

**Tuesday 16 May 2017 – Afternoon**

**GCSE TWENTY FIRST CENTURY SCIENCE  
BIOLOGY A/SCIENCE A**

**A161/01** Modules B1 B2 B3 (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<br>forename |  | Candidate<br>surname |  |
|-----------------------|--|----------------------|--|

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|---------------|--|--|--|--|--|------------------|--|--|--|--|
| Centre number |  |  |  |  |  | Candidate number |  |  |  |  |
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**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the barcodes.

**INFORMATION FOR CANDIDATES**

- The quality of written communication is assessed in questions marked with a pencil (✎).
- The number of marks is given in brackets [ ] at the end of each 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.

**PLEASE DO NOT WRITE ON THIS PAGE**

Answer **all** the questions.

1 Our chromosomes store the instructions that control how we develop and function.

(a) Which part of a human cell usually contains the chromosomes?

Put a tick (✓) in the box next to the correct answer.

cell membrane

chloroplast

cytoplasm

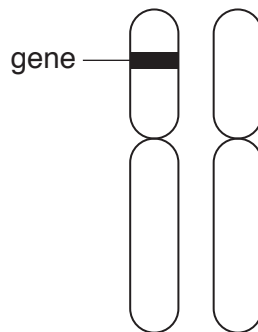
nucleus

[1]

(b) The diagram shows a pair of chromosomes.

A gene has been marked on the diagram.

Draw an allele of the gene on the diagram.



[1]

(c) Read the following sentences about the alleles of a gene.

Draw a ring around the correct word or number to complete each sentence.

The alleles **cannot** / **may** / **must** contain the same instructions.

An individual usually has **0** / **2** / **23** / **46** alleles of a gene.

[1]

[Total: 3]

2 Cystic fibrosis is a genetic disorder in humans.

(a) People with cystic fibrosis make thick, sticky mucus.

Write down **two other** symptoms of cystic fibrosis.

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

(b) Byron and Tania are friends.

- Byron is 22 years old. He has one faulty allele that causes cystic fibrosis.
- Tania is also 22 years old. She has one faulty allele that causes a disorder called Huntington’s disease.
- Neither person has noticed any symptoms.

Explain why Byron and Tania have **not** noticed any symptoms of the disorders.

Use ideas about the inheritance of the different alleles for these disorders in your answer.



*The quality of written communication will be assessed in your answer.*

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..... [6]

(c) Tania was tested for the allele that causes Huntington’s disease.

She had the genetic test several times.

Suggest why she had the test more than once.

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

(d) Tania is worried about telling others that she has the allele for Huntington’s disease.

Explain how sharing this information with others could have **financial** implications for Tania.

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..... [2]

[Total: 11]

3 Judith takes her female cat to see the vet.

The vet tells her that the cat is pregnant, and will give birth to five kittens.

(a) Judith thinks her cat mated with a male cat that lives nearby.

She hopes all of the kittens will look like their mother.

Use ideas about sexual reproduction to explain why not all of the kittens will look like their mother.

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..... [3]

(b) Judith reads about how a kitten develops from a fertilised egg cell.

(i) Complete the sentences by choosing the correct words from the list.

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

**all      none      some**

The fertilised egg cell divides. Early in development, ..... of the cells are stem cells. Each cell could develop into ..... of the cell types needed to make a kitten.

When the kitten is born, ..... of its cells are stem cells. [2]

(ii) What word is used to describe a stem cell **before** it becomes a particular cell type?

..... [1]

**[Total: 6]**

4 Control systems help to keep conditions constant inside the human body.

(a) Each control system has different parts.

Draw straight lines to join each **part** of a control system with its **job**.

| part              | job                  |
|-------------------|----------------------|
| receptor          | produce the response |
| processing centre | detect a change      |
| effector          | coordinate response  |

[2]

(b) The different parts of a control system must communicate with each other.

What do they use to communicate?

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

|                   |                          |
|-------------------|--------------------------|
| antigens          | <input type="checkbox"/> |
| bones             | <input type="checkbox"/> |
| hormones          | <input type="checkbox"/> |
| nerves            | <input type="checkbox"/> |
| white blood cells | <input type="checkbox"/> |

[1]

(c) It is important to keep a healthy water balance in the body.

Write down **one** way the body loses water.

..... [1]

[Total: 4]

5 Sophie and Callum live together. Recently there was an outbreak of chicken pox in the village where they live.

Chicken pox spreads very quickly and easily, through coughs and sneezes.

- Callum did not have chicken pox when he was a child. He developed chicken pox during the recent outbreak.
- Sophie had chicken pox when she was a child. She did not develop chicken pox during the outbreak.

Explain why Sophie did **not** develop chicken pox during the outbreak, but Callum did.



*The quality of written communication will be assessed in your answer.*

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..... [6]

**[Total: 6]**



6 Lifestyle factors affect our risk of developing heart disease.

Read the notes about Katrina and Hayley.

**Katrina**


22 years old  
Overweight  
Smokes every day



Katrina works long hours in the busy emergency department of a hospital. She drives to work. She is vegetarian, and eats a lot of fruit and vegetables.

**Hayley**

24 years old  
Ideal weight  
Does not smoke



Hayley is a fitness instructor and uses her bicycle to get around town. She has a glass of wine each evening. Her favourite snack is salted peanuts.

(a) Both Katrina and Hayley have some risk of developing heart disease.

Which person has the **highest** risk of heart disease?

Explain your answer.

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.....

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..... [2]

(b) Suggest **one** action that **Hayley** could take to reduce her risk of heart disease.

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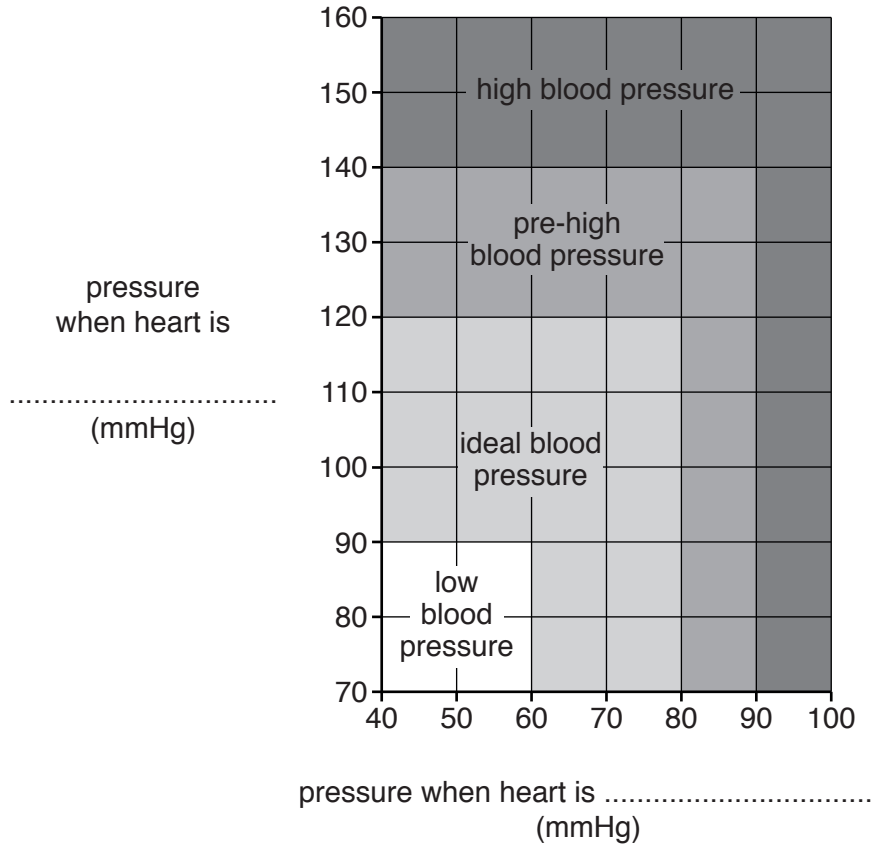
..... [1]

[Total: 3]

7 High blood pressure increases the risk of heart disease.

A person's blood pressure can be measured.

The graph below shows how blood pressure measurements are classified into categories.



(a) Complete the labels on the axes of the graph. [1]

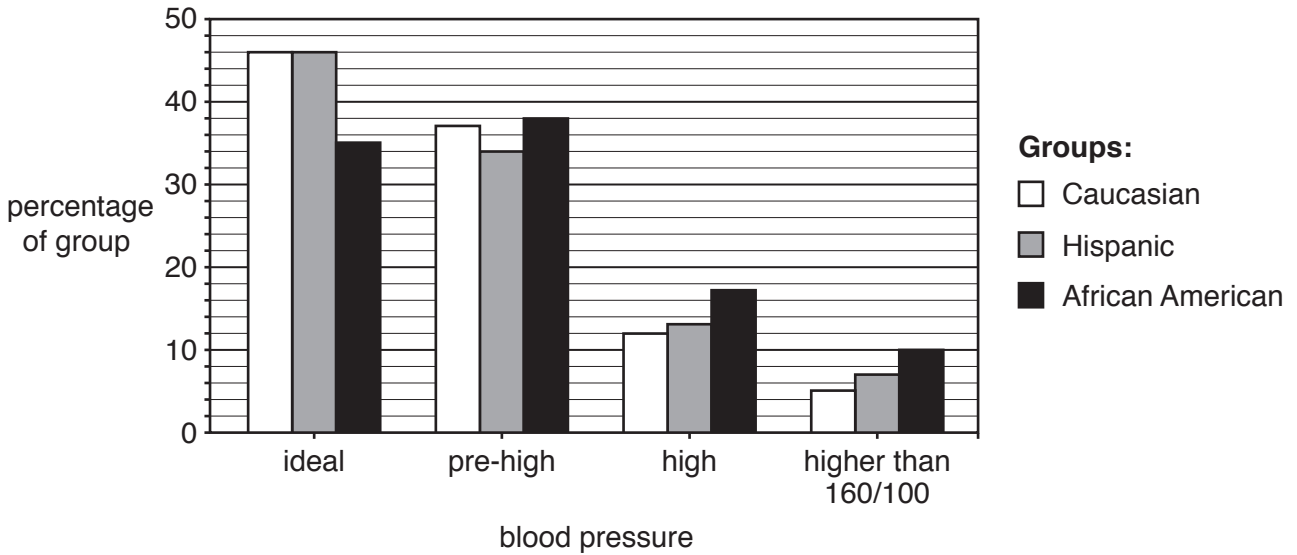
(b) Ali has high blood pressure. His blood pressure measurement is 150/90.

Ravi has ideal blood pressure. Estimate what his blood pressure measurement is likely to be.

blood pressure = 110/ ..... [1]

(c) A large study in the USA measured the blood pressures of three groups of people with different ethnic origins.

The results are shown in the graph on the opposite page.



(i) What percentage of the Caucasian group had ideal blood pressure?

percentage = ..... % [1]

(ii) What percentage of the African American group had a blood pressure measurement between 120/80 and 140/90?

Use both graphs to help you answer the question.

percentage = ..... % [1]

(iii) Each group contained 1000 people.

People with a blood pressure measurement higher than 160/100 have a very high risk of heart disease.

How many of the Hispanic people in the study have a very high risk of heart disease?

Show your working.

number of Hispanic people = ..... [2]

(iv) Which group of people has the **lowest** risk of developing heart disease?

Explain your answer.

.....

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.....

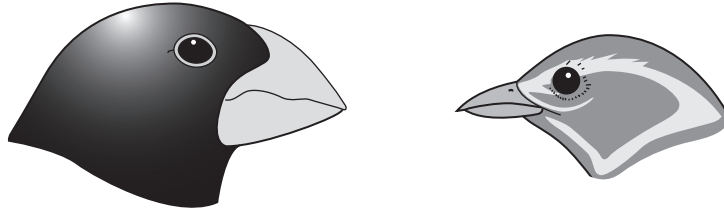
..... [2]

[Total: 8]

Turn over

8 Charles Darwin helped to develop the theory of evolution by natural selection.

He studied the Galápagos Islands finches, which have different beak sizes.



Darwin developed explanations based on observations. He also shared his ideas with other scientists.

Put **one** tick (✓) in each row of the table to show whether the statement describes an **observation**, an **explanation**, or an example of **sharing ideas** with other scientists.

|  | observation | explanation | sharing ideas |
|--|-------------|-------------|---------------|
| Some finches have larger beaks than others.  |             |             |               |
| Evolution happens because of variation and natural selection.                                  |             |             |               |
| Darwin noticed that finches with different sized beaks eat different types of food.            |             |             |               |
| There has been natural selection of finches with beak size better suited to their environment. |             |             |               |
| Darwin's book <i>On The Origin of Species</i> was published in 1859.                           |             |             |               |

[3]

[Total: 3]

- 9 A large tree makes lots of glucose on a warm, sunny day.

The glucose molecules contain carbon. The carbon is used by the tree's cells for chemical reactions and to make materials for growth.

Describe how this carbon can be recycled through the ground and the air so that it can eventually be used by another plant to make glucose.



*The quality of written communication will be assessed in your answer.*

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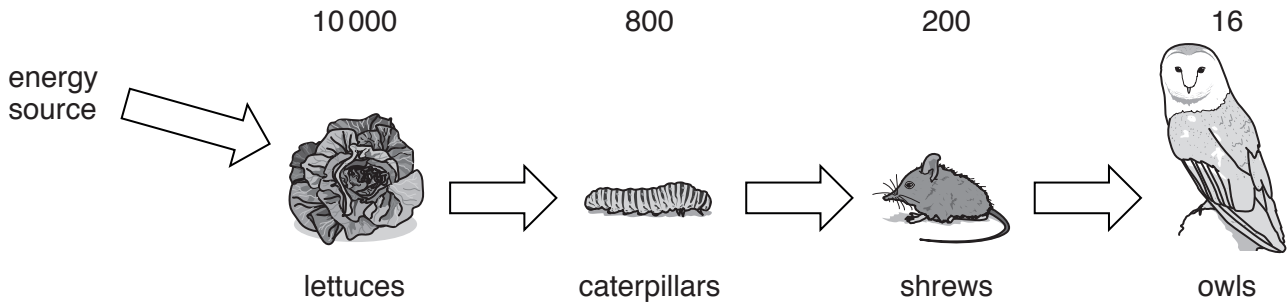
..... [6]

**[Total: 6]**

10 The diagram shows the transfer of energy through a food chain.

Each arrow represents an energy transfer.

Each number is the amount of energy stored in the population of organisms. The energy is measured in kJ per m<sup>2</sup> per year.



(a) What is the source of the energy absorbed by the lettuces?

Put a tick (✓) in the box next to the correct answer.

- the air
- a producer
- the soil
- a consumer
- the Sun

[1]

(b) How is energy transferred from the lettuces to the caterpillars?

..... [1]

(c) Not all of the energy stored in the lettuces is transferred to the caterpillars.

(i) Write down **two** ways that energy passes out of a food chain.

1 .....

2 ..... [2]

(ii) How much of the energy stored in the lettuces is **not** transferred to the caterpillars?

Show your working.

energy not transferred = .....kJ per m<sup>2</sup> per year [2]

(iii) The percentage efficiency of the energy transfer from the lettuces to the caterpillars is 8%.

Calculate the overall percentage efficiency of the energy transfer from the **lettuces** to the **owls**.

Show your working, and give your answer to **one** significant figure.

overall percentage efficiency = ..... % [2]

(d) Use ideas about energy to suggest why the owls are unlikely to have any predators.

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

[Total: 10]

**END OF QUESTION PAPER**

**ADDITIONAL ANSWER SPACE**

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

A large rectangular area with a solid vertical line on the left side and horizontal dotted lines across the rest of the page, providing space for writing answers.



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