



# Mark Scheme (Results)

Summer 2019

Pearson Edexcel GCSE

Combined Science (1SC0) Paper 1BH

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Summer 2019

Publications Code 1SC0\_1BH\_1906\_MS

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## General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Mark schemes have been developed so that the rubrics of each mark scheme reflects the characteristics of the skills within the AO being targeted and the requirements of the command word. So for example the command word 'Explain' requires an identification of a point and then reasoning/justification of the point.

Explain questions can be asked across all AOs. The distinction comes whether the identification is via a judgment made to reach a conclusion, or, making a point through application of knowledge to reason/justify the point made through application of understanding. It is the combination and linkage of the marking points that is needed to gain full marks.

When marking questions with a 'describe' or 'explain' command word, the detailed marking guidance below should be consulted to ensure consistency of marking.

Assessment Objective		Command Word	
Strand	Element	Describe	Explain
AO1		An answer that combines the marking points to provide a logical description	An explanation that links identification of a point with reasoning/justification(s) as required
AO2		An answer that combines the marking points to provide a logical description, showing application of knowledge and understanding	An explanation that links identification of a point (by applying knowledge) with reasoning/justification (application of understanding)
AO3	1a and 1b	An answer that combines points of interpretation/evaluation to provide a logical description	
AO3	2a and 2b		An explanation that combines identification via a judgment to reach a conclusion via justification/reasoning
AO3	3a	An answer that combines the marking points to provide a logical description of the plan/method/experiment	
AO3	3b		An explanation that combines identifying an improvement of the experimental procedure with a linked justification/reasoning

Question number	Answer	Additional Guidance	Mark
1(a)	division $0.0062 \div 2 / 6.2 \div 2$ (1)  <b>OR</b>  unit conversion  $0.0031 \times 1000 / 0.0062 \times 1000$ (1)  3.1 (picograms)	award full marks for correct answer with no working         accept 6.2/ 0.0031 for 1 mark with no working	<b>(2)</b>  AO2(1)

Question number	Answer	Additional Guidance	Mark
1(b)(i)	to precipitate the DNA	accept so the DNA is visible / so the DNA is not soluble (in ethanol)	<b>(1)</b>  AO1 (2)

Question number	Answer	Additional Guidance	Mark
1(b)(ii)	Any two from: <ul style="list-style-type: none"> <li>• mass of fruit (1)</li> <li>• volume of buffer (1)</li> <li>• crushing method /crushing time / crushed evenly (1)</li> <li>• volume of ethanol (1)</li> <li>• temperature (1)</li> <li>• pH /same buffer solution (1)</li> </ul>	accept amount of fruit / number of fruit cells /size of fruit ignore amount of buffer accept idea of incubation time ignore amount of ethanol accept fully filtered (1) accept same concentration of ethanol (1)	<b>(2)</b> A02 (2)

Question number	Answer	Additional Guidance	Mark
1(b)(iii)	Any one from: <ul style="list-style-type: none"> <li>• to obtain more data (1)</li> <li>• to identify anomalies (1)</li> <li>• see if the results are {the same /reliable/correct} (1)</li> <li>• to calculate a {mean/average} (1)</li> </ul>	accept to be sure their {results are valid / conclusion is valid} (1) ignore accuracy/precision	<b>(1)</b> A02(2)

Question number	Answer	Additional Guidance	Mark
1(c)	<p>Any three from:</p> <ul style="list-style-type: none"> <li>• mitosis produces 2 cells and meiosis produces 4 cells (1)</li> <li>• mitosis produces <b>genetically</b> identical cells and meiosis produces <b>genetically</b> different cells (1)</li> <li>• mitosis produces diploid cells and meiosis produces haploid cells (1)</li> <li>• mitosis produces body cells and meiosis produces {gametes /sex cells} (1)</li> </ul>	<p>accept offspring for cells</p> <p>mitosis is involved in asexual reproduction and meiosis is involved in sexual reproduction (1)</p>	<p><b>(3)</b></p> <p>AO1 1</p>

**(Total for question 1 = 9 marks)**

Question number	Answer	Additional Guidance	Mark
2(a)	<p>An explanation linking three of the following:</p> <ul style="list-style-type: none"> <li>• they are immune (to <i>Clostridium tetani</i>) (1)</li> <li>• because the vaccination contained an antigen / bacteria have antigens (1)</li> <li>• <b>memory lymphocytes</b> (1)</li> <li>• leading to the production of antibodies (1)</li> <li>• leading to a <b>secondary</b> (immune) response (1)</li> </ul>	<p>accept idea of inactive/dead bacteria in the vaccine</p> <p>accept bacteria killed {faster/quicker/quickly}</p>	<p><b>(3)</b></p> <p>AO2(1)</p>



Question number	Answer	Additional guidance	Mark
2(b)	<p>An explanation linking four of the following:</p> <ul style="list-style-type: none"> <li>• people do not finish their course (of Colistin) (1)</li> <li>• natural selection /evolution (occurs) (1)</li> <li>• some bacteria have a mutation/ (genetic) variation (1)</li> <li>• (these) resistant bacteria survive /resistant bacteria reproduce (1)</li> </ul>	<p>accept overuse / repeated exposure (to the antibiotic)</p> <p>accept they have evolved</p> <p>accept some bacteria have a {<b>gene/allele</b>} for resistance</p> <p>accept the non-resistant bacteria die / the fittest bacteria survive</p> <p>ignore immune bacteria</p>	<p><b>(4)</b></p> <p>AO2 1</p>

**(Total for question 2 = 7 marks)**

Question number	Answer	Mark
3(a)(i)	<p>A Eukarya</p> <p><b>3ai. The only correct answer is A</b></p> <p><i>B is not correct because plants are not single celled prokaryotic organisms</i></p> <p><i>C is not correct because plants are not single celled prokaryotic organisms and Monera is a kingdom</i></p> <p><i>D is not correct because Protista is a kingdom and not a domain</i></p>	<p><b>(1)</b></p> <p>AO1 (1)</p>

Question number	Answer	Mark
3(a)(ii)	<p>A oxygen produced sunlight absorbed by chlorophyll</p> <p><b>3a.ii. The only correct answer is A</b></p> <p><i>B is not correct because photosynthesis doesn't produce carbon dioxide and sunlight is not absorbed by mitochondria</i></p> <p><i>C is not correct because sunlight is absorbed by chlorophyll not mitochondria</i></p> <p><i>D is not correct because photosynthesis doesn't produce carbon dioxide it produces oxygen</i></p>	<p><b>(1)</b></p> <p>AO1 (1)</p>

Question number	Answer	Mark
3(a)(iii)	Any one from: <ul style="list-style-type: none"> <li>• (improved) genetic analysis (1)</li> <li>• DNA/RNA {screening/sequencing} (1)</li> <li>• domain theory is based on genetics (1)</li> <li>• differences between coding and non-coding DNA (1)</li> </ul>	<b>(1)</b> AO1

Question number	Answer	Additional guidance	Mark
3(b)(i)	<p><b>Measurement</b></p> <p>65 (mm) / 6.5 cm (1)</p> <p><b>Conversion</b></p> <p>65 mm = 65 000 <math>\mu\text{m}</math> (1)</p> <p><b>OR</b></p> <p>6.5 cm x 10 000 = 65 000 <math>\mu\text{m}</math> (1)</p> <p><b>Division</b></p> <p>65 000 <math>\div</math> 50 000 (1)</p> <p>1.3 (<math>\mu\text{m}</math>)</p>	<p>accept 63 mm – 66 mm ecf from incorrect measurement</p> <p>0.0013 x 1000 (1) ecf from incorrect conversion</p> <p>accept 6.5 <math>\div</math> 50 000 (1) 65 <math>\div</math> 50 000 (1)</p> <p>correct answer on answer line with no working 3 marks</p> <p>accept 1.26/1.28/1.32 (<math>\mu\text{m}</math>) for 3 marks</p>	<b>(3)</b> AO1(2)

Question number	Answer	Additional guidance	Mark
3(b)(ii)	<p>An answer including three of the following:</p> <ul style="list-style-type: none"> <li>• no nucleus /chromosomal DNA (1)</li> <li>• cell wall (1)</li> <li>• flagellum (1)</li> <li>• presence of ribosomes (1)</li> <li>• no membrane bound organelles / no mitochondria (1)</li> </ul>	<p>List rule applies:  reject nucleus  reject mitochondria</p> <p>accept DNA is in the cytoplasm</p> <p>accept:  pilli (1)  slime {coat / capsule / layer}(1)</p> <p>ignore: cell membrane / cytoplasm / chloroplast</p>	<p><b>(3)</b>  AO1 (1)</p>

Question number	Answer	Additional guidance	Mark
3(c)	<p>An explanation linking the following:</p> <ul style="list-style-type: none"> <li>• cut the gene (from the genome) using <b>restriction</b> enzymes (1)</li> <li>• cut the plasmid with a <b>restriction</b> enzyme (1)</li> <li>• to leave {complementary / matching} sticky ends (1)</li> <li>• join the DNA using <b>ligase</b> (1)</li> </ul>	<p>accept endonucleases</p> <p>accept endonucleases</p> <p>accept the same sticky ends</p> <p>reject lipase</p>	<p><b>(3)</b></p> <p>AO1(1)</p>

(Total for question 3 = 12 marks)

Question number	Answer	Mark
4(a)(i)	<p>A <math>0.008 \text{ s}^{-1}</math></p> <p><b>4ai. The only correct answer is A</b></p> <p><i>B is not correct because <math>1 \div 25</math> is not a rate calculation</i></p> <p><i>C is not correct because <math>25 \div 120</math> is not a rate calculation</i></p> <p><i>D is not correct because <math>120 \div 25</math> is not a rate calculation</i></p>	<p><b>(1)</b></p> <p>AO2(2)</p>

Question number	Answer	Additional guidance	Mark
4(a)(ii)	<p>An explanation including:</p> <ul style="list-style-type: none"> <li>increasing the {beads /enzyme/lactase} {decreases the time taken for glucose to be produced / increases the rate of reaction} (1)</li> </ul> <p>and two of the following:</p> <ul style="list-style-type: none"> <li>more beads increases the concentration of enzyme / more {enzyme / <b>lactase</b>} present (1)</li> <li>increased chance of collisions (1)</li> <li>with the active site (1)</li> </ul>	<p>accept reverse argument</p>	<p><b>(3)</b></p> <p><b>AO3</b></p> <p><b>2a+2b</b></p>

	<ul style="list-style-type: none"> <li>• which means more enzyme-substrate complexes are formed (1)</li> </ul>	<p>increasing the amount of lactase/enzyme {decreased the time for glucose to be produced/increases the rate of reaction} is worth 2 marks</p>	
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Question number	Answer	Additional guidance	Mark
4(a)(iii)	<p>An explanation linking the following:</p> <ul style="list-style-type: none"> <li>• lactose is the substrate (1)</li> <li>• to control a <b>variable</b> / it is a controlled <b>variable</b> (1)</li> <li>• allow results to be compared (1)</li> <li>• to allow a valid conclusion to be drawn /to make the experiment valid /to make the results valid (1)</li> </ul>	<p>ignore it is a control accept so that only <b>enzyme</b> (concentration) affects the reaction</p> <p>ignore: references to fair test / accurate / reliable results</p>	<p>(2)</p> <p>AO2(2)</p>

Question number	Answer	Additional Guidance	Mark
4(b)	<p>An answer that combines the following points to provide a plan:</p> <ul style="list-style-type: none"> <li>• Mix equal {number of beads/volume of lactase} with equal volume of lactose (1)</li> </ul>		<p>(3)</p> <p>AO3 3b</p>

	<ul style="list-style-type: none"> <li>• (incubate the tubes) at different temperatures (1)</li> <li>• test for (the presence of) glucose (at regular intervals) / time how long it takes to produce glucose (1)</li> </ul>	<p>accept heat for temperature</p> <p>accept the temperature that produces glucose quickest is the optimum</p>	
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**(Total for question 4 = 9 marks)**



Question number	Answer	Additional Guidance	Mark
5(a)(i)	<p>An answer including:</p> <ul style="list-style-type: none"> <li>• (statins) reduce the level of LDL cholesterol (1)</li> <li>• by 1.4 mmol per dm<sup>3</sup> / from 3.8 mmol per dm<sup>3</sup> to 2.4 mmol per dm<sup>3</sup></li> </ul>	<p>accept LDL cholesterol decreases</p> <p>accept idea that it decreases from 3.8 mmol per dm<sup>3</sup> to a lowest value of 2.3 mmol per dm<sup>3</sup></p> <p>accept 1.5 mmol per dm<sup>3</sup></p>	<p><b>(2)</b></p> <p>AO3 (1a+1b)</p>

Question number	Answer	Mark
5(a)(ii)	<p>An explanation linking the following:</p> <ul style="list-style-type: none"> <li>• level of LDL increases after the medication is stopped (1)</li> <li>• Increases risk of {heart disease/heart attack/stroke/cardiovascular diseases/high blood pressure} (1)</li> </ul>	<p><b>(2)</b></p> <p>AO3 2a+2b</p>

Question number	Answer	Mark
5(b)	<p>C mass and height</p> <p><b>5b. The only correct answer is C</b></p> <p><i>A is not correct because waist circumference is not used to calculate BMI</i></p> <p><i>B is not correct because neither waist circumference nor hip circumference are used to calculate BMI</i></p> <p><i>D is not correct because hip circumference is not used to calculate BMI</i></p>	<p><b>(1)</b></p> <p>AO1(1)</p>

Question number	Indicative content	Mark
*5(c)	<p><b>AO2</b></p> <ul style="list-style-type: none"> <li>• gonorrhoea is spread by exchange of bodily fluids / sexual contact</li> <li>• from mother to child during childbirth</li> <li>• barrier contraception methods/condoms will reduce spread</li> <li>• abstinence prevents infection</li> <li>• screening for infections</li> <li>• contact tracing partners of infected individuals</li> <li>• education on the disease and ways to reduce its spread</li> <li>• treating infections with antibiotics</li> </ul> <p><b>AO3</b></p> <ul style="list-style-type: none"> <li>• number of cases in males higher than females</li> <li>• number of cases in males has increased since 2008</li> <li>• number of cases in males has increased rapidly since 2010</li> <li>• number of cases in females has increased since 2010</li> <li>• rate of increases in cases is higher in men than women</li> <li>• comparative manipulation of data</li> </ul>	<p><b>(6)</b></p> <p>AO3/AO2</p>

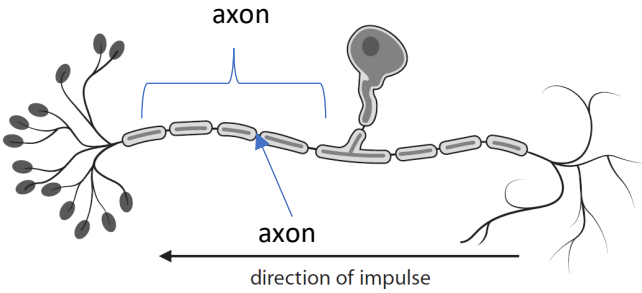
Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-2	<ul style="list-style-type: none"> <li>The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. (AO2)</li> <li>Interpretation and evaluation of the information attempted but will be limited with focus on mainly just one variable. Demonstrates limited synthesis of understanding. (AO3)</li> </ul>
Level 2	3-4	<ul style="list-style-type: none"> <li>The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. (AO2)</li> <li>Interpretation and evaluation of the information on both variables, synthesising mostly relevant understanding. (AO3)</li> </ul>
Level 3	5-6	<ul style="list-style-type: none"> <li>The explanation is supported through linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the context of the question. (AO2)</li> <li>Interpretation and evaluation of the information, demonstrating throughout the skills of synthesising relevant understanding. (AO3)</li> </ul>

Level	Mark	Additional Guidance	General additional guidance – the decision within levels
	0	No rewardable material.	The explanation of how Gonorrhoea is transmitted and infection rates reduced drives the level choice. The graph references decide the mark within the band
Level 1	1–2	<ul style="list-style-type: none"> <li>A simple explanation that includes one aspect from the mechanism of spread, ways in which gonorrhoea can be prevented or how the number of people infected can be reduced by treatment (AO2)</li> <li>A simple trend from the data (AO3)</li> </ul>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> <li>Gonorrhoea is spread by sexual contact/the exchange of body fluids</li> <li>The spread of gonorrhoea can be prevented by using a condom/barrier contraception/abstinence</li> <li>The number of people diagnosed with gonorrhoea has increased</li> <li>More men are diagnosed with gonorrhoea than women</li> <li>The number of cases in men and women are both rising</li> <li>The number of cases in males is rising faster than the number of cases in females.</li> </ul>
Level 2	3–4	<ul style="list-style-type: none"> <li>An explanation that includes at least two aspects from the mechanism of spread, ways in which gonorrhoea infection can be prevented or how the number of people infected can be reduced by treatment (AO2)</li> <li>The explanation makes reference to at least one trend in the graph including numerical values of relevant years or numbers of people diagnosed (AO3)</li> </ul>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> <li>Gonorrhoea is spread by sexual contact/the exchange of body fluids and it's spread can be prevented by using a condom/barrier contraception/abstinence. The number of cases in males has increased since 2008 and rapidly since 2010</li> <li>Gonorrhoea is spread by sexual contact/the exchange of body fluids and because it is a bacterial infection it can be treated with antibiotics. The number of people diagnosed is increasing, for women 5000 people were diagnosed in 2010 and 8000 in 2014</li> <li>Gonorrhoea is spread by sexual contact and educating people about the disease and the use of condoms will prevent it spreading. The number of cases diagnosed is increasing. In 2014 26000 men were diagnosed and 8000 women</li> </ul>
Level 3	5–6	<ul style="list-style-type: none"> <li>A detailed explanation that includes aspects from the mechanism of spread, ways in which gonorrhoea can be prevented and how the number of people infected can be reduced by treatment with antibiotics (AO2)</li> <li>The explanation makes a comparison between data in the graph including either the difference in infection rates between men and women or indicates the rise in the numbers of people diagnosed (AO3)</li> </ul>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> <li>Gonorrhoea is spread by sexual contact/the exchange of body fluids and it's spread can be prevented by using a condom/barrier contraception/abstinence. It is a bacterial infection, so it can be treated with antibiotics. The number of people diagnosed is increasing for men and women. For example, the number of cases in males has increased from 2008 to 2014 by 16 000.</li> <li>Gonorrhoea is spread by sexual contact/the exchange of body fluids and educating people about the disease and the use of condoms will prevent it spreading. It is treated with antibiotics, but antibiotic resistance is becoming a problem. The number of people diagnosed is increasing for men and women. More men are diagnosed each year than women, for example, in 2014 8000 women were diagnosed and 26 000 men were diagnosed.</li> </ul>

**(Total for question 5 = 11 marks)**

Question number	Answer	Additional Guidance	Mark
6(a)(i)	$2.0 \times 10^8 - 1.6 \times 10^7 /$ $200\,000\,000 - 16\,000\,000 / 184$ $000\,000 (1)$  $1.84 \times 10^8 / 1.8 \times 10^8$	award full marks for correct answer   accept $18.4 \times 10^7$ or $18 \times 10^7$ for 1 mark	<b>(2)</b>  AO2(1)

Question number	Answer	Additional guidance	Mark
6(a)(ii)	An explanation linking: <ul style="list-style-type: none"> <li>• (myelination) speeds up impulses (1)</li> <li>• insulates the {axon/neurone} (1)</li> <li>• motor neurones transmit information from the CNS / motor neurones transmit information to effectors / neurones in the brain connect to other neurones in the brain (1)</li> <li>• (motor neurones) transmit information over a greater distance (than neurones in the brain) (1)</li> </ul>	accept signals/messages for impulses   accept brain/spinal cord/relay neurone for CNS accept muscles/ glands for effectors   accept idea that motor neurones can be part of a reflex so need quick impulses (1)	<b>(3)</b>  AO2(1)

Question number	Answer	Mark
6(b)(i)	 <p>The diagram shows a neuron with a cell body (soma) and a tail-like structure (axon). The axon is covered by a myelin sheath. A blue bracket labeled 'axon' points to the myelin sheath. A blue arrow labeled 'axon' points to the axon itself. A black arrow labeled 'direction of impulse' points from right to left, indicating the direction of signal transmission.</p> <p>accept label line to any part of axon as indicated ignore lines to the myelin sheath</p>	(1) AO1(1)

Question number	Answer	Additional Guidance	Mark
6(b)(ii)	<p>An answer including:</p> <ul style="list-style-type: none"> <li>transmit <b>electrical</b> impulses (1)</li> <li>from {receptors / sense organ / named sense organ} to the {CNS / brain / spinal cord / relay neurone} (1)</li> </ul>	<p>accept signals/ messages for impulses</p> <p>accept named receptors</p> <p>ignore detect stimuli</p>	(2) AO1(1)

Question number	Answer	Additional guidance	Mark
6(c)	<p>An explanation linking the following:</p> <ul style="list-style-type: none"> <li>• synapse is a gap between neurones (1)</li> <li>• (electrical) impulse stimulates the release of chemical (1)</li> <li>• neurotransmitter (1)</li> <li>• (chemical/neurotransmitter) <b>diffuses</b> across the {gap/synapse} (1)</li> <li>• <b>stimulates</b> an (electrical) impulse in the <b>next neurone</b> (1)</li> </ul>	<p>accept by neurotransmission (1)</p>	<p><b>(4)</b></p> <p>AO1(1)</p>

**(Total for question 6 = 12 marks)**

