

GCSE

Additional Science B

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

General Certificate of Secondary Education

Mark Scheme for June 2014

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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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Annotations used in scoris

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

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

MARK SCHEME

Question	Answer	Marks	Guidance								
1 a i	<table border="1"> <thead> <tr> <th data-bbox="331 276 669 316">Job</th> <th data-bbox="669 276 1010 316">Part of the blood</th> </tr> </thead> <tbody> <tr> <td data-bbox="331 316 669 355">transports food</td> <td data-bbox="669 316 1010 355">plasma</td> </tr> <tr> <td data-bbox="331 355 669 395">clots blood</td> <td data-bbox="669 355 1010 395">platelets</td> </tr> <tr> <td data-bbox="331 395 669 435">carry oxygen</td> <td data-bbox="669 395 1010 435">red blood cells</td> </tr> </tbody> </table>	Job	Part of the blood	transports food	plasma	clots blood	platelets	carry oxygen	red blood cells	2	<p>allow plasma for clots blood allow erythrocytes/rbc/haemoglobin for carry oxygen</p>
Job	Part of the blood										
transports food	plasma										
clots blood	platelets										
carry oxygen	red blood cells										
a ii	<p>any two marks from</p> <p>make skin (cells to repair the cut) (1)</p> <p>make (red) blood (cells) (1)</p> <p>make white cells to fight infection (1)</p>	2	<p>allow repair/replaced (damaged) cells/tissues</p>								
b i	<p>A tricuspid (valve) (1)</p> <p>B left atrium (1)</p>	2	<p>allow phonetic spelling allow atrio-ventricular (valve)</p> <p>allow left atria / left auricle</p>								
b ii	<p>right side pumps blood to the lungs (1)</p> <p>left side pumps blood to the organs/rest of the body (1)</p>	2	<p>allow left side pumps blood to named organ except lungs allow left side pumps blood around the body</p> <p>allow to the body and lungs (1)</p>								
	Total	8									

Question	Answer	Marks	Guidance
2 a	<p>amino acid <input type="checkbox"/></p> <p>cellulose <input type="checkbox"/></p> <p>glucose <input type="checkbox"/></p> <p>haemoglobin <input checked="" type="checkbox"/></p> <p>insulin <input checked="" type="checkbox"/></p> <p>lactic acid <input type="checkbox"/></p>	2	each incorrect tick loses a mark
b	respiration (1)	1	allow higher level answer referring to type of respiration (aerobic or anaerobic respiration)
c	<p>any three from:</p> <p>pepsin does not work at pH levels greater than 3.5 / only works at pH below 3.5 (1)</p> <p>intestine pH is outside this range (at 7 to 8) (1)</p> <p>trypsin does not work at pH less than 5.5 / only works between 5.5 and 10 (1)</p> <p>stomach pH is outside this range (at 1 to 2) (1)</p>	3	<p>allow the pH peak of pepsin is within the range 1.5 – 2.0 / pepsin only work in low(er) pH / pepsin only works in (strongly) acidic conditions</p> <p>allow pepsin doesn't work at pH 7 or 8</p> <p>allow (idea that) intestine pH is too high / intestine is neutral / intestine is too alkaline</p> <p>allow the pH peak of trypsin is within the range 7.5 – 8.0 / trypsin works in higher pH</p> <p>allow trypsin doesn't work at pH 1 or 2</p> <p>allow (idea that) stomach pH is (too) low / stomach is (too) acidic</p>

Question	Answer	Marks	Guidance
			allow as one extra marking point, higher level responses e.g. correct mention of active site / denaturing / optimum pH (1)
	Total	6	


Question	Answer	Marks	Guidance
3	<p>[Level 3] identifies one feature suitable for genetic engineering AND gives one advantage of genetically engineered corn AND gives one risk of genetically engineered corn. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] identifies one feature suitable for genetic engineering AND gives one advantage of genetically engineered corn OR gives one risk of genetically engineered corn. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] identifies one feature suitable for genetic engineering OR gives one advantage of genetically engineered corn OR gives one risk of genetically engineered corn. 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 1, 2 and 3 may include:</p> <ul style="list-style-type: none"> • could select (genes) for resistance to insects • could select (genes) for resistance to pesticides/herbicides/selective weed killers • could select (genes) for resistance to disease/rotting (on stem) /frost damage/grow in different climates/altitudes • select (genes) that enhance growth / increase photosynthesis (ability to use light / water and carbon dioxide) • advantages of genetically engineered corn <ul style="list-style-type: none"> ◆ will get larger yield/ get more crop / harvest more ◆ corn not physically damaged by insects / more attractive to buy ◆ corn not physically damaged by pesticides / herbicides / selective weed killers ◆ corn produced more quickly ◆ improve texture/taste • risks of genetically engineered corn <ul style="list-style-type: none"> ◆ genes put into corn may have unexpected harmful effects to animals/humans ◆ may pass on insect resistance to other plants/weeds ◆ may pass on herbicide resistance to other plants/weeds <p>allow under risks idea of against moral/religious/ethical views</p> <p>Use the L1, L2, L3 annotations in Scoris. Do not use ticks.</p>
Total		6	

Question	Answer	Marks	Guidance
4 a	any two from: idea of rapid increase at first (0 to 2 years) (1) idea of smooth increase / steady rise / steady growth (to about 12 to 14 years) (1) idea of growth spurt from 13 to 16 years (1) levels off at 16 - 17 years / plateau 17 - 18 years (1)	2	allow any range or age within 13 to 16 years allow males grow until they're 17- 18 allow any year within the ranges
b	20 (cm)(at 18) (1)	1	
c	any two from: females are growing more/ faster/growth spurt (1) for menstrual cycle/periods (1) more breast growth (1) males and females enter puberty at different ages (1)	2	allow girls are bigger than boys
Total		5	

Question	Answer	Marks	Guidance
5 a	any two from: lustrous / shiny (1) clear / transparent (1) hard (1) high melting point (1) insoluble in water (1) does not conduct (electricity) (1)	2	allow reflects/refracts light/sparkle ignore to break
b	(graphite is) black / (graphite is) slippery (1)	1	allow layers can slide over each other easily allow layers can slide off onto paper allow it can leave marks on the paper allow it's a dark colour
c	Buckminster fullerene	1	allow phonetic spelling allow buckyball not Buckminster or fullerene on their own
	Total	4	

Question	Answer	Marks	Guidance
6 a	<p>any two from:</p> <p>same mass or volume or amount of water (in copper can) (1)</p> <p>same mass of fuel (1)</p> <p>same distance between spirit burner and (copper) can (1)</p> <p>use same burner each time (1)</p> <p>use same copper can/calorimeter each time (1)</p> <p>use same (size) flame or wick (1)</p> <p>use same temperature of water at start (1)</p>	2	<p>allow same level of water</p> <p>ignore same amount of fuel</p> <p>allow same distance between flame and can</p> <p>allow same beaker (as diagram in question resembles a beaker)</p>
b	exothermic (1)	1	allow correct answer ticked circled or underlined in list if answer line is blank
c i	<p>butanol (1)</p> <p>(because)</p> <p>largest temperature rise / aw (1)</p>	2	<p>allow lowest at beginning highest at the end</p> <p>allow temperature rise/change is 21(°C)</p> <p>ignore highest temperature at the end</p>
ii	<p>7600 (J) (2)</p> <p>BUT</p> <p>energy released = $100 \times 4.2 \times 18$ (1)</p>	2	<p>answer must have two sig figs</p> <p>unit not needed – ignore incorrect units, unless a con, e.g. 7600 kJ</p> <p>allow 7560 (J)</p> <p>look for correct answer first, 7600 (J) on own scores 2 marks despite any other working out</p> <p>allow 7.6 kJ for two marks but 7.56 kJ is one mark</p>
	Total	7	

Question	Answer	Marks	Guidance
7 a	calcium carbonate + hydrochloric acid → calcium chloride + water + carbon dioxide (1)	1	<p>allow = instead of → not and / & / instead of +</p> <p>allow correct formulae but equation does not need to balance e.g. $\text{CaCO}_3 + \text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$ allow mix of correct formulae and words</p>
b i	all (indigestion) tablet is used up / all calcium carbonate is used up / all hydrochloric acid is used up (1)	1	<p>allow all reactant used up allow higher level responses to limiting reactant allow nothing left to react</p> <p>ignore all the tablet has dissolved</p>
ii	(different volumes of acid give) same reaction time / aw	1	<p>allow both experiments take 68 seconds allow both give the same result ignore both give the same answer</p>

Question	Answer	Marks	Guidance
<p> b iii</p>	<p>[Level 3] Identifies the two correct experiments AND answer applies understanding of the reacting particle model to explain why increasing the temperature of the acid will increase the rate of reaction and shorten the reaction time Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] answer applies understanding of the reacting particle model to explain why increasing the temperature of the acid will increase the rate of reaction and shorten the reaction time Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] applies understanding that as temperature increases the rate increases so the reaction time decreases 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>	<p>6</p>	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points may include:</p> <ul style="list-style-type: none"> Experiments 1 and 3 support the conclusion and indicative points at level 2 <p>Indicative scientific points at level 2 may include:</p> <ul style="list-style-type: none"> At higher temperature acid particles move faster / particles have more energy At higher temperature more (successful) collisions (between acid and tablets) / collisions (between tablets and acid) are more energetic <p>allow ora for reacting particle explanation</p> <p>Indicative scientific points at level 1 may include:</p> <ul style="list-style-type: none"> reaction is faster when temperature is increased Faster reaction gives a shorter reaction time <p>ignore faster collisions / quicker collisions</p> <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
	<p>Total</p>	<p>9</p>	

Question	Answer	Marks	Guidance
8 a	1.0 (g) (2) BUT idea that mass of reactants equals mass of products / $6.9 + 5.1 = 3.0 + \text{mass of aspirin}$ / $12.0 = 3.0 + \text{mass of aspirin}$ (1)	2	
b	30% (1)	1	allow correct answer ticked circled or underlined in list if answer line is blank
c	reaction 1 does not have 100% (atom economy) (1) reaction 2 has 100% (atom economy) / no waste products in reaction 2 / all atoms in reactants converted into useful products (1)	2	allow experiment 1 has got waste product allow reaction 2 has a higher atom economy than reaction 1 ora (1)
	Total	5	

Question	Answer	Marks	Guidance
9 a	thinking distance (1)	1	
b i	52 (m) (1)	1	
ii	any one from: alcohol (1) drugs (1) tiredness (1) illness (1) concentration (1) distractions (1) age (1) reaction time(1)	1	ignore weather conditions allow examples of distraction / no distraction e.g. children crying / radio / mobile phone (1)
Total		3	

Question	Answer	Marks	Guidance
10	<p>[Level 3] Describes simple changes in GPE using equations to illustrate the answers AND Describes simple changes in KE using equations to illustrate the answers AND describes what happens to GPE when mass is doubled AND describes what happens to KE when mass is doubled Quality of written communication does not impede communication of the science at this level (5 – 6 marks)</p> <p>[Level 2] Describes simple changes in GPE AND Describes simple changes in KE AND Uses both equations to illustrate the answers Quality of written communication partly impedes communication of the science at this level (3 – 4 marks)</p> <p>[Level 1] Describes one simple change in GPE AND Describes one simple change in KE 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. Level 3 is only awarded when description includes information about what happens when mass is doubled</p> <p>descriptions of changes in GPE and KE when mass is doubled may include:</p> <ul style="list-style-type: none"> • doubling the mass of the ball doubles the GPE • GPE is proportional to mass • doubling the mass of the ball doubles the KE • KE is proportional to mass • Idea that the energy transfers remain the same <p>descriptions of changes in GPE and KE using equations may include:</p> <ul style="list-style-type: none"> • equation for GPE = mgh • GPE depends on height • so the higher the ball the more GPE it has • equation for KE = $\frac{1}{2}mv^2$ • KE depends on velocity / KE depends on speed • so the faster the ball the more KE it has • when the ball is not moving (the v is 0 so) the KE is 0 • the total KE + GPE is constant • the total KE + GPE is 100 J for any position <p>descriptions of changes in GPE and KE as the ball falls may include:</p> <ul style="list-style-type: none"> • GPE decreases / allow goes to 0 (J) • GPE decreases from 100 J to 20 J • GPE decreases by 80 J • KE increases / allow goes to 100J • KE increases from 0J to 80J • KE increases by 80 J

Question	Answer	Marks	Guidance
			<p>At level 1 if no other marks awarded allow one mark for a correct equation</p> <p>Use the L1, L2, L3 annotations in scoris. Do not use ticks.</p>
Total		6	

Question	Answer	Marks	Guidance
11 a	to measure distance / to see how far the car has travelled (1)	1	
b i	<p>any two from</p> <p>to make sure the time interval is correct/accurate / 0.5 seconds / AW (1)</p> <p>time is needed to calculate speed (1)</p> <p>a (small) change (in the time) will change the speed reading / to make sure the correct speed is calculated (1)</p> <p>to be sure the speed reading is correct (to fine or prosecute the speeding motorist) (1)</p>	2	<p>assume: it = time since time is mentioned in the stem of the question</p> <p>allow incorrect time will mean the car looks like it is going faster / slower than it actually is</p>
ii	(idea that) the car would have passed the end of the lines / not be in photograph 2 (1)	1	<p>allow car is out of view by then</p> <p>allow car has gone too far by then</p> <p>allow idea that cars speed may be changing so average value rather than accurate 'snapshot'</p>
c i	<p>no (no mark)</p> <p>speed of car is 8.8 (m/s) (which is below the speed limit) (2)</p> <p>but</p> <p>$\frac{4.4}{0.5}$ (1)</p>	2	if yes then no marks
ii	2 (cars) (1)	1	
	Total	7	

Question	Answer	Marks	Guidance
12 a	petrol (and) diesel (1)	1	both required either order allow gasoline for petrol allow LPG and diesel allow LPG and petrol ignore gas / oil
b i	(idea that) light (from the Sun goes onto the solar panels) (1)	1	ignore heat allow sunlight ignore sunshine
ii	any two from (may travel at a) low speed (1) (not enough / less light) at night (1) (not enough / less light when) cloudy / rainy / dull / sun not out (1) only have small (capacity) batteries / AW (1)	2	 allow bad weather if clearly linked to lack of sun(light) allow they travel a large distance [1]
iii	any two from make it streamlined / reduce air resistance / make it as light(weight) as possible / increase the size of the solar panels / increase the efficiency of the solar panels (1) if crash / flip over at high speeds the person inside may be injured more severely / AW (1) if moving at high speeds the person inside will need extra safety features / seatbelts / crumple zones / AW (1)	2	 allow idea that car roof and sides are thin / car is light(weight) so little protection from crash [1]
Total		6	

Question	Answer	Marks	Guidance
13	F distance = 1.8 (m) / is the furthest distance (1) force / weight = 750 (N) / is the heaviest weight (1) or 750 x 1.8 (2) and 1350 (J) (1)	3	if Lift identified as either A, B, C, D or E then max 2 marks if no other mark awarded then F can score 1 mark allow it's the highest one on the graph
	Total	3	

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