

# **Additional Science A**

General Certificate of Secondary Education

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

## **Mark Scheme for June 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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1. Annotations

Used in the detailed Mark Scheme:

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
(1)	separates marking points
<b>not/reject</b>	answers which are not worthy of credit
<b>ignore</b>	statements which are irrelevant - applies to neutral answers
<b>allow/accept</b>	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:

	correct response
	incorrect response
<input type="text" value="BOD"/>	benefit of doubt
<input type="text" value="NBOD"/>	no benefit of doubt
<input type="text" value="ECF"/>	error carried forward
<input type="text" value="0"/> , <input type="text" value="L1"/> , <input type="text" value="L2"/> , <input type="text" value="L3"/>	indicate level awarded for a question marked by level of response
<input type="text" value="A"/>	information omitted
<input type="text" value="CON"/>	contradiction

	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 and fourth boxes are required for the mark:*

<del>✗</del>
<del>✗</del>

*This would be worth  
1 mark.*

✓
<del>✗</del>

*This would be worth  
0 marks.*

<del>✗</del>
<del>✗</del>
✓
✓

*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			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
<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)	reduction	1	<b>accept</b> redox
	(b)	$2\text{Fe}_2\text{O}_3 + 3\text{C} \rightarrow 4\text{Fe} + 3\text{CO}_2$	2	all formulae correct ( <b>not</b> Fe <sub>2</sub> ) [1] balancing correct formulae [1] <b>look for</b> correct capitalisation and subscripts  <b>no ecf</b> for balancing following incorrect formulae <b>accept</b> multiples of correct balancing quantities
	(c) (i)	112 (1) g (1)	2	<b>accept</b> (112/160 =) 0.7 for [1] <b>accept</b> gram(s), mg, kg ...
	(ii)	iron weighs less than ore	1	<b>accept</b> less iron than iron ore
	(d) (i)	Al is more reactive (1)  then any of the following: <ul style="list-style-type: none"> <li>• than C</li> <li>• than Fe</li> <li>• so can't be reduced (owtte) (1)</li> </ul>	2	carbon less reactive than aluminium worth [2]
	(ii)	electrolysis	1	<b>accept</b> phonetic spelling <b>accept</b> electricity
<b>Total</b>			<b>9</b>	



Question		Answer	Marks	Guidance
2		<p><b>any three from</b> (George) graphs show there is a link/correlation/pattern ; description of correlation between graphs ; so trees damaged by (sulfur) fumes</p> <p>(Maria) there could be another explanation ; perhaps not enough data ; not enough information (to prove cause) ; possible causes e.g.</p> <ul style="list-style-type: none"> <li>• trees grow better in summer (anyway) ;</li> <li>• temperature changes during year ;</li> <li>• wind changes during the year ;</li> <li>• rain changes during the year ;</li> <li>• trees less able resist insects/disease in winter</li> </ul>	3	<p><b>accept</b> all three points from just Maria</p> <p><b>not</b> just pollution</p> <p><b>accept</b> any plausible cause, up to maximum of [3]</p>
<b>Total</b>			<b>3</b>	

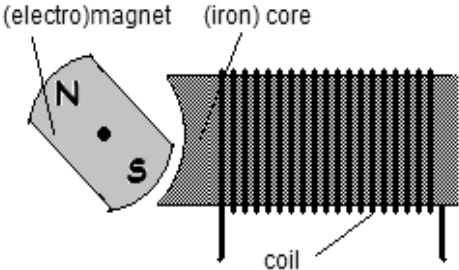
Question		Answer	Marks	Guidance
3		zinc, carbonate, bromide	2	<p>all three correct [2] any two correct [1] apply list principle to more than three ions treat incorrect symbol with correct word as a contradiction <b>accept</b> Zn, Br and CO<sub>3</sub>, ignore charge superscripts [2]</p>
<b>Total</b>			<b>2</b>	

Question	Answer	Marks	Guidance
4	<p><b>Level 3 (5–6 marks)</b> The candidate identifies both properties and explains them in terms of the structure/bonding of graphite. Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> Candidate identifies <b>either</b> of the properties <b>and</b> explains it in terms of the structure/bonding of graphite. Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> Candidate <b>either</b> identifies one of the properties <b>or</b> describes the structure/bonding of graphite. Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>This question is targeted at grades up to A.</b></p> <p><b>Relevant points include</b></p> <p><b>electrical conductivity</b></p> <ul style="list-style-type: none"> <li>• high conductivity/conductor of electricity</li> <li>• because <ul style="list-style-type: none"> <li>(only) three bonds for each atom</li> <li>(some) electrons free to move</li> </ul> </li> </ul> <p><b>melting point</b></p> <ul style="list-style-type: none"> <li>• high (above 800 °C)</li> <li>• because <ul style="list-style-type: none"> <li>giant structure</li> <li>strong bonding</li> <li>covalent bonds</li> <li>difficult to separate/lot of energy needed</li> </ul> </li> </ul> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
	<b>Total</b>	<b>6</b>	

Question		Answer	Marks	Guidance
5	(a)	current = $1.2/6.0 = 0.2$ A (1) power = $1.2 \times 0.20 = 0.24$ W (1)	2	ecf on incorrect calculation of current $6 \times 1.2 = 7.2$ [0] correct answer with no working for [2]
	(b)	doubles quadruples	1	both correct for (1)
<b>Total</b>			<b>3</b>	

Question		Answer	Marks	Guidance
6	(a)	<b>either</b> adjust setting of variable resistor (1); to change (total) resistance of the circuit (1); <b>or</b> add/remove cells (in series to the battery) (1); increase/decrease the voltage/current of the circuit (1); <b>or</b> replace battery with different battery/power pack (1); to change voltage of circuit (1) <b>or</b> add extra (fixed) resistors (in series with the diode) (1); to increase the (total) resistance/decrease the current of the circuit (1); <b>or</b> remove the variable resistor (1); to reduce (total) resistance/increases current of circuit (1) <b>or</b> add a switch (in series with diode) (1) to stop/switch off the current (1)	2	<b>accept</b> turn round diode [1] because one-way conductor [1]  <b>ignore</b> references to thermistor  <b>accept</b> volts/potential difference/p.d. for voltage  <b>accept</b> ohms for resistance  <b>ignore</b> rearrangement of components
	(b)	resistance at 0.12 A (0.60 V) is 5.0 (ohms) (1) resistance at 0.45 A (0.90 V) is 2.0 (ohms) (1) so resistance decreases with increasing p.d./current (1)	3	<b>accept</b> 5 anywhere <b>accept</b> 2 anywhere <b>ecf</b> from incorrectly calculated values <b>accept</b> ohms/R for resistance <b>accept</b> voltage for p.d. <b>accept</b> correct substitution but incorrect answer twice for [1]

Question			Answer	Marks	Guidance
6	(c)	(i)	Fiona	1	
		(ii)	Gary	1	
			<b>Total</b>	<b>7</b>	

Question	Answer	Marks	Guidance
7	<p><b>Level 3 (5–6 marks)</b> Identifies magnet, coil and core. Explains alternating nature of current in terms of changing magnetism in core from rotating magnet. Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> Identifies magnet and coil (of wire). Explains current in terms of changing magnetism from rotating magnet. Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1(1–2 marks)</b> Identifies magnet or coil. States that current caused by motion of magnet. Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>This question is targeted at grades up to A*.</b></p> <p><b>Indicative science points may include:</b> current due to p.d induced in coil by field lines cutting coil/change of magnetic field/change of magnetism/change of pole next to coil caused by rotation of magnet</p> <p>current in one direction when: N pole swaps for S magnetic field/magnetism increases field direction increases to the left</p> <p>current in other direction when: S pole swaps for N magnetic field/magnetism decreases field direction increases to the right</p> <p><b>Identification:</b> either labels or in discussion</p>  <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
	<b>Total</b>	<b>6</b>	

Question			Answer	Marks	Guidance
8			electrons negative an insulator the same	2	completely correct for (2) one or two mistakes for (1)
			<b>Total</b>	<b>2</b>	

Question			Answer	Marks	Guidance
9			magnet ----- provides a steady field ... (1) commutator ----- makes the current switch...(1)	2	
			<b>Total</b>	<b>2</b>	

Question		Answer	Marks	Guidance										
10	(a)	<table border="1" style="width: 100%; text-align: center;"> <tr> <td>T</td><td>T</td><td>G</td><td>C</td><td>T</td><td>A</td><td>A</td><td>G</td><td>C</td> </tr> </table>	T	T	G	C	T	A	A	G	C	1	T goes with A and vice versa G goes with C and vice versa any mistake [0]	
T	T	G	C	T	A	A	G	C						
	(b)	<table border="1" style="width: 100%;"> <tr> <td style="height: 20px;"></td> <td style="width: 20px;"></td> </tr> <tr> <td>The sequences of bases in the genes for actin...</td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="height: 20px;"></td> <td></td> </tr> <tr> <td>A cell can combine amino acids...</td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="height: 20px;"></td> <td></td> </tr> </table>			The sequences of bases in the genes for actin...	✓			A cell can combine amino acids...	✓			2	
The sequences of bases in the genes for actin...	✓													
A cell can combine amino acids...	✓													
	(c) (i)	200	1											
	(ii)	Dr Baker wants to study a fatal condition (1) Dr Smith wants to study a condition that affects most people (1)	2	<b>ignore common</b>										
<b>Total</b>			<b>6</b>											

Question	Answer	Marks	Guidance
11	<p><b>Level 3 (5–6 marks)</b> Describes a cutting method which would work. <b>Either</b> justifies use of cuttings <b>or</b> not use of seeds. Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> Describes a practical cutting method with a significant error or omission. <b>Either</b> justifies use of cuttings <b>or</b> not use of seeds. Could be <b>just</b> a description of a cutting method which would work. Quality of written communication partially impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> <b>Either</b> brief description of cutting method <b>or</b> justifies use of cuttings <b>or</b> justifies not use of seeds. Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>This question is targeted at grades up to C</b></p> <p><b>Relevant points may include:</b></p> <p><b>method</b></p> <ul style="list-style-type: none"> <li>• cut off (small) shoot/branch</li> <li>• dip in (hormone) powder</li> <li>• place in soil/compost</li> <li>• water regularly</li> <li>• until roots develop/leaves grow</li> </ul> <p><b>justification</b></p> <ul style="list-style-type: none"> <li>• (mature) plants are clones with inherited resistance</li> <li>• because they have same genes/DNA as parent tree</li> <li>• seeds formed by meiosis/sexual reproduction</li> <li>• not all seeds will have resistance</li> <li>• as they have genes from two trees</li> </ul> <p><b>ignore</b> argument based on the relative speed of each method  <b>ignore</b> discussions about meristems, unspecialised cells ...  <b>ignore</b> argument based on cost</p> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
	<b>Total</b>	<b>6</b>	



Question			Answer	Marks	Guidance														
12	(a)	(i)	0.02 read from graph (1) 0.02 x 200 =4 (1)	2	correct answer with no working for [2] no ecf for incorrect reading from graph														
		(ii)	1.2 mm	1	<b>accept</b> correct answer without units														
	(b)		Chromosomes are: <ul style="list-style-type: none"> <li>• copied during cell growth</li> <li>• separated in mitosis</li> </ul>	1	need both points to earn mark  <b>accept</b> chromosomes shared between new cells in mitosis for separated in mitosis														
	(c)		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="height: 20px;"></td> <td style="width: 20px;"></td> </tr> <tr> <td>More auxin moves to the shaded side of the shoot.</td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="height: 20px;"></td> <td></td> </tr> <tr> <td>The side of the shoot with most auxin grows more.</td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="height: 20px;"></td> <td></td> </tr> <tr> <td style="height: 20px;"></td> <td></td> </tr> <tr> <td style="height: 20px;"></td> <td></td> </tr> </table>			More auxin moves to the shaded side of the shoot.	✓			The side of the shoot with most auxin grows more.	✓							2	
More auxin moves to the shaded side of the shoot.	✓																		
The side of the shoot with most auxin grows more.	✓																		
<b>Total</b>				<b>6</b>															

Question		Answer	Marks	Guidance
13		Adult stem cells can become specialised ...	✓	1 mark for each correct tick
		Adult stem cells are unspecialised.	✓	
<b>Total</b>			<b>2</b>	

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