OCR
RECOGNISING ACHIEVEMENT

SPECIMEN **F**

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE

BIOLOGY A **A163/01**

Unit A163: Modules B7 (Foundation Tier)

MARK SCHEME

Duration: 1 hour

MAXIMUM MARK 60

This document consists of 16 pages

Guidance for Examiners

Additional guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, eg mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

/	=	alternative and acceptable answers for the same marking point
(1)	=	separates marking points
not/reject	=	answers which are not worthy of credit
ignore	=	statements which are irrelevant - applies to neutral answers
allow/accept	=	answers that can be accepted
(words)	=	words which are not essential to gain credit
words	=	underlined words must be present in answer to score a mark
ecf	=	error carried forward
AW/owtte	=	alternative wording
ORA	=	or reverse argument

Eg mark scheme shows 'work done in lifting / (change in) gravitational potential energy' (1)
work done = 0 marks
work done lifting = 1 mark
change in potential energy = 0 marks
gravitational potential energy = 1 mark

5. Annotations:
The following annotations are available on SCORIS.

✓	=	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

6. If a candidate alters his/her response, examiners should accept the alteration.

7. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

   Eg
   For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.
☐	☐	☑
☐	☐	☑
✓	☑	✓
☑	☑	✓
☐	☐	☐
This would be worth 0 marks.	This would be worth one mark.	This would be worth one mark.

8. The list principle:
   If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, eg one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

9. Marking method for tick boxes:

   Always check the additional guidance.

   If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.
   If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, eg shading or crosses.
   Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

   Eg If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

   the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	×	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	×		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

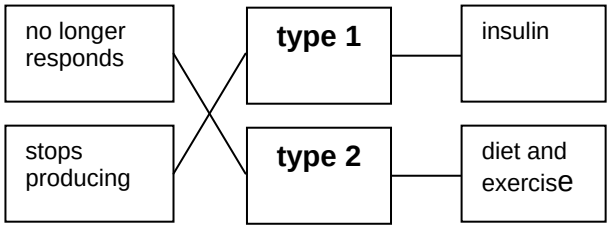
10. Three questions in this paper are marked using a Level of Response (LoR) mark scheme with embedded assessment of the Quality of Written Communication (QWC). When marking with a Level of Response mark scheme:

- Read the question in the question paper, and then the list of relevant points in the 'Additional guidance' column of the mark scheme, to familiarise yourself with the expected science. The relevant points are not to be taken as marking points, but as a summary of the relevant science from the specification.
- Read the level descriptors in the 'Expected answers' column of the mark scheme, starting with Level 3 and working down, to familiarise yourself with the expected levels of response.
- *For a general correlation between quality of science and QWC*: determine the level based upon which level descriptor best describes the answer; you may award either the higher or lower mark within the level depending on the quality of the science and/or the QWC.
- *For high-level science but very poor QWC*: the candidate will be limited to Level 2 by the bad QWC no matter how good the science is; if the QWC is so bad that it prevents communication of the science the candidate cannot score above Level 1.
- *For very poor or totally irrelevant science but perfect QWC*: credit cannot be awarded for QWC alone, no matter how perfect it is; if the science is very poor the candidate will be limited to Level 1; if there is insufficient or no relevant science the answer will be Level 0.

Question			Expected answers	Marks	Additional guidance
1	(a)	(i)	*structure 1:* cartilage *structure 2:* synovial fluid	[1]	both required for 1 mark
		(ii)	*structure 1 becomes worn away:* bones would grind together so movement would be more difficult *structure 2 increases in volume:* swelling/increase in pressure so movement would be more difficult	[2]	
	(b)	(i)	Gordon	[1]	
		(ii)	Liz and Christina	[1]	both correct responses for 1 mark
		(iii)	Doug	[1]	
		(iv)	Christina	[1]	
			Total	[7]	

2	(a)		**B** blood passes through heart twice / goes to lungs, then back to heart, then to body	[2]	
	(b)		carries oxygen/glucose to the heart muscles	[2]	

Question			Expected answers	Marks	Additional guidance
2	(c)	✎	**[Level 3]** Answer correctly uses labels from the diagram **and** the underlined terms to clearly explain, in the correct order, the sequence of events. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks) **[Level 2]** Answer uses labels from the diagram to explain, mostly in the correct order, the sequence of events. Answer may not use the underlined terms. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks) **[Level 1]** Answer describes some stages correctly, but omits other stages and/or confuses the order, and may not use the underlined terms. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	[6]	**relevant points include:** • right atrium contracts (which pushes valve open) and blood flows into <u>right ventricle</u> • right ventricle contracts, pushing blood into pulmonary artery (to the lungs) • idea that <u>valves</u> stop blood flowing backwards (from right ventricle into right atrium, and from pulmonary artery into right ventricle) • (oxygenated) blood (from the lungs) returns to the heart via the pulmonary vein into the <u>left atrium</u> • left atrium contracts (which pushes valve open) pushing blood into left ventricle • left ventricle contracts, pushing blood into aorta (to the body) • blood returns to the right atrium through the vena cava • (idea that <u>valves</u> stop blood flowing backwards from left ventricle into left atrium, and from aorta into left ventricle)
	(d)		left ventricle needs to push blood around whole body (1) left atrium only needs to push blood into the left ventricle (1)	**[2]**	
			Total	**[12]**	

Question			Expected answers	Marks	Additional guidance
3	(a)			[1]	LHS correct = 1 mark RHS correct = 1 mark

Question			Expected answers	Marks	Additional guidance
3	(b)	✎	**[Level 3]** Answer clearly shows good understanding of how eating complex carbohydrates and fibre can help maintain a constant blood sugar level. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks) **[Level 2]** Answer shows partial understanding of how eating complex carbohydrates and fibre can help maintain a constant blood sugar level. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks) **[Level 1]** Answer shows a limited understanding of how eating complex carbohydrates and fibre can help maintain a constant blood sugar level. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	[6]	**relevant points include:** • (complex carbohydrates and fibre are) digested more slowly than, simple carbohydrates / sugars • idea that this results in sugar being absorbed, over longer time period / more gradually • blood sugar level rises more slowly • body can remove the sugar from the blood (before the blood sugar level becomes too high) • idea of balance between, rate of sugar absorption / rate of increase in blood sugar level, and, use of sugar / removal of sugar from blood • this, keeps the blood sugar level constant / minimises highs and lows

Question			Expected answers	Marks	Additional guidance
3	(c)	(i)	1 and 3	[1]	both required for the mark; any order
		(ii)	2 and 4 and 6	[2]	any order three correct = 2 marks two or one correct = 1 mark if more than three lines identified, accept any correct numbers and then deduct 1 mark for the 4th response, 1 mark for the 5th response and 1 mark for the 6th response
			Total	**[10]**	

Question			Expected answers	Marks	Additional guidance
4	(a)		does not have waste products become reactants	[2]	4 correct = 2 marks 3 or 2 correct = 1 marks 1 correct = 0 marks
	(b)		lake / woodland / grassland / beach / coral reef named waste product correct explanation of how the named waste product becomes food/reactant for other animals/plants/microorganisms in the system	[3]	**credit** any correct example of a closed loop system
	(c)		used as food source for animals / seeds/acorns that are not used decompose so resources in excess acorns are recycled	[2]	
			Total	[7]	

Question			Expected answers	Marks	Additional guidance
5	(a)	✎	**[Level 3]** Answer correctly uses the words 'isolate', 'replicate', 'transfer' and 'vector' to explain all of the steps in the process in the correct sequence. Suggested benefits of using human insulin are described clearly. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks) **[Level 2]** Answer uses most of the underlined words to explain the process, but may omit a step or describe a step out of order. Possible benefits of using human insulin are included in the answer. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks) **[Level 1]** Answer describes some stages correctly, but omits other stages and/or confuses the order, and may not use the underlined terms. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	[6]	**relevant points include:** • isolate gene (that codes for) human insulin • replicate the gene • put the gene into a vector • such as a virus or plasmid • use vector to transfer the gene into bacteria • idea that DNA is a universal language that can be interpreted by any organism • idea of expression of the gene in the bacteria (to produce human insulin) • human insulin is the exact match for the required hormone / animal insulin may have some differences • less problem of allergy/adverse reaction to human insulin

<table>
<tr><th colspan="3">Question</th><th>Expected answers</th><th>Marks</th><th>Additional guidance</th></tr>
<tr><td>5</td><td>(b)</td><td></td><td>
<table>
<tr><th>economic</th><th>social</th><th>ethical</th></tr>
<tr><td>B</td><td>C</td><td>A</td></tr>
<tr><td>E</td><td>D</td><td>F</td></tr>
</table>
</td><td>[2]</td><td>6 correct = 2 marks
4 or 5 correct = 1 mark</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[8]</td><td></td></tr>
<tr><td>6</td><td></td><td></td><td>the chance of a problem occurring ☐
☐
☐
☐
the consequences of a problem … ☐</td><td>[1]</td><td>both correct for one mark</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[1]</td><td></td></tr>
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Question			Expected answers	Marks	Additional guidance
7	(a)		75	[1]	
	(b)		1.7 / 1.73	[1]	
	(c)	(i)	**S** at: range from 30 seconds up to 45 seconds **F** at: range from 1 minute 15 seconds up to 1 minute 45 seconds	[1]	both correct for one mark
		(ii)	4 (range 3 minutes 30 sec to 4 minutes 15 seconds)	[1]	**allow** ecf from part **(c)(i)**
	(d)		the heart rate was only taken at timed intervals / once every 30 seconds so it could have varied (between measurements) in ways that are not shown on the graph	[2]	**credit** an example, e.g. “the rate could have been greater than 130 between 1 and 2 minutes”
	(e)		idea of baseline assessment that can be compared to show improvement faster recovery means fitness improving / lower resting heart rate shows increased fitness / lower maximum heart rate shows increased fitness	[2]	
			Total	[8]	

Question			Expected answers	Marks	Additional guidance
8	(a)		$76/(2)^2$ 19	[2]	correct answer without working = 2 marks
	(b)		he is (in the range for) normal weight but he is at the very bottom of the normal range, so if he loses any body mass he will become underweight	[2]	
	(c)		**any three from:** some people have larger / thicker bones different BMI tables for males and females idea that a small change at the borderline between categories (e.g. small change in weight, or rounding to whole number from 1 d.p.) may shift the BMI into a different category (e.g. from 24 = normal to 25 = overweight) does not take age into account	[3]	**allow** one mark related to inaccuracies in measurement of BMI e.g. height will differ if measured with shoes on/off; mass will differ before/after eating / at different times of day / level of dehydration / clothes on/off; accuracy / calibration of measuring instruments may affect result;
			Total	[7]	

Assessment Objectives (AO) Grid

(*includes quality of written communication*✎)

Question	AO1	AO2	AO3	Total
1(a)(i)	1			**1**
1(a)(ii)		2		**2**
1(b)(i)	1			**1**
1(b)(ii)	1			**1**
1(b)(iii)	1			**1**
1(b)(iv)	1			**1**
2(a)	1	1		**2**
2(b)✎	2			**2**
2(c)	5	1		**6**
2(d)		2		**2**
3(a)	1			**1**
3(b)✎	4	2		**6**
3(c)(i)		1		**1**
3(c)(ii)			2	**2**
4(a)	2			**2**
4(b)		3		**3**
4(c)		1	1	**2**
5(a)✎	5	1		**6**
5(b)		2		**2**
6		1		**1**
7(a)		1		**1**
7(b)		1		**1**
7(c)(i)		1		**1**
7(c)(ii)		1		**1**
7(d)			2	**2**
7(e)		1	1	**2**
8(a)		2		**2**
8(b)			2	**2**
8(c)		2	1	**3**
Totals	**25**	**26**	**9**	**60**