OCR
RECOGNISING ACHIEVEMENT

SPECIMEN H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE **A161/02**

BIOLOGY A

Unit A161: Modules B1, B2, B3 (Higher 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 **20** pages. Any blank pages are indicated.

For Examiner's Use		
	Max	**Mark**
1	**10**	
2	**9**	
3	**3**	
4	**8**	
5	**2**	
6	**5**	
7	**2**	
8	**4**	
9	**6**	
10	**4**	
11	**4**	
12	**3**	
TOTAL	**60**	

Answer **all** the questions.

1 Scientists think embryonic stem cells could be used to treat some illnesses for which there is currently no cure.

(a) Complete the sentences about stem cells.

Embryonic stem cells can develop into any kind of cell. Therefore, stem cells are described as ..... .

During development of multi-cellular organisms, stem cells become ..... .

[2]

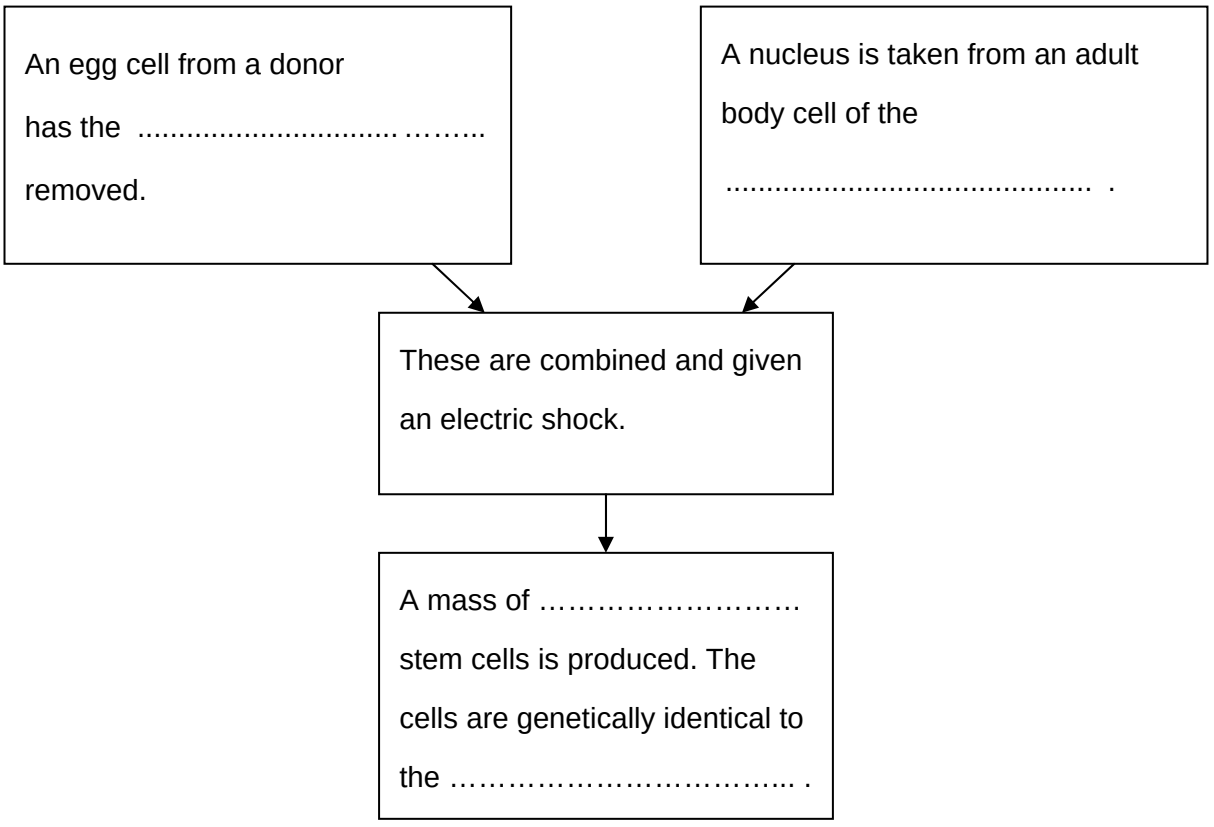
(b) Therapeutic cloning has been used to produce stem cells for the treatment of some disorders.

The flow chart illustrates the processes involved in therapeutic cloning.

Use the words provided to complete the flow chart.

Each word may be used once, more than once, or not at all.

adult **donor** **egg** **embryonic** **patient** **nucleus**



[2]

(c) The use of human embryos to produce stem cells has caused a lot of arguments.

Some people think that using stem cells from human **adults** would cause fewer arguments.

Discuss how using adult stem cells differs from using embryonic stem cells and why this might cause fewer arguments.

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

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

[Total: 10]

2 Read the information about phenylketonuria (PKU).

PKU is an inherited disorder.

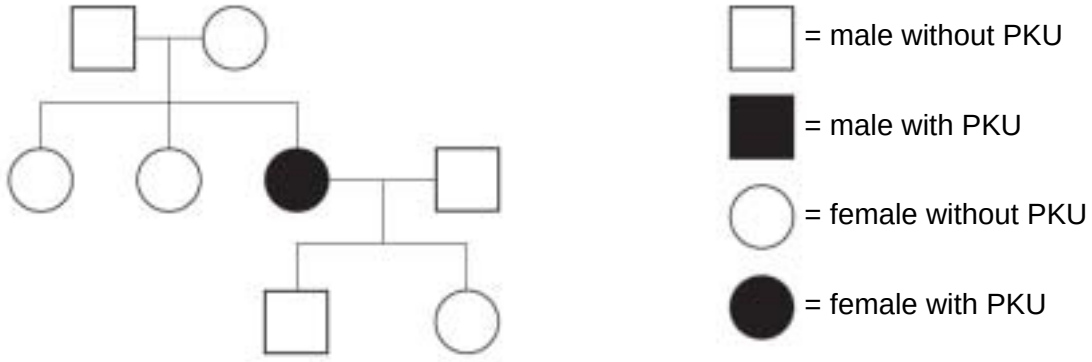
PKU is caused by a faulty gene.

A chemical called phenylalanine builds up in the bodies of people with PKU.

Too much phenylalanine causes serious health problems.

Serious health problems can be avoided with a controlled diet. The sooner this diet is started after birth, the less harm is caused.

(a) Look at the family tree.



Draw straight lines to link the correct **description** of the inheritance of PKU with the **two** correct **explanations.**

You should join **one** description with **two** explanations.

description	**explanation**
	Parents can be carriers of PKU.
PKU is inherited in the same way as cystic fibrosis.	
	PKU is caused by a dominant allele.
PKU is inherited in the same way as Huntington's disease.	
	Parents cannot be carriers of PKU.
PKU is inherited in a different way from cystic fibrosis and Huntington's disease.	
	PKU is caused by a recessive allele.

[2]

(b) Use the example of PKU to describe the difference between an individual's genotype and his or her phenotype.

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

(c) Doctors estimate that between 1 in 10 000 and 1 in 12 000 babies born in the UK has PKU.

The Office for National Statistics reported that 710 000 babies were born in the UK in 2008.

(i) Estimate the lower and upper limits for the number of babies born in the UK in 2008 that you would expect to have PKU.

from ..... to ..... **[1]**

(ii) Testing a baby for PKU costs the NHS £6.

Estimate the upper and lower limits of the cost to the NHS of identifying one baby with PKU.

from £..... to ..... **[1]**

(iii) Doctors have said that it is right to test all babies for PKU even though it costs the NHS money.

Use the information about PKU and your answers to parts **(i)** and **(ii)** to suggest reasons why the doctors have come to this conclusion.

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

[Total: 9]

3 Some strains of the bacterium *E. coli* can make us ill if they enter our body.

Read this information about one particular strain of *E. coli*.

- Bacteria of this strain can enter the body on contaminated food.
- A person may develop symptoms of food poisoning if the number of bacteria of this strain in the stomach is $\geq 1 \times 10^4$.
- A single bacterium of this strain can reproduce itself every 20 minutes in optimum conditions.

A piece of food is contaminated with 200 bacteria of this strain. The food is left at room temperature for 2 hours.

Jenny concludes that anybody who eats this piece of food will get food poisoning.

Discuss whether this conclusion is correct.

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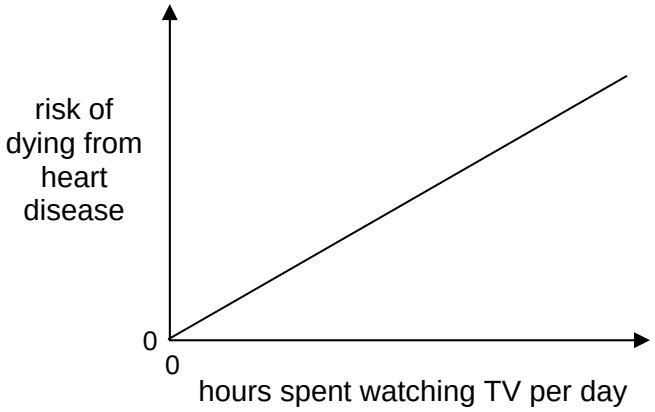
..... **[3]**

[Total: 3]

4 Toby sees this article in a newspaper.

> Heart disease is one of the most common causes of death in the UK.
>
> Some scientists claim that there is a correlation between the amount of time spent watching TV each day and the risk of dying from heart disease.
>
> They concluded that watching TV increases the risk of dying from heart disease.

(a) Toby draws a sketch graph to represent the correlation described in the article.



Discuss whether Toby's graph correctly represents the correlation described in the article.

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

(b) Toby watches TV every night after work. He is worried about the correlation reported in the article.

He decides to stop watching TV because he believes it will cause heart disease.

What advice would you give Toby about this?

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

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

[Total: 8]

5 This question is about how vaccines work.

Draw **one** straight line from the correct **content of a vaccine** to its **effect**.

Draw **one** straight line from this **effect** to the **reason for immunity**.

There should only be **two** straight lines in your answer.

content of a vaccine	**effect**	**reason for immunity**
antibodies against the disease-causing microorganism	more red blood cells are produced	the person already has the disease
a dose of antibiotics	white blood cells destroy the antibiotics	antibodies can be made quickly on reinfection
a safe form of the disease-causing microorganism	white blood cells make antibodies against microorganisms in the vaccine	stops microorganisms re-entering the body

[2]

[Total: 2]

6 This question is about antibiotics.

(a) Some antibiotics are becoming less effective.

This is because microorganisms are becoming resistant to antibiotics.

Which two reasons, when put together, can cause antibiotic resistance?

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

increased use of antibiotics	☐
random changes in the genes of microorganisms	☐
increased use of disinfectants in hospitals	☐
increased use of vaccines	☐
people always finishing a course of antibiotics	☐
development of new antibiotics	☐

[1]

(b) New antibiotics have to be developed.

Before new antibiotics can be used to treat humans they must be tested.

Some of the tests are done on groups of healthy human volunteers.

Some of the tests are done on groups of people with the illness that the drug will treat.

(i) What are the reasons for using these groups of people?

Put a tick (✓) in the correct box for each group of people.

There should be one tick in each row.

	to test for safety only	**to test for effectiveness only**	**to test for safety and effectiveness**
healthy volunteers			
people with the illness			

[2]

(ii) Some drugs trials in humans are called double-blind trials.

Explain what is meant by a double-blind trial.

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

[Total: 5]

7 The volume of urine produced by the body is controlled by the hormone ADH.

Damon drinks some beer.

How will the alcohol in the beer affect the amount of ADH released into Damon's bloodstream, and how will this affect the volume of urine Damon produces?

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

[Total: 2]

8 (a) Read the newspaper article.

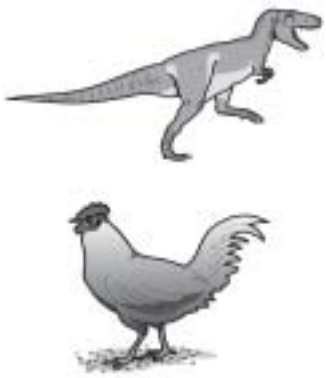
Are birds dinosaurs?

Tyrannosaurus rex (*T. rex*) is the most famous of all dinosaurs.

A 68-million-year-old fossil of a *T. rex* bone was found that still contained seven proteins.

Three of the proteins were very similar to proteins found in birds such as chickens. Two others were similar to proteins found in different animals.

Some scientists have suggested that this agrees with the idea that birds evolved from dinosaurs.



The article contains a hypothesis (a scientific explanation).

(i) Write down the hypothesis from the article.

.....

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

(ii) Some observations in the article support the hypothesis.

Put a tick (✓) in each row to show whether the observation **increases confidence in the hypothesis**, **decreases confidence in the hypothesis** or **neither**.

observation	increases confidence in the hypothesis	decreases confidence in the hypothesis	neither
Seven proteins were extracted from a *T. rex* fossil.			
Three proteins from *T. rex* were similar to the proteins found in chickens.			
Two proteins from *T. rex* were similar to proteins found in other animals.			

[1]

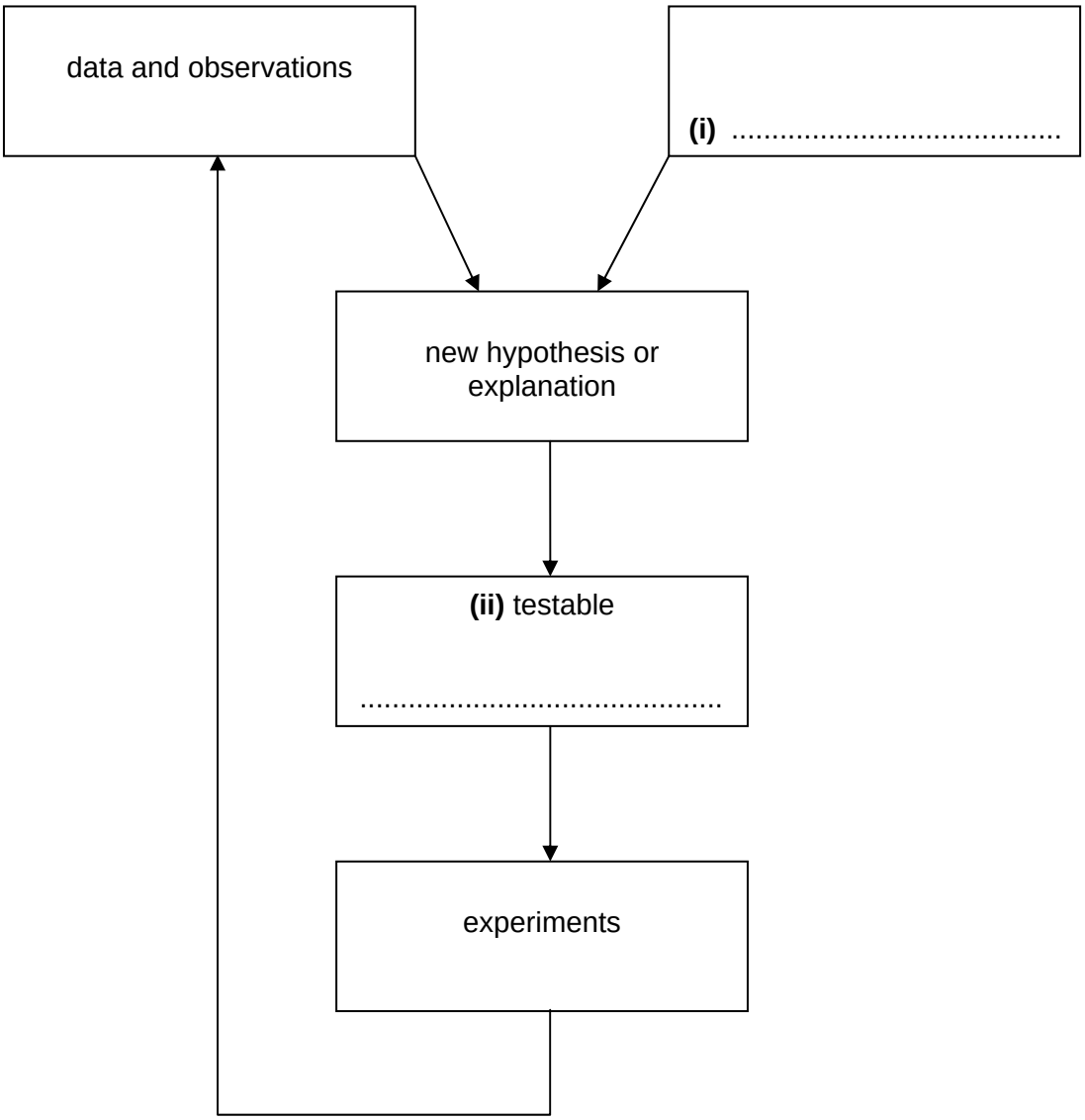
(b) The flow chart shows how science explanations change and develop.

Complete the flow chart by writing the answers to questions **(i)** and **(ii)** in the correct places.

Write the answers in the empty boxes in the flow chart.

(i) What is needed to produce an explanation, other than data and observations?

(ii) What does the new explanation give that can be tested by an experiment?



[2]

[Total: 4]

9 The Mexican tetra is a species of fish. It lives in rivers and is a silver colour.

Some of this fish have become trapped in caves where there is no light.

Over time the population of fish living in caves have lost their ability to produce the protein that gives them their body colour. They now appear colourless.

The cave fish are also blind because they do not have developed eyes.

Suggest and explain the evolutionary processes through which these changes could have occurred.

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

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

[Total: 6]

10 (a) The amount of carbon dioxide in the atmosphere has increased during the past 200 years.

Which of the following changes would slow down the increase of carbon dioxide in the atmosphere?

Put a tick (✓) in the box next to the **two** correct answers.

Stop burning forests to clear the land. ☐

Plant more grassland for cattle and sheep. ☐

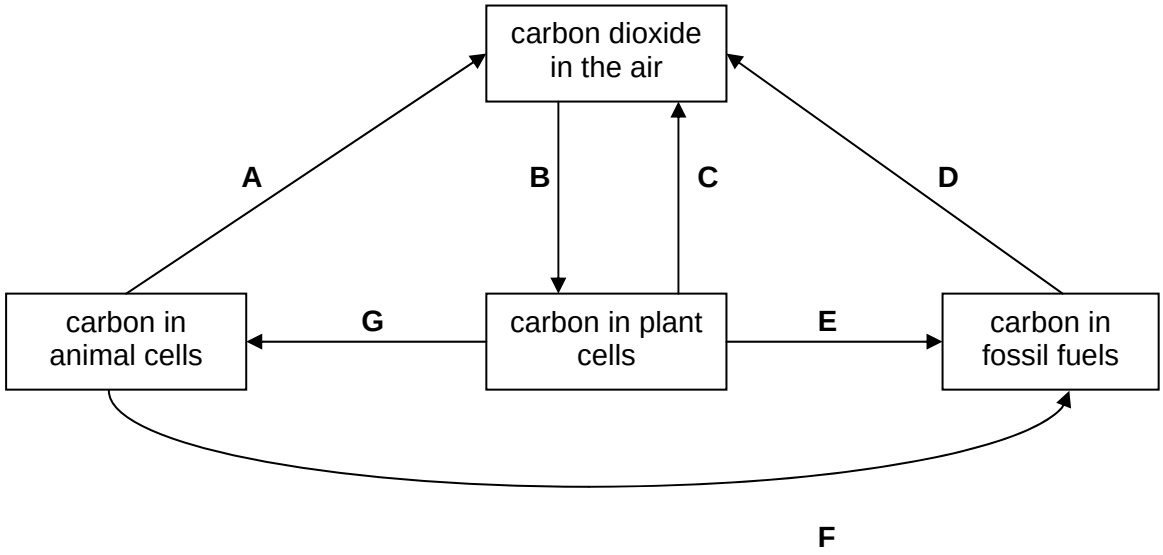
Cut back on the use of fossil fuels as a source of energy. ☐

Use wind power instead of nuclear power to generate electricity. ☐

Find new sources of oil and gas to replace the ones that are running out. ☐

[2]

(b) The diagram shows part of the carbon cycle.



(i) Which **two** arrows from **A**, **B**, **C**, **D**, **E**, **F** and **G**, show respiration?

arrows ..... and ..... **[1]**

(ii) Which arrow, **A**, **B**, **C**, **D**, **E, F** or **G**, shows combustion?

arrow ..... **[1]**

[Total: 4]

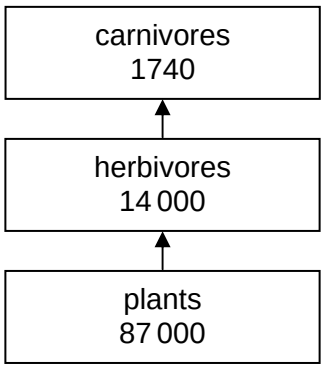
11 A scientist studied food chains in a river system in Florida, USA.

She calculated the energy in three feeding levels that she identified

- plants
- herbivores
- carnivores.

She was unable to find evidence for the existence of any further feeding levels.

The values she calculated for each feeding level are shown in the diagram in kJ / m^3 / year.



A study 10 years earlier had identified the presence of a fourth feeding level in this river system. This was due to the presence of a small population of top carnivores.

The percentage of the energy in the carnivores that was transferred to the top carnivores was only just enough to allow the top carnivores to survive. The energy in the top carnivores was 300 kJ / m^3 / year.

The scientist concluded from the data in her current study that it was very unlikely that the top carnivores were still present in the river system.

Discuss whether this conclusion is valid. You may use calculations in your answer.

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..... **[4]**

[Total: 4]

12 Scientists are studying an island in the Pacific Ocean.

Several years ago, an area of forest on the island was chopped down. A palm oil plantation was created in place of the forest.

The palm oil plantation is an example of a monoculture.

The table gives information about the island before and after the palm oil plantation was created.

	before plantation was created	**after plantation was created**
number of bird species	460	432
number of mammal species	194	186
number of plant species	9 562	8 134
number of reptile species	217	217
unemployment (% of total population)	14	9
income to the island (million dollars per year)	132	156

The Government is considering whether to create two more palm oil plantations on the island.

Should the extra plantations be created? Justify your answer.

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

[Total: 3]

[Paper Total: 60]

END OF QUESTION PAPER

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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

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
<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

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 **<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.

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

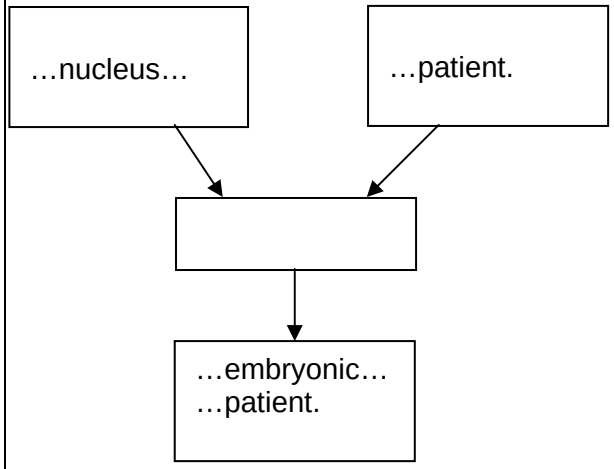
Edinburgh	
Manchester	
Paris	
Southampton	

   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 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.

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

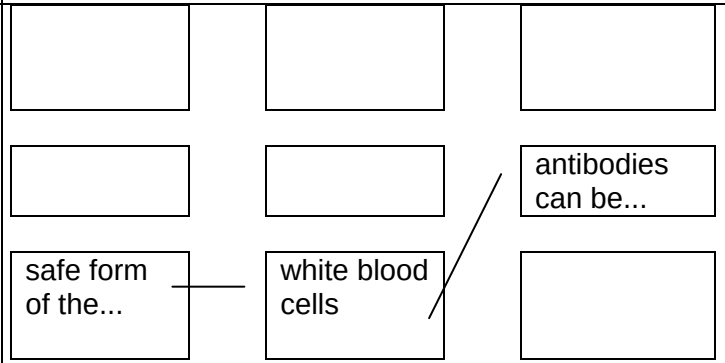
Question			Expected answers	Marks	Additional guidance
1	(c)	✎	**[Level 3]** Answer clearly explains how adult stem cells differ from embryonic stem cells **and** gives several examples of why using adult stem cells may cause arguments **and** makes a valid suggestion as to why using adult stem cells 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]**	

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

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]	

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]	

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]	

<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>

<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>

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]**	

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]	

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]**	

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**