OCR
Oxford Cambridge and RSA

GCSE

Additional Science B

Unit **B722/01:** Modules B4, C4, P4 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2014

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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.

1. These are the annotations, (including abbreviations), including those used in scoris, which are used when marking

Annotation	Meaning
BP	Blank Page – this annotation **must** be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
	correct response
	incorrect response
BOD	benefit of the doubt
NBOD	benefit of the doubt **not** given
ECF	error carried forward
^	information omitted
I	ignore
R	reject
CON	contradiction

2. 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

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1 a</td><td>any two from:
enters through leaves (1)
stomata (1)

by diffusion (1)</td><td>2</td><td>

ignore pores</td></tr>
<tr><td>b</td><td>herbicide (1)</td><td>1</td><td>mark answer on line first
allow answer ringed, underlined or ticked on diagram if no answer on the answer line</td></tr>
<tr><td>c</td><td>crop rotation (1)</td><td>1</td><td>more than one tick scores 0</td></tr>
<tr><td>d</td><td><table>
<tr><td>Sugar beet grows better after barley than after soya beans</td><td>✓(1)</td></tr>
<tr><td>The chemical used on barley plants reduces the size of the sugar beet crop</td><td></td></tr>
<tr><td>Sugar beet grows better after soya beans than after barley</td><td></td></tr>
<tr><td>The growth of sugar beet is affected by both soya beans and the chemical used</td><td>✓(1)</td></tr>
<tr><td>Sugar beet grows just as well after soya beans as after barley</td><td></td></tr>
</table></td><td>2</td><td>if more than 2 ticks deduct a m
ark for each extra tick</td></tr>
<tr><td>e</td><td>any two from:
idea that the results can be checked (1)

idea that the results can be compared (1)

to make other scientists aware of the work that has been done (1)

allows other scientists to collect further evidence / so other scientists can develop the work (1)

idea of recognition for work / improve career / become famous (1)</td><td>2</td><td>

ignore other people or public

ignore financial remuneration</td></tr>
<tr><td></td><td>Total</td><td>8</td><td></td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>2 a</td><td>air contains oxygen /

oxygen is needed for decay /

oxygen is needed for microbes or bacteria or fungi
(1)</td><td>1</td><td>allow idea that oxygen gets into the compost</td></tr>
<tr><td>b</td><td>any two from:

(dissolved) in water / in solution (1)

by root (hairs) (1)

(from) the soil (1)</td><td>2</td><td>

allow higher level answers eg active transport</td></tr>
<tr><td>c i</td><td>

decay in A was (at a) faster (rate) / ora (1)

idea that A finished quicker / ora (1)</td><td>2</td><td>ignore references to temperature
assume first reference is A if not stated

ignore just A decays more

allow less time to decompose (1)</td></tr>
<tr><td>ii</td><td><table><tr><td>grass clippings</td><td>A</td></tr><tr><td>sawdust</td><td>C</td></tr><tr><td>straw</td><td>B</td></tr></table>(1)</td><td>1</td><td></td></tr>
<tr><td></td><td>Total</td><td>6</td><td></td></tr>
</table>

Question	Answer	Marks	Guidance
3 a	**[Level 3]** **Answer includes details of how to set up a transect line and collect the data** **AND** **contains <u>two</u> correct conclusions from the data.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** **Answer includes some description of how use a quadrat** **AND** **<u>one</u> correct conclusion.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** **Answer includes some reference to how the experiment is conducted** **OR** **there is an attempt at a conclusion.** Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted from grades G to C** **Indicative scientific points may include:** **Method:** • method of sampling using quadrats to count individuals or percentage cover • use of a key to identify organisms • idea that a tape measure is used to set up a transect line • quadrats used at set distances along the line **Conclusion**: • an appreciation that o the organisms are growing at particular areas of the shore o some organisms are more abundant than others o some live over wider ranges o allow references to individual species e.g. **Lower shore** sawwrack , coral weed **Mid shore** limpets, barnacles, coral weed bladderwrack **Upper shore** bladderwrack **Use the L1, L2, L3 annotations in scoris; do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
4 a	(close to the) chloroplasts (1)	1	**ignore** chlorophyll
b	oxygen is given off / oxygen is a (waste) product / oxygen is produced / oxygen is made / (1) bacteria need oxygen (so move towards it) (1) photosynthesis is taking place in the chloroplasts / chlorophyll (1)	3	**allow** idea that most oxygen / higher concentration of oxygen is in this area (1) **ignore** references to glucose **allow** bacteria attracted to the oxygen (1) **but** bacteria need oxygen to respire (2) **ignore** references to breathing
c	palisade (mesophyll) (1)	1	**mark answer on line first** **allow** correct answer indicated on list if answer line is blank
	Total	**5**	

Question	Answer	Marks	Guidance
5 a	aluminium / gallium / indium / thallium / Al / Ga / In / Tl (1)	1	symbols must be correct if given
b i	neutron (1)	1	
ii	<u>+5</u> (1)	1	**ignore** positive or + on its own
iii	neutral (1)	1	**allow** correct answer indicated on list if answer line is blank **allow** 0
	Total	**4**	

Question	Answer	Marks	Guidance
6	**[Level 3]** **Applies understanding of the relationship between property and use of a material to give <u>two</u> properties needed by the metal** **AND** **identifies metal C with <u>two</u> reasons** Quality of written communication does not impede communication of the science at this level (5 – 6 marks) **[Level 2]** **Applies understanding of the relationship between property and use of a material to give <u>two</u> properties needed by the metal** **OR** **identifies metal C with a reason** Quality of written communication partly impedes communication of the science at this level (3 – 4 marks) **[Level 1]** **Applies understanding of the relationship between property and use of a material to give <u>one</u> property needed by the metal** **OR** **identifies C as a suitable metal (without a reason)** Quality of written communication impedes communication of the science at this level (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C.** **Indicative scientific points at all could include:** • Metal must be strong • Metal must not corrode or rust • Metal must be malleable • Metal must not be brittle **Reasons:** Metal **C** • idea that has highest relative strength / is very strong • idea that corrodes slowest / is slow to corrode **ignore** idea that metal **C** is the least corrosive **ignore** other properties **Use the L1, L2, L3 annotations in scoris; do not use ticks.**
	Total	**7**	

Question	Answer	Marks	Guidance
7 a	O_2 contains two (oxygen) atoms (1) O^{2-} has a charge / has a negative charge / has a 2- (1)	2	**ignore** does not have a charge **allow** is negative / has gained electrons (1)
b	sodium atom loses an electron (1) to form a stable electronic structure / to get a full outer shell / to get a noble gas electronic structure / to get the electronic structure of neon / to get a stable outer octet (1)	2	**allow** sodium atoms lose electrons **allow** more protons than electrons
c	Na_2O / ONa_2 (1)	1	**allow** $(Na^+)_2O^{2-}$ **allow** answer on right hand side of equation (the equation does not need to be balanced) e.g. $Na + O_2 \rightarrow Na_2O$ (1) **not** Na2O / Na^2O
	Total	**5**	

Question	Answer	Marks	Guidance
8 a	lakes / reservoirs / rivers (1)	1	**allow** wells / canals / streams (1) **ignore** oceans
b	water wastage through leakage = 1500 (1) percentage wastage = 16.7 (%) (1)	2	**allow** 1 500 000 000 **allow** ecf from wrong value of water leakage **allow** 16.6 (%) / 17 (%) (1) **not** 16 (%)
c	 lead (1) from (old) lead pipes (1) **OR** pesticides / nitrates / fertilisers (1) from run-off from farms (1) **OR** chlorinated compounds (1) by reaction of chlorine with impurities in water (1)	2	**allow** sodium fluoride, hormones etc. **allow** herbicides (1) **allow** washed into rivers (1) **ignore** chlorine or any other chemicals added in purification process **ignore** bacteria
	Total	**5**	

Question	Answer	Marks	Guidance
9 a	**any three from:** chlorine is used to sterilise water or purify water (1) chlorine is used to **kill** microbes or bacteria (1) chlorine is used to make bleach / disinfectants (1) chlorine is used to make pesticides (1) chlorine is used to make hydrochloric acid (1) chlorine is used to make plastics / used to make PVC (1) iodine is used to sterilise wounds / correct medical uses (1)	3	maximum **two** marks for chlorine **allow** to make water safe to drink **ignore** germs **ignore** cleaning swimming pools **allow** iodine is used as an indicator to test for starch (1)
b	chlorine + calcium iodide $\rightarrow$ iodine + calcium chloride (1)	1	**allow** correct formulae / mix of words and formulae e.g. $Cl_2 + CaI_2 \rightarrow CaCl_2 + I_2$ **allow** reactants in either order and / or products in either order **not** calcium iodine or calcium chlorine
c	fluorine / F / F_2 (1)	1	**allow** correct answer indicated on list if answer line is blank
	Total	**5**	

Question	Answer	Marks	Guidance
10 a i	B (1)	1	**allow** correct answer indicated on list or diagram if answer line is blank
ii	4 Ω scores (3) 4 (2) **but if the answer is incorrect or incomplete then:** $\frac{6}{1.5}$ scores (1) ohms / Ω (1)	3	mark the unit **independently** eg. ohms / Ω scores (1) eg 100 Ohms / 100 Ω scores (1)
b	**any 2 from the ideas that:** current in E is higher than F (1) both bulbs in F have same current (1) E and F have a different resistance (1)	2	 **allow** for full credit, higher level answer in terms of current eg Current in E is twice that in F (2) **allow** for full credit, higher level answer in terms of resistance eg E has lower resistance / F has higher resistance (2) E has a higher resistance scores 1 for being different resistance **if no other mark scored allow 1** for idea that voltage across bulb in E is greater than across each bulb in F
c i	C (1)	1	**allow** correct answer indicated on list if answer line is blank
ii	idea of safety (1)	1	**allow** higher level answers eg fuse blows if current is too large (1) **ignore** to stop the appliance becoming live / to stop you getting electrocuted **if answer includes safety ignore** explanations eg for safety to stop the appliance becoming live scores 1
	Total	**8**	

Question	Answer	Marks	Guidance
11 a	**any two from**: (artificial grass) is an insulator (1) (Sophie) becomes charged **or** static (electricity) or charge is produced on artificial grass (1) (Sophie gets a shock) when earthed (through the post) / (Sophie gets a shock) when charge flows to ground (1)	2	**OR allow reverse arguments** for real grass: idea that real grass (soil) is a conductor (1) idea that charge does not accumulate / charges flow to earth (continuously) (1)
b	**any two from:** rod needs to be an insulator (1) cloth needs to be an insulator (1) only insulators can become charged / only insulators pick up paper (1) metals do not work / are conductors / AW (1) BUT both need to be insulators (2)	2	**if no other mark awarded** **allow** nylon or polythene rods become charged or rods that pick up the paper become charged (1) **OR** copper or glass or aluminium rods do not become charged (1) **allow** metals do not become charged
c	paint or crop spraying / starting heart / defibrillator (1)	1	**allow** electrostatic cloths / dusters / photocopiers / printers (1)
	Total	**5**	

Question	Answer	Marks	Guidance
12	**[Level 3]** **Gives a detailed description of the method** **AND** **chooses tracer E giving a correct justification.** Quality of written communication does not impede communication of the science at this level (5 – 6 marks) **[Level 2]** **Gives a simple or partial description of the method** **AND** **chooses tracer D or E with a supporting reason.** Quality of written communication partly impedes communication of the science at this level (3 – 4 marks) **[Level 1]** **Gives a simple or partial description of the method involved** **OR** **chooses tracer D or E with a supporting reason** Quality of written communication impedes communication of the science at this level (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted up to grade C** **Indicative scientific points at level 3 for choice of tracer is:** gamma E emitter chosen for its appropriate (long enough to detect) half-life **AND** penetrates soil / pipe **Indicative scientific points at level 2 / level 1 for choice of tracer is** E emitter chosen for its appropriate (long enough to detect) half-life **OR** D / E emitter chosen for its appropriate (short enough not to cause harm) half life **OR** D / E / gamma source chosen for soil penetration **Description at all levels may include:** • uses a detector • measures radiation on surface along the pipe • blockage is where count rate changes / blockage shows a larger reading / blockage followed by a reduced reading **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
13 a	fission is **nuclei** splitting (1) fusion is **nuclei** joining (1)	2	**ignore** atoms splitting **ignore** atoms joining
b	idea that no-one has been able to repeat the experiment successfully / no-one has got the same result (1)	1	**allow** there were no (independent) witnesses to the cold fusion experiment / AW (1) **allow** no-one has been able to get cold fusion to work (1) **ignore** just the idea that no-one has repeated the experiment
c i	activity decreases with time / AW (1) need to ensure the patient gets the correct dose / AW (1)	2	**allow** gets weaker with time / AW (1) **ignore** becomes less ionising **allow** takes longer to receive the correct dose / AW (1)
ii	gamma (1)	1	**accept** alpha (for localised treatment) (1)
	Total	**6**	

Question	Answer	Marks	Guidance
14 a	radon gas, rocks, cosmic radiation (1) 85.5 (1)	2	**allow** in the air for radon **allow** from space for cosmic radiation **ignore** 86 if one of the sources is left out allow ecf if wrong source no ecf
b i	total radiation = 4120 (2)	2	**allow** one error in any figure or in addition for 1 mark correct values are (2410)+(260)+50+900+400+100
ii	**any two from**: idea that he is receiving higher than the average dose / higher than 3000 (1) but he receives lower than the limit put on workers / lower than 20, 000 (1) he receives (far) lower than the level shown to cause cancer / lower than 50,000 (1)	2	**allow ecf from (b)(i)** **allow** because he is only just above the average (1)
c i	background reading needs to be taken off (1)	1	other radiation is coming from the surroundings / AW (1)
ii	40 (1) 14 600 (1)	2	**if 40 is incorrect, allow** ecf for value for radiation coming from the worktop per day x 365
iii	Choose a worktop made of blackstone rather than bluestone. ✓ Put an extractor fan in her kitchen. ✓ Choose a worktop made of greystone rather than blackstone. Always use gloves when she is preparing food. Wear an apron in the kitchen.	1	**more than 2 ticks scores 0**
	Total	**10**	

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