OCR
RECOGNISING ACHIEVEMENT

GCSE

Additional Science B

General Certificate of Secondary Education

Unit **B722/01:** 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.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

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:

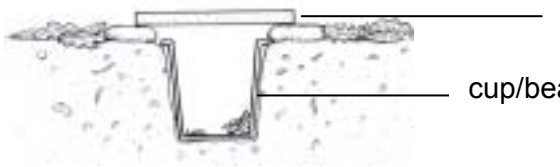
a. appropriate use of correct scientific terms
b. spelling, punctuation and grammar
c. developing a structured, persuasive argument
d. selecting and using evidence to support an argument
e. considering different sides of a debate in a balanced way
f. logical sequencing.

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

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**	

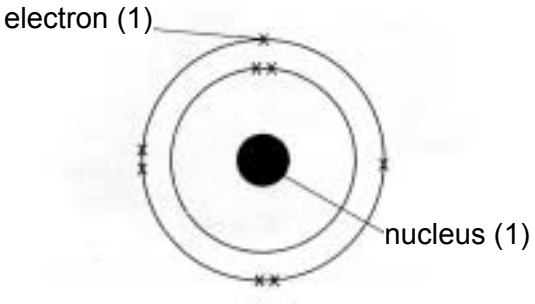
Question			Answer	Marks	Guidance
2	(a)	(i)	**any two from:** as the distance increases the number of bubbles decreases / ora (1) as distance increases light or energy decreases / ora (1) as light intensity increases the number of bubbles increases (1) **and** distance or light (intensity) affects (the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

Question			Answer	Marks	Guidance
3	(a)		**Level 3 (5–6 marks)** **Describes at least TWO suggestions to maximise growth** **AND** **explains both of them.** **OR** **Describes ONE suggestion to maximise growth** **AND** **provides TWO explanations** Quality of written communication does not impede communication of the science at this level. **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. **Level 1 (1–2 marks)** **Describes ONE suggestion to maximise growth.** 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 at levels 2 & 3 may include:** • 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 **Indicative scientific points at level 1 may include:** • 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) **Use the L1, L2, L3 annotations in scoris. Do not use ticks.**

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

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 iod**ine** **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)	✎	**Level 3 (5–6 marks)** **Candidate produces a detailed description of the work of both Dobereiner and Newlands.** Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** **Candidate produces a detailed description of the work of either Dobereiner or Newlands** ***OR*** **a partial description of the work of both.** Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** **Candidate produces a partial description of the work of either Dobereiner or Newlands.** 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 scientific points may include:** Dobereiner • 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. Newlands • 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. **Use the L1, L2, L3 annotations in scoris. Do not use ticks.**
			Total	**12**	

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

Question			Answer	Marks	Guidance
6	(a)		**any two from:** **Mark can be awarded for a correct comparison between at least two of the three metals** Idea that potassium fizzes more than sodium / sodium fizzes more than lithium / potassium fizzes more than lithium (1) Idea that potassium moves more quickly than sodium / sodium moves more quickly than lithium / potassium moves more quickly than lithium (1) a flame is **only** seen with potassium (1)	2	**answer must be comparative,** **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) **allow** e.g. sodium moves quickly (across the surface) and lithium moves (across the surface) (1)
	(b)		$2Na + 2H_2O \rightarrow 2NaOH + H_2$ correct reactants and products (1) correct balancing (1)	2	**allow** any correct multiple, including fractions e.g. $4Na + 4H_2O \rightarrow 4NaOH + 2H_2$ (2) **allow** = / ⇌ instead of → **not** and or & instead of '+' 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. 2Na + 2H2O → 2NAOH + H^2 (1)
			Total	**4**	

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

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)	Connor's trainers are conductors ☐ The carpet is made from an insulating material ✓ Charge conducts through the carpet ☐ Connor becomes charged walking over the carpet ✓ The carpet becomes charged by rubbing ✓ The water tap is an insulator ☐ The water tap is earthed ✓	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)		3 (Ω) (2) **but if answer is incorrect** 6 ÷ 2 (1)	2	
	(b)		**any three from:** idea that longer wires result in less current / ora (1) idea that thinner wires result in less current / ora (1) idea that longer wires have more resistance / wire **A** has more resistance (compared to **B**) (1) idea that thinner wires have more resistance / wire **C** has more resistance (compared to **B**) (1)	3	**Use ticks and crosses on this question** **allow** references to stronger and weaker currents **ignore** references to faster or slower currents **ignore** thickness of wire makes the current higher **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)
	(c)		yes (no mark) (lamp power) 5.4(W) (1) lamp power approximately half / AW / ora for wire (1)	2	**ignore** yes or no **ignore** incorrect units **2nd mark is dependent on first mark** **allow** ecf from incorrect power calculation **allow** lamp power not exactly half (1) **but** **allow** idea that currents in the same ratio or proportion (as voltages are the same) if no other mark awarded (1)
			Total	**7**	

Question			Answer	Marks	Guidance
10	(a)		**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. **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. **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. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to C.** **Indicative scientific points at all levels may include:** **Identification of source** • source **C** / gamma source selected **Explanations – half life** • 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) **Explanations – penetration** • gamma / **C** penetrates further (than alpha or beta) • gamma / **C** would leave body and be detected • gamma is least ionising **Indicative scientific points at level 1, if no other marks scored, may include:** • 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 **Use the L1, L2, L3 annotations in scoris. Do not use ticks.**

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

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**	

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

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**	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553