

Additional Science A

General Certificate of Secondary Education

Unit **A151/01**: Modules B4, C4, P4 (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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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
<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
	no benefit of doubt
	reject
	correct response

L1 , L2 , L3	indicate level awarded for a question marked by level of 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:

✗
✗

*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	
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

- 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)	oxygen	1	accept O ₂
	(b) (i)	any one from: not all bubbles are the same size; the pondweed might photosynthesise at different rates (in different 5 minute slots); variation in water temperature/additional heat from bulb; variation in dissolved CO ₂ / pH variation in pondweed sample (size, number of leaves, position in beaker) variation in light intensity of bulb	1	allow an example of human error e.g. incorrect measurement
	(ii)	20	1	accept answer given in the table
	(iii)	the more/ more intense / brighter the light, the more photosynthesis	1	allow reverse argument allow "it" = photosynthesis reject closer the light, the more photosynthesis ignore references to number of bubbles ignore reference to heat
	(c) (i)	light meter and quadrat	1	both required for the mark
	(ii)	there will be more plants (as she walks away from tree) (1) because there is less light (under the tree/in the shade) / lower light intensity (for photosynthesis) (1)	2	NB if they say there will be fewer plants, must say under the tree. allow reverse arguments ignore references to sun – e.g. "the sun can't get to them"
		Total	7	

Question	Answer	Marks	Guidance
2	<p>Level 3 (5–6 marks) Makes a clear comparison between aerobic and anaerobic respiration based on oxygen requirements, energy outputs or products Quality of written communication does not impede communication of the science at this level.</p> <p>Level 2 (3–4 marks) Gives more than one point about one or both types of respiration but there is no direct comparison between the two. Quality of written communication partially impedes communication of the science at this level.</p> <p>Level 1 (1–2 marks) Makes a valid point about only one type of respiration. Quality of written communication impedes communication of the science at this level.</p> <p>Level 0 (0 marks) Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p>This question is targeted at grades up to F</p> <p>Indicative scientific points include:</p> <ul style="list-style-type: none"> • anaerobic respiration takes place when there is a lack of oxygen • aerobic respiration needs/uses oxygen • anaerobic respiration produces lactic acid • lactic acid builds up • this causes pain/is uncomfortable • aerobic respiration produces carbon dioxide and water • energy released from glucose (in both) • aerobic respiration produces more energy (for a given amount of glucose) • anaerobic respiration leads to oxygen debt <p>reject anaerobic respiration produces ethanol / carbon dioxide accept correct word equation for aerobic respiration for 2 points(using oxygen and products) accept correct word equation for anaerobic respiration for 2 points(not using oxygen and production of lactic acid/products), BUT both equations only does not attain level 3 unless fully explained. ignore lactic acid causes cramp ignore references to air</p> <p>If answer suggests that respiration is breathing, limit to level 2 even if criteria for level 3 otherwise met.</p> <p>BEWARE ANSWERS WHICH COPY FROM THE STEM OF THE QUESTION</p>
	Total	6	

Question		Answer	Marks	Guidance
3	(a)	links A to 14°C / sea temperature / sea bacteria / the lower of the two temperature ranges ORA goes beyond shape of graph to <i>meaning</i> – maximum activity / optimum activity [of the enzyme]/denatures at specific temperature linked to graph	2	assume 'it' to mean enzyme A [see stem] any specified temperature must clearly belong to its appropriate graph must imply [enzyme] activity, not just optimum temperature "because when enzyme A gets over 14°C its activity drops" = 2
	(b)	the enzyme does not work/no reaction; the enzyme is permanently changed / destroyed/denatured/change shape of molecule or active site;	2	accept the experiment does not work allow no result reject enzyme killed/dies
Total			4	

Question		Answer	Marks	Guidance										
4	(a)	partially 40–60 a more concentrated	2	3 correct = 2 marks 2 correct = 1 mark 0 or 1 correct = 0 marks										
	(b)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="height: 15px;"></td><td style="width: 20px;"></td></tr> <tr><td style="height: 15px;"></td><td></td></tr> <tr><td style="height: 15px;"></td><td></td></tr> <tr><td style="height: 15px;">Repeat each concentration and calculate the average...</td><td style="text-align: center;">✓</td></tr> <tr><td style="height: 15px;"></td><td></td></tr> </table>							Repeat each concentration and calculate the average...	✓			1	
Repeat each concentration and calculate the average...	✓													
Total			3											

Question		Answer	Marks	Guidance												
5	(a)	toxic	1													
	(b)		1													
	(c) (i)	iron + chlorine (1) → iron chloride (1)	2	ignore any numbers given, as long as words are correct												
	(ii)	<table border="1" data-bbox="371 475 636 619"> <tr> <td>solid</td> <td>liquid</td> <td>gas</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>	solid	liquid	gas			✓	✓			✓			2	3 correct = 2 marks 2 correct = 1 mark 1 correct = 0 marks
solid	liquid	gas														
		✓														
✓																
✓																
	(d)	17	1													
Total			7													

Question		Answer	Marks	Guidance
6	(a)	KCl	1	must be capital K & C and lower case 'l', judged by eye allow full equation if formula is correct
	(b)	2	1	
	(c)	<p>any two from: realises that electrons are split into 'groups'; identifies the 'groups' as shells; numbers show how many electrons (in each shell); links '2' to inner shell / '1' to outer shell; there are 11 electrons (in the sodium atom); first two shells are complete;</p>	2	an answer of "It shows how many electrons are in each shell" scores 2 marks
	(d)	<p>[particles are] ions/it is ionic; [particles / ions have] charge/reference to positive or negative; [charged particles/charge can] move</p>	3	
Total			7	

Question	Answer	Marks	Guidance
7	<p>Level 3 (5–6 marks) The candidate selects several of the points, and links at least two of them to correct reasons why each indicate membership or not of the group. Quality of written communication does not impede communication of the science at this level.</p> <p>Level 2 (3–4 marks) The candidate selects one or more of the points, and links one of them to a correct reason why it indicates membership or not of the group. May also suggest inappropriate/ insufficient reasons. Quality of written communication partly impedes communication of the science at this level.</p> <p>Level 1 (1–2 marks) The candidate identifies one or more suitable points, but gives no correct reason. Quality of written communication impedes communication of the science at this level.</p> <p>Level 0 (0 marks) The candidate selects only inappropriate points for their choice. OR transfers all the information from the table without comment.</p>	6	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points may include:</p> <p>property and reason for being in a group/Jo correct</p> <ul style="list-style-type: none"> • formulae of chlorides - the same • formula of oxides - the same • reactivity - fits a trend • densities - fit a trend <p>property and reason for not being in a group/Ann correct</p> <ul style="list-style-type: none"> • melting points of elements - don't fit a clear trend • melting points of oxides - don't fit a clear trend <p>other points</p> <ul style="list-style-type: none"> • formulae give a very strong indication of group • Identifies the group as group 2 • realises that Y is a metal / they are all metals • identifies Y as magnesium <p>Insufficient or inappropriate reasoning</p> <ul style="list-style-type: none"> • melting points are all similar • melting points show a clear trend • reference to boiling points • densities are all similar • reactions with water too different to be one group • reactions with water very similar • proton number increases down a group • proton number itself is not a useful indication <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
	Total	6	

Question		Answer	Marks	Guidance
8	(a)	<p>any of the following:</p> <ul style="list-style-type: none"> • (initial) speed may vary • reaction time of driver / timer may vary • tyres may change temperature / get worn • different part of road surface used • doesn't push on brakes the same way each time <ul style="list-style-type: none"> • it may rain/weather conditions change between tests • errors / inaccuracies in measuring equipment 	1	<p>ignore mention of distance</p> <p>accept different force/pressure, time not "may not stop at the same time"</p>
	(b)	<p>any two of the following, (1) each: mean/average values are the same; large overlap of ranges/spread; valid comparison between sets of values e.g. consistency of Gripmore and smallest value for Slideless;</p>	2	accept quoted values from table to illustrate range/spread
	(c)	<p>any two of the following, (1) each:</p> <ul style="list-style-type: none"> • repeat the experiment • find more data from other sources • try it with a different car/tyres/speed/weather conditions • improve measurement techniques / apparatus • to get a better value of the mean 	2	
Total			5	

Question	Answer	Marks	Guidance
9	<p>Level 3 (5–6 marks) Includes at least one statement from the key physics category, and several points from any of the other two categories. Quality of written communication does not impede communication of the science at this level.</p> <p>Level 2 (3–4 marks) Includes several points from any of the three categories. Quality of written communication partially impedes communication of the science at this level.</p> <p>Level 1 (1–2 marks) Includes a valid statement from any of the three categories. Quality of written communication impedes communication of the science at this level.</p> <p>Level 0 (0 marks) Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p>This question is targeted at grades up to C</p> <p>Relevant points include:</p> <p>key physics</p> <ul style="list-style-type: none"> • forces between objects act in (interaction) pairs • which are equal in size • and opposite in direction <p>forces on rocket</p> <ul style="list-style-type: none"> • gas pushes the rocket • rocket gains momentum / accelerates • unbalanced/resultant force • force/pushed in an upwards direction • air resistance/drag acts downwards/opposes motion • weight/gravity acts downwards/opposes motion <p>forces on gas</p> <ul style="list-style-type: none"> • rocket pushes on gas • to give it momentum • in a downwards direction <p>ignore ref to upthrust</p>
	Total	6	

Question		Answer	Marks	Guidance
10	(a)	CitiStrol is 2.5 m/s^2 EasyShop is 3.0 m/s^2 GoFar is 5.0 m/s^2	2	all three correct for (2) any two or one correct for (1) ignore unqualified answer of yes If the answer is not in the official space look elsewhere ignore reference just to time taken – they must calculate an acceleration. ignore units incorrect conclusion (No) with correct calculations scores 1 mark.
	(b)	120 000 J	1	
		The driving force does work on the car. <input checked="" type="checkbox"/> The kinetic energy of the car remains ... <input type="checkbox"/> The weight of the car increases as it ... <input type="checkbox"/> The driving force is greater than the ... <input checked="" type="checkbox"/> The reaction from the ground increases ... <input type="checkbox"/>	2	correct pattern for (2) one mistake for (1)
Total			5	

Question		Answer	Marks	Guidance
11	(a)	A	1	
	(b)	B	1	
Total			2	

Question		Answer	Marks	Guidance
12		down; up; gravitational potential energy;	2	3 correct = 2 marks 2 correct = 1 mark 1 correct = 0 marks
		Total	2	

