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 2015

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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.

Annotations used in scoris

Annotation	Meaning
	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

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>(carbon dioxide +) water (1) → (glucose +) oxygen (1)</td><td>2</td><td>allow correct formulae / mix of formulae and words</td></tr>
<tr><td>b</td><td><table>
<tr><td>Temperatures would be too low for photosynthesis.</td><td>✓(1)</td></tr>
<tr><td>It is never light in the Antarctic.</td><td></td></tr>
<tr><td>Water would leave the bacteria by osmosis.</td><td>✓(1)</td></tr>
<tr><td>There is no carbon dioxide in the Antarctic.</td><td></td></tr>
<tr><td>The salt would enter the bacteria by osmosis.</td><td></td></tr>
</table></td><td>2</td><td>if more than 2 ticks, deduct a mark for each extra tick</td></tr>
<tr><td></td><td>Total</td><td>4</td><td></td></tr>
</table>

Question	Answer	Marks	Guidance
2 a	transpiration (1)	1	
b i	idea of taken up by the root / root hairs (1) idea of moves up the stem (1) idea that pulled up by water evaporating from the leaves (1)	3	 **ignore** moves up the stalk **ignore** references to osmosis **allow for additional marking point** water travels in xylem (1) **but not** water travels in phloem
ii	**B** (1)	1	**allow** correct answer ticked, circled or underlined on graph if answer line is blank
iii	idea that the plant is still losing water (by transpiration / evaporation) (1) however it cannot lose as much (as it does in the light) / must lose less than $6cm^3$ (1)	2	 **allow** higher level answers that refer to the closing of stomata (1) **allow** the plant is losing **less** water (by transpiration / evaporation) (2) **ignore** references to photosynthesis
	Total	**7**	

Question	Answer	Marks	Guidance
3	**[Level 3]** **Answer includes reference to the role of at least one mineral in plant growth** **AND** **links the decrease in land use to increasing yield due to increasing fertiliser use.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** **Answer includes reference to fertilisers containing minerals for plant growth <u>or</u> reference to fertilisers increasing crop yield** **AND** **describes a trend shown on the graph.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** **Answer includes reference to fertilisers containing minerals for plant growth <u>or</u> reference to fertilisers increasing crop yield** **OR** **describes a trend shown on the graph.** 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 <u>at level 3</u> may include:** **Role of minerals** • Nitrates / nitrogen are needed for proteins / amino acids / (leaf) growth / prevent yellow leaves • Phosphates / phosphorus for respiration / DNA / cell membranes / root growth / prevent discoloured leaves • Magnesium for photosynthesis / chlorophyll / prevent yellow leaves • Potassium for respiration / photosynthesis / enzymes / production of flowers or fruit / prevent discoloured leaves **Linked Trends** • Idea that using fertilisers means need less land is needed to grow more crops **Indicative scientific points <u>at levels 1 & 2</u> may include:** **Reference to fertilisers** • Fertilisers contain minerals • Fertilisers contain nitrates / nitrogen / phosphates / phosphorus / magnesium / potassium • Minerals or fertilisers are needed for plant growth • Idea that fertilisers increase crop yield or crops grow bigger or get more crops **ignore** better crops / crops grow quicker **ignore** fertiliser contain or provide nutrients **Trends** • (Since 1950) fertiliser or mass use has increased • (Since 1950) area (of land used) has decreased **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**
	Total	**6**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>4 a</td><td>
<table>
<tr><td>bacteria</td><td><u>Decomposers (1)</u></td><td>(yes)</td><td>(yes)</td><td><u>yes (1)</u></td></tr>
<tr><td>fungi</td><td>(decomposers)</td><td>(yes)</td><td>(yes)</td><td>(yes)</td></tr>
<tr><td>earthworm</td><td>(detritivores)</td><td>(yes)</td><td><u>no</u></td><td>(no)</td></tr>
<tr><td>woodlice</td><td><u>detritivores(1)</u></td><td>(yes)</td><td><u>yes</u></td><td>(no)</td></tr>
</table>
</td><td>3</td><td>one mark for decomposers

one mark for detritivores

one mark for no / yes / yes all correct</td></tr>
<tr><td>b i</td><td>A (1)</td><td>1</td><td>allow correct answer ticked, circled or underlined in table if answer line is blank</td></tr>
<tr><td>ii</td><td>idea that both earthworms and woodlice can get in / idea that earthworms can get in (1)

(earthworms / woodlice) increase the surface area for the bacteria / fungi / decomposers to work on (1)</td><td>2</td><td>allow more detritivores can get in / all the detritivores can get in (1)
ignore idea that every organism or more organisms can get in
ignore more decomposers can get in</td></tr>
<tr><td>iii</td><td>low(er) temperature / (too) cold (1)

bacteria / decomposers / earthworms / woodlice are less active (1)</td><td>2</td><td>allow ground or leaves frozen (1)
allow idea that bacteria or fungi need heat (1)

allow organisms are less active (1)
allow higher level answers linked to respiration / enzymes (1)
ignore bacteria / decomposers / earthworms / woodlice hibernate or are killed</td></tr>
<tr><td></td><td>Total</td><td>8</td><td></td></tr>
</table>

Question	Answer	Marks	Guidance
5 a	**A** (1)	1	**allow** copper carbonate → copper oxide + carbon dioxide (1)
b	**E** (1)	1	**allow** sodium + water → sodium hydroxide + hydrogen (1)
c	**C** (1)	1	**allow** potassium chloride + silver nitrate → silver chloride + potassium nitrate (1)
d	**D** (1)	1	**allow** sodium hydroxide + copper sulfate → copper hydroxide + sodium sulfate (1)
	Total	**4**	

Question	Answer	Marks	Guidance
6 a	three **(1)**	1	
b	**[Level 3]** **Explains that the results do not support the conclusion** **AND** **a complete description of the flame test** Quality of written communication does not impede communication of the science at this level (5 – 6 marks) **[Level 2]** **Explains that the results do not support the conclusion** **OR** **a complete description of the flame test** **OR** **partial explanation of results <u>and</u> a partial description of the flame test** Quality of written communication partly impedes communication of the science at this level (3 – 4 marks) **[Level 1]** **Explains that flame test indicates sodium or flame test does not indicate potassium** **OR** **barium chloride result indicates sulfate** **OR** **a partial description of the flame test** 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 levels could include** **Explanation of results:** • flame test indicates presence of sodium / yellow flame indicates sodium / potassium would give a lilac flame • barium chloride indicates sulfate present **Description of flame test:** • use a flame test wire or splint / spray sample through the flame • dip wire or splint into solution • put wire or substance into a (blue Bunsen) flame • observe the colour of the flame **Use the L1, L2, L3 annotations in scoris. Do not use ticks.**
	Total	**7**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>7 a</td><td>aquifer / well / river / reservoir (1)</td><td>1</td><td>allow rain / pond / canal / stream / (mountain) spring
allow a named river, eg Thames (1)
ignore oceans</td></tr>
<tr><td>b i</td><td><table><tr><th>Region</th><th>Difference between water available and water needed in m^3</th></tr><tr><td>A</td><td>400</td></tr><tr><td>B</td><td>0</td></tr><tr><td>C</td><td>1500</td></tr><tr><td>D</td><td>2000</td></tr><tr><td>E</td><td>100</td></tr></table>(1)</td><td>1</td><td>all three answers needed for the mark</td></tr>
<tr><td>ii</td><td>idea that all the water available is needed (1)</td><td>1</td><td>allow there is no spare water available (1)
ignore idea that there is a water shortage in region B</td></tr>
<tr><td></td><td>Total</td><td>3</td><td></td></tr>
</table>

Question	Answer	Marks	Guidance
8 a	**Y** (1) does not react (with water) (1)	2	**W, X or Z scores 0 for the question** **allow** does not rust (1)
b	**any three from:** **high** boiling point / solid **at room temperature** (1) (good) heat conductor (1) (good) electrical conductor (1) malleable / can be worked into sheets (1) ductile / can be made into wire (1) hard (1) strong (1) flexible / not brittle (1) shiny / lustrous (1)	3	**allow** chemical properties such as react with acids / forms basic oxides / form positive ions (1) **allow** (good) conductor for 1 mark, if neither heat nor electrical specified **allow** can be shaped (1) **ignore** strength unless qualified **allow** sonorous (1) **ignore** melting point / density / reaction with water / solid (unless qualified) / durable / hard wearing
	Total	**5**	

Question	Answer	Marks	Guidance
9 a	**any two from:** idea that there is more evidence being found (1) idea that better technology / equipment available nowadays (1)	2	 **allow** idea that finding out more about them / making new discoveries / better understanding / scientists are still working on the topic (1) **ignore** reference to discoveries of new elements
b	atom number is the number of protons (in the atom) (1) mass number is the number of protons added to the number of neutrons (in the nucleus) / number of particles in a nucleus (1)	2	**ignore** reference to number of electrons **but** **not** idea of number of protons **and** electrons added together
c	 sulfur (1) (sulfur) atoms have 16 electrons / (sulfur) is in group 6 and period 3 / (sulfur) has an atomic number of 16 (1)	2	**marking points are independent** **allow** S (1) **allow** contains 16 protons (1)
	Total	**6**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>10 a</td><td>A (1)</td><td>1</td><td>allow correct answer ticked, circled or underlined on diagram if answer line is blank</td></tr>
<tr><td>b</td><td>6 (ohms) scores (2)

but if answer incorrect or incomplete then

$\frac{3}{0.5}$ (1)</td><td>2</td><td></td></tr>
<tr><td>c</td><td>1.5 (W) (1)</td><td>1</td><td>allow correct answer ticked, circled or underlined in list if answer line is blank</td></tr>
<tr><td>d</td><td><table><tr><th>(lamp is brighter)</th><th>(lamp is less bright)</th><th>(lamp has normal brightness)</th></tr><tr><td></td><td>✓</td><td></td></tr><tr><td></td><td>✓</td><td></td></tr><tr><td></td><td></td><td>✓</td></tr><tr><td></td><td></td><td>✓</td></tr></table>(2)</td><td>2</td><td>all rows correct (2)

any 3 or 2 rows correct (1)

BUT 0 or 1 correct scores (0)</td></tr>
<tr><td>e</td><td><table><tr><td>kettle</td><td></td></tr><tr><td>food mixer</td><td>✓</td></tr><tr><td>hairdryer</td><td>✓</td></tr><tr><td>toaster</td><td></td></tr><tr><td>washing machine</td><td></td></tr></table>(2)</td><td>2</td><td>both correct (2)

one correct (1)

if more than 2 ticks, deduct a mark for each extra tick</td></tr>
<tr><td></td><td>Total</td><td>8</td><td></td></tr>
</table>

Question	Answer	Marks	Guidance
11 a	3 (1)	1	**mark answer on line first** **allow** glass, plastic & polythene ticked, circled or underlined in list if answer line is blank
b	**any two from:** idea that that there is friction (between her clothes and the seat) (1) idea that Daisy becomes charged (due to friction) (1) idea that shock caused when charge flows to earth / AW (1)	2	 **allow** car instead of seat **allow** gains or loses **electrons** / **electrons** move (1) **allow** idea that Daisy is earthed (1)
c	paint sprayer **and** defibrillators (1)	1	**both needed for mark**
	Total	**4**	

Question	Answer	Marks	Guidance
12	**[Level 3]** **Explains why Edward needs to wear a radiation badge** **AND** **explains how the badge works** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** **Explains why Edward needs to wear a radiation badge** **OR** **explains how the badge works** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** **Makes a relevant comment about the badge** 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 all levels may include:** **Why Edward needs to wear a badge** • Nuclear radiation kills cells / causes cell mutation / causes cell or tissue damage • Nuclear radiation can cause cancer • Nuclear radiation / X-rays cause ionisation **How the badge works** • Different thicknesses absorb different types of radiation • Different materials absorb different radiation • Black/grey shows that radiation has penetrated that part of the badge • The darker the film the higher the level of radiation **Relevant comment about the badge** • It shows the type of radiation • It shows the strength of the radiation • It shows how much radiation • Idea that badge monitors radiation **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
13 a	radiation **D** chosen (1) must be gamma as this penetrates skin or can be detected outside the body **or** cannot be alpha as alpha cannot penetrate skin / damages cells (1) should be a short half-life as radiation can damage cells in the body (1)	3	**First marking point is independent of second and third marking points** explanation **must** accompany choice to gain the mark(s) eg **allow** A (no mark) because it is gamma and penetrates the skin (1) **allow** C (no mark) because it has a short half-life and radiation can damage cells in the body (1) **allow** idea of short half-life so radiation won't be in the body for long (1)
b	fission splits the **nucleus** (1) fusion joins (two) **nuclei** (1)	2	**ignore** fission splits the **atom** **ignore** fission breaks down or breaks up the nucleus **ignore** fusion joins two **atoms**
c	rocks / living things (1) idea that different / more rock or different / more vegetation (found in different places) (1)	2	**allow** nuclear industry (1) **allow** cosmic waves (1) **ignore** nuclear weapons **allow** eg Aberdeen has more granite than Liverpool scores 2 marks
	Total	**7**	

Question	Answer	Marks	Guidance
14 a i	strong to stop bullets / strong to protect the soldiers (1) low density so (jacket) lightweight to wear (1)	2	 **allow** low density so the jacket would be light (1) **ignore** it is light unless qualified **ignore** low density so more comfortable to wear **ignore** quoting of figures from the table unless qualified **if no other mark awarded,** **allow** strong and low density / strong and lightweight (1)
ii	stronger (1) but 10 times stronger (2)	2	 **allow** 5000 – 500 or 4500 (MPa) stronger (2) **but not** 4500 (MPa) difference
b i	9 (years) (1)	1	
ii	95 (%) (1)	1	**allow** 94 - 96% (1)
iii	any four from: strong (1) idea that graphite will not run out for a long time (1) idea that graphite will run out in 70 years / indium will run out in 9 years / graphite will last longer (than indium) (1) idea of useful (for touch screen devices) because it has a high transparency (1) for a low resistance (1)	4	
	Total	**10**	

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