



GCSE

Additional Science A

General Certificate of Secondary Education

Unit A151/01: Modules B4, C4, P4

Mark Scheme for June 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.

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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
	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.

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.

<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 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, 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.

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, 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	✓	✗	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	✗		✓		✓	✓		✓	
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)	(i)	any answer between 2 and 5 inclusive	1	
		(ii)	any answer greater than 12 up to and including 18 hours (1) more light gives no further growth (1)	2	if time not correct, cannot score second mark. allow sample D allow this is the optimum amount of light for growth allow gives maximum growth
		(iii)	light an increase method	2	3 correct = 2 marks 2 correct = 1 mark

Question		Answer	Marks	Guidance
(b)		<p>[Level 3] Names most structures correctly and links some structures to their functions in photosynthesis.</p> <p>Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Names some structures correctly and links some structures to correct functions.</p> <p>Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] EITHER names some structures correctly OR gives a correct function for one structure. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C</p> <p>Functions in photosynthesis</p> <ul style="list-style-type: none"> • nucleus (A) has genetic code for enzymes/proteins • cell membrane (B) is where water/CO₂/oxygen passes in/out of cell • cytoplasm (C) contains substances (involved in photosynthesis) / the site where enzymes or proteins are made • chloroplasts (D) (contain chlorophyll which) absorbs light <p>General functions</p> <ul style="list-style-type: none"> • nucleus or part A controls cell/contains DNA/chromosomes/genetic material • cell membrane or part B lets substances in/out / allows diffusion • cytoplasm or part C contains (dissolved) substances / where (cell) reactions take place • chloroplasts or part D contain chlorophyll / are where photosynthesis happens <p>Allow carbon dioxide and water are needed (by the cell) for photosynthesis as a general function.</p> <p>Correct Names:</p> <ul style="list-style-type: none"> • A = nucleus • B = cell membrane • C = cytoplasm • D = chloroplast <p>When looking for correct names, do not allow cell wall for cell membrane or chlorophyll for chloroplast, however allow correct function (from lists above).</p>
		Total	11	

Question		Answer	Marks	Guidance
2	(a)	needs more oxygen (1) plus, either: because she needs more energy; she respires faster; (1)	2	accept get oxygen quicker both answers must be comparative ignore she is moving (more) ignore she needs more air ignore she works more/harder accept correct argument relating to greater production of carbon dioxide i.e. produces more carbon dioxide (1) plus either: to be got rid of; because more respiration (1)
	(b)	25 minute dive (1) $180/6 = 30$ minus 5 minute safety margin (1)	2	any time other than 25 minutes scores 0 must show some calculation and consider 5 minutes for 2 nd mark accept 30-5 as minimum for calculation NB there are other ways of doing the calculation – candidate might calculate the volume for each of the 3 times and selecting but MUST consider the 5 minutes
	(c)	anaerobic (respiration)	1	
		Total	5	

Question		Answer	Marks	Guidance										
3	(a)	<p><i>Gary is incorrect because:</i> <i>any two from:</i></p> <p>the enzyme does not work at 70°C / (the enzyme) does not do the job at 70°C/no reaction at 70°C; (1)</p> <p>enzyme will be denatured; (1) links reduced enzyme activity to the function of washing powder, ie stain removal; (1)</p>	2	<p>max 1 mark if they say Gary is correct</p> <p>allow at high temperature/ any temperature from 37°C upwards</p> <p>accept correct reference to the optimum temperature (stated as 23 or 24°C)</p> <p>ignore enzyme will react too fast</p>										
	(b)	<table border="1"> <tr><td></td><td></td></tr> <tr><td>The work has not been peer reviewed.</td><td>✓</td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td>The enzyme has not been tested by other scientists.</td><td>✓</td></tr> </table>			The work has not been peer reviewed.	✓					The enzyme has not been tested by other scientists.	✓	2	<p>accept any clear indication of correct choice</p> <p>if more than 2 boxes ticked, deduct 1 mark for each additional incorrect response</p>
The work has not been peer reviewed.	✓													
The enzyme has not been tested by other scientists.	✓													
		Total		4										

Question		Answer	Marks	Guidance
4	(a)		1	accept any clear indication of correct choice e.g drawn in square on bottle
	(b)	(most reactive) chlorine, bromine, iodine (least reactive)	1	must have all three halogens
	(c)	chlorine+ sodium iodide \rightarrow iodine + sodium chloride	1	reactants may be either way round products may be either way round 'ide' and 'ine' endings must be correct if symbol equation given, must be completely correct, i.e. $\text{Cl}_2 + 2\text{NaI} \rightarrow \text{I}_2 + 2\text{NaCl}$
		Total	3	

Question		Answer	Marks	Guidance
5	(a)	blue brown green colourless	1	accept any clear indication of correct choice if more than 1 box ticked = 0
	(b)	<i>any three from:</i> detail of test eg put the substance into the flame; (1) (look at) flame colour ; (1) each different element has a characteristic flame colour OR gives the colour for sodium [yellow or orange]; (1) mention of a line spectrum; (1)	3	accept any ref to flame colour colour is not on the spec, but give credit as it shows realisation that flame colour is characteristic (but, if any incorrect colour for sodium, does not score)
	(c) (i)	11	1	accept any clear indication of correct choice if more than 1 answer ringed = 0
	(ii)	2.8	1	accept any clear indication of correct choice if more than 1 answer ringed = 0
	(iii)	Solid sodium chloride always conducts electricity. Solid sodium chloride often conducts electricity. Melted sodium chloride conducts electricity. Sodium chloride solution conducts electricity.	1	accept any clear indication of correct choice if more than 2 boxes ticked, deduct 1 mark for each additional incorrect response
			Total	7

Question		Answer	Marks	Guidance
6	(a)	98°C	1	accept any clear indication of correct choice If no temperature ringed/indicated from 4 given answers, look for answer given in box on table. if more than 1 answer ringed = 0
	(b)	One mark; Solid (at room temperature) / needs to be melted / needs to be a liquid / needs to be kept hot; (1) Plus any two from: idea of sodium being (very) reactive; (1) sodium reacts with water; (1) hydrogen produced; (1) consequence of hydrogen gas eg explosions; (1)	3	accept sodium needs to be heated ignore <u>pipes</u> will melt / get damaged / <u>pipes</u> react ignore 'it explodes', must be idea that hydrogen explodes
		Total	4	

Question	Answer	Marks	Guidance
7	<p>[Level 3] Gives a statement and explanation for either Te & I or A & B plus a statement or explanation for the other. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Makes statements about both A and B and Te and I OR gives a statement and explanation for either A & B or Te and I. OR general explanations about elements in groups linked to properties Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Gives a statement or explanation about A and B OR Te and I OR a statement that elements are placed in groups Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C</p> <p>statements (what he did): A & B</p> <ul style="list-style-type: none"> • (Left gaps) for undiscovered elements • (Left gaps) as he realised that none of the known elements fit into these positions • (Left gaps) because he predicted existence of A & B <p>NB If refers to unknown (unqualified) rather than undiscovered elements, limit to Level 2, as communication impeded.</p> <p>explanations (why he did it):</p> <ul style="list-style-type: none"> • keeps other elements in correct groups • so that they could be placed in correct group • position (of elements) based on properties <p>statements (what he did): Te & I</p> <ul style="list-style-type: none"> • reversed position of atomic mass/did not follow the order of atomic mass <p>NB If refers to numbers (127 or 128) rather than atomic mass, limit to Level 2, as communication impeded.</p> <p>explanations (why he did it):</p> <ul style="list-style-type: none"> • so that they could be placed in correct group • position (of elements) based on properties <p>NB Do not allow if they say that A & B or Te & I are in the same group. If candidate refers to the spaces/gaps, assume is referring to A and B even if A and B not specified.</p>
	<p style="text-align: right;">Total</p>	6	

Question		Answer	Marks	Guidance
8	(a) (i)	speed = 0.510 m/s; (1) average = 0.505 m/s (1)	2	speed: accept 0.51 average: accept 0.5047 / 0.5046 r / 0.5046 (i.e. 6 recurring, shown by r or dot over number 6) do not accept 0.504 / 0.51 / answers with more than 4 decimal places
	(ii)	EITHER (Jim is wrong / speed must change as it falls because) increasing height increases speed; OR (Jim is right cases fall at a steady speed OR difficult to tell because) averages are inside each others ranges / data ranges overlap etc;	1	answer should indicate whether or not Jim is correct accept values or (average) speeds are close together idea do not accept <u>times</u> are similar
	(b)		2	3 correct lines = 2 marks 1 or 2 correct lines = 1 mark two lines from one box loses mark for that box
		Total	5	

Question		Answer	Marks	Guidance
9		<p>[Level 3] Answer covers both rise and fall of the ball, with a momentum or energy argument and the effects on the motion of the ball. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Answer covers rise or fall with stated force and the effect on the motion of the ball or correct link to energy or momentum. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Answer makes one or more statements describing the rise or fall of the ball or names a force with correct direction. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to E</p> <p>Indicative scientific points at Level 3 may include:</p> <ul style="list-style-type: none"> the momentum of the ball decreases on the way up as it slows down momentum increases on the way down as it speeds up air resistance reduces momentum / speed / KE <p>Accept energy explanations:</p> <ul style="list-style-type: none"> throughout gains GPE on the way up so loses KE and so slows on the way up loses GPE on the way down so gains KE on the way down and so speeds up <p>Indicative scientific points at Level 2 may include:</p> <ul style="list-style-type: none"> gravity slows ball down on the way up/ball loses momentum gravity speeds ball up on the way down/gains momentum air resistance slows ball down throughout <p>Indicative scientific points at Level 1 may include:</p> <ul style="list-style-type: none"> slows down as it rises speeds up as it falls again stops for a moment at the top gravity acts downwards air resistance acts against motion <p>accept velocity for speed accept weight for gravity accept friction for air resistance ignore references to sideways motion ignore references to forces / speed change of ball during act of throwing or catching</p>
		Total	6	

Question		Answer	Marks	Guidance
10	(a)	Ben loses kinetic energy. Ben gains kinetic energy. Ben has a constant kinetic energy. Ben loses gravitational potential energy. Ben gains gravitational potential energy. Ben has a constant gravitational potential energy.	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	accept any clear indication of correct choice if more than 2 boxes ticked, deduct 1 mark for each additional incorrect response
	(b) (i)	$\text{momentum change} = 3200 \times 0.2 = 640 \text{ kg m/s}$	2	accept 160 kg m/s for [1] accept correct answer with no working for [2]
	(ii)	momentum = $80 \times 5 = 400 \text{ kg m/s}$; safe because $400 < 640$;	2	if 400 not given, no marks working not required ignore units allow ecf from (i) for full marks as long as 400 kg m/s used NB must compare correctly with answer from (i) for 2 nd mark if does not give a figure for maximum safe momentum change look at answer to b(i) for 2 nd marking point
		Total		6

Question		Answer	Marks	Guidance
11		<p><i>any three from:</i></p> <p>weight downwards; (1) reaction upwards; (1) friction (from ground) forwards; (1) air resistance backwards (1)</p>	3	<p>for weight accept gravity/pull of the earth ignore gravity keeps him on the ground for reaction accept upwards force from ground</p> <p>accept drag for air resistance</p> <p>direction is needed to earn the mark in each case</p> <p>ignore mass</p>
		Total	3	

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