

GCSE

Additional Science B

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

General Certificate of Secondary Education

Mark Scheme for June 2016

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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.

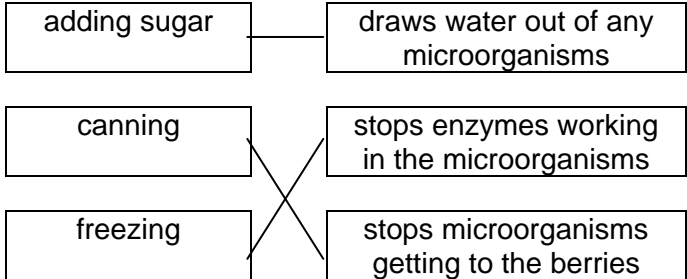
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Annotations

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
<u> </u>	=	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	fertiliser (1)	1	
b	to stop them rotting / decaying / decomposing (1)	1	allow idea of stopping bacteria or fungi or microorganisms growing (1) ignore going bad / mouldy
c	 <pre> graph LR A[adding sugar] --- B[draws water out of any microorganisms] C[canning] --- D[stops enzymes working in the microorganisms] E[freezing] --- F[stops microorganisms getting to the berries] C --- F E --- D </pre>	2	all correct (2) one or two correct (1)
Total		4	

Question	Answer	Marks	Guidance
2 a i	<p>Any two from: they feed on them (1)</p> <p>use to build nests / habitat destroyed (1)</p> <p>use as cover (1)</p> <p>place to breed (1)</p> <p>shelter (1)</p>	2	<p>allow if no insects, no food for birds or bats / idea that food chain is broken (1)</p> <p>allow idea of insects or birds or bats live in trees (1)</p> <p>allow idea of protection from predators (1)</p>
ii	idea that they feed on dead material (1)	1	not references to detritivores feeding
iii	<p>Any three from:</p> <p>population is all (the organisms of) one species living in the same habitat (1)</p> <p>community is all the organisms / species / populations living in the same habitat (1)</p> <p>community is all the organisms living in the ash woodland (1)</p> <p>population is all the ash trees or horseshoe bats or thorn moths or woodpeckers (1)</p>	3	<p>allow all the same type of organism living in the same area (1)</p> <p>not the number of species</p> <p>need reference to same habitat or area at least once for marking points one or two</p>
iv	lake (1)	1	allow correct answer ticked, circled or underlined in list if answer line is blank
b	<p>leaves will not get any water / minerals (1)</p> <p>idea that photosynthesis will stop / they will not be able to make any food (1)</p>	2	<p>allow idea that leaves need water (to survive) (1)</p> <p>allow xylem transports water (1)</p> <p>allow idea that transpiration will stop</p> <p>allow idea that water is needed for photosynthesis</p>
c	<p>possible (1)</p> <p>because it is American ash (1)</p>	2	<p>Mark independently</p> <p>allow American ash indicated on the key (1)</p>
	Total	11	

Question	Answer	Marks	Guidance								
3 a	<p>any two from:</p> <p>wild catch increased (at the start) (1)</p> <p>wild catch has now levelled off (after about 1990) (1)</p> <p>farmed fish is continuing to increase (1)</p> <p>farmed fish has increased much more since about 1980 (1)</p> <p>wild catch is higher than farmed fish (1)</p> <p>wild catch fluctuates (more than farmed fish catch) (1)</p> <p>total amount of fish eaten has increased (1)</p>	2	<p>allow wild catch is most commonly eaten / ora (1)</p>								
b	80 (million tons) (1)	1	allow 78 – 82 (1)								
c	<table border="1" data-bbox="389 951 786 1161"> <tbody> <tr> <td>hydroponics</td> <td><input type="checkbox"/></td> </tr> <tr> <td>intensive</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>native</td> <td><input type="checkbox"/></td> </tr> <tr> <td>organic</td> <td><input type="checkbox"/></td> </tr> </tbody> </table> <p>(1)</p>	hydroponics	<input type="checkbox"/>	intensive	<input checked="" type="checkbox"/>	native	<input type="checkbox"/>	organic	<input type="checkbox"/>	1	
hydroponics	<input type="checkbox"/>										
intensive	<input checked="" type="checkbox"/>										
native	<input type="checkbox"/>										
organic	<input type="checkbox"/>										
Total		4									

Question	Answer	Marks	Guidance
4	<p>[Level 3] Answer includes an appreciation that photosynthesis is happening in the light or clear bottle AND photosynthesis produces oxygen AND respiration (in the dark bottle) decreases oxygen levels Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Answer includes an appreciation that photosynthesis is happening in the light or clear bottle OR photosynthesis or green plants produce oxygen OR respiration (in the dark bottle) decreases oxygen levels Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Answer includes some understanding that the greenness is plants OR that (sun)light affects the amount of oxygen OR describe how oxygen level changes in both bottles There may be limited use of specialist terms. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points at levels 2 & 3 may include:</p> <ul style="list-style-type: none"> • Photosynthesis needs light to occur • Photosynthesis or green plants releases oxygen • Respiration uses up oxygen <p>Indicative scientific points at level 1 may include:</p> <ul style="list-style-type: none"> • The green is due to plants • Oxygen increases when there is sunlight • Oxygen levels increase in clear bottle • Oxygen level in the dark bottle drops <p>Use L1, L2 and L3 annotations in RM Assessor; do not use ticks in this question.</p>
Total		6	

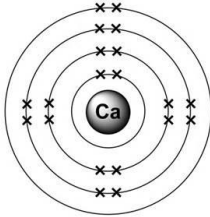
Question	Answer	Marks	Guidance
5 a		3	<p>all five correct (3)</p> <p>three or four correct (2)</p> <p>one or two correct (1)</p>
b	idea of more evidence / experiments showed that earlier theories were incorrect (1)	1	<p>allow idea that more experiments have been carried out (1)</p> <p>allow better equipment or technology available (1)</p> <p>allow idea that more scientists looked at the evidence (1)</p>
Total		4	

Question	Answer	Marks	Guidance
6	<p>[Level 3] Clearly explains why O₂ is a molecule AND Clearly explains why CaO is a compound AND Constructs the correct balanced symbol equation Quality of written communication does not impede communication of the science at this level (5 – 6 marks)</p> <p>[Level 2] Clearly explains why O₂ is a molecule <u>and</u> clearly explains why CaO is a compound OR Constructs the correct balanced symbol equation Quality of written communication partly impedes communication of the science at this level (3 – 4 marks)</p> <p>[Level 1] Clearly explains why O₂ is a molecule OR Clearly explains why CaO is a compound OR Constructs the unbalanced symbol equation Quality of written communication impedes communication of the science at this level (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C.</p> <p>Indicative scientific points at level 3 must include:</p> <ul style="list-style-type: none"> • $2\text{Ca} + \text{O}_2 \rightarrow 2\text{CaO}$ or any other correct multiple <p>Relevant points at levels 1 and 2 could include</p> <ul style="list-style-type: none"> • CaO is a compound because it contains two elements chemically bonded • CaO is a compound because (formula) has more than one element chemically bonded • CaO is a compound because it contains calcium and oxygen chemically bonded • CaO is a compound because (formula) has two different symbols <p>not CaO is a compound because it is a mixture of calcium and oxygen or two elements</p> <ul style="list-style-type: none"> • O₂ has two atoms bonded together • O₂ has two oxygen atoms bonded together <p>not O₂ is a molecule because it is one (type of) atom</p> <ul style="list-style-type: none"> • Unbalanced symbol equation: eg $\text{Ca} + \text{O}_2 \rightarrow \text{CaO}$ ie symbols / formulae need to be correct <p>Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.</p>
Total		6	

Question	Answer	Marks	Guidance
7 a	(yes because) (potassium gives a) lilac flame (in the flame test) (1) (iodide because a) pale yellow precipitate (with silver nitrate) (1)	2	no marks for just saying yes – marks are for explanation if no, 0 for question allow result from test 2 shows that it contains potassium (1) allow result from test 5 shows that it contains iodide (1)
b	any three from: idea of use a (flame test) wire (1) dip wire into solution / dip wire into solid (1) put wire or substance into a (blue Bunsen) flame (1) observe the colour of the flame (1)	3	marks can be awarded from a labelled diagram if heating in a test tube / beaker etc scores 0 for question allow use a wooden splint / spray solution (1)
	Total	5	

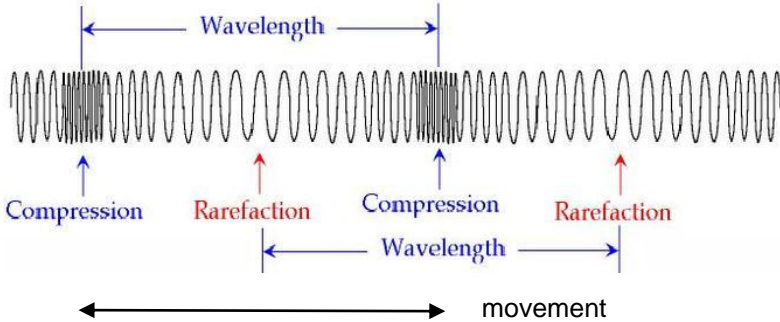
Question	Answer	Marks	Guidance
8 a	zinc oxide (1)	1	allow zinc oxide circled or underlined in the equation if answer line is blank
b	0.88 (g) (1) a gas escapes / carbon dioxide is made (1)	2	unit not required not the name of a wrong gas being evolved
c	3 (1)	1	ignore Zn, C and O / zinc, carbon and oxygen
Total		4	

Question	Answer	Marks	Guidance
9 a	any two from: very reactive (1) reacts with oxygen / reacts with air (1) reacts with water (1)	2	allow idea of preventing reaction with oxygen / air (1) allow idea of preventing reaction with water (1) allow two marks for reacts with moist air or with damp air allow they do not react with oil (1)
b	rubidium / caesium / francium (1)	1	allow Rb / Cs / Fr (1) ignore lithium / sodium / potassium
Total		3	

Question	Answer	Marks	Guidance
10 a	20 (1)	1	
b	4 (1) idea that there are four sets of numbers (in the electronic structure) (1)	2	allow correct diagram showing electronic structure 
Total		3	

Question	Answer	Marks	Guidance
11 a	positive and negative (1)	1	both required for the mark allow either order
b	aluminium foil is not an insulator / aluminium is a conductor (1) (so) balloon does not becomes charged (1)	2	Assume unqualified answer refers to the balloon allow idea that aluminium cannot become charged (1) allow electrons do not transfer to or from the balloon (1)
c	any one from: defibrillator (1) (dust) precipitator (1) paint or crop spraying (1)	1	allow to jump start a heart / to remove dust from chimneys / electrostatic duster / printer / photocopier (1) ignore just painting
Total		4	

Question	Answer	Marks	Guidance
12 a	2.5 (Ω) (2) but if incorrect $\frac{5}{2}$ (1)	2	
b	40 (cm) (2) but if incorrect allow the idea of: 2/5ths of 100 (1) or 0.05 ohms/cm (1)	2	
Total		4	

Question	Answer	Marks	Guidance
13	<p>[Level 3] Correctly labels 3 features AND gives a similarity <u>and</u> a difference Quality of written communication does not impede communication of the science at this level (5 – 6 marks)</p> <p>[Level 2] Correctly labels 1 or 2 features AND gives a similarity <u>or</u> a difference Quality of written communication partly impedes communication of the science at this level (3 – 4 marks)</p> <p>[Level 1] Correctly labels 1 or 2 features OR gives a similarity <u>or</u> a difference Quality of written communication impedes communication of the science at this level (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted up to grade E</p> <p>Indicative scientific points may include:</p> <p>Similarities:</p> <ul style="list-style-type: none"> • coils vibrate / oscillate / move • both waves transfer energy <p>Differences:</p> <ul style="list-style-type: none"> • transverse (or Fig 13.1) up and down and longitudinal (or Fig 13.2) movement side to side • wavelength shorter (in longitudinal wave or Fig 13.2) / ora • transverse (or Fig 13.1) has crests / troughs or longitudinal (or Fig 13.2) has compressions / rarefactions <p>Features:</p> <ul style="list-style-type: none"> • wavelength labelled • movement labelled • compression labelled • rarefaction labelled  <p>The diagram shows a longitudinal wave moving to the right, as indicated by a black arrow at the bottom labeled 'movement'. The wave consists of alternating regions of high particle density (compressions) and low particle density (rarefactions). Two blue double-headed arrows above the wave indicate the wavelength, measured from the center of one compression to the center of the next. Two red double-headed arrows below the wave indicate the distance between a compression and the following rarefaction. Labels 'Compression' and 'Rarefaction' are placed below the wave with red arrows pointing to the respective regions.</p> <p>Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.</p>
Total		6	

Question	Answer	Marks	Guidance																		
14 a	A (1) idea that half-life is time to reduce count rate to half its original value / idea that half-life is time taken to reduce to 3000 (1) BUT idea that A reaches half its original value (3000) in a shorter time than the others (2)	3	If A not chosen, 0 for question allow time for activity to halve / time for half the mass of isotope to decay / time for half the atoms or nuclei to decay (1) ignore time to give out half the radiation / half of the time taken for the substance to decay ignore time for half the atom or nucleus to decay ignore just it has the shortest half-life (in stem of question) allow detail from the graphs eg reaches half original value between 20 and 30 sec for A 40 and 50 sec for B 60 and 70 sec for C (1) allow it has the steepest gradient at the start (1) eg A's activity halves in the shortest time (3) ignore faster or quicker time																		
b	nucleus (1)	1	allow phonetic spelling (1)																		
c	<table border="1" data-bbox="320 1034 987 1313"> <thead> <tr> <th>statement</th> <th>opinion</th> <th>fact ...</th> </tr> </thead> <tbody> <tr> <td>... waste ...</td> <td></td> <td>✓</td> </tr> <tr> <td>... ionises ...</td> <td></td> <td>✓</td> </tr> <tr> <td>... better than ...</td> <td>✓</td> <td></td> </tr> <tr> <td>... eyesore ...</td> <td>✓</td> <td></td> </tr> <tr> <td>Uranium nuclei ...</td> <td></td> <td>✓</td> </tr> </tbody> </table> <p style="text-align: right;">(2)</p>	statement	opinion	fact waste ...		✓	... ionises ...		✓	... better than ...	✓		... eyesore ...	✓		Uranium nuclei ...		✓	2	all correct (2) 3 or 4 correct scores (1) 0, 1 or 2 correct (0) more than one tick on any row negates a mark
statement	opinion	fact ...																			
... waste ...		✓																			
... ionises ...		✓																			
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... eyesore ...	✓																				
Uranium nuclei ...		✓																			
Total		6																			

Question	Answer	Marks	Guidance
15 a	Statement 1 - correct or Statement 2 – correct AND Statement 3 - incorrect (1) (statement 1 and / or statement 2) – gamma can get through body (1) (statement 3) – radioactivity will reduce (over time) (1)	3	 allow idea that gamma can be detected outside the body (1) allow idea that drink / source has a short half-life (1) allow idea that they would not give the drink if it was dangerous (1)
b	any two from: similar wavelength / frequency (1) both electromagnetic (1) both ionising (1) same speed (1)	2	 allow idea that both damage living cells (1) if no other mark awarded, allow idea that both penetrate skin (1)
Total		5	

Question	Answer	Marks	Guidance								
16 a i	October (1) the energy in sugars drops most (in that month) / photosynthesis drops most (1)	2	Second marking point is dependent on the first allow the graph drops most or rapidly in that month (1)								
ii	1000 (kJ)	1									
b i	any two from: same month / time of the year / both in July (1) same place / area of forest (1) same area of tree (1)	2	ignore same brightness or intensity of sun allow same environment / habitat (1)								
ii	(No, it) trapped the same amount (1) 32 000 (1)	2	allow no, both trapped 32 000 for (2) allow 32 000 written in table (1)								
c	5(%) (2) but , if answer incorrect $1600/32000 \times 100$ (1)	2	allow 0.05 (1)								
d	<table border="1"> <tbody> <tr> <td>The evergreen tree has more efficient photosynthesis because it traps more light.</td> <td></td> </tr> <tr> <td>The evergreen tree has more efficient photosynthesis because it uses the trapped light more efficiently.</td> <td></td> </tr> <tr> <td>The deciduous tree has more efficient photosynthesis because it traps more light.</td> <td></td> </tr> <tr> <td>The deciduous tree has more efficient photosynthesis because it uses the trapped light more efficiently.</td> <td>✓</td> </tr> </tbody> </table>	The evergreen tree has more efficient photosynthesis because it traps more light.		The evergreen tree has more efficient photosynthesis because it uses the trapped light more efficiently.		The deciduous tree has more efficient photosynthesis because it traps more light.		The deciduous tree has more efficient photosynthesis because it uses the trapped light more efficiently.	✓	1	More than one tick scores 0
The evergreen tree has more efficient photosynthesis because it traps more light.											
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The deciduous tree has more efficient photosynthesis because it uses the trapped light more efficiently.	✓										
Total		10									

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