OCR
RECOGNISING ACHIEVEMENT

GCSE

Additional Science A

General Certificate of Secondary Education

Unit **A151/01:** Modules B4, C4, P4 (Foundation Tier)

Mark Scheme for June 2013

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

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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.

1. **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:

	correct response
	incorrect response
BOD	benefit of doubt
NBOD	no benefit of doubt
ECF	error carried forward
0 , L1 , L2 , L3	indicate level awarded for a question marked by level of response
^	information omitted
CON	contradiction
R	reject

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

2. **ADDITIONAL OBJECTS:** You **must** assess and annotate the additional objects for each script you mark. Where credit is awarded, appropriate annotation must be used. If no credit is to be awarded for the additional object, please use annotation as agreed at the SSU.

3. 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 <u>and</u> 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 <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)		glucose on LHS (1) lactic acid on RHS (1)	2	
	(b)		cytoplasm	1	
			Total	**3**	

Question			Answer	Marks	Guidance
2	(a)		<table><tr><td></td><td colspan="3">concentration inside leaf in ppm</td></tr><tr><td></td><td>less than 0.04%</td><td>between 0.04% and 21%</td><td>greater than 21%</td></tr><tr><td>oxygen</td><td></td><td></td><td>✓</td></tr><tr><td>carbon dioxide</td><td>✓</td><td></td><td></td></tr></table>	2	1 mark for each correct row

Question			Answer	Marks	Guidance
2	(b)		**Level 3 (5–6 marks)** Photosynthesis and respiration both set in correct context of plants and fish, with correct details of both. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Reference to photosynthesis in plants and respiration in fish. OR one process described in detail. OR complete process described without mention of words photosynthesis and respiration. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Reference to more than one of any of the relevant points. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to C.** **Relevant points include:** • plants photosynthesise • fish respire • carbon dioxide taken in by plants • carbon dioxide used in photosynthesis • photosynthesis/plants produce oxygen • fish need/use oxygen • oxygen is used in respiration • fish/respiration produce carbon dioxide • carbon dioxide (from respiration) is available for plants • oxygen (from photosynthesis) is available for fish **accept** plants use oxygen during respiration **accept** plants give out carbon dioxide during respiration **ignore** references to fish “breathing” **ignore** discussion of nitrates or other nutrients **ignore** suggestions of fish eating/being fed by the plants **ignore** anaerobic **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**8**	

Question			Answer	Marks	Guidance
3	(a)		protein genes active	2	3 correct = 2 marks 1 or 2 correct = 1 mark
	(b)		alcohol/ethanol	1	
			Total	**3**	

Question			Answer	Marks	Guidance
4	(a)		points correctly plotted (1) straight line of best fit drawn (1)	2	**accept** +/- one small division must look straight by eye ecf for their plotted points
	(b)		from graph [to within ± 1 scale division] (1) idea of no [%] change in length /no osmosis takes place at that concentration (1)	2	 **accept** it is where the line crosses the axis
	(c)		**Either** **one improvement plus reason** [Reproducibility / repeatability] **OR** **any two improvements** repeat the experiment ; use more cylinders ; use cylinders from the same potato ; use more concentrations ; take the average	2	**ignore** 'confidence' [stem] and 'fair test' **accept** reference to improved reliability / accuracy **accept** look for outliers **accept** use longer cylinders **ignore** use more accurate equipment "repeat – to see if the pattern is the same"! = 2
			Total	**6**	

Question			Answer	Marks	Guidance
5	(a)		-184°C -37°C **59°C** 219°C	1	
	(b)	(i)	**chlorine** bromine iodine	1	
		(ii)	It has the greatest reactivity. ✓ It has the highest boiling point. It has the highest melting point. It is a liquid at room temperature.	1	
	(c)	(i)	Bromine / Br / Br_2	1	
		(ii)	17	1	
		(iii)	2 on inner circle 8 on middle circle 7 on outer circle	2	all three shells correct = 2 17 electrons shown = 1 **accept** unambiguous alternatives to crosses
		(iv)	charge (on the ion) is negative (1) (chlorine) gains one (electron) (1)	2	**accept** in symbols eg Cl^- **accept** one more electron than proton
		(v)	sodium + chlorine ➔ sodium chloride **OR** chlorine + sodium ➔ sodium chloride	1	Sodium chloride must end in IDE **accept** $2Na + Cl_2$ [or $Cl_2 + 2Na$] ➔ 2NaCl must be correct
		(vi)	potassium chloride	1	**accept** mis-spelling of potassium **accept** KCl
			Total	**11**	

Question			Answer	Marks	Guidance
6			**Level 3 (5–6 marks)** The candidate identifies points from all three relevant aspects of the answer. OR discusses points from 2 aspects with one in more detail. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Candidate identifies points from two relevant aspects of the answer OR discusses one of the aspects, in more detail. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Candidate identifies or discusses a scientific point about one of the relevant aspects. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to E** **Indicative scientific points may include:** **3 relevant aspects:** **1. Reasons for grouping** • any mention of the idea of properties of the elements • links groups to similarities in element • gives an example of a group/the elements in the group **accept** extra information about atomic structure/proton number/period **2. Empty spaces or gaps in table** • empty spaces for undiscovered/predicted/new elements. • idea that the properties of the missing elements are also predicted. • idea that these gaps were left because no known element had those properties. **3. Reasons for acceptance** • after they found new elements to fit the gaps • idea of when scientists saw the evidence • idea of when predictions were confirmed **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
7			**first marking point** discusses lines / wavelengths/ frequencies/ positions / pattern [of lines] **and two from** sodium (completely) **matches** the sample ; potassium doesn't match ; idea that sample contains other compounds [beside sodium]	3	One mark reserved for reference to lines / position some lines in the sodium match the sample = 1 some lines in the sample match the sodium = 2 "Both sodium and the sample have bold lines" = 1 for lines, but there is no implication of complete match
			Total	**3**	

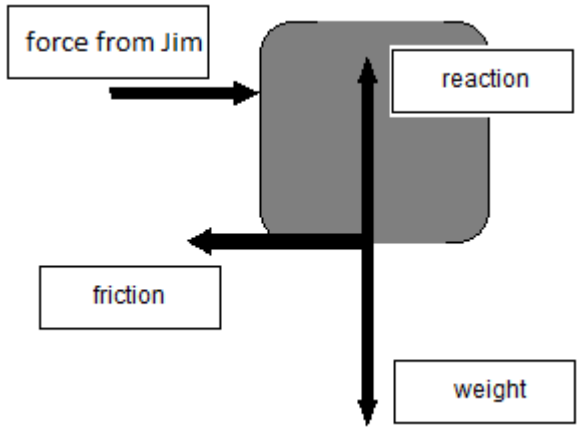
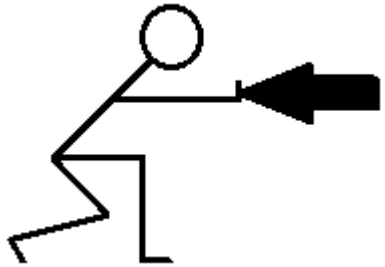
<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>8</td><td>(a)</td><td>(i)</td><td>0.20 s</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>0.18 s to 0.22 s</td><td>1</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td>any two from
• calculate mean of new results: 0.16 s ;
• less than previous mean (0.20 s) ;
• outside previous range ;
• all reaction times less than previous ones ;
• ranges do not overlap

one mark
a correct conclusion (consistent with analysis of data)
(eg reaction time decreases/she gets faster)</td><td>3</td><td>apply ecf from (a)

accept all (reaction) times are faster</td></tr>
<tr><td></td><td>(c)</td><td></td><td><table><tr><td>GPE transfers to kinetic energy.</td><td>✓</td></tr><tr><td>The KE remains constant</td><td></td></tr><tr><td>KE transfers to GPE</td><td></td></tr><tr><td>The GPE remains constant</td><td></td></tr></table></td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>6</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
9			**Level 3 (5–6 marks)** Correctly discusses more than one scientific point to describe the safety aspects [of what happens in a crash]. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Discusses at least one of the science points correctly. The science may not link directly to the safety aspects, and there may also be some incorrect science. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Describes a safety aspect with little or no explanation OR recognises that the force/impact, or the momentum or energy is a key factor but has little understanding. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to C.** **Indicative points may include:** **science points:** • increase stopping distance [for passenger/car] (accept "more to crush") • increase time [for occupants/car] to stop OR of impact • reduce force/impact [on occupants] • needed to reduce their momentum/speed/velocity • because force = momentum change÷time. • energy argument [1] eg smaller force to do the same work/energy because stopping distance is longer etc. • energy argument [2] large crumple zones absorb more energy than small ones **safety points:** • increases safety/reduces harm to occupants • crumple zone damaged instead of occupants Assume that the candidate is talking about larger crumple zones unless specified otherwise. **accept** slows the passenger/car down **ignore** "reaction times", surface area and pressure arguments **Ignore** cars with different mass a Level 1 response might be "Reduces the risk of injury – to the occupant" **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
10	(a)		8.0÷0.4 (1) = 20 (m/s) (1)	2	attempt to use distance/time for (1) 20 = 2 marks
	(b)		B	1	**accept** unambiguous indication on graph B
			Total	**2**	

Question			Answer	Marks	Guidance
11	(a)			2	reaction, weight, and friction in correct boxes **ignore** gravity **all three** correct = 2 marks **one** correct = 1 mark
	(b)		 200 (N) (1) (force) to the left/towards Jim (1) equal to force on box by Jim OR Jim's force and force on Jim are an interaction pair OR action and reaction equal OR they are equal and opposite (1)	3	Answer may be on diagram or written below Assume an arrow to the right is the force of Jim on the box, unless otherwise explained in words or on the diagram. **ignore** vertical arrows and vertical forces **ignore** weight/mass **ignore** arrows labelled friction **ignore** '200N' written anywhere except arrow to the left **accept** (force) back on Jim OR (force) against Jim OR (force) from the box **accept** arrows to the left even if not horizontal **accept** 2 arrows one to left and one to the right, both labelled 200(N) for 3rd mark [This will get all 3 marks]
			Total	**5**	

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