

Mark Scheme (Results)

Summer 2022

Pearson Edexcel GCSE In Biology (1SC0) Paper 1BH

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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		

## Paper 1SC0 1BH June 2022

Question number	Answer	Additional guidance	Mark
1(a)	A description linking <b>two</b> from:		(2)
	• weak (1)		AO1 1
	hydrogen bonds (1)	accept H bonds reject hydro bonds	
	• complementary bases (1)	reject flydfo bollds	
	• A-T/C-G(1)	accept the names of the base pair	

Question number	Ans	Answer							Additional guidance	Mark				
1(b)(i)														(2)
	Т	Т	G	Α	Т	Т	G	С	G	Т	Α	Α	accept lower	
	Α	Α	С	Т	Α	Α	С	G	С	Α	Т	Т	case letters	AO2 1
	top	line ard	e co 1 m	rrec	tly	pair all t	ed ( the	(1) Cs a			n th			

Question number	Answer	Mark
1(b)(ii)	B 4	(1)
	The only correct answer is B	AO2 1
	<b>A</b> is incorrect because each 3 amino acids would need 9 bases to be present	
	C is incorrect 6 amino acids would need 18 bases	
	<b>D</b> is incorrect because 12 amino acids would need 36 bases	

Question number	Answer	Mark	
1(b)(iii)	D double helix	(1)	
	The only correct answer is D	AO1 1	
	<b>A</b> is incorrect because a DNA molecule is not three separate strands		
	<b>B</b> is incorrect because the DNA molecule consists of two strands		
	<b>C</b> is incorrect because a DNA molecule is a double helix not a single helix		

2)
01 2
<b>O</b> :

Question number	Answer	Additional Guidance	Mark
1(c)(ii)	to precipitate the DNA / because DNA is insoluble in ethanol	accept to see the DNA	(1) AO1 2

Total marks for question 1 = 9 marks

Question number	Answer	Mark
2(a)(i)	gonorrhoea	(1)
		AO3 1a

Question number	Answer	Additional guidance	Mark
2(a)(ii)	(66 000 000 ÷ 1000) = 66 000 (1)	award full marks for correct answer no working	(2) AO2 1
	(66 000) x 3.7 =244 200 (people) or	accept answers in standard form	
	$(3.7 \div 1000) = 0.0037(1)$		
	(0.0037) x 66 000 000 = 244 200 (people)		
	or		
	(66 000 000 x 3.7) = 244 200 000 (1)		
	$(244\ 200\ 000\ \div\ 1000) = 244200$		
		accept 244200 to any incorrect magnitude for one mark	

Question number	Answer	Additional guidance	Mark
2(a)(iii)	Any one from:		(1)
	• it is {passed/spread} from person to person (1)	accept <b>spread</b> by {sexual contact / body fluids}	A01 1
	caused by bacteria (1)	accept pathogen ignore caused by a virus	

Question number	Answer	Additional guidance	Mark
2(a)(iv)	Any one from:		(1)
	avoid sexual contact (1)		AO2 1
	• use a {condom/femidom} (1)	accept use a barrier form of contraception	
	• screen people for an infection (1)		
	treat the infection/give antibiotics     (1)	ignore protection / contraception	

Question number	Answer	Additional guidance	Mark
2(a)(v)	An explanation including the following:		(2)
	<ul> <li>it is {killed/inhibited} by antibiotics (1)</li> </ul>	accept disrupt cell processes (in bacteria) /prevent (bacteria) reproducing	AO2 1
	because chlamydia is caused by bacteria (1)	accept antibiotics are used to kill bacteria for 2 marks	

Question number	Answer	Additional guidance	Mark
2(b)	An explanation linking the following:		(2)
	<ul> <li>HIV {destroys white blood cells / reduces the number of white blood cells} (1)</li> </ul>	accept named white blood cells	AO2 1
	<ul> <li>which compromises the immune system / making the person more susceptible to other {pathogens / infections / diseases} (1)</li> </ul>	accept weakens the immune system	
		ignore more susceptible to AIDS	

Total for question 2 = 9 marks

Question number	Answer	Additional guidance	Mark
3(a)(i)	An explanation including <b>four</b> of the following:	accept <i>Klebsiella</i> for bacteria	(4) A02 1
	<ul> <li>by natural selection / evolution (1)</li> </ul>	accept they evolve	
	<ul> <li>mutation in the bacterium /variation in the population (1)</li> </ul>	accept some bacteria have a {gene/allele} for antibiotic resistance	
	<ul> <li>only the resistant bacteria survived treatment by antibiotics / resistant bacteria survive when people don't finish the course (1)</li> </ul>	accept non- resistant bacteria killed <b>by antibiotics</b>	
	<ul> <li>the resistant bacteria {reproduce / divide} (1)</li> </ul>		
	<ul> <li>offspring inherit the resistance / resistance passed onto future generations / process repeats increasing level of resistance (1)</li> </ul>	ignore offspring are identical	

Question number	Answer	Additional guidance	Mark
3(a)(ii)	people not completing their course of antibiotics/overuse of antibiotics	accept acted as a selection pressure	(1) AO1 1
	divisiones	accept being used to treat viruses/examples	7.61
		ignore misuse unqualified	

Question number	Answer	Mark
3(a)(iii)	B it does not have a nucleus	(1)
	The only correct answer is B	AO1 1
	<b>A</b> is incorrect because prokaryotic cells do not have chloroplasts	
	<b>C</b> is incorrect because prokaryotic cells have ribosomes	
	<b>D</b> is incorrect because prokaryotic cells can reproduce without a host	

Question number	Answer	Additional guidance	Mark
3(b)	A description including three of the following:		(3)
	the antibiotic would go through a development phase (1)	accept examples of the development phase	AO2 1
	• pre-clinical (stage / trials) (1)	pridee	
	<ul> <li>testing on animals / testing in- vitro / on cells (1)</li> </ul>	accept named animals	
	clinical (stage / trials) (1)		
	<ul> <li>testing on (healthy) volunteers / testing on patients (1)</li> </ul>		
	double-blind trials (1)	accept a description of double-blind trials e.g. placebo and drug	

**Total for question 3 = 9 marks** 

Question number	Answer	Additional guidance	Mark
4(a)	milk B contains fat / milk B had a high fat content	accept milk B is less dense	(1)
	<b>3</b>	accept lipid / oil	AO2 2

Question number	Answer		Mark
4(b)(i)	An explanation including the following:		(3)
	• lipase digests {fat/lipid} (1)	accept breakdown for digest	A01 2
	<ul> <li>forming fatty acids (and glycerol) (1)</li> </ul>	digest	
	which are acidic / lowering the pH of the mixture / making the mixture more acidic (1)	accept removing fat makes the milk more acidic	

Question number	Answer	Additional guidance	Mark
4(b)(ii)	An explanation linking <b>two</b> from:		(2)
	<ul> <li>milk A did not contain any/much fat (1)</li> </ul>	accept lipids	A02 2
	<ul> <li>fatty acids were not produced</li> </ul>	accept fewer fatty acids were produced	
	• as there was no <b>substrate</b> (1)		

Question number	Answer	Additional Guidance	Mark
4(b)(iii)	An explanation linking <b>three</b> of the following:		(3) A02 2
	the temperature is above the optimum (1)	accept the temperature was high	
	<ul><li>the {lipase / enzyme}</li><li>denatures (1)</li></ul>	reject {enzyme / lipase} is killed	
	• so <b>active site</b> changes shape (1)		
	<ul> <li>no enzyme -substrate complexes formed / no longer complementary to the substrate / cannot bind the substrate (1)</li> </ul>	accept so it could not break down the fat / no fatty acids produced	

**Total for question 4 = 9 marks** 

Question number	Answer	Additional guidance	Mark
5(a)	A description including <b>four</b> of the following:		(4)
	<ul><li>use the {root tip / meristem} (1)</li></ul>	accept the end of the root for root tip	A03 3a
	<ul> <li>Soften the root (with alcohol/heat/acid) (1)</li> </ul>		
	<ul> <li>crush the root onto the slide/take a thin section</li> <li>(1)</li> </ul>	accept description of a root squash accept use a layer of cells	
	Stain the root / named stain (1)	accept dye ignore ink	
	Add a drop of water to the slide (1)		
	Add a cover slip (1)	accept another slide / description of a cover slip	

Question number	Answer	Additional guidance	Mark
5(b)	A description including <b>three</b> from:		(3)
	• two cells (1)		AO1 1
	<ul> <li>diploid cells / same number of chromosomes as parent cell (1)</li> </ul>	accept 23 pairs of chromosomes / 46 chromosomes	
	• <b>genetically</b> identical cells (1)		
	• body cells (1)	accept <b>cells</b> for growth / repair	

Question number	Answer	Additional guidance	Mark
5(c)	Select 45 cells in mitosis (1)	Award full marks for correct answer with no working	(3) A03 2ab
	$(45) \div 89 \times 100 = 50.561 (1)$	ecf for workings that show the use of an incorrect number of cells up to and including 89 cells	
	50.6	ecf if the workings show their answer to 3 s.f.	

Question number	Answer	Additional Guidance	Mark
5(d)	(makes cell division) uncontrolled	accept idea of cell division being rapid / increased	(1) A01 1
		ignore references to mutation / tumour	

**Total for question 5 = 11 marks** 

Question number	Answer	Additional guidance	Mark
6(a)(i)	Any <b>one</b> from:		(1)
	<ul> <li>pig kidneys cannot be used in humans (1)</li> </ul>	ignore so it grows human kidneys	AO2 1
	<ul> <li>pig kidneys would be rejected (by humans) (1)</li> </ul>		
	<ul> <li>to prevent competition between the pig and the human organ (1)</li> </ul>		
	<ul> <li>so the human kidneys form properly (1)</li> </ul>	accept so there is room for the human kidneys	

Question number	Answer	Mark
6(a)(ii)	An explanation linking <b>two</b> from:	(2)
	<ul> <li>stem cells {are undifferentiated / are unspecialised / can differentiate / become specialised / form any type of cell} (1)</li> </ul>	A01 1
	<ul> <li>so can produce the {kidney / kidney cells / kidney tissue} (1)</li> </ul>	
	<ul> <li>that won't be rejected (when transplanted)         <ul> <li>(1)</li> </ul> </li> </ul>	

Question number	Answer	Additional guidance	Mark
6(b)(i)	A comparison including <b>three</b> of the following:		(3)
	<ul> <li>the number of transplants needed increased rapidly but the number of donors {only increased slightly /remained low} (1)</li> </ul>		AO3 2ab
	<ul> <li>from {2014 / 2015} the numbers of transplants required decreased (1)</li> </ul>	accept peaked in {2014 / 2015}	
	the number of donors available was always lower than the number of transplants needed (1)	accept there are not enough donors for the transplants needed	
	<ul> <li>comparison of figures from the graph of the number of people needing an organ and donating an organ (1)</li> </ul>	accept a comparative mathematical manipulation of the data	

Question number	Answer	Mark
6(b)(ii)	not enough donors are available / to increase the number of organs for donation / to meet the demand	(1)
	for organ transplants	AO3 2b

Question number	Indicative content	Mark
6(c)	<ul> <li>the gene that codes for human insulin is identified</li> <li>in the human DNA</li> <li>this is removed using a restriction enzyme</li> <li>the plasmid of a bacterial cell is removed</li> <li>using lysosomes/lysozyme</li> <li>the plasmid is cut open</li> <li>using (the same) restriction enzyme</li> <li>leaving complementary sticky ends</li> <li>the human gene is inserted into the bacterial plasmid</li> <li>using the enzyme ligase</li> <li>the plasmid is returned to the bacterial cell</li> <li>the bacterial cell multiplies</li> </ul>	(6)

Level	Mark	Descriptor	
	0	No rewardable material.	
Level 1	1-2	<ul> <li>Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1)</li> <li>Presents an explanation with some structure and coherence. (AO1)</li> </ul>	
Level 2	3-4	<ul> <li>Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or underdeveloped. (AO1)</li> <li>Presents and explanation that has a structure which is mostly clear, coherent and logical. (AO1)</li> </ul>	
Level 3	5-6	<ul> <li>Demonstrates accurate and relevant biological understanding throughout. Understanding of scientific ideas is detailed and fully developed. (AO1)</li> <li>Presents and explanation that has a well developed structure which is clear, coherent and logical. (AO1)</li> </ul>	

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-2	<ul> <li>A brief understanding of the removal of the human gene or how the bacterial cell is altered</li> <li>The process described links to the next or a key aspect of the process</li> </ul>
Level 2	3-4	<ul> <li>A brief understanding of both the removal of the human gene and the use of a plasmid / bacterial DNA / vector</li> <li>Linked to the use of at least one correct enzyme</li> </ul>
Level 3	5-6	<ul> <li>A clear understanding of the removal of the human gene, the use of the bacterial plasmid including one correct enzyme, and insertion of the (recombinant) plasmid into a bacterium</li> <li>Linked to the correct enzymes for removal of the gene and the insertion into the plasmid AND the role of sticky ends</li> </ul>

Level	Mark	Examples of answers
	0	No rewardable material.
Level 1	1-2	<ul> <li>The human insulin gene is inserted into the bacterial DNA - 1</li> <li>Cut the human insulin gene from a cell and insert it into the bacteria -2</li> <li>Cut the human insulin gene leaving sticky ends - 2</li> </ul>
Level 2	3-4	<ul> <li>Cut the human insulin gene and cut a plasmid. Insert the gene into the plasmid DNA - 3</li> <li>Cut the human insulin gene and cut a plasmid with restriction enzymes. Insert the gene into the plasmid DNA - 4</li> <li>Remove the insulin gene using restriction enzymes and cut the plasmid with the same restriction enzyme, Use ligase to insert the gene into the plasmid - 4</li> </ul>
Level 3	5-6	<ul> <li>Cut the insulin gene using a restriction enzyme that leaves sticky ends. Cut the plasmid DNA with the same restriction enzyme and insert the gene into the plasmid. Insert the recombinant plasmid back into the bacteria - 5 (no ligase)</li> <li>Cut the insulin gene using a restriction enzyme. Cut the plasmid DNA with the same restriction enzyme and insert the gene into the plasmid. Insert the recombinant plasmid back into the bacteria - 5 (no sticky ends)</li> <li>Cut the insulin gene using a restriction enzyme that leaves sticky ends. Cut the plasmid DNA with the same restriction enzyme to leave complementary sticky ends. Join the gene and the plasmid using ligase. Insert the recombinant plasmid back into the bacteria - 6</li> </ul>

**Total for question 6 = 13 marks**