C</p> <p><b>Indicative scientific points about consequences may include:</b></p> <ul style="list-style-type: none"> <li>explains mountain building, volcanoes, earthquakes.</li> <li>magnetic stripes in crust on sea-floor</li> <li>tectonic plates move apart</li> <li>continental drift</li> <li>justify aspects of Wegener's ideas</li> </ul> <p><b>Indicative scientific points about mechanisms may include:</b></p> <ul style="list-style-type: none"> <li>Movement in mantle</li> <li>Convection current pushing crust</li> <li>molten rock exuded at mid-ocean ridge</li> <li>new rocks formed in opening in crust</li> <li>newer rocks close to gap &amp; older further off</li> <li>crustal plates move slowly apart from mid-ocean ridge</li> </ul> <p><b>accept</b> discussion of Wegener's lack of acceptance by the scientific community</p> <p><b>accept</b> description of symmetrical magnetic stripes as evidence (on H-tier Specification only)</p> <p><b>ignore</b> any references to religious authority</p>
			<b>Total</b>	<b>6</b>	

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