

# **Additional Science A**

General Certificate of Secondary Education

Unit **A152/02**: Modules B5, C5, P5 (Higher 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:*

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*This would be worth 1 mark.*

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*This would be worth 0 marks.*

<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<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, 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			<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Manchester	<input type="checkbox"/>	<b>x</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	
Paris				<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Southampton	<input type="checkbox"/>	<b>x</b>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
<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:

- 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.

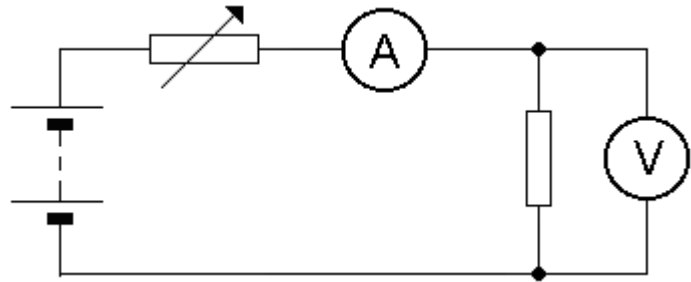
Question		Answer	Marks	Guidance
1	(a)	340,000 (tonnes) (2)  (compares with) 150,000 / use 190,000 (more) (1)	3	if 340,000 tonnes not given, look for 17,000x20 for 1 mark  <b>ignore</b> "it is true"
	(b)	<p><b>[Level 3]</b> For each of the three numbers, candidates give a reason for the inaccuracy. The reasons are specific to each number rather than general statements such as reliability of internet sites. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p><b>[Level 2]</b> The candidate gives a reason for the inaccuracy of two of the three numbers Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p><b>[Level 1]</b> The candidate gives a reason for the inaccuracy of one of the three numbers or makes a general statement about why the numbers may be inaccurate. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p><b>[Level 0]</b> A worthy looking answer, but does not go beyond ideas of 'average' or 'difficulty of taking measurements'. Answer not worthy of credit. (0 marks)</p>	6	<p><b>This question is targeted at grades up to A*</b></p> <p><b>Indicative scientific points may include:</b></p> <p><b>allow</b> 'the numbers have been rounded up' for one of the quantities only</p> <p><b>volcano</b></p> <ul style="list-style-type: none"> <li>difficulty of measuring output of volcano / it is an estimate</li> <li>output will be variable [ignore weather affects production CO<sub>2</sub>]</li> </ul> <p><b>flight cancellations</b></p> <ul style="list-style-type: none"> <li>not all European flights may have been cancelled</li> <li>not all flights would have taken off anyway</li> <li>only flights from major airports / filed with air traffic control centres will have been counted</li> </ul> <p><b>flight emissions</b></p> <ul style="list-style-type: none"> <li>amount of carbon dioxide per flight is an average value</li> <li>amount of carbon dioxide per flight depends on many factors such as <ul style="list-style-type: none"> <li>size/mass of plane</li> <li>distance of flight</li> <li>how modern the plane is</li> </ul> </li> </ul> <p><b>general statements</b></p> <ul style="list-style-type: none"> <li>trustworthiness of some internet sites</li> <li>rounding numbers is a general statement if not tied in to a particular quantity</li> </ul> <p><b>Ignore</b> repeatability / needs more readings</p> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>

Question		Answer	Marks	Guidance
1	(c)	<p><b>Idea of multiple bonds (1)</b> mentions giant structure / lattice [of any type] / large number of bonds</p> <p><b>Idea of difficult of breaking the structure (1)</b> covalent / strong / difficult to break</p>	2	<p><b>ignore</b> tightly packed</p> <p><b>accept</b> a reference to diamond for first marking point.</p> <p>Even accept diamond shape.</p> <p><b>ignore</b> intermolecular</p> <p>Any mention of <b>ions/ionic</b> means that only the <b>first</b> marking point is available.</p> <p>“it is a strong ionic structure” = 0 ie both the same marking point</p> <p>“it is an ionic lattice/giant structure” = 1</p> <p>“It is a covalent lattice/ giant structure” = 2</p>
<b>Total</b>			<b>11</b>	

Question		Answer	Marks	Guidance
2	(a)	aluminium too reactive / more reactive than carbon/ carbon not reactive enough (1)	1	<p><b>allow</b> “Bonds between Al and O are too strong”</p> <p><b>ignore</b> “it won’t react with carbon” [stem]</p> <p><b>ignore</b> Aluminium oxide is too reactive</p>
	(b) (i)	27+27+16+16+16 (1)	1	<b>accept</b> 54+48
	(ii)	1X54/102 = 0.53 (1)	1	
	(iii)	7,500 – 7,600 (1)	1	no ecf
	(c)	both .... (1) move (1) gain electrons (1)	3	
	(d)	oxygen (produced at the electrode) (1) (reacts with electrode) to make carbon dioxide (1)	2	<b>accept</b> oxidation (of electrode)
<b>Total</b>			<b>9</b>	



Question	Answer	Marks	Guidance
3	<p><b>[Level 3]</b> Discusses charge transfer, though with some errors, and goes on to correctly explain one of the effects. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p><b>[Level 2]</b> Correctly explains one of the effects in an electrical context, or discusses charge transfer, possibly incorrectly. <b>OR</b> discusses charge transfer [possibly incorrectly] and gives a <b>very</b> poor explanation of one of the electrical phenomena. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p><b>[Level 1]</b> Realises that it is a charge or attempts to explain an electrical phenomenon. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p><b>[Level 0]</b> Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p><b>This question is targeted at grades up to C</b></p> <p><b>Indicative scientific points may include:</b></p> <p><b>Charge transfer</b></p> <ul style="list-style-type: none"> <li>• friction/rubbing transfers electrons between materials</li> <li>• electrons have negative charge</li> <li>• atoms which lose electrons have positive charge</li> <li>• atoms which gain electrons have negative charge</li> <li>• balloon and hair must/can be insulators</li> <li>• so that electrons can't flow easily through them</li> </ul> <p><b>Hair sticks to balloon</b></p> <ul style="list-style-type: none"> <li>• balloon and hair have opposite charge</li> <li>• so attract (and stick to each other)</li> </ul> <p><b>Hair stands on end</b></p> <ul style="list-style-type: none"> <li>• hairs have the same charge</li> <li>• so repel each other (and stand on end)</li> </ul> <p><b>Hair slowly goes down</b></p> <ul style="list-style-type: none"> <li>• hairs lose their charge slowly [<b>ignore</b> charge runs out]</li> <li>• hair must be a conductor</li> </ul> <p><b>ignore</b> static energy <b>accept</b> static for charge at level 1 and 2</p> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
	<b>Total</b>	6	

Question		Answer	Marks	Guidance
4	(a)		2	ammeter in series before or after resistor for [1] voltmeter in parallel with resistor for [1] <b>ignore</b> any gap in the final circuit <b>look for</b> correct circuit symbols reject if line through symbol eg $\nabla$
	(b) (i)	0.53 A (1)	1	accept 0.5
	(ii)	reference to $R=V/I$ (1)  idea that as R increases, I decreases, ORA if R less so I higher (1)	2	<b>allow</b> ecf calculation from above, eg 2.5/11.75 <b>ignore</b> $R=V/C$ , triangle reminders of Ohm's law calculation must be in $R=V/I$ format <b>ignore</b> slows the current down
	(c)	resistance was not – data current – theory resistance of resistor - suggested	2	correct pattern for 2 marks one or two correct for 1 mark
	(d)	resistance and power <b>both</b> increase (1) gets hotter (1)	2	<b>ignore</b> any numbers, look for the idea of both increasing
	(e)	Carlos (1)	1	
		<b>Total</b>	<b>10</b>	

Question		Answer	Marks	Guidance								
5	(a)	<table border="1"> <tr> <td>The current ...</td> <td>... is induced across the ...</td> </tr> <tr> <td>The voltage ...</td> <td>... produces a changing ...</td> </tr> <tr> <td>The electro ...</td> <td>... has a potential ...</td> </tr> <tr> <td>The coil of wire ...</td> <td>... continually changes ...</td> </tr> </table>	The current ...	... is induced across the ...	The voltage ...	... produces a changing ...	The electro ...	... has a potential ...	The coil of wire ...	... continually changes ...	2	all correct [2] one to three correct for [1]
The current ...	... is induced across the ...											
The voltage ...	... produces a changing ...											
The electro ...	... has a potential ...											
The coil of wire ...	... continually changes ...											
	(b)	idea of voltage conversion (1) transformers (1)	2	if nothing has scored on the left, accept reference to 'step-up/down' = 1 <b>do not con</b> "step-up current"								
<b>Total</b>			<b>4</b>									

Question		Answer	Marks	Guidance
6		meristems have unspecialised cells (1)	2	<b>accept</b> "a cell that can specialise / can become any type of cell"
		mitosis / asexual reproduction / splits into identical cells (1)		<b>ignore</b> references to same dna/ genes
<b>Total</b>			<b>2</b>	

Question		Answer	Marks	Guidance
7	(a)	haemoglobin increased by 80%, to 180%, by a factor of 1.8, 18/10 (1)  myoglobin increased by 5900%, to 6000%, by a factor of 600, 6.0/0.1 (1)  [%] <b>increase</b> in myoglobin is greater / more significant / has closest correspondence to maximum dive (1)	3	[this is a <b>division</b> calculation, 18/10 and 6.0/0.1]   <b>ignore</b> myoglobin is more significant

Question	Answer	Marks	Guidance
7 (b)	<p><b>[Level 3]</b> Is aware that the code/DNA is in the nucleus, and that information is transferred, to the cytoplasm, where the protein is made. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p><b>[Level 2]</b> Shows only a partial overview of the overall process, but can give several pieces of relevant detail. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p><b>[Level 1]</b> Does not show any overview of the whole process, but gives at least one piece of relevant detail. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p><b>[Level 0]</b> Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p><b>This question is targeted at grades up to D</b></p> <p><b>Indicative scientific points may include:</b></p> <p><b>Relevant points include:</b></p> <ul style="list-style-type: none"> <li>• DNA is in nucleus</li> <li>• DNA sequence is copied to mRNA</li> <li>• gene codes for myoglobin</li> <li>• copy of genetic information /messenger RNA goes to cytoplasm</li> <li>• allow reference to ribosome instead of cytoplasm</li> <li>• where protein is made</li> <li>• order of bases in a gene is the code for building protein</li> <li>• protein built up from amino</li> </ul> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
(c) (i)	38 2 both parent and new	2	3 correct = 2 marks 1 or 2 correct = 1 mark
	(ii) Brain cells and muscle cells have all the same genes (1) Brain cells have some genes switched on... (1)	2	
	<b>Total</b>	<b>13</b>	

Question		Answer	Marks	Guidance
8	(a)	Adult stem cells have the potential to form new cells (1) After successful treatment there could be a need.... (1)	2	
	(b)	Tom (1) nothing is risk free / 100% safe (1)	2	treat as independent marking points
	(c)	Any argument that shows that this one case is not representative  (no) because a single case does not provide good evidence for or against a correlation	1	result may not be representative / may be outweighed by a large number of positives / might be an outlier  <b>accept</b> "there is <b>only</b> one result" / "not enough evidence" / that animal was sick  <b>ignore</b> differences between animals and humans
		<b>Total</b>	<b>5</b>	

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