

Additional Science B

General Certificate of Secondary Education

Unit **B721/01**: Modules B3, C3, P3 (Foundation Tier)

Mark Scheme for June 2012

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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

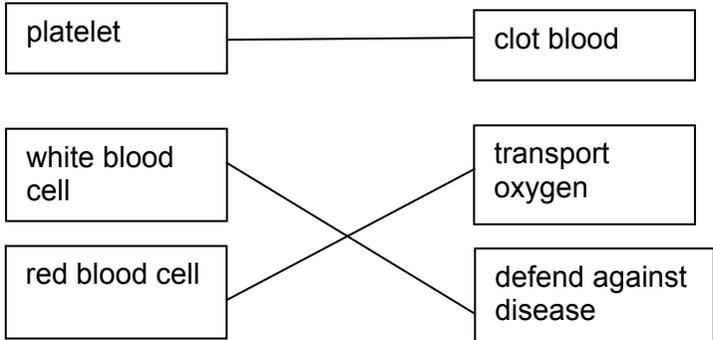
Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt not given
	error carried forward
	information omitted
	ignore
	reject
	contradiction
	Level 1
	Level 2
	Level 3

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
<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)	fertilisation (1)	1	
	(b)	replacement of worn out cells (1) repair (of damaged tissue) (1)	2	allow asexual reproduction / cloning (1) ignore growth / replication
	(c)	any two from: there are no flowers / fruit (1) so only one parent (1) with the plantlets growing on extensions / AW (1) idea of extensions being runners (1)	2	allow with the young plants / offspring growing on extensions (1) allow offspring growing on runners (2)
Total			5	

Question		Answer	Marks	Guidance
2	(a)	50 (1)	1	If answer line is blank look for answer in table
	(b)	bar drawn at 38, 52 and 50 (2)	2	all three bars correct (2) one or two bars correct (1) allow error carried forward / if a not answered assume step ups are 50
	(c)	star jumps changes his pulse rate the most (1)	1	allow highest pulse rate (1)
	(d)	(i) This is because my muscles need more carbon dioxide (1)	1	
		(ii) This is because my muscles need more oxygen (1)	1	allow This is because my muscles produce more carbon dioxide (1) ignore more glucose ignore reference to lactic acid
Total			6	

Question	Answer	Marks	Guidance
3 (a)	<p>any three from : Sara used the whole leaf or not just the lower surface used or / AW (1)</p> <p>(this made) leaf too thick (1)</p> <p>(so that) light could not get through (1)</p> <p>she used too much stain or the wrong stain (which made it dark) (1)</p> <p>idea of not enough light source or light setting is wrong or mirror is pointing the wrong way (1)</p>	3	<p>allow she did not use only the lower surface (1)</p> <p>but not just no light source</p> <p>ignore dirty lens</p> <p>ignore reference to incorrect focus or incorrect microscope</p>
(b)	 <pre> graph LR A[platelet] --- B[clot blood] C[white blood cell] --- D[defend against disease] E[red blood cell] --- F[transport oxygen] </pre>	2	<p>all correct (2)</p> <p>one or two correct (1)</p>
	Total	5	

Question	Answer	Marks	Guidance
4 (a)	<p>[Level 3] Describes the structure of DNA in detail and relates this to function. Includes ideas about DNA contains a base sequence coding enzymes or attempts higher level e.g. ideas of complementary base pairs. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Describes more than one structure of DNA and links the idea that DNA codes for proteins or states that that enzymes are proteins. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Describes more than one simple structural feature or mentions double helix or one function in simple 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 Level 3 may include:</p> <ul style="list-style-type: none"> • contains 4 different bases • bases sequence codes for a protein • each gene has a different sequence of bases • each gene codes for a different enzyme • higher level ideas e.g. bases are T A G C or complementary base pairs / 3 bases code for each amino acid <p>Indicative scientific points at Level 2 may include:</p> <ul style="list-style-type: none"> • descriptions of structures from level 1 • idea of cross links • double helix • DNA codes for proteins • enzymes are proteins • DNA codes for enzymes <p>Indicative scientific points at Level 1 may include:</p> <ul style="list-style-type: none"> • section of DNA is called a gene • chromosomes are made from DNA • contains bases • ladder like structure / twisted ladder / helix • has two strands • allow higher level structural ideas e.g. reference to • number of different bases / correct idea of ATCG • DNA is a code

Question			Answer	Marks	Guidance
	(b)	(i)	idea that resistance is caused by a gene / DNA (1) DNA / gene is moved from the wild plant to the crop plant (1)	2	not immune ignore chromosomes allow the resistance gene is moved from wild to crop plant (2)
		(ii)	any one from: potato might be poisonous / might change taste / might not get as high a yield (1)	1	ignore may have side / harmful effects allow some people may have allergies / makes people ill (1) allow might spread to weeds etc (1) allow might be less nutritious (1)
			Total	9	

Question			Answer	Marks	Guidance
5	(a)		semiconductors (1)	1	
	(b)		strong (1)	1	
			Total	2	

Question		Answer	Marks	Guidance
6		<p>B because it conducts electricity/ good conductor (1)</p> <p>has a melting point above 950°C (1)</p>	2	<p>no mark for B on its own</p> <p>allow B has a high melting point / will not melt in the liquid its melting point is 3652°C (1)</p> <p>allow A has a high melting point / will not melt in the liquid (1)</p> <p>but A has a high melting point and does not conduct (0)</p> <p>allow C is a good conductor (1)</p> <p>but C is a good conductor and has a low melting point (0)</p> <p>ignore reference to hardness</p>
		Total	2	

Question		Answer	Marks	Guidance
7	(a)	<p>[Level 3]</p> <p>Describes at least two costs and explain at least one of these costs involved and explains why drugs need to be tested before they are used.</p> <p>Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2]</p> <p>Describes at least two costs involved and explains why drugs need to be tested before they are used or Describes at least two costs involved and explains one of them Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1]</p> <p>Describes at least two costs involved or begins to explain why drugs need to be tested before they are used. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0]</p> <p>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 E <u>explanations that may be included</u></p> <ul style="list-style-type: none"> • raw materials can be expensive as harvests can fail / large amount have to be grown / difficult to find • secure conditions needed in factory as drugs can be used as an illegal drug • testing / development is time consuming therefore expensive • batch process used which is more expensive than continuous / labour intensive • extraction / production expensive as need to be pure • expensive transport as raw materials may be imported to UK / transport needs to be secure (if drugs are dangerous) • marketing expensive as you have to pay for advertising <p><u>reasons for testing that may be included</u></p> <ul style="list-style-type: none"> • drugs need to be tested to ensure they are safe • tested to make sure they work <p><u>descriptions that may be included</u></p> <ul style="list-style-type: none"> • labour costs • energy costs • cost of raw materials • cost of extraction of raw material • cost of manufacturing equipment / uses batch process • cost of transport • marketing • time needed to research or development • cost of testing

Question		Answer	Marks	Guidance
	(b)	<p>any two from:</p> <p>so others can test to see if it works (1)</p> <p>so others can show it is safe (1)</p> <p>so others can develop the drug further / modify the drug (1)</p> <p>lets doctors / patients / pharmacists know about the drug (1)</p>	2	ignore let other people know about the drug
		Total	8	

Question			Answer	Marks	Guidance
8	(a)	(i)	15 (cm ³) (1)	1	allow 15 – 15.5
		(ii)	slows down then (reaction) stops (1) gradient of graph becomes less steep / AW (1)	2	ignore starts fast not rate increases rapidly / rate goes up allow by looking at the gradient (1) allow line levels off / line steeper at start (1)
	(b)		any two from: powder the zinc / make the zinc into smaller lumps (1) increase the temperature (of the reaction) (1) increase the concentration of the hydrochloric acid (1)	2	allow she can increase the surface area (1) ignore strength of acid allow stir the reaction (1) ignore changes in volumes or amounts ignore references to pressure
	(c)		A slow reaction producing a small volume of gas A slow reaction producing a large volume of gas A fast reaction producing a small volume of gas A fast reaction producing a large volume of gas ✓ (1)	1	more than one tick scores zero
			Total	6	

Question			Answer	Marks	Guidance
9	(a)		125 (1)	1	
	(b)	(i)	$\text{ZnCO}_3 \rightarrow \text{ZnO} + \text{CO}_2$ (1)	1	allow = instead of \rightarrow allow multiples not and or & instead of + not ZnCO_3 or Zno or Co_2
		(ii)	1.32 (g) (1)	1	
		(iii)	3.24 (g) (1)	1	If no answer look in table
Total				4	

Question			Answer	Marks	Guidance
10	(a)		7560(J) (2) 100 x 4.2 x 18 (1)	2	mark answer line first allow 151.2 (1)
	(b)		C because it releases or transfers the most energy (1)	1	no mark for C on its own allow ecf from (a) allow has the highest energy (1)
Total				3	

Question		Answer	Marks	Guidance
11	(a)	<p>speed calculation 32.1 (2)</p> <p>but if answer is incorrect</p> <p>$17.68 \div 0.55$ (1)</p>	2	<p>if answer space is blank allow correct answer (2) or correct division (1) in the table allow 32 / 32.15 / 32.145455 / 32.145 (2) but 32.2 / 32.0 / 32.14(1)</p>
	(b)	<p>first ball is fastest delivery / AW (1)</p> <p>reason released with greatest force or acceleration (from hand) / AW (1)</p>	2	<p>assume answer is referring to first ball unless stated differently</p> <p>allow bowled the ball faster(1)</p> <p>allow bowled the ball harder or ran up faster or has greater thrust (1)</p> <p>allow ecf from 11(a) e.g. (28.0) is the slowest (1) so released with less force (1) allow reverse argument</p>
		Total	4	

Question		Answer	Marks	Guidance
12	(a)	0.13 (2) but if answer is incorrect 5.1 ÷ 40 (1) unit m/s ² or m/metres per second ² or m/metres per second squared	3	allow 0.1275 (2) but 0.12 / 0.127 (1) allow ms ⁻² allow metres per second per second or m per s per s
	(b)	any two from: (X) no acceleration (1) (Y) deceleration or negative acceleration (1) (Z) idea that here there is greater deceleration or negative acceleration (compared to Y) / AW (1) AND correctly links the shape of the graph to at least one description of X, Y or Z (1)	3	assume it refers to acceleration e.g. it stays the same in X (0) allow steady speed / constant speed(1) not acceleration stays the same ignore cruising speed allow slows down (1) not acceleration goes down allow same time as Y but bigger speed change (1) allow slows down if not mentioned for Y (1) e.g. no acceleration at X as line is horizontal (2) e.g. deceleration at y as line goes down (2) ignore just 'straight line' unless qualified maximum of 2 marks if no mention of the gradient e.g. X has no change in speed then they slow down then they slow down but with greater deceleration (2) e.g. X has no change in speed as the line is flat then they slow down then they slow down but with greater deceleration (3)
		Total	6	

Question	Answer	Marks	Guidance
13	<p>[Level 3] Describes at least one advantage and one disadvantage with detailed explanation e.g. specific reference to effects of named pollutants and describes one way effect of cars can be monitored or tested</p> <p>Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Describes at least one advantage and one disadvantage with explanations or Describes at least one advantage and one disadvantage without explanation and describes one way cars can be monitored or tested</p> <p>Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Describes at least one advantage and one disadvantage. or Describes one way cars can be monitored or tested.</p> <p>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 <u>advantages may include:</u></p> <ul style="list-style-type: none"> • lower noise levels / quieter cars • less pollution • less petrol or diesel / oil reserves / fossil fuels used <ul style="list-style-type: none"> • lower noise levels linked to benefit to society / environment • lower / less CO₂ emissions so less effect on global warming • could improve road safety due to generally lower speeds. • petrol or diesel / oil reserves / fossil fuels which are needed for other things or are fast running out • lower / CO₂ emissions / less greenhouse gases <p><u>disadvantages may include:</u></p> <ul style="list-style-type: none"> • pedestrians can't hear cars • power stations still need to produce electricity • cars can't travel as far / fast <ul style="list-style-type: none"> • quiet(er) cars could be a danger to pedestrians • electricity produced at a power station and power stations release greenhouse gases • construction of charging points / batteries could add to pollution • electricity production needs fossil fuels • not enough power points to recharge <p><u>monitoring point may include:</u></p> <ul style="list-style-type: none"> • monitoring CO₂ levels to look for a reduction • monitoring noise levels to look for a reduction • comparing results to assess any real benefit check / monitor accident figures for any change.
	Total	6	

Question		Answer	Marks	Guidance
14		Matthew (1) and Miriam (1)	2	any order if answer line is blank allow answers ticked, ringed beside the talking heads if more than two names reduce by (1) for each additional name to a minimum of zero
Total			2	

Question		Answer	Marks	Guidance																		
15	(a) (i)	18.0 56.0	1	allow 18 and 56 all have to be correct for the mark																		
	(ii)	idea that as speed increases stopping distance increases (rapidly) (1) increased stopping distance means more chance of collision / accident / harming a pedestrian (1)	2	allow the faster you are going the greater the breaking / thinking distance (1)																		
	(b) (i)	all points correctly plotted and straight line drawn (1)	1																			
	(ii)	idea that thinking distance shows a steady increase and braking distance increases more rapidly (1)	1	allow breaking distance becomes greater than thinking distance (as speed increases) /ora (1) but not breaking distance is always greater than thinking distance allow ecf if graph is plotted incorrectly																		
	(c)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>safety</th> <th>prevents accidents</th> <th>protects car occupants</th> </tr> </thead> <tbody> <tr> <td>ABS..</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>crumple...</td> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td>air..</td> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td>electric..</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>traction ...</td> <td style="text-align: center;">(✓)</td> <td></td> </tr> </tbody> </table>	safety	prevents accidents	protects car occupants	ABS..	✓		crumple...		✓	air..		✓	electric..	✓		traction ...	(✓)		2	all four correct = (2) 2 or 3 correct = (1) 1 correct = (0)
safety	prevents accidents	protects car occupants																				
ABS..	✓																					
crumple...		✓																				
air..		✓																				
electric..	✓																					
traction ...	(✓)																					
Total			7																			

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