OCR
RECOGNISING ACHIEVEMENT

SPECIMEN F

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE **A162/01**

BIOLOGY A

Unit A162: Modules B4, B5, B6 (Foundation Tier)

MARK SCHEME

Duration: 1 hour

MAXIMUM MARK 60

This document consists of 16 pages

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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, e.g. 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
<u>words</u>	=	underlined words must be present in answer to score a mark
ecf	=	error carried forward
AW/owtte	=	alternative wording
ORA	=	or reverse argument

e.g. 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 **<u>not</u>** given
ECF	=	error carried forward
^	=	information omitted
I	=	ignore
R	=	reject

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

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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.

e.g.
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, e.g. 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, e.g. 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.

E.g. 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 quality of QWC*: determine the level based upon which level descriptor best describes the answer; you may awarded 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.

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Question			Expected answers	Marks	Additional guidance
1	(a)	(i)	**any three from:** the enzyme has <u>permanently</u> stopped working because the <u>active site</u> has changed shape (due to the high temperature), so hydrogen peroxide no longer fits so the enzyme cannot break down hydrogen peroxide to produce oxygen gas / the reaction cannot occur	[3]	**ignore** refs. to experimental error **credit** "the enzyme has been denatured"
		(ii)	so that she could obtain repeatable/reproducible results and could say for certain that temperature was causing the change in results because only the temperature varied	[2]	**ignore** reference to fair test
	(b)	(i)	6	[1]	**reject** "14 to 20"
		(ii)	the range is smaller than the differences between the mean results at 20°C and 30°C / the range does not overlap with the (mean) result at 30°C which increases confidence in the conclusion	[2]	**accept** confidence is decreased because the range is large compared to the (mean) result at 30°C / owtte for maximum of 1 mark

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Question	Expected answers	Marks	Additional guidance
(c) ✎	**[Level 3]** Answer correctly predicts that no gas will be collected and uses details of the 'lock and key' model in the correct order to explain why, with correct explanation of substrate/active site specificity. All information in the 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 correctly predicts that no gas will be collected and describes some details of the 'lock and key' model, but may omit some details and/or not make the correct order clear. Substrate specificity may be mentioned but not clearly explained. 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 correctly predicts that no gas will be collected and may reference the 'lock and key hypothesis' by name or simply state that starch "will not fit" but does not explain any of the details. 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:** • she will not collect any gas • because catalase has an active site • and only the hydrogen peroxide (molecule) is the correct shape to fit into the active site • starch will not fit, so will not form an enzyme-substrate complex • so the reaction will not occur / starch will not be broken down • and no oxygen gas will be formed • this is the 'lock and key' model
	Total	**[14]**	

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Question			Expected answers	Marks	Additional guidance
2	(a)	(i)	contains enzymes for the reactions in aerobic respiration	[1]	**accept** site of aerobic respiration
		(ii)	where enzymes are made for respiration / contains enzymes used in anaerobic respiration	[1]	**accept** site of anaerobic respiration
	(b)		ethanol	[1]	**accept** phonetic spellings
	(c)		The blood does not supply enough glucose to the muscle cells. ☐ Too much blood reaches the muscle cells. ☐ The blood removes too much carbon dioxide from the muscle cells. ☐ The blood supplies too much lactic acid to the muscle cells. ☐ The blood does not supply enough oxygen to the muscle cells. ✓ The blood removes too much water from the muscle cells. ☐	[1]	
			Total	[4]	

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Question			Expected answers	Marks	Additional guidance
3	(a)	(i)	2 and 4	[1]	
		(ii)	the amount of diffusion is greater when the concentration difference is greater	[1]	
	(b)		glucose molecules would diffuse across into solution **A** until they balance / reach equilibrium	[1]	
			Total	[3]	

Question			Expected answers	Marks	Additional guidance
4	(a)		**mitosis**: A, D, E **meiosis**: B, C	[2]	one mark for each correct set of responses/ each box
	(b)		so that the cell/gamete can fuse with/fertilise another gamete and produce a zygote/cell with the correct number of chromosomes	[1]	
	(c)		organelles increase in number chromosomes are copied	[2]	
			Total	[5]	

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Question			Expected answers	Marks	Additional guidance
5	(a)	✎	**[Level 3]** Answer correctly predicts that the stem will grow towards the light, explains how this directional growth occurs and explains why this gives the plant a better chance of survival. All information in the 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 correctly predicts that the plant will grow towards the light, and explains how this occurs but does not explain the effect on the plant's survival **OR** Answer correctly predicts that the plant will grow towards the light, and explains the effect on the plant's survival but does not explain how the directional growth occurs. 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 correctly predicts that the plant will grow towards the light, and may predict the effect of survival without explaining it, but does not explain how the directional growth occurs. 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:** • the stem of the plant • will grow towards the light - **ignore** references to the plant "bending" towards the light - **accept** "will grow towards the window" • because the growth (rate) is higher on the dark side / lower on the side facing the light source • this directional growth is called phototropism • and will increase the plant's chance of survival • because the plant obtains more light • which allows it to photosynthesise more (rapidly) / make more food • this causes the plant to grow more quickly / is an advantage **ignore** refs. to the plant being better able to compete with other plants, as there are no other plants on the windowsill

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Question			Expected answers	Marks	Additional guidance
5	(b)		accept the conclusion because roots grew in the solution containing the plant hormone reject the conclusion because the solution also contained glucose so we do not know which chemical caused the roots to grow	[2]	
			Total	[8]	

Question			Expected answers	Marks	Additional guidance
6	(a)	(i)	16 (cell stage)	[1]	
		(ii)	(the cells) start to specialise	[1]	
	(b)	(i)	after 12 hours some embryos have passed the stage where cells are unspecialised / 8 cell stage	[1]	
		(ii)	**any two from:** there were three rounds of cell division in embryo **B** but four in embryo **E** the rate of cell division in embryo **B** was , slower / half , (compared to embryo **E**) between 12 and 18 hours the rate of cell division was constant in embryo **E** (over the twelve hours) but , changed / decreased , in embryo **B** the , average / mean , rate of cell division was slower in embryo **B** than in embryo **E**	[2]	
		(iii)	there were 3 rounds of cell division in embryo A between 12 and 18 hours (which is more than in the 6 to 12 hour period for any of the embryos)	[1]	OWTTE **accept** any other correct pattern which does not support the conclusion
			Total	[6]	

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Question			Expected answers	Marks	Additional guidance
7	(a)		**D**	[1]	
	(b)		Daniel Joel	[2]	**accept** answers in either order
			Total	[3]	

Question			Expected answers	Marks	Additional guidance
8				[4]	credit a maximum of 2 points against animals experiments, and a maximum of 2 points in support of animal experiments
			against: **any 2 from:** it is wrong / ethical objection it is cruel / it hurts the animals it is like playing God / religious objection animals cannot give consent drugs may work differently in animals compared to humans / information obtained may not be applicable to humans		
			in support: **any 2 from:** it helps to discover new or useful information many people benefit and only a few animals are harmed / benefits outweigh costs it is better than experimenting with models / simulations it is cheaper than experimenting on humans allows larger scale experiments		**ignore** ”better than testing on humans”, unless explained
			Total	[4]	

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Question			Expected answers	Marks	Additional guidance
9	(a)		**component** → **part of the reflex** muscle cells in the iris → effector light sensitive cells in the retina → receptor central nervous system → processor	[2]	
	(b)		**any two from:** stepping grasping sucking	[2]	**accept** suckling for sucking
			Total	[4]	

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Question			Expected answers	Marks	Additional guidance
10		✎	**[Level 3]** Answer correctly names all parts of CNS and PNS, and clearly describes what the CNS and PNS do. Location and structure of CNS are clearly linked to the difficulties in studying it. All information in the 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 considers components and roles at a high level but only for **one** of the parts (CNS **or** PNS, but not both) **OR** Answer considers both parts (CNS and PNS) but omits details and/or technical terms. There is some mention of the difficulty in understanding how the CNS works e.g. less accessible than PNS, very complicated. 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 names or describes components, but omits or confuses roles. Little or no effort is made to describe the difficulties of understanding the CNS. 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:** *CNS:* • comprises brain and spinal cord • processes signals from sensory neurons • links sensory neurons to motor neurons (via relay neurons) *PNS:* • comprises sensory and motor neurons • sensory neurons transmit/communicate/deliver signals/impulses from receptors (to CNS) - **accept** skin/eyes/ears/taste buds/nose etc. instead of the word “receptors” but award 5 marks max. • motor neurons transmit/communicate/deliver signals/impulses from CNS to effectors • motor neurons stimulate effectors - **accept** named types of effectors (e.g. muscles, endocrine glands) instead of the word “effectors”
			Total	**[6]**	

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Question			Expected answers	Marks	Additional guidance
11	(a)		light mean = 7 dark mean = 13	[1]	**accept** light = 5 if the outlier (test 1) is rejected **accept** dark = 15 if the outlier (test 1) is rejected
	(b)		woodlice prefer the dark which helps them avoid predators	[2]	**accept** this helps them stay cool / prevents drying out
			Total	[3]	

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Assessment Objectives (AO) Grid

(includes quality of written communication ✎)

Question	AO1	AO2	AO3	Total
1(a)(i)		3		**3**
1(a)(ii)		2		**2**
1(b)(i)		1		**1**
1(b)(ii)		1	1	**2**
1(c)✎	2	4		**6**
2(a)(i)	1			**1**
2(a)(ii)	1			**1**
2(b)	1			**1**
2(c)	1			**1**
3(a)(i)		1		**1**
3(a)(ii)			1	**1**
3(b)			1	**1**
4(a)	2			**2**
4(b)	1			**1**
4(c)	2			**2**
5(a)✎	4	2		**6**
5(b)			2	**2**
6(a)(i)	1			**1**
6(a)(ii)	1			**1**
6(b)(i)			1	**1**
6(b)(ii)		2		**2**
6(b)(iii)			1	**1**
7(a)	1			**1**
7(b)	2			**2**
8		4		**4**
9(a)	1	1		**2**
9(b)	2			**2**
10✎	3	3		**6**
11(a)		1		**1**
11(b)		1	1	**2**
Totals	**26**	**26**	**8**	**60**

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