



GCSE

Additional Science B

General Certificate of Secondary Education

Unit **B722/01**: Modules B4, C4, P4 (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.

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For answers marked by levels of response:

- a. **Read through the whole answer from start to finish**
- b. **Decide the level that best fits** the answer - match the quality of the answer to the closest level descriptor
- c. **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

- d. Use the L1, L2, L3 annotations in Scoris to show your decision; do not sue ticks.

Quality of Written Communication skills assessed in 6 mark extended writing questions include:













- a. appropriate use of correct scientific terms
- b. spelling, punctuation and grammar
- c. developing a structured, persuasive argument
- d. selecting and using evidence to support an argument
- e. considering different sides of a debate in a balanced way
- f. logical sequencing.

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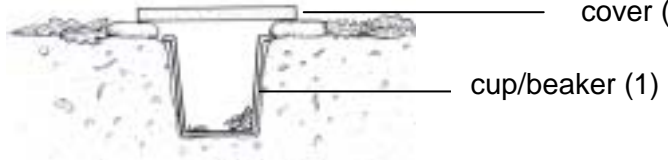
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Annotations

Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt not given
	error carried forward
	information omitted
	ignore
	reject
	contradiction
	Level 1
	Level 2
	Level 3

Abbreviations, annotations and conventions used in the detailed Mark Scheme.

/	=	alternative and acceptable answers for the same marking point
(1)	=	separates marking points
allow	=	answers that can be accepted
not	=	answers which are not worthy of credit
reject	=	answers which are not worthy of credit
ignore	=	statements which are irrelevant
()	=	words which are not essential to gain credit
—	=	underlined words must be present in answer to score a mark (although not correctly spelt unless otherwise stated)
ecf	=	error carried forward
AW	=	alternative wording
ora	=	or reverse argument

Question			Answer	Marks	Guidance
1	(a)	(i)	<p>any one from:</p> <p>idea that can leave over night / ora (1)</p> <p>idea that can leave unattended / ora (1)</p> <p>pooter not suitable as beetles too big (1)</p> <p>idea that (pitfall traps) catch animals that live on the ground (1)</p>	1	<p>allow catcher does not need to be present (1)</p> <p>allow beetles can't climb out (1)</p> <p>ignore references to fast beetles</p> <p>ignore too dark at night to use a pooter / net</p> <p>e.g. when beetle goes along ground it will fall into the trap (1)</p>
		(ii)	<p>idea of container (e.g. cup or beaker) in hole in the ground (1)</p> <p>plus one from:</p> <p>cover (1)</p> <p>bait (1)</p> <p>leave overnight (1)</p>	2	<p>marks can be scored from a labelled diagram</p>  <p>allow put the pitfall trap in the ground (1)</p> <p>ignore just 'dig a hole'</p> <p>allow cover with leaves / put leaves over the top (1)</p> <p>allow use detergent to stop beetles escaping (1)</p>

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Question		Answer	Marks	Guidance
	(b) (i)	overgrown area: 40 (1) flower bed: 28 (1)	2	
	(ii)	any two from: (more in overgrown area because:) beetles better hidden (from their predators) / ora (1) more food for beetles because more prey / ora (1) less disturbance / not killed by pesticides or insecticides / ora (1)	2	allow more cover (1) allow flower bed more open so they cannot hide (1) ignore simply more grass / long(er) grass allow more insects (for beetles to eat) (1) ignore simply 'less predation' ignore simply 'more food' not beetles eat grass
	(c)	any two from: increase rate of decay (1) increase surface area (for decay) (1) decay provides minerals or nutrients or essential elements (for plants) (1)	2	allow idea that bacteria or fungi or microbes can break down further (1) allow examples of minerals: nitrates / phosphates / potassium / magnesium (1)
Total			9	

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Question			Answer	Marks	Guidance
2	(a)	(i)	<p>any two from:</p> <p>as the distance increases the number of bubbles decreases / ora (1)</p> <p>as distance increases light or energy decreases / ora (1)</p> <p>as light intensity increases the number of bubbles increases (1)</p> <p>and</p> <p>distance or light (intensity) affects (the rate of) photosynthesis</p> <p>or</p> <p>photosynthesis produces oxygen (1)</p>	3	<p>allow as distance increases less oxygen or gas released / ora (1)</p> <p>ignore air but allow air bubbles</p> <p>not other named gases</p> <p>ignore heat</p> <p>allow more oxygen or gas released as light increases / ora (1)</p> <p>BUT</p> <p>allow increased light (intensity) increases (the rate of) photosynthesis (2)</p>
		(ii)	<p>use a measuring cylinder / syringe (2)</p> <p>or any two from</p> <p>measure volume (of oxygen) (1)</p> <p>use of ruler (to measure gas collected) (1)</p> <p>measure height of gas / measure height of oxygen (1)</p>	2	
	(b)	(i)	osmosis (1)	1	allow diffusion (1)
		(ii)	<p>photosynthesis (1)</p> <p>support / stay turgid (1)</p>	2	<p>allow can produce sugars or glucose (1)</p> <p>ignore references to growth and respiration</p> <p>allow keeps the cell in shape (1)</p> <p>allow (creates pressure) so they stand upright (1)</p> <p>allow prevents drooping or wilting (1)</p> <p>allow transport of minerals / sugar / food (1)</p>
Total				8	

Question	Answer	Marks	Guidance
3 (a)	<p>Level 3 (5–6 marks) Describes at least TWO suggestions to maximise growth AND explains both of them.</p> <p>OR</p> <p>Describes ONE suggestion to maximise growth AND provides TWO explanations Quality of written communication does not impede communication of the science at this level.</p> <p>Level 2 (3–4 marks) Describes ONE suggestion to maximise growth and explains it. OR describes TWO suggestions to maximise growth with no explanation. Quality of written communication partly impedes communication of the science at this level.</p> <p>Level 1 (1–2 marks) Describes ONE suggestion to maximise growth. 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.</p> <p>Indicative scientific points at levels 2 & 3 may include:</p> <ul style="list-style-type: none"> • add heating or control temperature – to increase rate of photosynthesis or increase rate of growth • add carbon dioxide – to increase rate of photosynthesis • add fertiliser or manure – to provide minerals or nutrients or essential elements for growth (not just better crops or helps plants grow) • add fertiliser or manure – increased growth rate / grows bigger lettuces (not just better crops or helps plants grow) • add pesticide / insecticide / fungicide – to kill pests • use biological control / introduce predators – to kill pests • add herbicide / hoe – to remove weeds / remove competitors. • idea of spacing out lettuces – to reduce competition • add detritivores (e.g. worms) – to add nutrients • good soil quality – so plants get nutrients or avoid water logging <p>Indicative scientific points at level 1 may include:</p> <ul style="list-style-type: none"> • add heating or control temperature • add carbon dioxide • add fertiliser or manure • add pesticide / insecticide / fungicide • use biological control / introduce predators • add herbicide / hoe • idea of spacing out lettuces • good soil quality • add detritivores (e.g. worms) <p>Use the L1, L2, L3 annotations in scoris. Do not use ticks.</p>


Question		Answer	Marks	Guidance
	(b)	<p>any two from: (not scientific because:)</p> <p>idea that cannot quantify taste (1) idea that cannot define what is 'natural' (1)</p> <p>idea that it is only his opinion (1)</p>	2	<p>allow cannot judge what is natural (1)</p> <p>allow doesn't refer to science (1) allow hasn't said that he has scientific proof (1) allow he has no evidence (1)</p>
		Total	8	

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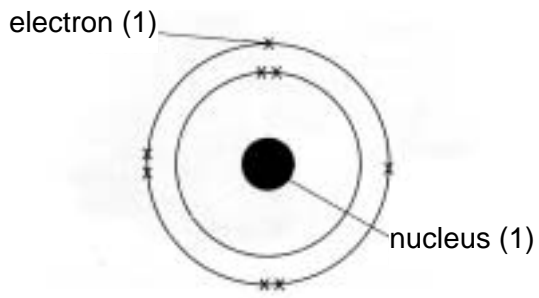
Question			Answer	Marks	Guidance
4	(a)	(i)	iodine (1)	1	allow I / I ₂ (1)
		(ii)	chlorine and iodine / oxygen and sulfur (1)	1	both required for the mark allow Cl and I or O and S (1) allow Cl ₂ / I ₂ / O ₂
		(iii)	magnesium (1)	1	allow Mg (1)
	(b)		period 3 (1) (because it) has 3 (occupied electron) shells (1)	2	ignore it has 3 numbers
	(c)		sodium + iodine → sodium iodide (1)	1	not sodium + iodine → sodium iodine allow = instead of → not and / & / instead of + allow correct formulae but equation does not need to balance eg Na + I ₂ → NaI allow mix of correct formulae and words

Question		Answer	Marks	Guidance
	(d) 	<p>Level 3 (5–6 marks) Candidate produces a detailed description of the work of both Dobereiner and Newlands.</p> <p>Quality of written communication does not impede communication of the science at this level.</p> <p>Level 2 (3–4 marks) Candidate produces a detailed description of the work of <u>either</u> Dobereiner <u>or</u> Newlands</p> <p>OR a partial description of the work of both. Quality of written communication partly impedes communication of the science at this level.</p> <p>Level 1 (1–2 marks) Candidate produces a partial description of the work of <u>either</u> Dobereiner <u>or</u> Newlands. 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. Indicative scientific points may include:</p> <p>Dobereiner</p> <ul style="list-style-type: none"> • triads consist of three elements • recognised groups of elements • identified patterns between elements with similar properties • middle one of triad has a relative atomic mass which is the average of the other two • identifies triads eg Li, Na and K or F, Cl and Br or Ca, Sr and Ba or S, Se and Te. <p>Newlands</p> <ul style="list-style-type: none"> • arranged elements in order of their relative atomic mass • elements with similar chemical properties were 8 positions away from each other • this is similar to musical notes in an octave • noble gases not yet discovered • pattern does not work for all elements. <p>Use the L1, L2, L3 annotations in scoris. Do not use ticks.</p>
		Total	12	

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Question		Answer	Marks	Guidance
5	(a)	 <p>electron (1)</p> <p>nucleus (1)</p>	2	<p>allow proton or neutron instead of nucleus (1)</p> <p>ignore ion</p> <p>allow nuclear (1)</p>
	(b)	${}_{17}^{37}\text{Cl}$ (1)	1	allow correct answer ticked, circled or underlined in list if answer line is blank
Total			3	

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Question		Answer	Marks	Guidance
6	(a)	<p>any two from: Mark can be awarded for a correct comparison between at least two of the three metals</p> <p>Idea that potassium fizzes more than sodium / sodium fizzes more than lithium / potassium fizzes more than lithium (1)</p> <p>Idea that potassium moves more quickly than sodium / sodium moves more quickly than lithium / potassium moves more quickly than lithium (1)</p> <p>a flame is only seen with potassium (1)</p>	2	<p>answer must be comparative,</p> <p>ignore potassium reacts more than the other two allow potassium is the only one to fizz violently (1) allow e.g. potassium fizzes violently and sodium fizzes rapidly (1)</p> <p>allow e.g. sodium moves quickly (across the surface) and lithium moves (across the surface) (1)</p>
	(b)	<p>$2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$</p> <p>correct reactants and products (1) correct balancing (1)</p>	2	<p>allow any correct multiple, including fractions e.g. $4\text{Na} + 4\text{H}_2\text{O} \rightarrow 4\text{NaOH} + 2\text{H}_2$ (2)</p> <p>allow = / \rightleftharpoons instead of \rightarrow not and or & instead of '+'</p> <p>balancing mark is dependent on the correct formulae but allow 1 mark for a balanced equation with a minor error in subscripts / formulae e.g. $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}^2$ (1)</p>
Total			4	

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Question		Answer	Marks	Guidance
7	(a)	<p>idea that metal A has a low density / lightweight or density (of metals B and C) is too high (so wires would sag) (1)</p> <p>idea that metal A is cheap(er) or metals B and C are too expensive (1)</p>	2	<p>assume unqualified answer refers to metal A</p> <p>ignore other properties from the table i.e. melting point and electrical conductivity</p> <p>allow B and C have too high a density (1)</p> <p>ignore A is light or Band C are heavy</p> <p>allow B and C are too expensive (1)</p> <p>allow reference to just one metal eg metal C is too expensive (1)</p> <p>allow because of density and cost (1) if no other mark scored</p>
	(b)	<p>strong (1)</p> <p>flexible (1)</p>	2	<p>mark first two properties with the exception of those which should be ignored as stated below</p> <p>allow strength or idea that can hold a lot of weight (1)</p> <p>allow easy to bend (1)</p> <p>allow ductile (1)</p> <p>allow does not corrode / thermal expansion / idea of reactivity (1)</p> <p>ignore malleable</p> <p>ignore durable</p> <p>ignore non-corrosive</p> <p>ignore properties given in the table i.e. melting point, electrical conductivity, density and cost</p>
	(c)	copper, iron and sulfur	2	<p>3 correct scores 2 marks</p> <p>1 or 2 correct scores 1 mark</p> <p>ignore Cu, Fe, S</p>
Total			6	

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Question			Answer	Marks	Guidance
8	(a)	(i)	positive negative (1)	1	both needed any order
		(ii)	dust attracted or dust moves (1) but dust attracted to the brush or dust moves to the brush (2)	2	not dust attracted to television allow dust sticks to brush (2)
	(b)	(i)	<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Connor's trainers are conductors <input type="checkbox"/></div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">The carpet is made from an insulating material <input checked="" type="checkbox"/></div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Charge conducts through the carpet <input type="checkbox"/></div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Connor becomes charged walking over the carpet <input checked="" type="checkbox"/></div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">The carpet becomes charged by rubbing <input checked="" type="checkbox"/></div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">The water tap is an insulator <input type="checkbox"/></div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">The water tap is earthed <input checked="" type="checkbox"/></div>	2	all 4 correct (2) 2 or 3 correct (1) 1 correct (0)
		(ii)	paint or crop spraying / removing dust or smoke from chimneys / electrostatic precipitators (1)	1	allow painting cars (1) allow printers / photocopiers (1) allow electrostatic dusters (1) ignore just lightning and lightning conductors ignore jump starting cars ignore tasers
Total				6	

Question		Answer	Marks	Guidance
9	(a)	<p>3 (Ω) (2)</p> <p>but if answer is incorrect</p> <p>6 \div 2 (1)</p>	2	
	(b)	<p>any three from:</p> <p>idea that longer wires result in less current / ora (1)</p> <p>idea that thinner wires result in less current / ora (1)</p> <p>idea that longer wires have more resistance / wire A has more resistance (compared to B) (1)</p> <p>idea that thinner wires have more resistance / wire C has more resistance (compared to B) (1)</p>	3	<p>Use ticks and crosses on this question</p> <p>allow references to stronger and weaker currents ignore references to faster or slower currents ignore thickness of wire makes the current higher</p> <p>allow idea of resistance C > A > B (2) calculations show the resistances are 3 / 1.5 / 6 (2) allow higher level answers eg double length = 2x resistance / ora (1) half thickness / diameter = 4 x resistance / ora (1)</p>
	(c)	<p>yes (no mark)</p> <p>(lamp power) 5.4(W) (1)</p> <p>lamp power approximately half / AW / ora for wire (1)</p>	2	<p>ignore yes or no</p> <p>ignore incorrect units</p> <p>2nd mark is dependent on first mark allow ecf from incorrect power calculation allow lamp power not exactly half (1)</p> <p>but allow idea that currents in the same ratio or proportion (as voltages are the same) if no other mark awarded (1)</p>
		Total	7	

Question	Answer	Marks	Guidance
10 (a)	<p>Level 3 (5–6 marks) Identifies C / gamma should be used. AND the answer justifies this with reference to length of half life AND the ability to penetrate out of the body. Quality of written communication does not impede communication of the science at this level.</p> <p>Level 2 (3–4 marks) Identifies C / gamma should be used. AND the answer justifies this with reference to length of half life or the ability to penetrate out of the body. Quality of written communication partly impedes communication of the science at this level.</p> <p>Level 1 (1–2 marks) Identifies C / gamma should be used OR answer makes any relevant reference to a property of one of the types of radiation. 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 scientific points at all levels may include:</p> <p>Identification of source</p> <ul style="list-style-type: none"> • source C / gamma source selected <p>Explanations – half life</p> <ul style="list-style-type: none"> • refer to half-life of C being very short / little radiation emitted after a few half-lives • gamma / C would decrease faster (so causing less harm) <p>Explanations – penetration</p> <ul style="list-style-type: none"> • gamma / C penetrates further (than alpha or beta) • gamma / C would leave body and be detected • gamma is least ionising <p>Indicative scientific points at level 1, if no other marks scored, may include:</p> <ul style="list-style-type: none"> • refer to relatively long half-life of A • very long half-life of B • idea of A / alpha and B / beta staying in the body too long • alpha / A and beta / B could harm inside of body / tissue / organs etc • alpha A and beta / B would be stopped by body / not leave body <p>Use the L1, L2, L3 annotations in scoris. Do not use ticks.</p>

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Question		Answer	Marks	Guidance	
	(b)	<p>any two from:</p> <p>idea that Dermot states an opinion (1)</p> <p>idea that Sheng Li's statement is based on scientific data (1)</p> <p>idea that dose received is low or below what we receive naturally (1)</p>	2	<p>allow Dermot does not know the facts / Dermot does not have the evidence (1)</p> <p>allow idea that Sheng Li is a professional / Sheng Li knows about scanning dangers / Sheng Li knows what he is doing (1)</p>	
	(c)	(i)	D (1)	1	
		(ii)	A (1)	1	
			Total	10	

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Question		Answer	Marks	Guidance
11	(a)	X / a temperature of millions of degrees Celcius (1)	1	allow correct answer ticked, circled or underlined in list if answer line is blank
	(b)	R shows joining of nuclei / two nuclei fuse or join together (1)	1	allow shows joining of atoms / two atoms fuse or join together but not shows joining of molecules / two molecules fuse or join together allow two small circles join to make one (1) (limit of acceptability) allow S shows particle emitted from nucleus T shows splitting of nucleus / fission (1)
Total			2	

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Question			Answer	Marks	Guidance
12	(a)	(i)	360 (1)	1	
		(ii)	(untrue because) it is an average reading (1) therefore some will be higher and some lower (1)	2	allow everyone is different / Bob or Jenny could be different (1) allow specific examples of differences e.g. some people are bigger or taller than others / different genders / one might have a heart or health condition / different diets / one might do more exercise (1)
	(b)		using ultrasound does not involve injection / idea that it is non-invasive / does not involve an injection / does not damage cells or tissues / less risk from ultrasound (than radioactivity) / idea that injections are painful / ora (1)	1	ignore ultrasound is easier / quicker allow ultrasound is safer / less harmful (1) allow injections are more stressful (1)
	(c)	(i)	1.50 (metres squared) (1)	1	allow 1.5 (1) allow 1.49 to 1.51 (1)
		(ii)	4 (1) healthy (as less than 4.2) (1)	2	allow ecf from (c)(i) allow normal / just above normal (1) allow ecf from cardiac index calculation e.g. an answer 4.5 would mean she is unhealthy can score the conclusion mark

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Question		Answer	Marks	Guidance
	(iii)	it takes into account the size of the body / bigger people will have a bigger heart or bigger cardiac output (1)	1	allow includes surface area of body (1) allow it is tailored to individuals (1) ignore it is more accurate
	(d)	(larger mammals) have a longer life expectancy / ora (1) (larger mammals) have a lower or slower heart rate / ora (1)	2	assume unqualified answer refers to larger mammals allow (for larger mammals) the higher the heart rate, the lower the life expectancy / ora (2)
		Total	10	

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