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 2017

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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.

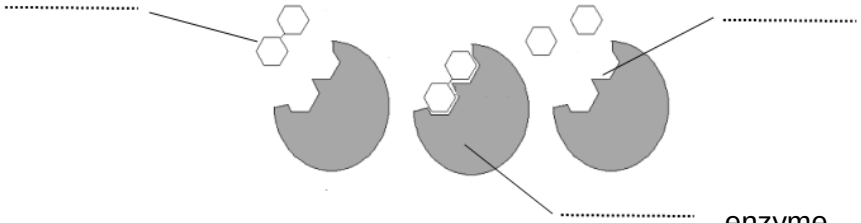
OCR will not enter into any discussion or correspondence in connection with this mark scheme.

Annotations used in scoris

Annotation	Meaning
	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

Question	Answer	Marks	Guidance
1 a	organism A shows only one cell / single cell (so it could be unicellular) (1) organism B is (made up of more than one type of cell so) is multicellular / many other cells / more than one cell (1)	2	**answer must be linked to correct organism.** **allow** A has no nucleus / has free (strands of) DNA (1) **ignore** B has a nucleus/nuclei **allow** B has (different) cells (1)
b	substrate active site  enzyme (2)	2	**all correct = 2 marks** **1 or 2 correct = 1 mark**
	Total	**4**	

Question	Answer	Marks	Guidance
2 a i	(maximum change is 100-10 =) 90 (1)	1	**ignore** units
a ii	blood travels through section **A** then **B** then **C** (1) because (large) drop in pressure (from **A** to **C**) (1)	2	**allow** (from left) to right on the graph (1) **allow** it goes down to the right side (1) **allow** section A through to C (1) **ignore** from the heart unless qualified **allow** blood flows from high to low pressure area (1) **allow** blood pressure gets lower/decreasing (1)
b	(section) **A** (1) because arteries carry blood at high pressures / as blood pressure higher / more pressure (1)	2	 **allow** need a lot of pressure to go through arteries (1)
	Total	**5**	

Question	Answer	Marks	Guidance
3 a	**chloroplasts** ☐ **chromosomes** ☐ **genes** ☐ **mitochondria** ✓ (1)	1	**more than one tick zero.**
b i	gene to make **anti-cancer** proteins / code to make anti-cancer proteins (1)	1	**allow anti-cancer** gene / DNA (1)
b ii	**agree:** to cure people / help people live / save lives / prevent illness (1) idea that it is cheap(er) (1) idea that cancer is a serious illness (1) **against:** unsure of effects on chickens / goats / animals / humans / us (1) idea of cruelty to animals / morally wrong / unnatural (1) (medicine) proteins could get into the food (chain) (1) idea that eating chickens / goats / animals could affect us in the long run (1)	2	**must have 1 agree mark and 1 mark against** **allow** benefit health (1) **allow** increases yield (1) **allow** concern about the harm it may do to goats / chickens / animals / humans / us (1) **allow** idea of religious reasons / religious belief / unethical / people are vegetarian (1)

c	**any two from:** could be used to change faulty human genes (1) used to cure (certain) disorders (1) reduce risk of (child born with) disability (1) less risk of (faulty) gene/DNA being inherited (1)	2	**allow** could be used in gene therapy (1) **allow** cure/prevent diseases (1) **allow** prevent disabilities (1)
	Total	**6**	

Question	Answer	Marks	Guidance
4 a	**[Level 3]** compares the growth of plants and animals in detail **and** uses data from the graph Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** attempts to compares the growth of plants and animals **and** uses data from the graph Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** makes an observation about the growth of animals **or** the growth of plants. 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 mark)	6	**This question is targeted at grades up to C.** **Indicative scientific points at level 3 may include:** **indicative point from level 2 plus one of -** • Idea that plant growth only occurs in certain areas / shoot tips / root tips (meristems) but animals grow over most of the body • Idea that plants gain height from cell enlargement (as well as cell division) but animals is just cell division **Indicative scientific points at level 2 may include:** **Use of data to include either appropriate heights or ages from the graph** • during 15-25 years (any value in range) humans stop growing • tree steady increase in height throughout the 80 years • 0 - 5 years fastest for animal growth • animal / human stop growing at 20 years but tree continue to grow • trees reach 800-1000 (cm)(any value in range) • animals/humans stop at 150 – 200 (cm) (any value in range) **comparisons to include two comparative statements from level 1 or a comparative statement such as** • plants growing at faster rate than humans ORA **Indicative scientific points at level 1 may include:** • animal / human stop growing early in their life • tree keeps on growing throughout. • animal/human increase in height early in life • animals/human growth decreasing / shrinking in size in old age • animals/humans grow faster when younger and then slow down • animals increase faster earlier in life **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**

b	so that the correct number of chromosomes are in the new cells (1)	1	**allow** to keep the right **amount** of chromosomes/DNA/genes (1) **allow** to keep the new cells diploid (1) **allow** desired outcome 23 pairs (1)
c	to increase the chance of fertilisation (1)	1	**allow** sperm get damaged/many fail to **reach egg** (1) **allow** sperm more chance of reaching the egg (1) **allow** more chance of getting female pregnant / better chance of having a baby / to increase chance of reproduction (1) **allow** make sure fertilisation happens / more chance of breeding successfully (1)
d	**advantage maximum 1 mark:** can be sure of the characteristics of the plants (1) all plants will be (genetically) identical (1) it is possible to mass produce plants (1) quicker process (than growing from seed) (1) can grow plants that are difficult to grow from seed (1) **disadvantage maximum 1 mark:** if plants become susceptible to disease all plants will be affected (1) if plants become susceptible to change in environmental conditions then all plants will be affected (1) lack of **genetic variation** (1)	2	**must have at least 1 mark for advantage and 1 mark for disadvantage** **allow** you get the plant you want (1) **allow** you will get an exact copy (1) **allow** to make lots of plants / to get more plants (1) **ignore** to create large crop **ignore** just easier **ignore** references to cost e.g. more profit / cheap **allow** if one gets a disease then they all will (1) e.g. drought will affect all of them (1) **allow** less opportunity to create new varieties in future / reduced gene pool (1)
	Total	**10**	

Question	Answer	Marks	Guidance
5 a	magnesium + hydrochloric (acid) → magnesium chloride + hydrogen(1)	1	**allow** = or ⇌instead of arrow (1) **not** 'and' or '&' instead of + **allow** correct formulae instead of names – the equation does not have to be balanced. Mg + HC*l* → MgCl_2 + H_2 **allow** a mixture of names and correct formulae **ignore** 'hydrolic'
b i	150 (cm^3) (1)	1	**ignore** units **allow** 0.15 **dm^3** (1)
ii	(lumps) have small**er** surface area / have less exposed particles (1) (lumps) have less collisions (per second) (1)	2	**assume answer refers to magnesium lumps** **answers must be comparative** **allow** ora if powder specified **ignore** references to volume **allow** ora if powder specified **allow** lower chance of collisions / less frequent collisions / less successful collisions (1) **allow** collisions less likely for lumps (1) **ignore** references to speed e.g. collisions are slower
iii	any value above 10 (cm^3 per minute) (1)	1	
	Total	**5**	

Question	Answer	Marks	Guidance
6 a	34 (1)	1	**ignore** any units given
b i	3.6 (g)	1	
ii	320 (g) (2) **BUT if answer is incorrect then** use of 680/6.8 or idea that 100 x more hydrogen peroxide used (1)	2	**allow** full marks for correct answer even with incorrect working out
	Total	**4**	

Question	Answer	Marks	Guidance
7 a	idea that batch process involves making a substance for a fixed time then stops and then starts again (1) idea that continuous process involves making a substance 24/7 (1)	2	**allow** batch process used to make small amounts of substance / use to make substances with a seasonal demand (1) **allow** (as and) when needed / made in bits not all the time / short-term (1) **ignore** made in batches unqualified **allow** day and night / non-stop / all the time / all the year round / large amounts / used to make substances always in high demand (1) **allow** continuous process used to make bulk chemicals (1) **ignore** made continuously unqualified
b	**any two from:** drug must be pure (1) must be tested to see that they work (1) must be tested to check for side-effects / make sure they are not harmful (1)	2	 **allow** do what it is needed for (1) **allow** safe / not poisonous (1)
c	no **any two from:** melting point cannot be higher than actual value (1) melting point should be sharp / melting point should not be a range / should be a smaller range (1) **D** (is most likely the most pure) (1)	2	**no** marks for no on its own if **yes 0** marks for the question **allow** highest melting point should be 157°C / up to 157°C (1) **allow** melting point not exactly 157°C / (in E the) melting point is between 2 numbers (1) **allow** so it is **D** (1) **allow D** has a smaller range (2)
	Total	**6**	

Question	Answer	Marks	Guidance
8	**Level 3** **Describes four physical properties of diamond AND explains in terms of hardness or melting point why diamond is used in cutting tools** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **Level 2** **Describes three physical properties of diamond OR Describes two physical properties of diamond and explains in terms of hardness or melting point why diamond is used in cutting tools** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **Level 1** **Describes one physical properties of diamond** 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. (0marks)	6	**This question is targeted at grades up to C.** **Indicative scientific points may include:** **Physical properties** • hard / does not scratch • high melting point / high boiling point • lustrous / shiny / brilliant • colourless • transparent / clear / see through • insoluble • does not conduct **electricity** • (good) conductor of **heat** **ignore** strong **Explanation** • hard so will not blunt easily / wear down / become less sharp / become dull • high melting point so will not melt (due to friction) • is hard so it is able to cut everything
	Total	**6**	

Question	Answer	Marks	Guidance
9 a	**Z** (1) has the high**est** atom economy (1)	2	 **not** reference to percentage yield
b	**V** (1) has the low**est** (percentage) yield (1)	2	 **not** reference to atom economy **allow** percentage of yield is 30% (1) **ignore** not got a lot of yield
	Total	**4**	

Question	Answer	Marks	Guidance
10 a	speed (1)	1	if answer line blank allow correct answer indicated in the list
b	velocity has direction (1)	1	if answer line blank allow correct answer indicated in the list
c i	5 (m/s) (1)	1	if answer line blank allow correct answer indicated in the list
ii	5 (m/s^2) (2) **if answer incorrect** 15/3 (1) **or** $\frac{15 - 0}{3}$ (1) **or** $\frac{0 - 15}{3}$ (1)	2	**ignore** minus or plus sign in answer
iii	decreases / less / goes down / slower (1)	1	**allow** becomes 0 (1)
		6	

Question	Answer	Marks	Guidance
11 a	(idea of a) **different** gravitational field strength (1)	1	**allow** gravity is **different** (1) **ignore** just force is different **but allow** different gravitational force (1) **not** gravitational potential energy / GPE
b	(unit) J **or** Joule **or** Joules (1) 78 (2) **but if answer incorrect** 3.9 x 20 (1)	3	if answer line blank or incomplete allow answer in table **allow** Nm (1)
c	**any two from** (friction) acts against movement / stops the object (moving) / makes it harder to move the object (1) causes energy loss (1) reduces efficiency (1)	2	 **allow** higher level answers: e.g. greater resultant force / more force needed to overcome (1) e.g. air is causing drag (1) **allow** more energy needed (to move the object) (1)
	Total	**6**	

Question	Answer	Marks	Guidance
12	**Level 3: (5-6 marks)** **Detailed description of difference in KE** **AND** **detailed description of changes in GPE during ride.** Quality of written communication does not impede communication of science at this level. **Level 2: (3-4 marks)** **Simple description of difference in KE** **AND** **simple description of changes in GPE during ride.** **OR** **Detailed description of difference in KE OR changes in GPE during ride.** Quality of written communication partly impedes communication of science at this level. **Level 1: (1-2 marks)** **Simple description of difference in KE** **OR** **simple description of changes in GPE during ride.** Quality of written communication impedes the communication of science at this level **Level 0: (0 marks)** Insufficient or irrelevant science. Not worthy of credit.	6	This question is targeted up to grade C Indicative scientific points may include (but are not limited to) the following: **KE descriptions** **simple** • girls have different mass / Laura has more mass **ignore** reference to height • KE depends on mass **detailed** • Laura has more mass than Kylie so has more KE / ORA • use of equation KE = ½ mv^2 • speed of Kylie and Laura at **B** is the same **GPE changes** **simple** • roller coaster car position or girls position changes during the ride / there is a change in height of the ride • GPE depends on height of car **detailed** • GPE greatest at **A /** diagram labelled high(est) GPE • GPE least at **C /** diagram labelled low(est) GPE • Correct description of changes in GPE e.g. high at **A**, decreases at **B** and decreases again at **C** • GPE reduces as car falls • Use of equation GPE - mgh **Level 1 descriptions only** Laura has more weight / Laura is bigger
	Total	**6**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>13 a</td><td>thinking distance is not a time / thinking distance is a distance (1)

braking distance is not before you brake / braking distance is after you brake (1)

braking distance is not the only thing that is important in road safety / thinking distance is important in road safety / stopping distance is important in road safety (1)</td><td>3</td><td>if answer line blank allow corrections on the homework

allow thinking and braking distance are important for road safety (1)

If no other mark and the first statement not selected then allow 1 mark for two or three correctly identified mistakes</td></tr>
<tr><td>b</td><td>any two from:
decrease thinking distance / decrease braking distance / decrease stopping distance ora (1)

the condition of the road is poor (1)

less likely to injure the workers (at a lower speed/50mph) ora (1)</td><td>2</td><td>allow examples of longer reaction time – e.g. more distractions in road works area (1)

allow examples of poor road conditions e.g. the lanes are narrower / the surface is damaged (1)

allow less chances of (severe) accidents (1)</td></tr>
<tr><td>c</td><td><table><tr><th>Risk</th><th>Benefit</th></tr><tr><td>C</td><td>(A)</td></tr><tr><td>D</td><td>B</td></tr><tr><td></td><td>E</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>(2)</td><td>2</td><td>answers can be in any order within each column

four correct (2)
three correct (1)</td></tr>
<tr><td></td><td>Total</td><td>7</td><td></td></tr>
</table>

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

www.ocr.org.uk/

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Head office
Telephone: 01223 552552
Facsimile: 01223 552553