OCR
RECOGNISING ACHIEVEMENT

SPECIMEN F

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE **A163/01**

BIOLOGY A

Unit A163: Module B7 (Foundation Tier)

Candidates answer on the question paper
A calculator may be used for this paper

OCR Supplied Materials:
None

Other Materials Required:
- Pencil
- Ruler (cm/mm)

Duration: 1 hour

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES
- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES
- Your quality of written communication is assessed in questions marked with a pencil (✎).
- The number of marks for each question is given in brackets **[ ]** at the end of the question or part question.
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are indicated.

For Examiner's Use		
	Max	**Mark**
1	**7**	
2	**12**	
3	**10**	
4	**7**	
5	**8**	
6	**1**	
7	**8**	
8	**7**	
TOTAL	**60**	

Answer **all** the questions.

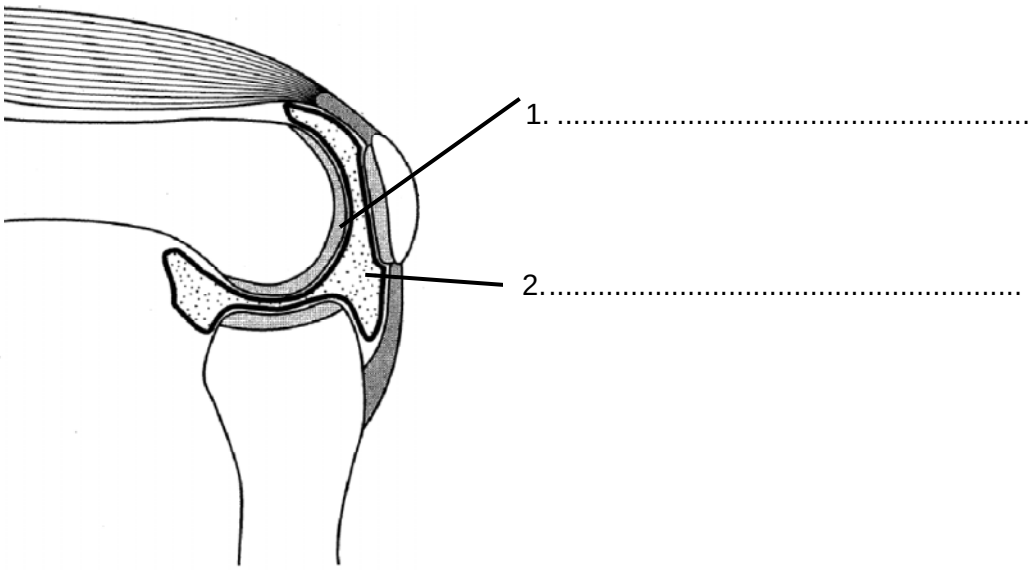
1 Vertebrates have an internal skeleton for support and movement.

(a) Bones are held together at joints.

(i) Complete the labelling of the diagram of a joint.

Choose from the following words.

bone **cartilage** **ligament** **synovial fluid** **tendon**



[1]

(ii) Each of these structures can be damaged.

Suggest what effect each of the following would have on the **functioning** of the joint.

structure 1 becomes worn away .....

.....

structure 2 increases in volume.....

..... **[2]**

(b) Taking part in athletics can be beneficial but risky.

Read the views of these people and then answer the following questions.

(i) Which person is talking about a benefit to themselves without considering the risks?

answer ..... **[1]**

(ii) Which **two** people are talking about a risk to themselves?

answers ..... and ..... **[1]**

(iii) Which person is talking about neither a benefit nor a risk to themselves?

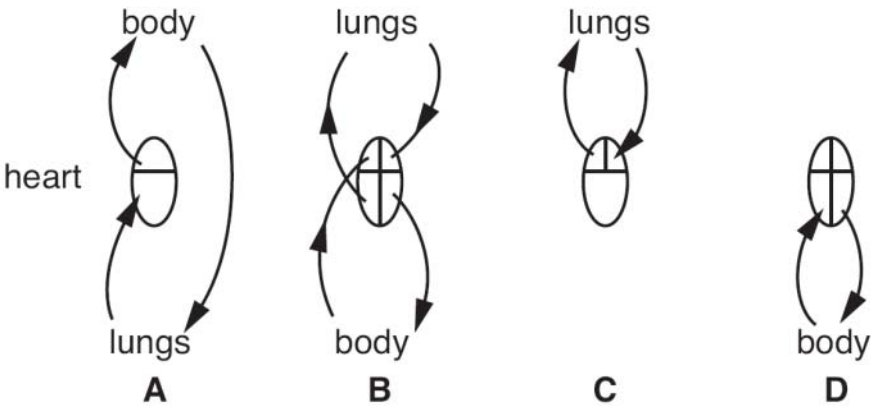
answer ..... **[1]**

(iv) Which person is talking about the benefits and risks to themselves?

answer ..... **[1]**

[Total: 7]

2 Mammals have a double circulatory system.



(a) Which diagram, **A**, **B**, **C** or **D**, shows a double circulatory system?

Write down the letter of the correct diagram and explain why you have chosen this diagram.

.....

..... **[2]**

(b) The heart is a muscular pump.

Describe the role of the coronary artery.

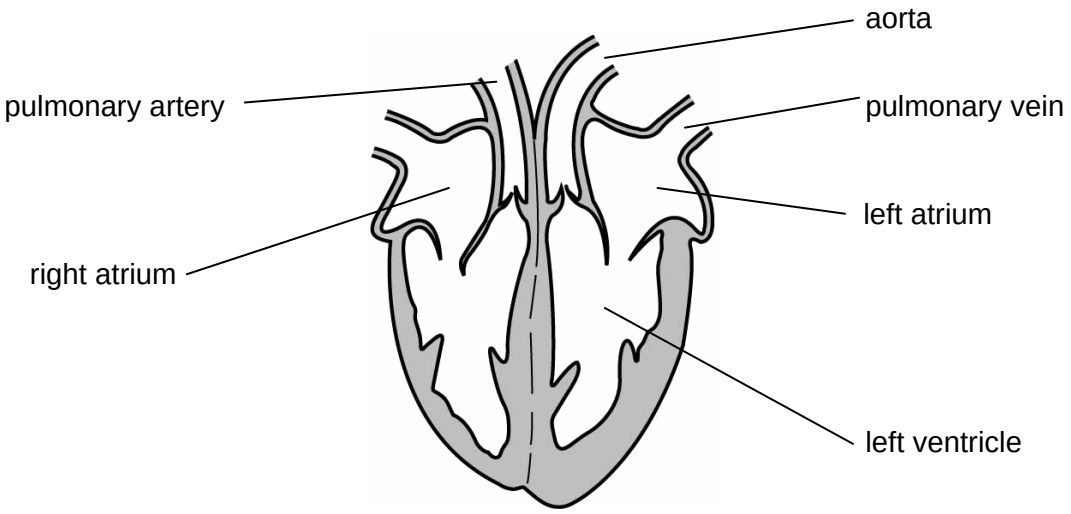
.....

.....

..... **[2]**

(c) Look at the diagram of the heart.

Some structures have been labelled.



Describe how blood flows through the heart, starting and finishing with the right atrium.

In your answer you should:

- use the names of the structures that are involved – some are labelled in the diagram
- make the order of events clear.

The quality of written communication will be assessed in your answer to this question.

.....

.....

.....

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.....

.....

..... **[6]**

(d) Suggest why the walls of the left ventricle have thicker muscles than the walls of the left atrium.

.....

.....

..... **[2]**

[Total: 12]

3 This question is about diabetes.

(a) Draw a straight line linking each **cause** of the condition to the **type of diabetes**. Then draw another straight line linking each **type of diabetes** to the way in which people with the condition can help to **control** it.

cause	type of diabetes	control
usually caused when the body no longer responds to its own insulin	**type1**	usually controlled by insulin injections
usually caused when the pancreas stops producing enough insulin	**type 2**	usually controlled by diet and exercise

[1]

(b) Some people with diabetes can help to manage their condition by eating food that is high in fibre and complex carbohydrates.

Explain how this can help to control their diabetes.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

(c) Read the article about diabetes.

The article was written by a doctor for his local newspaper.

Each line of the article has been numbered.

Diet and diabetes

1 The number of cases of diabetes is increasing.

2 We need to persuade people to have a better lifestyle.

3 There is a direct correlation between being overweight and developing diabetes.

4 Some people think they can eat whatever they like and it will not affect their chances of developing diabetes.

5 If you develop diabetes you may need to have insulin injections every day.

6 If only the Government could insist that we all ate a low fat diet, we could reduce the risk of developing diabetes later in life to almost zero.

(i) Which **two** lines of the article are statements based on data?

lines ..... and ..... **[1]**

(ii) Which lines of the article are statements based on the doctor's opinions or values?

lines ..... **[2]**

[Total: 10]

4 This question is about closed loop ecosystems.

(a) Complete the following sentences.

Put a (ring) around the correct choice to complete each sentence.

A closed loop system **has waste / does not have waste**.

This is because the **products / reactants** from one part of the system

become / do not become the **products / reactants** for another part of the system.

[2]

(b) Write down one example of a closed loop system and describe examples of how the system is a closed loop.

.....

.....

.....

..... **[3]**

(c) An oak tree produces many more seeds (acorns) than it needs to replace itself when it dies.

Use ideas about closed loop systems to suggest why this overproduction of acorns is not wasteful.

.....

.....

.....

.....

..... **[2]**

[Total: 7]

5 This question is about genetic modification.

(a) Explain how bacteria can be genetically modified to produce human insulin.

Suggest benefits of using human insulin rather than insulin extracted from animals.

The quality of written communication will be assessed in your answer to this question.

.....

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..... **[6]**

(b) Plants can be genetically modified to have particular features. For example, wheat can be genetically modified to be resistant to weed killer.

Look at the statements about the implications of genetic modification of crops.

Some of the statements relate to economic considerations, some of the statements relate to social considerations, and some of the statements relate to ethical considerations.

A It is morally wrong to alter the DNA of living things.

B Farmers may make more profit from their crops.

C Local communities should be able to decide if genetically modified organisms should be released into the environment.

D People can buy a bigger range of fruit and vegetables all year round.

E Because the crops produce bigger yields, the food can be sold more cheaply in the shops.

F Some people believe it is wrong to tamper with nature.

For each statement, identify whether it is an **economic** consideration, a **social** consideration or an **ethical** consideration.

Put each letter, **A**, **B**, **C**, **D**, **E** and **F**, in the correct column of the table.

economic	social	ethical

[2]

[Total: 8]

6 Nanotechnology is now being used in the food industry.

We need to make decisions about the risk of using nanotechnology in food.

Which two of the following should we use to assess the size of the risk?

Put ticks (✓) in the boxes next to the **two** correct answers.

the chance of a problem occurring	☐
the benefits of using nanotechnology	☐
how much nanotechnology will cost	☐
how many people are in favour of using nanotechnology	☐
the consequences of a problem occurring	☐

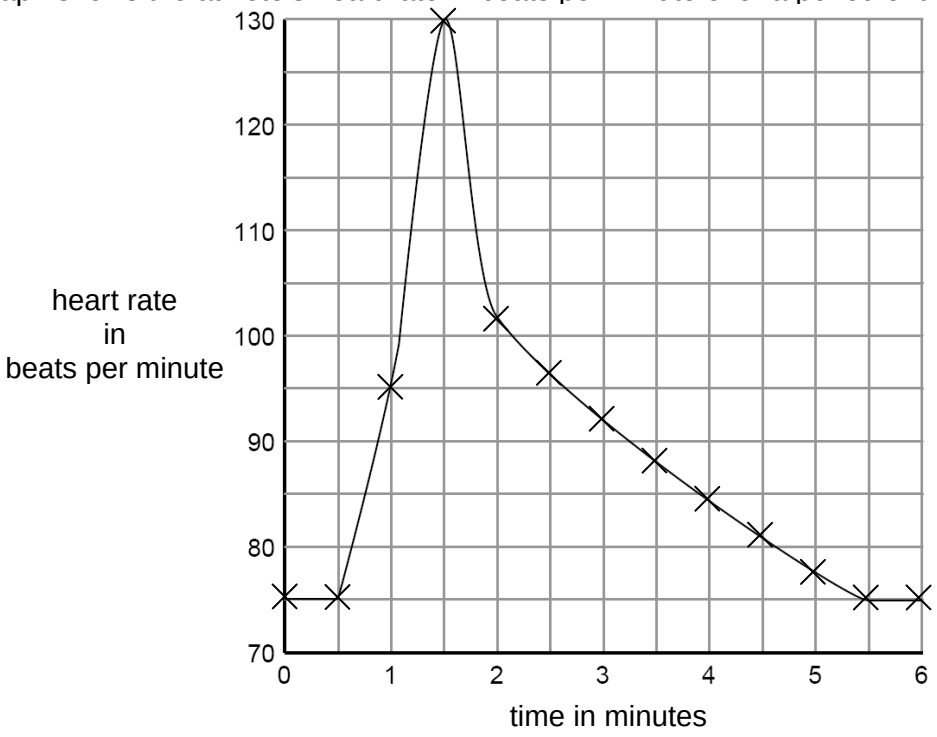
[1]

[Total: 1]

7 The heart rate of an athlete is measured during a training session.

A reading is taken once every 30 seconds.

The graph shows the athlete's heart rate in beats per minute over a period of time.



(a) Write down the athlete's resting heart rate in beats per minute.

answer ..... beats per minute **[1]**

(b) Express as a simple ratio the maximum heart rate compared to the resting heart rate.

answer ..... **[1]**

(c) **(i)** Write an **S** at the point on the time axis when the athlete **started** exercising.

Write an **F** at the point on the time axis when the athlete **finished** exercising. **[1]**

(ii) How long after stopping exercising did it take for the heart rate to return to normal?

answer..... min **[1]**

(d) Examine the graph carefully.

Explain why the graph does not fully display the heart rate of the athlete.

.....

.....

..... **[2]**

(e) Suggest how the data collected in parts **(a)**, **(b)** and **(c)** would be useful to the athlete in assessing his progress over several months of training.

.....

.....

..... **[2]**

[Total: 8]

8 Jake is concerned about his weight.

(a) He is 200 cm tall and has a body mass of 76 kg.

Use this formula to calculate Jake's body mass index (BMI).

Show your working.

$$\text{BMI} = \frac{\text{mass (kg)}}{[\text{height (m)}]^2}$$

BMI = ... **[2]**

(b) Look at the body mass index (BMI) table.

BMI	condition
less than 19	underweight
19 – 24	normal weight
25 – 29	overweight
30 – 40	obese
over 40	severely obese

Discuss whether Jake should be concerned about his body mass.

.....

..... **[2]**

(c) Suggest reasons why the BMI table may not be an accurate way of evaluating whether a person is over or underweight.

.....

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.....

.....

[3]

[Total: 7]

[Paper Total: 60]

END OF QUESTION PAPER

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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

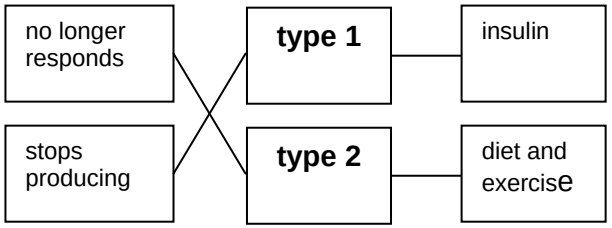
10. Three questions in this paper are marked using a Level of Response (LoR) mark scheme with embedded assessment of the Quality of Written Communication (QWC). When marking with a Level of Response mark scheme:

- 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>
</table>

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**

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