RECOGNISING ACHIEVEMENT

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.

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
Words	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
BOD	benefit of doubt
CON	contradiction
	incorrect response
ECF	error carried forward
	draw attention to particular part of candidate's response
NBOD	no benefit of doubt

R	reject
✓	correct response
1 2 3	draw attention to particular part of candidate's response
^	information omitted

Subject-specific Marking Instructions

a. If a candidate alters his/her response, examiners should accept the alteration.

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.

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.	Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.
☐	☐	☒
☐	☐	☒
☒	✓	✓
☒	☒	✓
☐	☐	☐
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, 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 <u>should be blank</u> (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)	**[Level 3]** **Names most structures** correctly and links **some** structures to their **functions in photosynthesis.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** **Names some structures** correctly and links some structures to correct **functions.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[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) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C** **Functions in photosynthesis** • nucleus (A) has genetic code for enzymes/proteins • cell membrane (B) is where water/CO_2/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 **General functions** • 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 **Allow** carbon dioxide and water are needed (by the cell) for photosynthesis as a general function. **Correct Names**: • A = nucleus • B = cell membrane • C = cytoplasm • D = chloroplast When looking for correct names, do not allow cell wall for cell membrane or chlorophyll for chloroplast, however allow correct function (from lists above).
	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 2nd 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**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>3</td><td>(a)</td><td></td><td>Gary is incorrect because:
any two from:

the enzyme does not work at 70°C / (the enzyme) does not do the job at 70°C/no reaction at 70°C; (1)

enzyme will be denatured; (1)
links reduced enzyme activity to the function of washing powder, ie stain removal; (1)</td><td>2</td><td>max 1 mark if they say Gary is correct

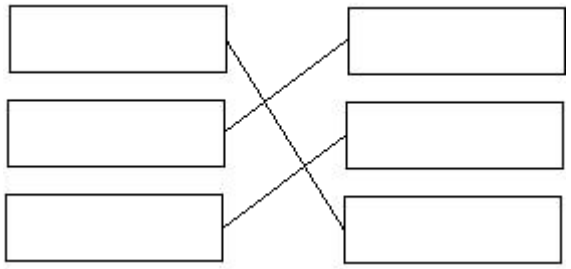
allow at high temperature/ any temperature from 37°C upwards
accept correct reference to the optimum temperature (stated as 23 or 24°C)
ignore enzyme will react too fast</td></tr>
<tr><td></td><td>(b)</td><td></td><td><table><tr><td></td><td></td></tr><tr><td>The work has not been peer reviewed.</td><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></td><td>2</td><td>accept any clear indication of correct choice
if more than 2 boxes ticked, deduct 1 mark for each additional incorrect response</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>4</td><td></td></tr>
</table>

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➔ 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. $Cl_2 + 2NaI \rightarrow I_2 + 2NaCl$
			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)		*any three from:* 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			**[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) **[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) **[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) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C** **statements (what he did):** **A & B** • (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 **NB** If refers to unknown (unqualified) rather than undiscovered elements, limit to Level 2, as communication impeded. **explanations (why he did it):** • keeps other elements in correct groups • so that they could be placed in correct group • position (of elements) based on properties **statements (what he did):** **Te & I** • reversed position of atomic mass/did not follow the order of atomic mass **NB** If refers to numbers (127 or 128) rather than atomic mass, limit to Level 2, as communication impeded. **explanations (why he did it):** • so that they could be placed in correct group • position (of elements) based on properties **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.
			Total	**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 owtte;	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			**[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) **[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) **[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) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to E** **Indicative scientific points at Level 3 may include:** • 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 Accept energy explanations: • 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 **Indicative scientific points at Level 2 may include:** • 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 **Indicative scientific points at Level 1 may include:** • 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 **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
			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. ☐	2	**accept** any clear indication of correct choice if more than 2 boxes ticked, deduct 1 mark for each additional incorrect response
	(b)	(i)	momentum change = 3200 × 0.2 = 640 kg m/s	2	**accept** 160 kg m/s for [1] **accept** correct answer with no working for [2]
		(ii)	momentum = 80 × 5 = 400 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 2nd mark if does not give a figure for maximum safe momentum change look at answer to b(i) for 2nd marking point
			Total	**6**	

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

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