

Additional Science A

General Certificate of Secondary Education

Unit **A153/01**: Modules B6, C6, P6 (Foundation 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
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:

	correct response
	incorrect response
	benefit of doubt
	no benefit of doubt
	error carried forward
	indicate level awarded for a question marked by level of response
	information omitted
	contradiction
	reject
	indicate uncertainty or ambiguity
	draw attention to particular part of candidate's response

2. 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:

✗
✗

*This would be worth
1 mark.*

✓
✗

*This would be worth
0 marks.*

✗
✗
✓
✓

*This would be worth
1 mark.*

c. 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		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

- d. 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:

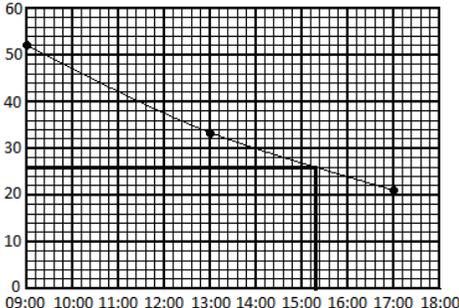
Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

- 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	<p>Level 3 (5–6 marks) Correctly describes features of the radiation, the process and the safety aspects. Quality of written communication does not impede communication of the science at this level.</p> <p>Level 2 (3–4 marks) Describes features of two from: the radiation, the process and the safety aspects. Quality of written communication partly impedes communication of the science at this level.</p> <p>Level 1 (1–2 marks) Describes features of one of: the radiation, the process or the safety aspects. Quality of written communication impedes communication of the science at this level.</p> <p>Level 0 (0 marks) Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p>This question is targeted at grades up to C:</p> <p>Indicative science content includes: radiation is described in terms of:</p> <ul style="list-style-type: none"> • radioactive source (accept X-ray tube) • this emits ionising radiation • which is gamma radiation (accept X-ray) • this radiation is penetrating • which kills cells <p>process is described in terms of:</p> <ul style="list-style-type: none"> • bacteria/fungi/microorganisms are in/on food • wrap food in airtight material/sealed box • exposed to radiation/put close to radiation source • dose must be enough to do the job • which is either a strong source or for a long time • radiation kills bacteria/fungi/microorganisms <p>ignore spraying or injecting into food</p> <p>safety aspects are described in terms of:</p> <ul style="list-style-type: none"> • happens in a separate area/room • source and food kept behind shielding • shielding is thick/lead/metal • workers don't go near source • because (ionising) radiation harms people • machines handle the food • workers wear monitoring badges • workers' exposure to radiation is limited to permitted levels. • Workers wear protective clothing(ignore confusion between irradiation and contamination here) <p>ignore safety spectacles</p>
	Total	6	

Question		Answer	Marks	Guidance
2	(a)	<p>any 3 from:</p> <p>attempt to use data to halve the activity of the sample (1)</p> <p>estimate half-life of sample within the range 6-6.5 (1)</p> <p>either recognition that half life of sample is shorter than molybdenum/half-life of sample is closer to technetium or comment on purity/contamination based on data (1)</p>	3	<p>correct statement of half life of sample is 6 to 6.5 (2)</p> <p>ignore technetium's half life is 6 hours from table</p> <p>"it has a half life of 6 hours" =2 because it refers to sample not technetium</p> <p>allow for first 2 marking points :Smooth curve <u>with construction lines</u> drawn on graph</p>  <p>look for a conclusion which is compatible with their value for half-life</p>
	(b) (i)	<p>the patients (1)</p> <p>they get better diagnoses/doctors can find out what is wrong with them (1)</p>	2	<p>if patients not chosen, 0 marks</p> <p>ignore cure them or 'acts as a tracer' (in the question stem)</p>
	(ii)	<p>the visitors (1)</p> <p>least contact with the Tc-99/shortest exposure time (1)</p>	2	<p>if visitors not chosen, 0 marks</p> <p>allow either proximity (not very close to sources/not been injected with it) or time (not there often or for long)</p>
	(iii)	<p>the government</p>	1	
Total			8	

Question			Answer	Marks	Guidance
3	(a)	(i)	80 mSV	1	
		(ii)	16 in 1000	1	
	(b)		all radiation is reflected by her skin radiation breaks molecules into ions radiation only kills cells radiation passes straight through her	1	
	(c)		17 mSv	1	
Total				4	

Question			Answer	Marks	Guidance
4			neutrons and protons electrons	2	completely correct for (2) one or two correct for (1)
Total				2	

Question		Answer	Marks	Guidance
5	(a)	MRI cortex pathways	2	3 correct = 2 marks 1 or 2 correct = 1 mark
	(b)	any one from repeat many times; link to a strong stimulus e.g. colour, light, smell or sound use memory method	1	ignore 'pattern' as it is in the question or idea of practice/revision/review/testing e.g. link to objects/places, use mnemonic, song/story
	(c) (i)	Dawn	1	
	(ii)	Dawn	1	
Total			5	

Question		Answer	Marks	Guidance												
6	(a)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">As the diameter of the neuron, increases the speed of the impulse increases.</td> <td style="text-align: center; width: 20px;">✓</td> </tr> <tr> <td style="height: 15px;"> </td> <td> </td> </tr> <tr> <td style="height: 15px;"> </td> <td> </td> </tr> <tr> <td style="height: 15px;"> </td> <td> </td> </tr> <tr> <td style="padding: 2px;">There is a correlation between diameter and speed.</td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="height: 15px;"> </td> <td> </td> </tr> </table>	As the diameter of the neuron, increases the speed of the impulse increases.	✓							There is a correlation between diameter and speed.	✓			2	
As the diameter of the neuron, increases the speed of the impulse increases.	✓															
There is a correlation between diameter and speed.	✓															
	(b)	lower speed / slower speed /quotes a speed < 60 m/s(1) because the fatty sheath speeds up (conduction) (1)	2	ora												
Total			4													

Question		Answer	Marks	Guidance
7	(a)	<p>Level 3 (5–6 marks) Describes the path of the impulse through a reflex arc using some correct terms. Should have clear indication of impulse to CNS and back but may omit transfer neuron. A mistake may be made in the function of a part. Quality of written communication does not impede communication of the science at this level.</p> <p>Level 2 (3–4 marks) Describes some operations in the correct sequence but the names of parts may be missing or incorrect. May incorrectly include idea of brain sending a signal. Quality of written communication partially impedes communication of the science at this level.</p> <p>Level 1 (1–2 marks) Makes relevant comments about the process, but probably does not give any details of the reflex arc. Describes response to the stimulus in terms of light causing the blink. May recognise eye as sensor, and that messages are sent along nerves. Quality of written communication impedes communication of the science at this level.</p> <p>Level 0 (0 marks) Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p>This question is targeted at grades up to E. Relevant points include:</p> <p>parts of reflex arc</p> <ul style="list-style-type: none"> Flash/light is the stimulus receptor (cells) in retina/eye = sensor impulses carry messages along neurons/nerve cells sensory neuron to CNS (central nervous system) PNS (peripheral nervous system) = sensory & motor neurons synapses are gaps between neurons relay/transfer neurons join sensory and motor neurons motor neurons to effector effector (cells) = muscles of eyelids/face (allow iris or pupil) blink is the response <p>process</p> <ul style="list-style-type: none"> (bright) light goes into eye Message/impulse sent to CNS/brain (allow spinal cord) There's no brain processing('you don't have to think about it') Message goes back to eye/eyelids/muscles Light causes a reaction/ light makes you blink Pupil gets smaller This protects the eye/prevents injury Allow rapid response, fast conduction electrical impulses (Higher tier) Allow process is involuntary /automatic (Higher tier) <p>accept references to spinal cord in the reflex as students are not required to know the anatomy of cranial nerves</p>
	(b)	the slowest time was on the last result/3 rd is slower than 2 nd /there is not a clear pattern or trend in the data.	1	e.g. data is random
Total			7	

Question		Answer	Marks	Guidance
8	(a)	any one from help it find food/ help it avoid a predator/danger	1	'simple animal' may be interpreted by candidates as any animal so accept any reasoned response which involves moving towards good conditions or away from bad conditions, e.g. find a mate, return to parent.
	(b)	food makes it salivate/ the food was a primary stimulus (1) pigs associate yellow bucket with food/ /the bucket was a secondary stimulus for the pig (1) repetition/over a long time/becomes a habit/response becomes a reflex/not a reflex it was born with (1)	3	accept 'pigs think/realise/learn/memorise/remember/etc. that there's food in the bucket' for associate. 3 rd marking point is about the way that the conditioned reflex is programmed in over time Do not credit 'always' or 'every time' as implying repetition as those terms are in the question stem
Total			4	

Question		Answer	Marks	Guidance
9	(a)	potassium hydroxide, calcium hydroxide	1	accept any Group I or Group II hydroxides and ammonium hydroxide/ammonia solution / Limewater ignore sodium hydroxide
	(b)	acid + alkali + salt → water <input type="checkbox"/> acid + alkali → salt + water <input checked="" type="checkbox"/> acid → alkali + salt + water <input type="checkbox"/> acid → alkali + salt → water <input type="checkbox"/>	1	
	(c)	sodium nitrate	1	
	(d)	pH meter universal indicator/pH paper/pH indicator	2	NOT indicator paper or indicator alone
	(e)	H ⁺	1	

Question		Answer	Marks	Guidance
	(f) (i)	<p>any three from gradual decrease at start (with increasing volume) (1);</p> <p>(changes) suddenly/large change (1);</p> <p>gradual decrease at end (with increasing volume) (1)</p>	3	<p>allow 'changes slowly'</p> <p>allow 'neutralisation point is at 20' for recognition of this change</p> <p>if just 'pH decreases/goes down' then give (1) overall</p>
	(ii)	20cm ³	1	
	(iii)	neutralised	1	
	(g)	<p>[1] reactants / energy at the start / energy of reactants / reactants at the start (1);</p> <p>[2] showing energy is given out/lost/exothermic (1);</p> <p>[3] products / energy at the end / energy of products / products at the end (1)</p>	3	<p>allow chemicals, possibly named, for reactants not just 'energy' unqualified</p> <p>must refer to energy for this mark. Can accept 'energy gets lower/energy falls/energy changes' etc accept temperature increases/it gets hot</p> <p>allow chemicals, possibly named, for products not just 'energy' unqualified</p>
Total			14	

Question	Answer	Marks	Guidance
10	<p>Level 3 (5–6 marks) Recognition that volume rather than concentration has been investigated and a description of how it can be improved. Quality of written communication does not impede communication of the science at this level.</p> <p>Level 2 (3–4 marks) Some relevant comments made about variables or improvements to method. OR A relevant comment made about a variable and an improvement to method. Quality of written communication partially impedes communication of the science at this level.</p> <p>Level 1 (1–2 marks) Makes a relevant comment about a variable OR method Quality of written communication impedes communication of the science at this level.</p> <p>Level 0 (0 marks) Insufficient or irrelevant science. Answer not creditworthy</p>	6	<p>This question is targeted at grades up to C Relevant points include: Variables</p> <ul style="list-style-type: none"> • control the mass of chips • control the size of chips/surface area of chips • control the volume of reactants • control the temperature • control the shaking <p>Improvements to Method</p> <ul style="list-style-type: none"> • Maintain overall volume and correctly vary concentration of acid. • how to measure rate/measures time • precision of equipment • repetition • Extend range e.g. different concentrations. Accept doing more experiments with different volumes <p>ignore fair testing ignore testing additional variables</p>
	Total	6	

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