OCR
Oxford Cambridge and RSA

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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

Annotations used in scoris

Annotation	Meaning
BP	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
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
__ = 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

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1 a i</td><td><table><tr><th>Job</th><th>Part of the blood</th></tr><tr><td>transports food</td><td>plasma</td></tr><tr><td>clots blood</td><td>platelets</td></tr><tr><td>carry oxygen</td><td>red blood cells</td></tr></table></td><td>2</td><td>allow plasma for clots blood
allow erythrocytes/rbc/haemoglobin for carry oxygen</td></tr>
<tr><td>a ii</td><td>any two marks from

make skin (cells to repair the cut) (1)

make (red) blood (cells) (1)

make white cells to fight infection (1)</td><td>2</td><td>allow repair/replaced (damaged) cells/tissues</td></tr>
<tr><td>b i</td><td>A tricuspid (valve) (1)

B left atrium (1)</td><td>2</td><td>allow phonetic spelling
allow atrio-ventricular (valve)

allow left atria / left auricle</td></tr>
<tr><td>b ii</td><td>right side pumps blood to the lungs (1)

left side pumps blood to the organs/rest of the body (1)</td><td>2</td><td>allow left side pumps blood to named organ except lungs
allow left side pumps blood around the body

allow to the body and lungs (1)</td></tr>
<tr><td></td><td>Total</td><td>8</td><td></td></tr>
</table>

Question	Answer	Marks	Guidance
2 a	amino acid ☐ cellulose ☐ glucose ☐ haemoglobin ✓ insulin ✓ lactic acid ☐	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	**any three from:** pepsin does not work at pH levels greater than 3.5 / only works at pH below 3.5 (1) intestine pH is outside this range (at 7 to 8) (1) trypsin does not work at pH less than 5.5 / only works between 5.5 and 10 (1) stomach pH is outside this range (at 1 to 2) (1)	3	**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 **allow** pepsin doesn't work at pH 7 or 8 **allow** (idea that) intestine pH is too high / intestine is neutral / intestine is too alkaline **allow** the pH peak of trypsin is within the range 7.5 – 8.0 / trypsin works in high**er** pH **allow** trypsin doesn't work at pH 1 or 2 **allow** (idea that) stomach pH is (too) low / stomach is (too) acidic

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	**[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) **[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) **[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) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C.** **Indicative scientific points at level 1, 2 and 3 may include:** • 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 ♦ 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 ♦ 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 **allow** under risks idea of against moral/religious/ethical views **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**
	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	**any two from**: same mass or volume or amount of water (in copper can) (1) same mass of fuel (1) same distance between spirit burner and (copper) can (1) use same burner each time (1) use same copper can/calorimeter each time (1) use same (size) flame or wick (1) use same temperature of water at start (1)	**2**	 **allow** same level of water **ignore** same amount of fuel **allow** same distance between flame and can **allow** same beaker (as diagram in question resembles a beaker)
b	exothermic (1)	**1**	**allow** correct answer ticked circled or underlined in list if answer line is blank
c i	butanol (1) (because) largest temperature rise / aw (1)	**2**	 **allow** lowest at beginning highest at the end **allow** temperature rise/change is 21(^{0}C) **ignore** highest temperature at the end
ii	7600 (J) (2) **BUT** energy released = 100 x 4.2 x 18 (1)	**2**	answer must have **two sig figs** unit not needed – ignore incorrect units, unless a con, e.g. 7600 kJ **allow** 7560 (J) look for correct answer first, 7600 (J) on own scores 2 marks despite any other working out **allow** 7.6 kJ for two marks but 7.56 kJ is one mark
	Total	**7**	

Question	Answer	Marks	Guidance
7 a	calcium carbonate + hydrochloric acid → calcium chloride + water + carbon dioxide (1)	1	**allow** = instead of → **not** and / & / instead of + **allow correct** formulae but equation does not need to balance e.g. $CaCO_3 + HCl \rightarrow CaCl_2 + H_2O + CO_2$ **allow** mix of correct formulae and words
b i	all (indigestion) tablet is used up / all calcium carbonate is used up / all hydrochloric acid is used up (1)	1	**allow** all reactant used up **allow** higher level responses to limiting reactant **allow** nothing left to react **ignore** all the tablet has dissolved
ii	(different volumes of acid give) same reaction time / aw	1	**allow** both experiments take 68 seconds **allow** both give the same result **ignore** both give the same answer

Question	Answer	Marks	Guidance
b iii	**[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) **[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) **[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) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C** **Indicative scientific points may include:** • Experiments **1** and **3** support the conclusion and indicative points at level 2 **Indicative scientific points at level 2 may include:** • 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 **allow ora** for reacting particle explanation **Indicative scientific points at level 1 may include:** • reaction is faster when temperature is increased • Faster reaction gives a shorter reaction time **ignore** faster collisions / quicker collisions **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**9**	

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 + mass of aspirin / 12.0 = 3.0 + 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	**[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) **[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) **[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) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**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** **descriptions of changes in GPE and KE when mass is doubled may include:** • 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 **descriptions of changes in GPE and KE using equations may include:** • equation for GPE = mgh • GPE depends on height • so the higher the ball the more GPE it has • equation for KE = ½ 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 **descriptions of changes in GPE and KE as the ball falls may include:** • 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
			At level 1 if no other marks awarded allow one mark for a correct equation **Use the L1, L2, L3 annotations in scoris.** **Do not use ticks.**
	Total	**6**	

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