OCR
RECOGNISING ACHIEVEMENT

SPECIMEN H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE

BIOLOGY A **A161/02**

Unit A161: Modules B1, B2, B3 (Higher 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, 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.

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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.

   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

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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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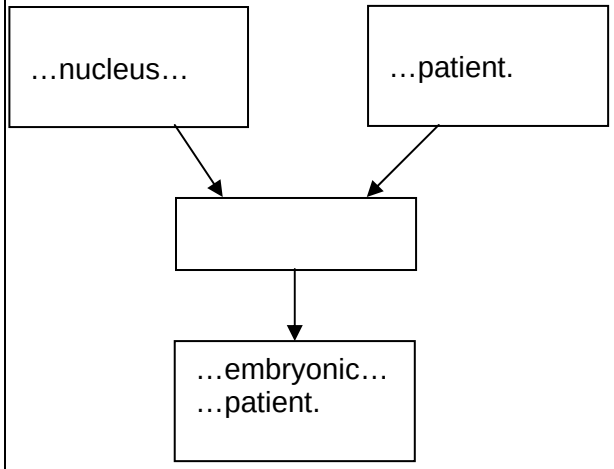
Question			Expected answers	Marks	Additional guidance
1	(a)		non-specialised / unspecialised / undifferentiated / pluripotent / totipotent specialised / differentiated	[2]	
	(b)			[2]	all three boxes correct = 2 marks two boxes correct = 1 mark

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Question			Expected answers	Marks	Additional guidance
1	(c)	✎	**[Level 3]** Answer clearly explains how adult stem cells differ from embryonic stem cells **and** gives several examples of why using adult stem cells may cause arguments **and** makes a valid suggestion as to why using adult stem cells may cause **fewer** arguments than using embryonic stem cells. 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 omits one of the required three sections **OR** considers all three sections but lacks detail/examples. 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 only considers one or two of the sections and lacks detail/examples **OR** refers to "ethical issues" without explaning what the issues are. 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]**	**accept** "ASC" for adult stem cells, and "ESC" for embryonic stem cells **relevant points include:** adult stem cells are different from embryonic stem cells because they • are taken/made from adult tissues • (are unspecialised but) can only develop into a limited range of cell types **accept** examples of adult stem cells, e.g. from bone marrow using adult stem cells may cause some arguments because • it is 'playing God' / religious objection / some actions are wrong whatever the consequences • may lead to reproductive cloning • issue of obtaining informed consent from patient (e.g. brain damaged patient) • benefit(s) may not outweigh arguments against using adult stem cells may cause fewer arguments than using embryonic stem cells because • patient can give consent (whereas embryo cannot) • no embryos are killed/wasted **accept** "not wasting a life" **ignore** arguments based on cost
			Total	**[10]**	

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Question			Expected answers	Marks	Additional guidance
2	(a)		**description** **explanation** PKU is inherited in the same way as cystic fibrosis. Parents can be carriers of PKU. PKU is caused by a recessive allele.	[2]	choice of only top left box = 1 mark any line from the top left box indicates the candidate's choice then look at the right hand boxes to award second mark **both** top and bottom "explanation" boxes selected = 1 mark no extra boxes allowed
	(b)		genotype is the two alleles inherited for PKU eg Pp or pp or PP phenotype is what characteristic is shown eg whether or not an individual has PKU	**[2]**	**accept** any letter for alleles **reject** reference to phenotype being the showing of <u>symptoms</u> (as a phenotype could equally be the presence of a non-symptomatic disease)
	(c)	**(i)**	59 to 71	**[1]**	
		(ii)	£60 000 to £72 000	**[1]**	look for error carried forward

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Question			Expected answers	Marks	Additional guidance
2	(c)	(iii)	idea that benefits outweigh costs one life worth more than £60 000-£72 000 / 59-71 lives improved/owtte each year can start treatment very early to limit damage / this saves (NHS) money in the long run (because it is expensive to treat people who get ill due to PKU) / idea that parents have the right to know or can start preparing for child with PKU	[3]	**accept** some actions are right whatever the cost **allow** ecf from part **(i)** and **(ii)** **accept** any numbers in range
			Total	[9]	

Question			Expected answers	Marks	Additional guidance
3			**any three from:** number of bacteria after 2 hours is 12800 (or 1.28 x 10^4), which is a sufficient number to cause food poisoning idea that if conditions were not optimum the actual number may be lower than this idea that not enough data/evidence/information, or would need to measure more things, to conclude that person will definitely get food poisoning idea of immune response against bacteria or toxins / acid in stomach destroying bacteria or toxins	[3]	
			Total	[3]	

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Question			Expected answers	Marks	Additional guidance
4	(a)		**any two from:** correlation is in the correct direction (positive) should not start at zero as your risk of dying from heart disease can never be 0 / not watching TV will not stop you getting heart disease not enough evidence to assume linear correlation	[2]	
	(b)	✎	**[Level 3]** Answer clearly explains the links between the ideas of correlation, factors and cause, and considers genetic **and** lifestyle factors. 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 limited understanding of correlation, factors and cause, and gives examples of relevant factors. 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 only gives examples of factors without considering ideas of correlation and cause **OR** only states that TV does not necessarily cause heart disease without considering other factors. 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:** • idea that an observed correlation does not necessarily mean that watching TV (the factor) causes heart disease (the outcome) • idea that the factor might increase the probability of the outcome, but does not necessarily lead to it (does not make it certain to happen) • idea that other factor(s) may be just as important, or more important • Toby might be able to / need to change other factors (to lower his risk of developing heart disease) **ignore** refs. to the article not being trustworthy **ignore** refs. to the study needing to be repeated, etc. examples of other factors: • genetic factors / family history of disease • lifestyle factors, e.g. lack of exercise, poor/fatty diet, stress, smoking / excessive nicotine, drinking / excessive alcohol **accept** economic factors if linked to poor diet etc.
			Total	[8]	

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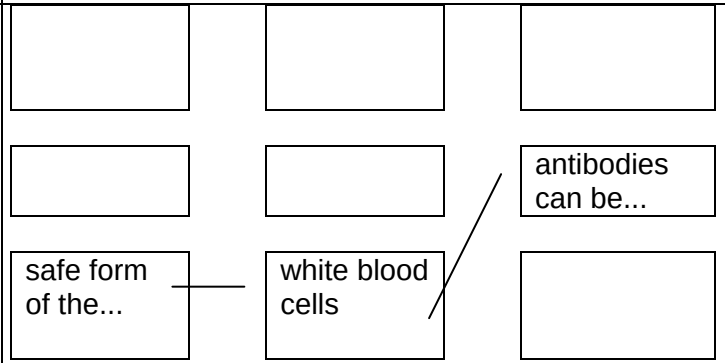
Question	Expected answers	Marks	Additional guidance
5		[2]	one mark for each correct line any other lines between sections = 0 marks for that section
	Total	[2]	

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<table>
<tr><th colspan="3">Question</th><th>Expected answers</th><th>Marks</th><th>Additional guidance</th></tr>
<tr><td>6</td><td>(a)</td><td></td><td>increased the use of antibiotics ✓
random changes in genes ✓
☐
☐
☐
☐</td><td>[1]</td><td>both ticks = 1 mark
tick in any other box = 0 marks</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td><table><tr><th></th><th>safety</th><th>effective-ness</th><th>both</th></tr><tr><td>healthy</td><td>✓</td><td></td><td></td></tr><tr><td>illness</td><td></td><td></td><td>✓</td></tr></table></td><td>[2]</td><td>one mark for each correct tick
more than one tick in any row = 0 marks for that row</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>doctor does not know who receives the drug
patient does not know who receives the drug</td><td>[2]</td><td>accept ‘nobody knows who receives the drug‘ for two marks</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[5]</td><td></td></tr>
<tr><td>7</td><td></td><td></td><td>alcohol in lager suppresses ADH production
resulting in a greater volume of (more dilute) urine</td><td>[2]</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[2]</td><td></td></tr>
</table>

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<table>
<tr><th colspan="3">Question</th><th>Expected answers</th><th>Marks</th><th>Additional guidance</th></tr>
<tr><td>8</td><td>(a)</td><td>(i)</td><td>birds evolved from dinosaurs</td><td>[1]</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td><table><tr><th>observation</th><th>increases</th><th>decreases</th><th>neither</th></tr><tr><td>Seven proteins</td><td></td><td></td><td>✓</td></tr><tr><td>three proteins</td><td>✓</td><td></td><td></td></tr><tr><td>two proteins</td><td></td><td>✓</td><td></td></tr></table></td><td>[1]</td><td>three correct indications of choice and the other six boxes blank for this mark</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>imagination</td><td>[1]</td><td>accept synonyms or paraphrases eg creativity, insight, intuition, thinking outside the box, innovation, (new) ideas
accept aspects of training eg knowledge
reject evidence, data, measurements or the like</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>predictions</td><td>[1]</td><td>accept synonyms or paraphrases eg saying what you expect to happen
accept theory here also (predictions are an aspect of a theory)
reject hypothesis, model, new ideas
must imply predictions as part of the idea</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[4]</td><td></td></tr>
</table>

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Question			Expected answers	Marks	Additional guidance
9		✎	**[Level 3]** Correctly uses ideas about natural selection to clearly explain how these changes could have occurred. 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]** Some aspects of natural selection correctly described, but only some are used to provide an explanation of. 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]** Aspects of natural selection correctly described, but not clearly used to explain changes. 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]**	**valid points include:** • (random) mutations cause fish to not make pigment and/or not develop eyes • in caves there is no (or little) light, so fish would not be able to see, would not be able to be seen, and would not need protection from (strong) sunlight • therefore lack of eyes and pigment give no disadvantage • can save resources by not producing pigment / eyes • these resources can be used for growth/movement etc • this is an advantage • idea that advantage = fitness • fitness allows each form to survive / breed more successfully / increase in number • this is natural selection • over time, blind form only in caves / normal form only in rivers
			Total	**[6]**	

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Question			Expected answers	Marks	Additional guidance
10	(a)		Stop burning forests … ☐ ☐ Cut back on the use of fossil fuels … ☑ ☐ ☐	[2]	one mark for each correct tick three ticks deduct one mark four or five ticks = 0 marks
	(b)	(i)	**A** and **C**	[1]	both required, any order
		(ii)	**D**	[1]	
			Total	[4]	

11			*Conclusion is valid because:* calculation to show that % of energy in plants transferred to herbivores is around 16% calculation to show that % of energy in herbivores transferred to carnivores is around 12% assume that % of energy in carnivores transferred to top carnivores likely to be 12% or less (because it decreases with each transfer up the food chain) if 12% transferred (which is best case scenario), energy in top carnivores would be around 208 kJ / m^3 / year, which is not enough to allow them to survive	[4]	no mark for saying valid
			Total	[4]	

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Question			Expected answers	Marks	Additional guidance
12			*Yes:* **any three from:** unemployment would be (further) reduced income to island would be (further) increased loss of species not significant / only small reductions / some groups of species (i.e. lizards) not affected at all benefits (to humans) outweigh costs to biodiversity *No:* **any three from:** importance of maintaining biodiversity first plantation caused loss of species, more plantations could cause even more loss some species lost may be unique to the island, hence loss = extinction gains in employment and income do not outweigh losses in biodiversity	**[3]**	no marks for 'yes' or 'no'
			Total	**[3]**	

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Assessment Objectives (AO) Grid

(includes quality of written communication✎)

Question	AO1	AO2	AO3	Total
1(a)	2			**2**
1(b)	2			**2**
1(c)✎	3	3		**6**
2(a)	1	1		**2**
2(b)	1	1		**2**
2(c)(i)		1		**1**
2(c)(ii)		1		**1**
2(c)(iii)		2	1	**3**
3		1	2	**3**
4(a)			2	**2**
4(b)✎	2	3	1	**6**
5	2			**2**
6(a)	1			**1**
6(b)(i)	2			**2**
6(b)(ii)	2			**2**
7	2			**2**
8(a)(i)	1			**1**
8(a)(ii)	1			**1**
8(b)(i)	1			**1**
8(b)(ii)	1			**1**
9✎		6		**6**
10(a)		2		**2**
10(b)(i)	1			**1**
10(b)(ii)	1			**1**
11		2	2	**4**
12		1	2	**3**
Totals	**26**	**24**	**10**	**60**

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