

Science B

General Certificate of Secondary Education

Unit **B711/01**: Modules B1, C1, P1 (Foundation Tier)

Mark Scheme for June 2013

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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.

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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 use ticks.

Quality of Written Communication skills assessed in 6-mark extended writing questions include:

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

Annotations

Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt <u>not</u> 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)	35 (1)	1	
	(b)	(DNA testing) helps them to identify the sex of the birds (1) so you can make sure correct birds are put together (1) BUT put male and female (pair) together / put male and female to breed (2)	2	allow cannot tell if they are putting a male and female to breed (2) allow higher level responses such as: look for hereditary disorders / faulty genes / harmful mutation (1) check for pedigree (1) avoid inbreeding (1) check that birds are not stolen (1) not captured from the wild (1)
	(c)	the macaw would have a wider field of view (1) because of monocular vision (1)	2	allow can see all round (easily without moving head) allow wider range of area not binocular allow would help it spot predators (1) ignore prey
Total			5	

Question		Answer	Marks	Guidance
2	(a)	pancreas (1)	1	mark answer line first but allow correct ringed underlined answer from list
	(b)	<p>[Level 3] Explanation of the usefulness of the food pyramid. AND Control for Type 1 and Type 2 diabetes. AND Some other information about diabetes. Quality of written communication does not impede communication of the science at this level. (5–6 marks)</p> <p>[Level 2] Explanation of the usefulness of the food pyramid. AND Information about diabetes. Quality of written communication partly impedes communication of the science at this level. (3–4 marks)</p> <p>[Level 1] Knows idea that insulin is involved in diabetes. OR (blood) sugar levels are not controlled. OR suggests control of diet will help control the amount of sugar taken into body. OR should select foods mainly from bottom of pyramid / shows how much of each food is best. 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. Indicative scientific points may include:</p> <p>At level 2 and 3 Explanation of the usefulness of the food pyramid may include:</p> <ul style="list-style-type: none"> • diabetics should eat more from bottom / named food(s) to prevent over-eating of sugary foods • diabetics should eat less from top / named food(s) prevent over-eating of sugary foods allow sugary foods /glucose as alternative for sweets <p>Information about diabetes may include:</p> <ul style="list-style-type: none"> • blood sugar level not controlled or too high • none or too little insulin produced by body • insulin controls blood sugar levels / stops hypo(glycaemic) or hyper(glycaemic) effects • Type 1 diabetes needs injections of insulin • Type 2 diabetes can usually be controlled using diet. <p>Use the L1, L2, L3 annotations in scoris, do not use ticks.</p>

Question		Answer	Marks	Guidance
	(c)	<p>any two from:</p> <p>(contains) receptors (1)</p> <p>to detect light / to see light (1)</p> <p>to detect colours / to see colours (1)</p> <p>changes light (energy) into electrical (energy) / AW</p>	2	<p>allow (contains) rods / (contains) cones (1)</p> <p>allow light sensitive / photosensitive / absorb light (1)</p> <p>allow photoreceptors (2)</p> <p>allow colour receptors (2)</p> <p>allow light sensitive cells (2)</p> <p>ignore reflects light / refracts light</p> <p>ignore allows light into the eye / focuses light</p> <p>ignore controls light / controls colour (that enters the eye)</p>
Total			9	

Question		Answer	Marks	Guidance
3	(a)	(diet) B	1	mark answer line first but allow correct ringed underlined answer from list
	(b)	(i)	1	
		(ii)	2	allow ecf allow answer 75.2 to 75.3
		but $\frac{146 \times 100}{194}$ (1)		
		(iii)	2	allow ecf
		idea that exercise needs to be intensified / keeps current training within 70 to 75% range (1) because his training regime gives a range between 65% and 75% but he needs to be 70% and 80% / some of his training is below 70% (1)		
		Total	6	

Question		Answer	Marks	Guidance
4	(a)	fungus (1)	1	allow fungi not bacteria/virus/protozoa
	(b)	any two from: drugs can be very toxic / harmful (to body) (1) need to monitor their use carefully (1) drugs can be addictive (1) (doctors are) needed to assess dosage for treatment (1)	2	allow potentially allergenic ignore dangerous unless qualified allow avoids misuse / AW allow can have bad reactions with other drugs ignore some drugs are stronger allow can cause overdose
	(c)	idea that the skin is a barrier / broken skin allows entry (of new pathogen) (1) idea of (further/secondary) infection (1)	2	allow stops pathogens entering the body allow disease ignore germs
		Total	5	

Question		Answer	Marks	Guidance
5	(a)	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>food additive</p> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px;">antioxidant</div> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px;">emulsifiers</div> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px;">flavour enhancer</div> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px;">food colour</div> </div> <div style="text-align: center;"> <p>job of the additive</p> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px;">improves the colour of a food</div> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px;">makes a food taste better</div> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px;">stops foods reacting with oxygen</div> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px;">helps to stop oil and water separating in a food</div> </div> </div>	2	two or three correct (1) but all four correct (2)
	(b)	process is irreversible / AW (1) new substance / gas is made (1) but carbon dioxide (gas) is made (2)	2	allow large heat change / large energy change / change needs heat allow CO ₂
Total			4	

Question		Answer	Marks	Guidance	
6	(a)	<p>any two from:</p> <p>hydrogen sulfide, sulfur dioxide or nitrogen dioxide (1)</p>	1	<p>if any other gas included then award 0 marks allow H₂S, SO₂, NO₂</p>	
	(b)	(i)	(major source of carbon monoxide is from) cars or motor vehicles (1)	1	<p>allow factories allow there are no cars or motor vehicles near volcanoes allow burning of fossil fuels</p> <p>allow volcanoes do not give out carbon monoxide</p>
		(ii)	<p>any two from:</p> <p>less hydrogen sulfide in city centre (1) less sulfur dioxide in city centre (1) more CFCs in city centre (1) more nitrogen dioxide in city centre (1)</p>	2	<p>allow ora with clear reference to volcano eg more hydrogen sulfide near volcano ignore references to carbon monoxide</p>
	(c)	<p>sulfur dioxide (causes acid rain) (1)</p> <p>but</p> <p>(idea of) more sulfur dioxide near volcano / ORA (2)</p>	2	<p>not if more than one gas named e.g. sulfur dioxide and hydrogen sulfide (0)</p> <p>for second marking point there needs to be a clear comparison e.g. near a volcano it is 1500 and in city it is only 200 (1)</p>	
	(d)	2NO + O ₂ → 2NO ₂ (1)	1	<p>allow any correct multiple including fractions allow = instead of →</p> <p>allow balanced equation on the line or on the original equation. If there is a contradiction take the answer on the answer line.</p> <p>not & or and instead of + ignore poor use of case or subscript</p>	
Total			7		

Question	Answer	Marks	Guidance
7	<p>[Level 3] One word equation or symbol equation for complete and one for incomplete combustion are written. AND Appreciation that the type of combustion is determined by the amount of oxygen/air present. OR Two correctly balanced equations, one for each type of combustion. Quality of written communication does not impede communication of the science at this level. (5–6 marks)</p> <p>[Level 2] Identifies more than one aspect of complete combustion. AND Identifies more than one aspect of incomplete combustion. Quality of written communication partly impedes communication of the science at this level. (3–4 marks)</p> <p>[Level 1] Identifies one aspect of complete combustion. AND Identifies one aspect of incomplete combustion. Quality of written communication impedes communication of the science at this level. (1–2 marks)</p> <p>[Level 0] Insufficient or irrelevant science such as repeating the question. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C.</p> <p>Complete combustion</p> <ul style="list-style-type: none"> • makes carbon dioxide (and water) (may be shown from incomplete equations eg butane → carbon dioxide) • needs excess oxygen or air • gives more energy than incomplete • burns with a blue flame <p>Equations</p> <ul style="list-style-type: none"> • butane + oxygen → carbon dioxide + water • $C_4H_{10} + O_2 \rightarrow CO_2 + H_2O$ (does not need to be balanced) <p>Incomplete combustion</p> <ul style="list-style-type: none"> • makes carbon monoxide, (carbon and water) (may be shown by incomplete equations eg butane + air → carbon • happens with a shortage of oxygen or air • makes soot or poisonous gas • gives less energy than complete combustion • burns with a yellow flame <p>Equations</p> <ul style="list-style-type: none"> • butane + oxygen → carbon monoxide + water • butane + oxygen → carbon + water • $C_4H_{10} + O_2 \rightarrow CO + H_2O$ (does not need to be balanced) • $C_4H_{10} + O_2 \rightarrow C + H_2O$ (does not need to be balanced) <p>Use the L1, L2, L3 annotations in scoris. Do not use ticks.</p>
	Total	6	

Question		Answer	Marks	Guidance
8	(a)	<p>any two from:</p> <p>polymers will rot / polymers will decay / polymers will decompose / AW (1)</p> <p>the amount of litter will be reduced (1)</p> <p>the need for land-fill sites will decrease (1)</p>	2	<p>allow polymers will break down</p> <p>ignore they can be recycled</p>
	(b)	<p>any two from:</p> <p>results can be checked (1)</p> <p>so that further evidence can be collected (1)</p> <p>to provide information to other scientists or public or other organisations / AW (1)</p> <p>so he can get recognition for his work (1)</p>	2	<p>allow peer-review / results can be evaluated (1)</p> <p>allow work can be developed further (1)</p> <p>allow so other scientists cannot take credit (1)</p>
	(c)	polychloroethene / 'poly(chloroethene)' (1)	1	<p>allow pvc</p> <p>not polychloroethane</p>
	(d)	C (1)	1	
Total			6	

Question		Answer	Marks	Guidance
9		<p>any two from:</p> <p>evaporates easily / volatile (1)</p> <p>non-toxic / not poisonous (1)</p> <p>does not react with water (1)</p> <p>does not irritate (the skin) (1)</p>	2	<p>allow has a low boiling point</p> <p>allow smell (1)</p> <p>ignore harmful unless qualified</p> <p>allow one property with a qualification for 2 marks eg must evaporate easily (1) so the perfume can diffuse quickly (1)</p> <p>allow doesn't stain (1)</p> <p>ignore flammability</p>
Total			2	

Question			Answer	Marks	Guidance
10	(a)	(i)	refraction (1)	1	allow refracting
		(ii)	(it is) reflected (1)	1	allow reflecting ignore idea of bouncing
	(b)		<p>any two from: (idea that) different lasers (can be used to) produce different colours of light (1)</p> <p>(idea that) (narrow beams of light) can be pointed in different directions / different beams of light can be used at the same time / beams are separate from each other (1)</p> <p>(idea that) beams of light can be seen in the air when smoke (or other named particles) are present (1)</p> <p>(idea that) beams can be made to co-ordinate with music or fireworks (1)</p> <p>(idea that) lasers can be directed accurately to make a (moving) picture / can travel in straight lines (1)</p> <p>idea that beam is intense / seen at a great(er) distance (1)</p>	2	<p>ignore colourful</p> <p>allow beam is bright (and sharp)</p>
	(c)	(i)	<p>each letter or number has a particular code / correct example of a code being sent (1)</p> <p>idea of light is turned on and off (1)</p> <p>but (idea of) short and long flashes (of light) (2)</p>	2	<p>example of a code eg SOS is three short flashes of light, three long flashes of light, three short flashes of light (2)</p> <p>ignore dots and dashes</p>
		(ii)	portable / convenient / can be used on the move (1)	1	<p>allow signals can be sent without the use of wires</p> <p>allow wires can break</p> <p>allow examples e.g. can be sent with a torch</p>
Total				7	

Question	Answer	Marks	Guidance
11	<p>[Level 3] Estimated time with IR and reason given including mention of conduction AND Estimated time with microwaves and reason given including mention of more fat and/or water content or less conduction Quality of written communication does not impede communication of the science at this level. <p style="text-align: right;">(5–6 marks)</p> [Level 2] Estimated time quoted with IR and reason given AND Estimated time quoted with microwaves and reason given Quality of written communication partly impedes communication of the science at this level. <p style="text-align: right;">(3–4 marks)</p> [Level 1] Estimated time with IR and reason given OR Estimated time with microwaves and reason given OR Estimated time for IR and estimated time for microwave cooking quoted OR One reason each for IR and microwave time increasing Quality of written communication impedes communication of the science at this level. <p style="text-align: right;">(1–2 marks)</p> Level 0 Insufficient or irrelevant science. Answer not worthy of credit. <p style="text-align: right;">(0 marks)</p> </p>	6	<p>This question is targeted at grades up to C. Indicative scientific points may include:</p> <p>IR/oven heating estimate</p> <ul style="list-style-type: none"> • suitable estimate of more than 5 minutes / 10 -15 minutes <p>reason</p> <ul style="list-style-type: none"> • surface of pizza approximately the same size or slightly larger because of increased depth • only surface(s) heated • energy must be conducted through the pizza • idea that water or fat content not important in this method of heating <p>microwave heating estimate</p> <ul style="list-style-type: none"> • suitable estimate of more than 1.5 minute • surface of pizza approximately the same size or slightly larger because of increased depth • idea that microwaves penetrate more than 7mm • so idea of less conduction needed (compared to IR) • idea of more water and/or fat content so time for cooking is reduced compared to IR • idea that water or fat content important in this method of heating <p>accept higher level answers in terms of KE transfer between particles during conduction</p> <p>Use the L1, L2, L3 annotations in scoris. Do not use ticks.</p>
	Total	6	

Question		Answer	Marks	Guidance
12	(a)	B (1)	1	more than one answer on answer line scores 0 marks if answer line blank allow B correctly indicated on the diagram
	(b)	2.84 (m/s) (2) but if incorrect 1.42 x 2.0 (1)	2	allow 2.8 (m/s) (2) mark the answer line first but check table for correct answer if not given on answer line
	(c) (i)	X correctly plotted at 6 cm, 2.8(4) m/s (1)	1	allow + or – ½ square allow ecf from 12b
	(ii)	as diameter of spring increases the wave speed decreases / ORA (1)	1	allow negative correlation
	(iii)	1.7 (m/s) (1)	1	allow answer in the range 1.6–1.8 (m/s)
Total			6	

Question		Answer	Marks	Guidance
13	(a)	ultraviolet (1)	1	allow UV more than one answer on answer line scores 0 if answer line blank allow ultraviolet correctly indicated on the list
	(b)	idea that tests all have results that increase the time you can safely stay in the sun (1) but idea that all the tests increase the length of time you can stay safely in the sun by a factor of 3 (2)	2	
	(c)	(detected by) seismometers (1) (recorded on a) seismograph (1) (idea of an early) warning system / detected under the sea / to allow humans to move away from the area / move away from buildings / move away from the sea (1)	3	allow phonetic spelling ignore sensor allow seismogram allow use Richter scale allow recorded graphically or on a computer
Total			6	

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