



GCSE

Science B

Unit **B712/01**: Modules B2, C2, P2 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2014

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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.

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

Annotation	Meaning
	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
	benefit of the doubt
	benefit of the doubt not given
	error carried forward
	information omitted
	ignore
	reject
	contradiction

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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

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Question	Answer	Marks	Guidance
1 a i	50 (1)	1	
a ii	8% (1)	1	more than one answered ringed = 0
b	mark independently insects (1) because they have six legs (1)	2	allow three body sections / wings (1) not 8 or more legs / two body parts ignore segments/ antennae / jointed appendages / exoskeleton /4 legs
	Total	4	

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Question	Answer	Marks	Guidance
2 a	<p>plant / species numbers are increasing (1) (until 7m) then it levels off / then stays at 5 (1)</p> <p>but plant /species numbers are increasing the further you get from the tree /ora (2)</p>	2	<p>allow plant / species numbers go up (1) not insect species ignore just numbers quoted from table</p>
b	<p>any two from: (sun) light (1) water (1) space (1)</p>	2	<p>ignore minerals / nutrients / food / shelter / habitat /Sun / soil / oxygen</p> <p>allow carbon dioxide(1)</p>
c	<p>no (no mark) any two from: likely to be less plants (1) there are trees there (but none on the right)(1) so there will be more competition (1) idea there will be less light / water / minerals / space (1)</p>	2	<p>marks are for explanation if answer 'yes' then no marks if left blank then mark answer</p> <p>allow idea that the trees take the light / water / minerals / space(2)</p> <p>allow soil pH may be different(1) ignore fewer resources</p>
d	<p>any two from: leaves or nitrogen compounds are broken down / decompose / idea of decomposers (1)</p> <p>idea of nitrates forming / released (1)</p> <p>idea plants use nitrates / nitrogen compounds to make proteins (1)</p>	2	<p>allow rot /decay/leaves are biodegradable (1) ignore degrade ignore animals eating the leaves / animals decomposing</p> <p>allow soluble molecules form (1) ignore nitrogen released allow nitrates / soluble molecules taken in by roots (1) allow idea nitrates become available in soil(1) ignore roots take in minerals / nutrients / nitrogen compounds</p>
	Total	8	

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Question	Answer	Marks	Guidance
3 a	see predators behind them / have wider field of view to see predators / have (almost) 360°view to see predators (1)	1	<p>allow idea they can see predators coming and still have head down to feed</p> <p>allow idea of all round vision to spot predators e.g. can see predators from all directions</p> <p>allow can see an attack from behind</p> <p>ignore monocular vision unqualified</p> <p>ignore see predators from the side</p> <p>ignore so they can see their prey</p> <p>ignore just 'can see in front as well as behind'</p>
b	<p>(thick) fur (1) as it insulates / traps air(1)</p> <p>or</p> <p>small ears / short legs (1) reduces surface area or less blood can reach the surface of the ears / legs (1)</p>	2	<p>allow reduce energy transfer between animal and surroundings (1)</p> <p>ignore hair</p> <p>ignore behavioural adaptations such as migration</p> <p>ignore traps heat</p> <p>ignore references to hooves or counter current exchange system</p> <p>allow small surface area to volume ratio (1)</p> <p>allow layer of fat (1) which is an insulator (1)</p>

Question	Answer	Marks	Guidance
c	<p>[Level 3] Provides detailed explanation for migration and provides a detailed explanation of protection. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Provides a limited explanation of protection and migration. or Provides detailed explanation for migration or Provides a detailed explanation of protection. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Provides a limited explanation of protection or migration. 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. (0marks)</p>	6	<p>This question is targeted at grades up to E Indicative scientific points for detailed explanations may include:</p> <p>protection</p> <ul style="list-style-type: none"> • live in large groups for protection from predators • huddle together to keep warm • give birth all together so less chance of calves being caught / safer for calves <p>migration</p> <ul style="list-style-type: none"> • move (south) to get food in winter as heavy snow will cover food / find food not covered in snow • move (south) where there is less snow so it is easier to get food / can find more food <p>ideas that could be either migration or protection</p> <ul style="list-style-type: none"> • move to give birth in area where there are less predators / that are safer for calves / calves more likely to survive /AW <p>Indicative scientific points for limited explanation may include:</p> <p>protection</p> <ul style="list-style-type: none"> • living in large groups is safer / they can protect each other • give birth all together /at the same time • give birth / eat food where there are no predators <p>migrate</p> <ul style="list-style-type: none"> • find food • move (south) where there is less snow / escape (bad) weather / escape snow / escape the cold / where it is warmer <p>ideas that could be either migration or protection</p> <ul style="list-style-type: none"> • escape predators / makes it harder for predators to catch them <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
Total		9	

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Question	Answer	Marks	Guidance
4 a	<p>idea that those with stripes got bitten less / ora (1)</p> <p>idea that striped adaptation passed on to next generation / ora (1)</p>	2	<p>allow stripes stop zebras being bitten (1)</p> <p>allow flies are attracted to the zebras without stripes and bite them (1)</p> <p>ignore ones with no stripes die leaving only stripes</p> <p>ignore those without stripes had become more attractive to flies</p> <p>allow striped zebras breed giving offspring their characteristics (1)</p> <p>allow striped zebras bred and passed on the stripes (1)</p> <p>allow (only) zebras with stripes were left so reproduced (1)</p> <p>allow those with stripes or not bitten survived and reproduced passing on the gene of stripes (1)</p>
b i	<p>count /compare the number of flies stuck to each zebra (1)</p> <p>or</p> <p>less flies on striped model or zebra / ora (1)</p>	1	<p>allow measure the mass of flies on each model or zebra (1)</p> <p>allow more flies bite models or zebras without stripes (1)</p> <p>allow flies less attracted to striped model / zebra (1)</p> <p>allow no flies on the striped model or zebra (1)</p> <p>allow more complex the pattern the less likely the flies are to stick (1)</p>
b ii	<p>Other scientists try the experiment with different coloured zebra. <input type="checkbox"/></p> <p>Other scientists repeat the experiment and they get similar results <input checked="" type="checkbox"/></p> <p>Repeat the experiment with different sized zebra. <input type="checkbox"/></p> <p>Repeat the experiment in winter when there are fewer flies <input type="checkbox"/></p>	1	<p>more than one tick scores zero</p>
Total		4	

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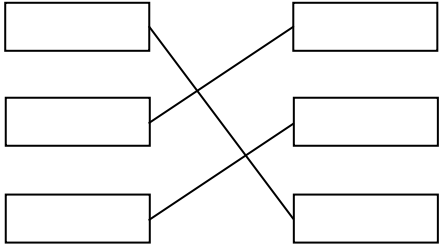
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Question	Answer	Marks	Guidance
5 a	addition of or reaction with oxygen (1)	1	<p>allow loss of electrons (1) allow reacts to make an oxide / oxide is made (1) allow oxygen and water react to cause rusting (1) ignore oxygen is used ignore 'hydrated iron oxide' is formed / 'hydrated oxide' formed ignore there is an oxide or oxygen in the equation ignore reference to water ignore oxygen and water cause rusting</p>
b	<p>one or two from similarities both malleable (1)</p> <p>both heat conductors (1) both electrical conductors (1) both shiny (1) high melting point (1) high boiling point (1) both sonorous (1) both ductile (1)</p> <p>then one or two from differences iron is more dense than aluminium /ora (1)</p> <p>iron is magnetic (but aluminium is not) (1) iron corrodes/ rusts easily (but aluminium does not) (1)</p>	3	<p>to gain 3 marks must have both a similarity and a difference</p> <p>allow bendy /easily shaped (1) ignore melted into shape / easily moulded</p> <p>allow conductors for one mark</p> <p>ignore strong / hard</p> <p>allow aluminium lightweight (1) ignore reference to heavy and light</p> <p>allow aluminium has lower melting point / they have different melting points (1)</p>

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			ignore references to cost
c	amalgam – filling teeth solder – joining electrical wires brass – making musical instruments 	2	all correct scores 2 one or two correct scores 1
Total		6	

Question	Answer	Marks	Guidance
6 a	5 (1)	1	
b	5 (1)	1	
c	mark independently calcium hydroxide / Ca(OH) ₂ (1) because it is an alkali or base (1)	2	ignore it's a neutraliser / soil conditioner / it is soluble
d i	calcium hydroxide / Ca(OH) ₂ (1)	1	
ii	idea that it contains more of the essential elements (1)	1	allow contains more nitrogen allow contains phosphorus allow contains two essential elements (rather than one) ignore just 'contains more elements'
Total		6	

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Question	Answer	Marks	Guidance
7 a	air (1)	1	
b	$\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$ formulae (1) balancing (1)	2	balancing mark is conditional on correct formulae allow any correct multiple e.g. $2\text{N}_2 + 6\text{H}_2 \rightarrow 4\text{NH}_3$ (2) allow = or \rightleftharpoons or \rightleftharpoons for arrow not 'and' or & for + allow one mark for correct balanced equation with minor errors in case, subscript and superscript e.g. $\text{N}^2 + 3\text{h}_2 \rightarrow 2\text{NH}_3$
c	any two from fertilisers (1) making nitric acid (1) dyes (1) cleaning agents (1) pharmaceuticals or drugs (1) explosives (1)	2	allow used to increase crop yield (1) ignore weedkiller allow hair dye(1) allow disinfectant / kill bacteria (1) e.g. shampoo / kitchen cleaner (1) ignore bleach / soap allow named drug(1) ignore in medicine allow smelling salts (1)
	Total	5	

Question	Answer	Marks	Guidance
8 a	<p>Level 3 Selects a suitable material for both of the uses. Applies knowledge to give more than one correct property of a material to make a girder <u>and</u> a kitchen worktop, linking property to use. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>Level 2 Selects a suitable material for one of the uses. AND Applies knowledge to give at least one correct property of a material to make a girder <u>and</u> a kitchen worktop, linking properties to both uses. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>Level 1 Applies knowledge to give at least one correct property of a material to make a girder <u>or</u> kitchen worktop no need to link the materials to its use <u>or</u> selects a suitable material for either worktop or girder 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. (0marks)</p>	6	<p>This question is targeted at grades up to C. If wrong material chosen lower mark in level Ignore irrelevant properties Indicative scientific points may include:</p> <p>properties for girder</p> <ul style="list-style-type: none"> • strong • as cheap as possible • corrosion resistant <p>choice for girder either</p> <ul style="list-style-type: none"> • material B • it has good strength and is cheap <p>or</p> <ul style="list-style-type: none"> • material E • it is strong but corrodes very slowly <p>properties for worktop</p> <ul style="list-style-type: none"> • non absorber • hard • as cheap as possible • low density • does not corrode <p>choice for worktop either</p> <ul style="list-style-type: none"> • material D • as it is quite hard, cheaper (than C), does not absorb water, does not corrode and density lower than C <p>or</p> <ul style="list-style-type: none"> • material C • as it is hardest, does not absorb water, does not corrode • <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>

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Question	Answer	Marks	Guidance
10 a i	carbon dioxide / water vapour / nitrous oxide (1)	1	allow correct formula carbon dioxide / nitrous oxide ignore just 'water /H ₂ O' ignore steam /carbon monoxide / CFC's / ozone ignore methane
ii	idea gas is in (Earth's) atmosphere (1) prevents heat radiating into space / traps IR radiation (1)	2	e.g. gas is trapped in (Earth's) atmosphere / released into (Earth's) atmosphere (1) ignore gas that causes global warming /climate change allow stops heat leaving Earth (1)
b	0.2(kW) (2) but if incorrect 230 x 0.87 (1) (£)60(.00) (1)	3	allow 0.2001(kW) (2) allow 200 / 200.1(1) allow ecf for calculation of cost from power calculated (xkW x 2000x0.15) allow 60.03 (1)
Total		6	

Question	Answer	Marks	Guidance
11	<p>[Level 3] Explains why beta radiation is chosen AND not alpha or gamma AND gives explanation of how the thickness varies with position across the sample. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Explains why alpha or gamma cannot be chosen OR Explains why beta radiation is chosen AND Explains how thickness varies across the sample. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Explains of why alpha or gamma not chosen OR Explains why beta radiation is chosen OR Explains about thickness changing across the sample. 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 that explain why beta is chosen may include:</p> <ul style="list-style-type: none"> • beta can go through plastic • only beta count rate varies with thickness <p>Indicative scientific points that explain why alpha or gamma are not chosen may include:</p> <ul style="list-style-type: none"> • alpha is stopped / the count rate is zero • alpha is absorbed by the plastic • gamma passes through / count rate not affected by plastic • idea that values for alpha or gamma do not change <p>Indicative scientific points Explanation of how thickness varies from 0 – 100cm may include:</p> <ul style="list-style-type: none"> • count rate changes with thickness • thicker the lower the count /ora • 0 cm to 30 cm / at the start - no change in thickness • 40 cm to 60 cm / in the middle - thickness increases / thicker • 70 cm to 100 cm / at the end – thickness decreases / thinner <p>Use the L1, L2, L3 annotations in scoris. Do not use ticks.</p>
Total		6	

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Question	Answer	Marks	Guidance
12 a	120 as waste energy on diagram (1) efficiency calculated at 20% (1)	2	allow 0.2 (1) not 0.2 % or 0.2J allow 1/5 (1)
b	any two from energy absorbed as heat by surface (1) wind (turbines) (1) (glass used for) passive solar heating / AW (1) idea of reflected and focussed by curved mirror /AW (1)	2	allow photosynthesis (1) allow biomass (1) allow (to heat) greenhouse(1) allow reflected rays used in cooking (1) ignore solar panels ignore 'photocells' ignore used to heat water
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Question	Answer	Marks	Guidance
13 a	asteroid (1)	1	mark answer on line first allow answer ringed, underlined or ticked if no answer on the answer line
b	planet (1)	1	mark answer on line first allow answer ringed, underlined or ticked if no answer on the answer line
c	gravity does not let light escape (1)	1	allow gravitational pull prevents them letting light out
d	any two from takes too long to get there (and back) / distance is too far to travel (1) unable to carry enough resources AW(1) too cold (for humans to explore) / AW (1)	2	allow can't survive because of how long it takes to get there (1)) but ignore just 'because of how long it takes to get there' ignore you can only go so far e.g. food / water / oxygen / air ignore -200°C unless qualified e.g. it is -200 °C = 0 but humans can't survive – 200°C (1) ignore just 'because of the temperature' but allow can't survive the temperature (1) not it is too hot allow ora for unmanned spacecraft
	Total	5	

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Question	Answer	Marks	Guidance
14 a i	5000 (thousands of tonnes) (1)	1	ignore units
ii	idea that it is generally upward with minor drops (1)	1	allow trend is increasing (1) if decreases linked to years they must be correct (2005, 2008,2009) e..g increases then decreases in 2009(1) increases then decreases in 2006 = 0 allow in most years it is increasing ignore in some years it is increasing
iii	Asia – goes up (1) America – not changed or fallen slightly (1)	2	not Asia goes up and down allow America falling /decreasing /more or less stayed the same not America is increasing
b i	China (1) idea of (greatest) difference is between 3780 and 5430 / (greatest) difference is 1650(1) then any one from increased industry (1) growing economy (1) large or growing population (1) developing country (1) making more goods needing copper (1)	3	if China not identified then only 3rd mark is available Check alongside table for calculation of differences allow use of percentage increase instead allow working out to calculate differences allow industry uses more copper(1) allow more building or construction (1) allow world population has increased (1) ignore more people use it allow increase in computer industry (1)
ii	25.8 (%) (2) if answer incorrect then $\frac{5430}{21040} \times 100$ scores (1)	2	allow 26 (%) (2) allow 25 (%) (1)

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iii	<p>any one from China is using more copper than it is making (1) China will need to import copper (1)</p>	1	<p>allow higher percentage used than (percentage) produced / ora (1) allow China does not have enough copper for its needs (1) allow China will run out of copper (1) allow China will need to buy copper (1) allow China would have to recycle more copper (1) ignore just 'not enough copper'</p> <p>If answer for 14bii is greater than 34.5% to gain credit reverse arguments must be applied allow ecf from % is higher e.g. would have to find export market / problem of how to store extra copper</p> <p>allow ecf from % is the same (34.5%) e.g. China does not have a problem as they are using the same amount as they make</p>
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

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Head office
Telephone: 01223 552552
Facsimile: 01223 552553

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