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]

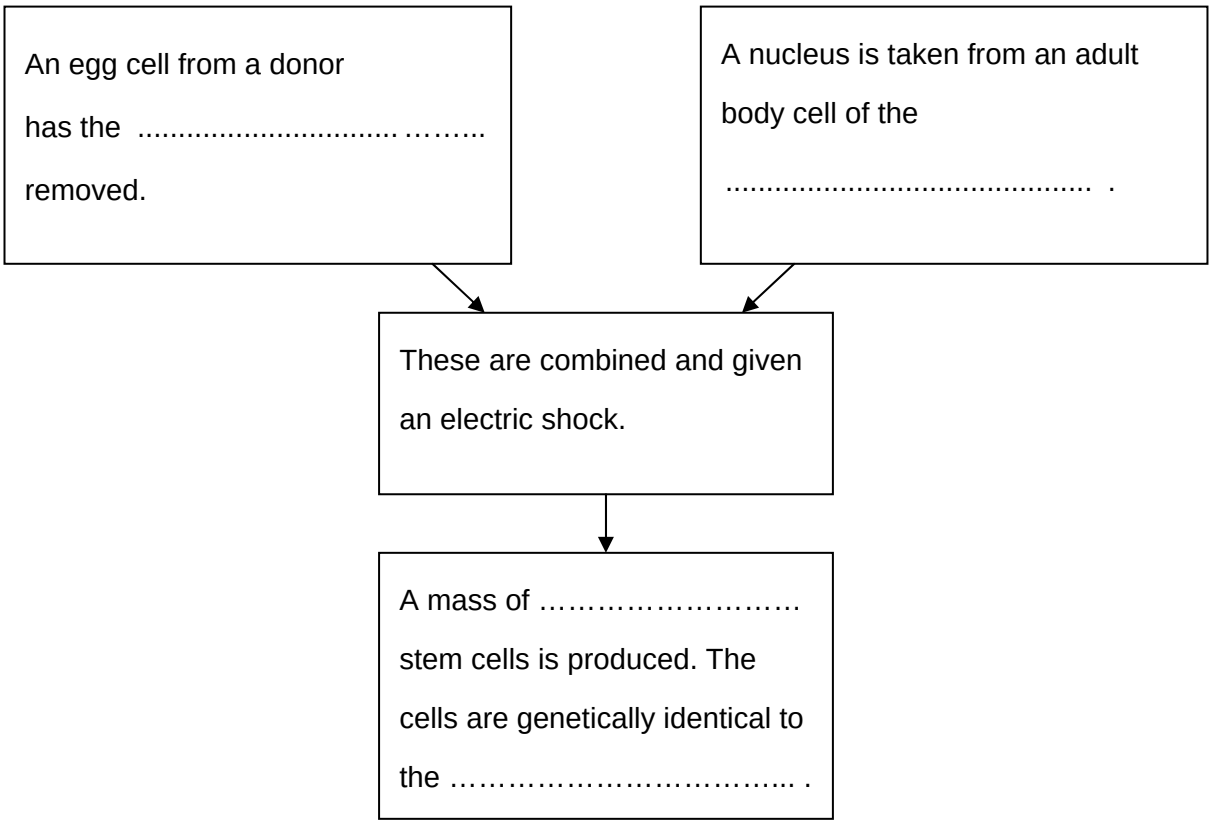
(b) Therapeutic cloning has been used to produce stem cells for the treatment of some disorders.

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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[Total: 10]

2 Read the information about phenylketonuria (PKU).

PKU is an inherited disorder.

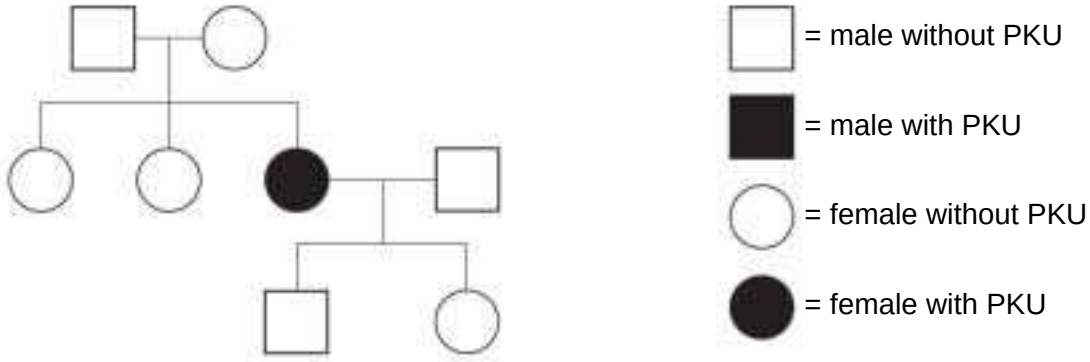
PKU is caused by a faulty gene.

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**
PKU is inherited in the same way as cystic fibrosis.	Parents can be carriers of PKU.
PKU is inherited in the same way as Huntington's disease.	PKU is caused by a dominant allele.
PKU is inherited in a different way from cystic fibrosis and Huntington's disease.	Parents cannot be carriers of PKU.
	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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[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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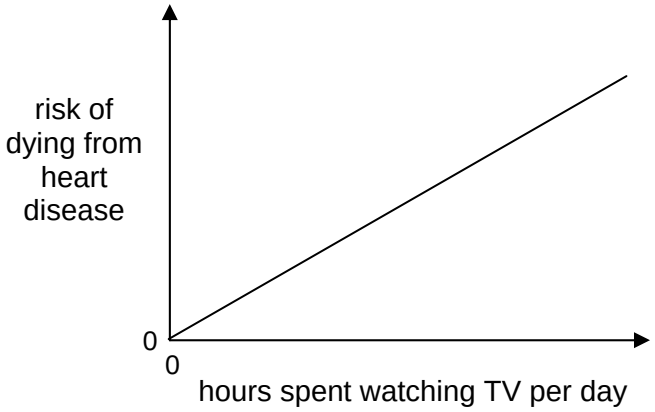
[Total: 3]

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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(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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[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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[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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[Total: 2]

8 (a) Read the newspaper article.

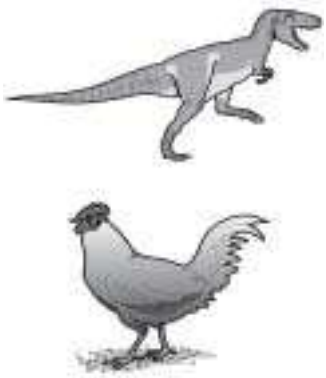
Are birds dinosaurs?

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.

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..... **[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]

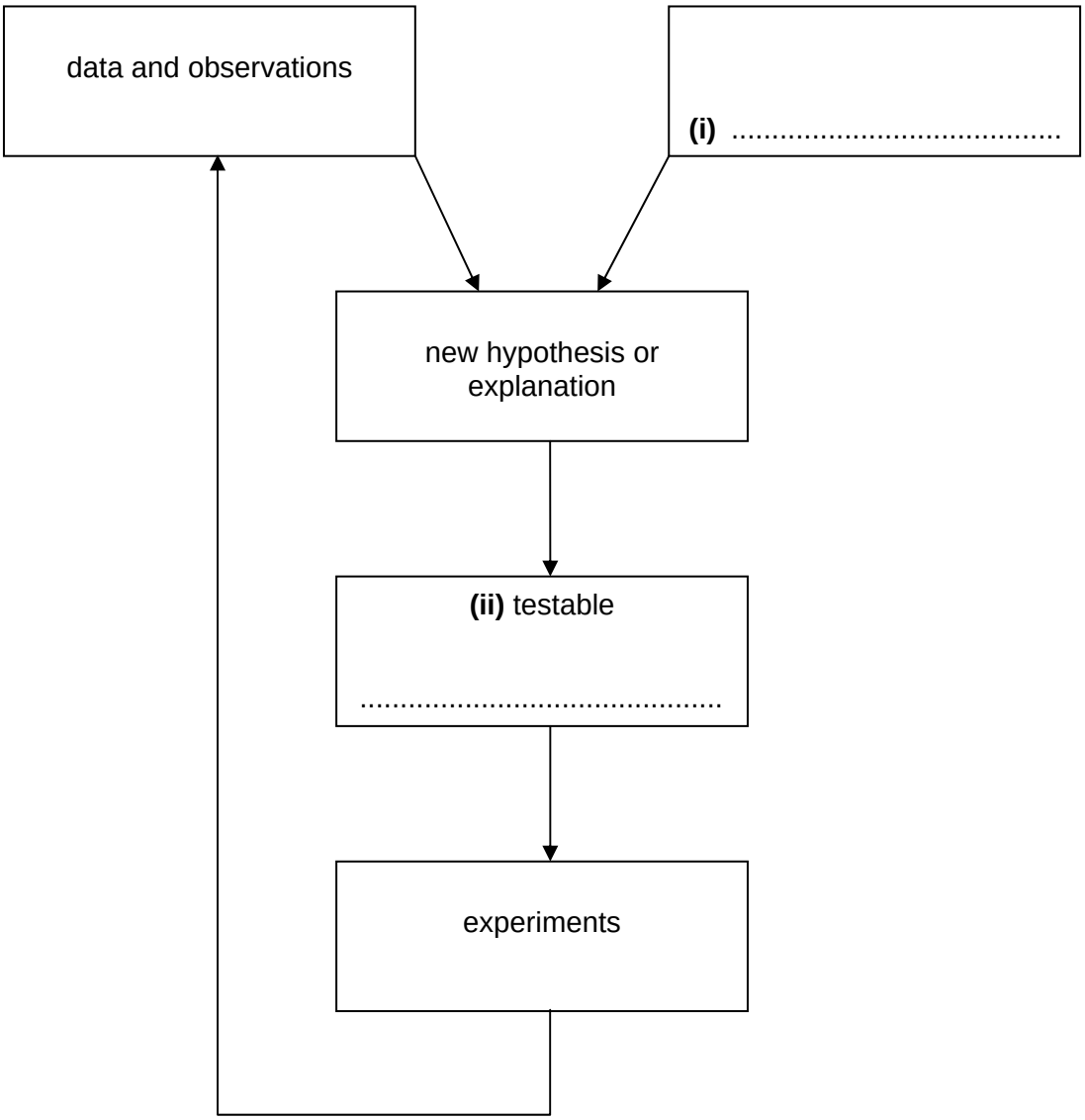
(b) The flow chart shows how science explanations change and develop.

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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[Total: 6]

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

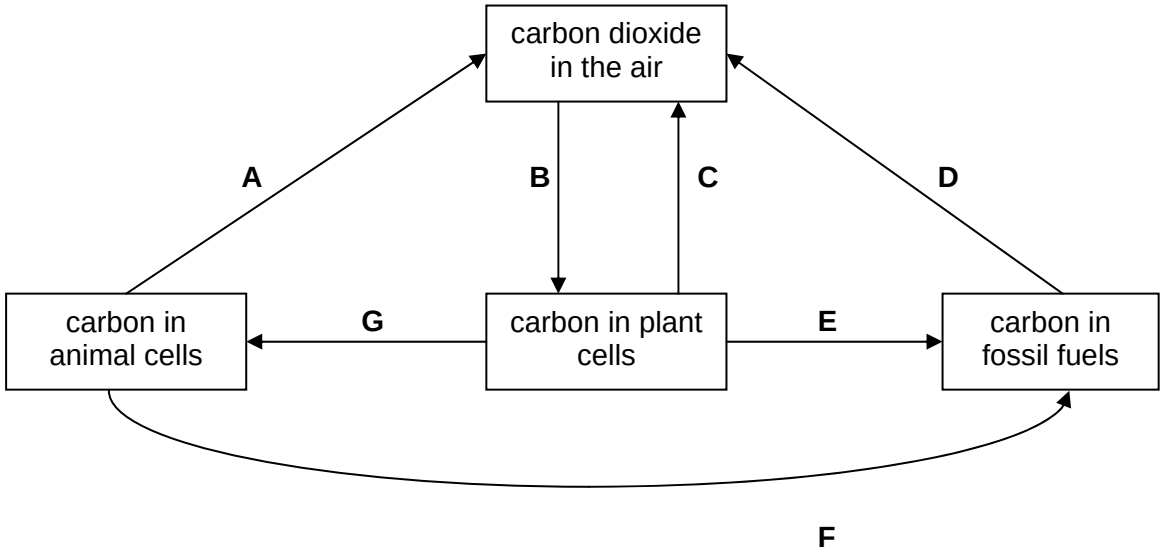
Which of the following changes would slow down the increase of carbon dioxide in the atmosphere?

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]

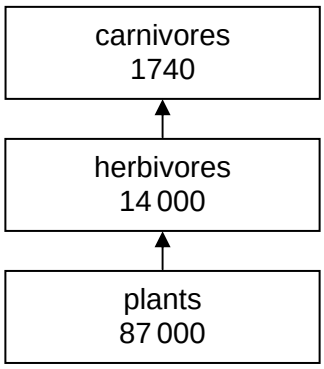
11 A scientist studied food chains in a river system in Florida, USA.

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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[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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[Total: 3]

[Paper Total: 60]

END OF QUESTION PAPER

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