

Please write clearly in block capitals.

Centre number

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# GCSE SCIENCE A BIOLOGY

# H

Higher Tier Unit Biology B1

Tuesday 16 May 2017

Afternoon

Time allowed: 1 hour

### Materials

For this paper you must have:

- a ruler.

You may use a calculator.

### Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

### Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 3(b) should be answered in continuous prose. In this question you will be marked on your ability to:
  - use good English
  - organise information clearly
  - use specialist vocabulary where appropriate.

### Advice

- In all calculations, show clearly how you work out your answer.

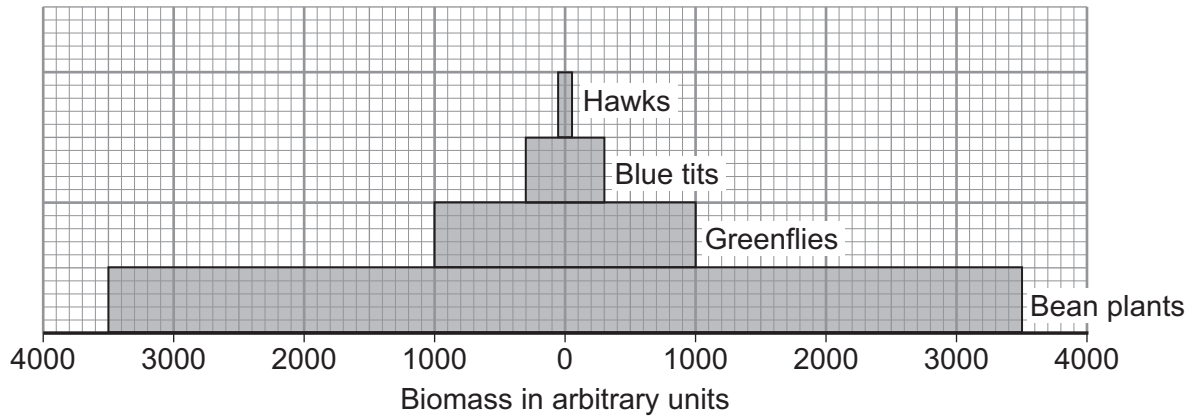
For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
<b>TOTAL</b>	



Answer **all** questions in the spaces provided.

- 1 **Figure 1** shows a pyramid of biomass for a food chain.

**Figure 1**



**Key**

 = 500 arbitrary units

- 1 (a) (i) Not all of the biomass of the bean plants is converted into the biomass of greenflies.

Calculate the biomass of bean plants that is **not** converted into the biomass of greenflies.

**[2 marks]**

Use information from **Figure 1**.

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Biomass = \_\_\_\_\_ arbitrary units



- 1 (a) (ii)** For every 10 grams of biomass eaten by the hawks, more than 8 grams of biomass are lost.

Give **one** way in which the biomass eaten by hawks is lost from the food chain.

**[1 mark]**

Tick (✓) **one** box.

Hawks reproduce

Hawks produce faeces

Hawks grow

Hawks feed on other birds

- 1 (b)** When the bean plants grow they gain biomass.

Complete the sentences.

**[2 marks]**

The bean plants gain biomass by the process of \_\_\_\_\_.

In this process, the bean plants make a carbohydrate called \_\_\_\_\_.

5

**Turn over for the next question**

**Turn over ►**



2 Charles Darwin developed the theory of evolution by natural selection in the 1800s.

2 (a) Describe the process of evolution by natural selection.

[3 marks]

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2 (b) In the 1870s, cartoons of Darwin looking like a monkey were published in magazines.  
The cartoons were published after Darwin wrote a book about his theory of evolution.

2 (b) (i) Suggest **one** reason why cartoons of Darwin looking like a monkey were drawn.

[1 mark]

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2 (b) (ii) Give **two** reasons why Darwin's theory of evolution by natural selection was only gradually accepted.

[2 marks]

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**3** The human body responds to changes in internal conditions and external conditions.

**3 (a)** The water and ion content of the body must be controlled.

Ions are lost from the body in different liquids from different organs.

**3 (a) (i)** Complete **Table 1** to show **two** ways ions are lost from the body.

**[4 marks]**

**Table 1**

Liquid	Organ
_____	_____
_____	_____

**3 (a) (ii)** How are the ions which are lost from the body replaced?

**[1 mark]**

\_\_\_\_\_

\_\_\_\_\_

**Question 3 continues on the next page**

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**3 (b)** In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

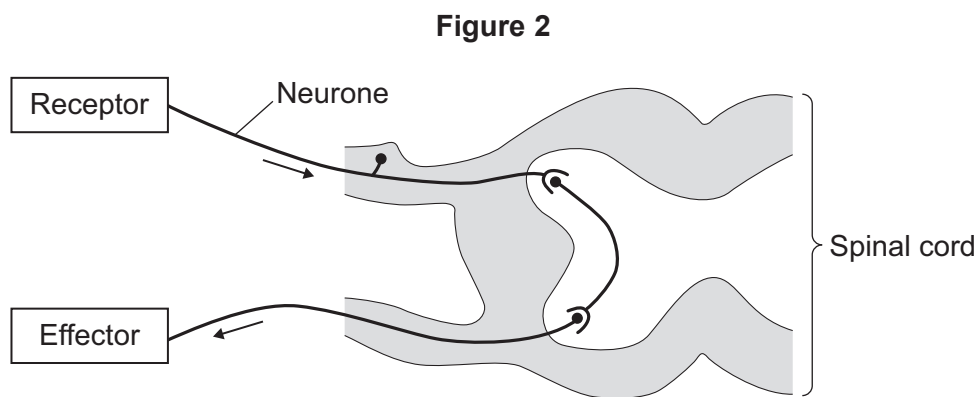
Reflexes allow humans to respond to stimuli (changes in the environment).

One example of a reflex is when a finger touches a hot kettle and the arm is pulled away.

Sense organs contain receptors that detect stimuli.

Effectors are muscles or glands which respond.

**Figure 2** is a diagram of a simple reflex pathway.



Describe how a simple reflex works.

Your answer should include:

- one type of receptor and the stimulus that the receptor detects
- how information is passed from the receptor to the effector.

**[6 marks]**

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Extra space \_\_\_\_\_

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**Turn over for the next question**

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4 Plants, animals and microorganisms are involved in the carbon cycle.

Describe how **living plants** are involved in the carbon cycle.

[4 marks]

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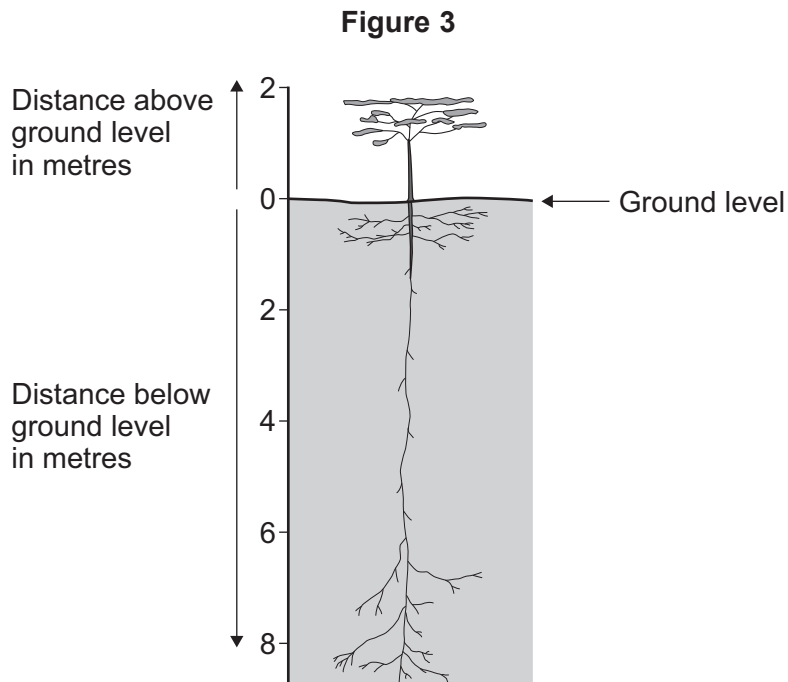
4





5 Plants and animals living in hot, dry habitats have adaptations to survive.

5 (a) **Figure 3** shows an acacia tree.



5 (a) (i) Describe the root system of the acacia tree, shown in **Figure 3**.

Suggest how the root system helps the acacia tree to survive in dry habitats.

[3 marks]

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Question 5 continues on the next page

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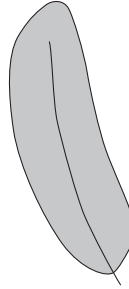
- 5 (a) (ii) **Figure 4** shows one leaf from an acacia tree and one leaf from a tree that lives in a cool, moist habitat. The leaves are drawn to the same scale.

**Figure 4**

**One leaf from an acacia tree  
living in a hot, dry habitat**



**One leaf from a tree  
living in a cool, moist habitat**



Use information from **Figure 4** to suggest how the leaf of the acacia tree helps the tree to survive in hot, dry habitats.

**[2 marks]**

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- 5 (b) The branches of acacia trees have long, sharp thorns.

What is the advantage to the tree of having long, sharp thorns?

**[1 mark]**

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5 (c) Most animals store fat in their bodies.

5 (c) (i) Suggest **one** reason why animals store fat.

[1 mark]

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5 (c) (ii) **Figure 5** shows a camel and a llama.

Camels live in hot environments. Llamas live in cold environments.

**Figure 5**

**Camel**



**Llama**



**Table 2** gives information about stored fat in a camel and in a llama.

**Table 2**

	Percentage of body mass which is stored fat	Part of the body where most fat is stored
Camel	21	In the hump
Llama	20	In a layer under the skin

Suggest why most of the fat is found in different parts of the body of the two animals.

[2 marks]

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Turn over ►



**6 (a)** Tuberculosis (TB) is an infectious disease caused by a bacterium.

A person can be vaccinated against TB.

The vaccine contains the TB bacterium.

**6 (a) (i)** Describe the difference between the bacteria in the vaccine and the bacteria that cause the disease.

**[1 mark]**

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**6 (a) (ii)** **Table 3** shows antibody production in a non-vaccinated person and a vaccinated person when infected with TB bacteria.

**Table 3**

	<b>Number of antibodies produced</b>	<b>Speed of antibody production</b>
Non-vaccinated person	Few	Slow
Vaccinated person	Many	Very fast

Explain the differences in antibody production shown in **Table 3**.

**[2 marks]**

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**6 (b)** Bacteria may mutate and become resistant to an antibiotic.

**Table 4** shows how the percentages of non-resistant and resistant strains in the population of bacteria change over time when an antibiotic is used.

**Table 4**

Number of generations of bacteria	Percentage (%) in population of bacteria	
	Non-resistant strain	Resistant strain
5	99	1
50	95	5
500	80	20
5 000	60	40
50 000	30	70

**6 (b) (i)** Why does the percentage of the resistant strain in the population of bacteria change?

**[3 marks]**

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**6 (b) (ii)** Suggest why antibiotics should **not** be used to treat some people who have sore throats.

**[2 marks]**

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7 Reproduction may be sexual or asexual.

7 (a) Describe **one** advantage to a species of sexual reproduction rather than asexual reproduction.

[1 mark]

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7 (b) Mitochondria contain genes. The genes control some of the reactions in respiration.

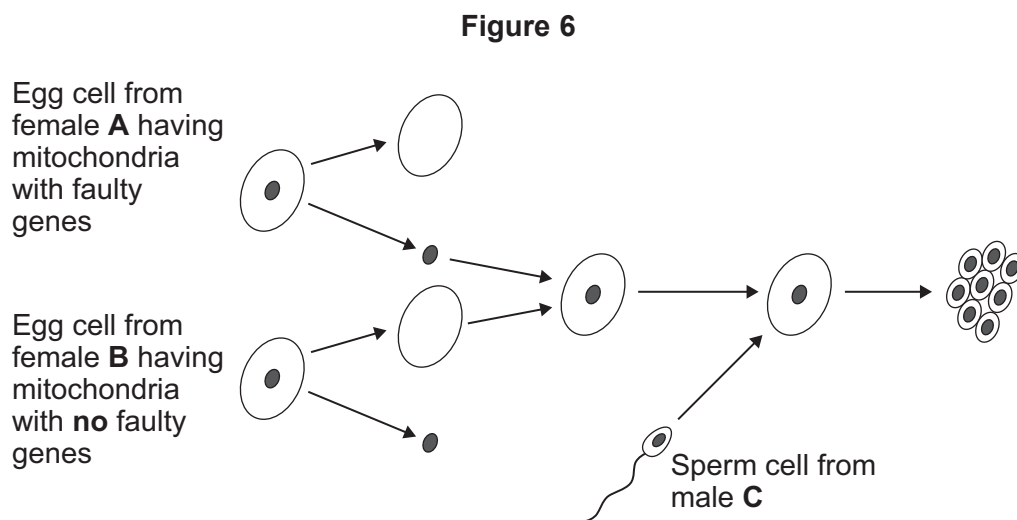
In a person with mitochondrial disease, genes in the mitochondria are faulty. The person may have muscle weakness, blindness and heart failure.

In human reproduction, an embryo will have mitochondria from the cytoplasm of the mother's egg cell.

Scientists have developed a way of solving the problem of a child inheriting mitochondrial disease.

**Figure 6** shows the process.

The cells involved come from three different people, **A**, **B** and **C**.



7 (b) (i) Describe the process shown in **Figure 6**.

Use your knowledge of sexual reproduction and adult cell cloning.

[4 marks]

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7 (b) (ii) Explain why the embryo formed from the process shown in **Figure 6** will **not** have mitochondrial disease.

[2 marks]

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7 (b) (iii) Suggest **one** ethical objection to this process being used for reproduction in humans.

[1 mark]

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Turn over for the next question

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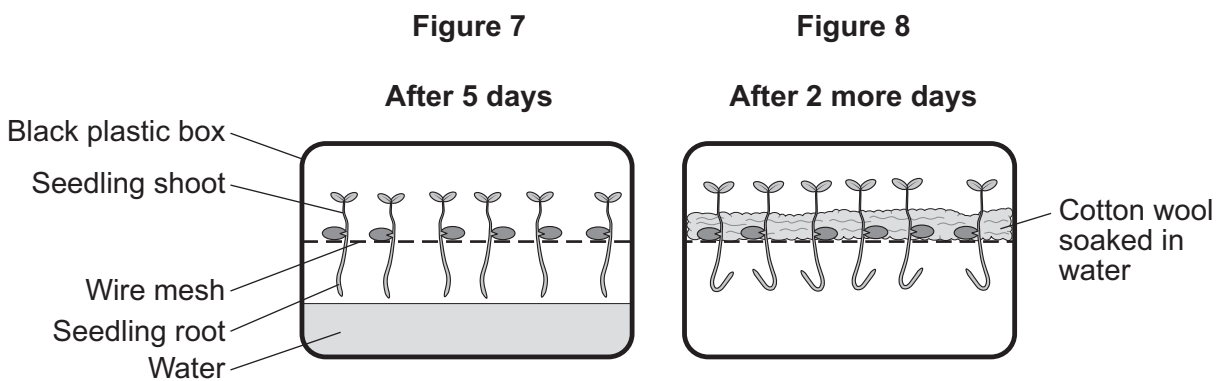


8 Students investigated the sensitivity of plants to different stimuli.

The students:

- put cress seeds onto wire mesh above some water in a black plastic box which did not allow light to enter
- left the seeds to grow in darkness for 5 days
- poured out the water after the 5 days
- then put cotton wool soaked in water on top of the wire mesh
- left the seedlings for 2 more days.

Figure 7 and Figure 8 show the results of the investigation.



8 (a) Shoots are sensitive to light and gravity.

What conclusions can you make about the growth of the seedling shoots in response to light **and** gravity from the results shown in **Figure 7**?

Explain why you made these conclusions.

[3 marks]

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**8 (b)** One student said:

“Roots are sensitive to the stimuli of gravity and moisture.”

Explain which of these two stimuli is more important to the growth of roots.

Refer to the results shown in **Figure 7** and **Figure 8**.

**[2 marks]**

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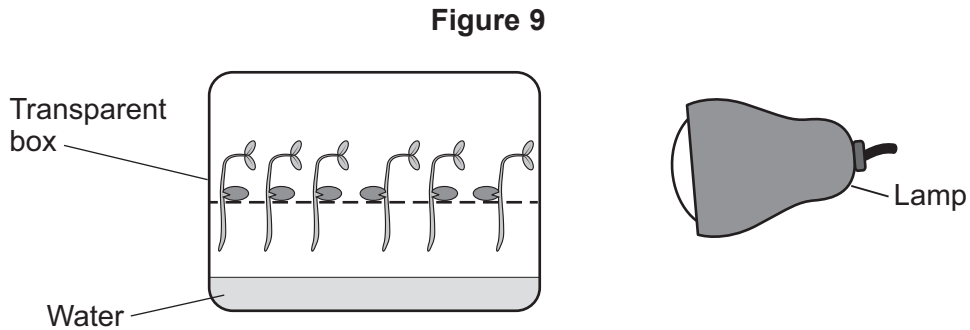
**Question 8 continues on the next page**

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**8 (c)** In a different investigation students grew cress seeds in a transparent box. The students directed light from a lamp on to one side of the box.

**Figure 9** shows the results after 7 days.



**8 (c) (i)** Explain what caused the seedling shoots to grow in the way shown in **Figure 9**. **[2 marks]**

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**8 (c) (ii)** What is the advantage to the cress seedlings of the response to light shown in **Figure 9**? **[2 marks]**

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**END OF QUESTIONS**



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