

Please write clearly in block capitals.

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# GCSE SCIENCE A BIOLOGY

# H

Higher Tier Unit Biology B1

Tuesday 17 May 2016

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 2 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.



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

**1** Nicotine and alcohol are drugs that affect the brain.

**1 (a) (i)** What is the correct description of both nicotine and alcohol?

**[1 mark]**

Tick (✓) **one** box.

illegal, medical drugs

illegal, recreational drugs

legal, medical drugs

legal, recreational drugs

**1 (a) (ii)** Why do people find it difficult to stop smoking?

**[1 mark]**

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**1 (b)** A drug company has developed a new drug which helps people to stop smoking. The new drug prevents the feeling of pleasure caused by nicotine in the smoke.

The new drug is now being tested on rats which have been given a lot of alcohol to drink.

The company wants to find out if the drug can help people to stop drinking alcohol.

**1 (b) (i)** It is important that the tests on rats are done by an independent company.

What is meant by an independent company?

**[1 mark]**

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**1 (b) (ii)** Why is it important that the tests are done by an independent company?

**[1 mark]**

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**1 (b) (iii)** Some scientists believe that the part of the brain sensitive to alcohol is the same as the part of the brain sensitive to nicotine.

Explain why the new drug might be useful for treating people who find it difficult to stop drinking alcohol.

**[2 marks]**

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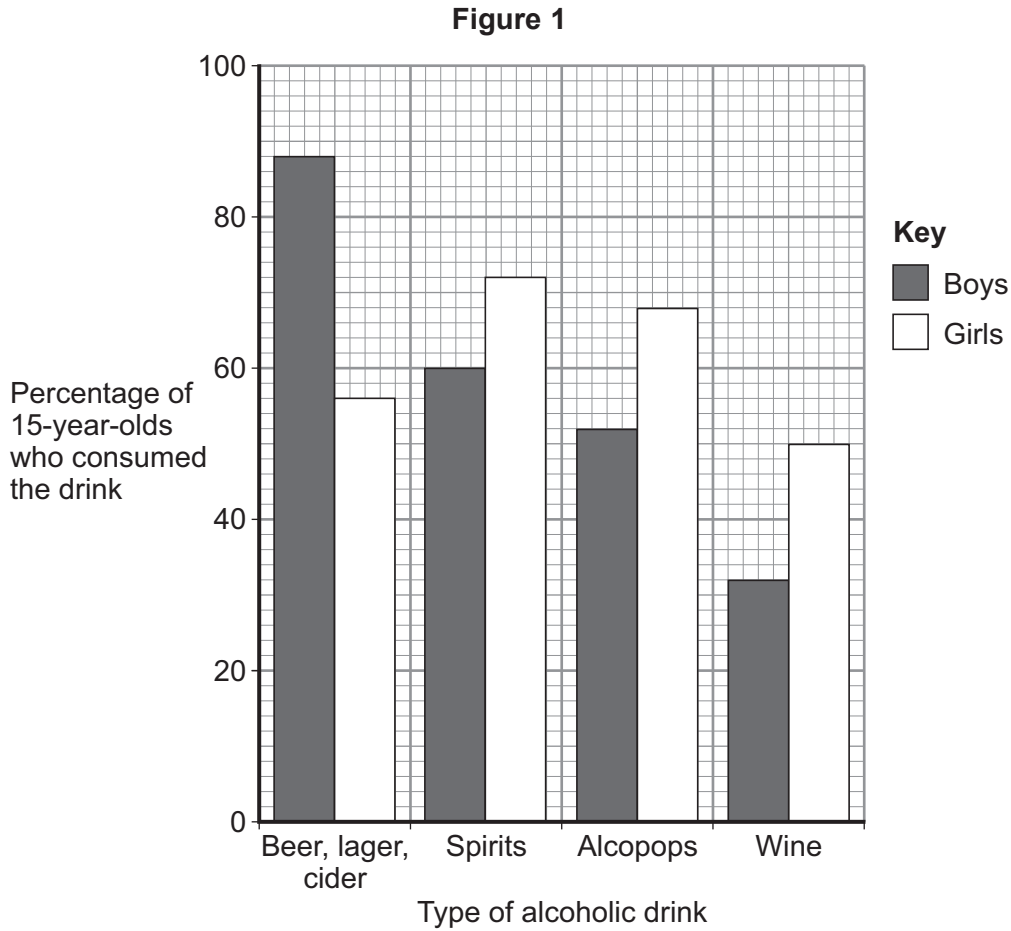
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**Question 1 continues on the next page**

**Turn over ►**



1 (c) **Figure 1** shows the results of a survey into the different types of alcoholic drinks consumed by one hundred 15-year-old boys and one hundred 15-year-old girls in the UK.



1 (c) (i) Describe the differences between the **types** of alcoholic drink consumed by boys and by girls.

Use **only** information from **Figure 1**.

[2 marks]

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1 (c) (ii) A newspaper headline stated:

**“All boys drink alcohol”**

Use information from part (c) and **Figure 1** to give **one** reason why the newspaper headline may **not** be correct.

[1 mark]

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3 Students investigated decomposition.

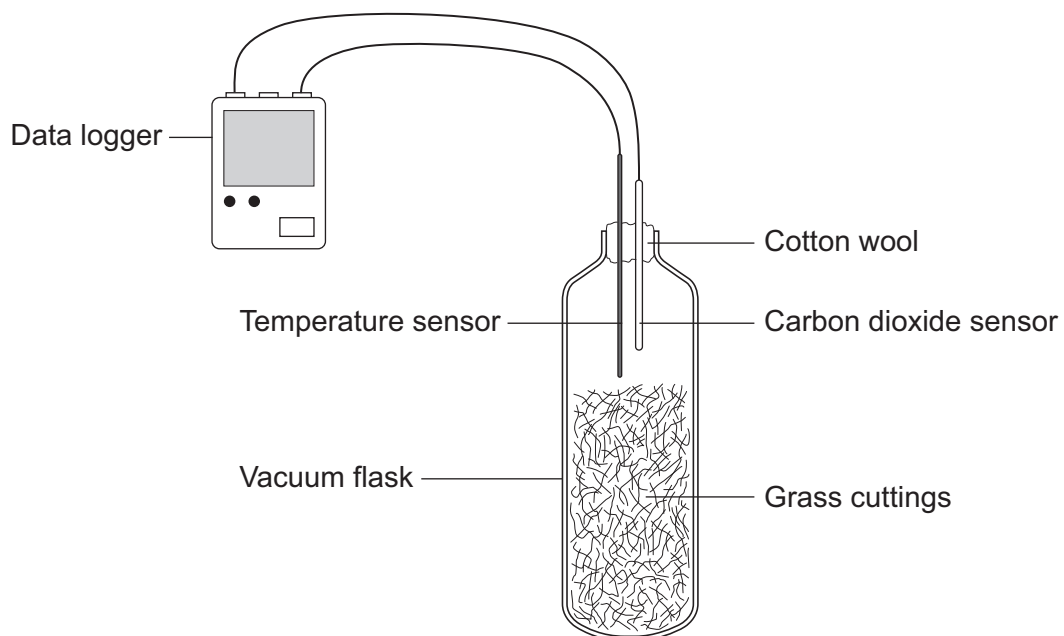
The students:

- put some decaying grass cuttings into a vacuum flask
- put a carbon dioxide sensor and a temperature sensor in the flask
- attached the sensors to a data logger
- closed the flask with cotton wool.

A vacuum flask was used to reduce the loss of thermal energy.

Figure 2 shows the investigation.

Figure 2



3 (a) Give **one** advantage of using a temperature sensor attached to a data logger instead of a thermometer.

[1 mark]

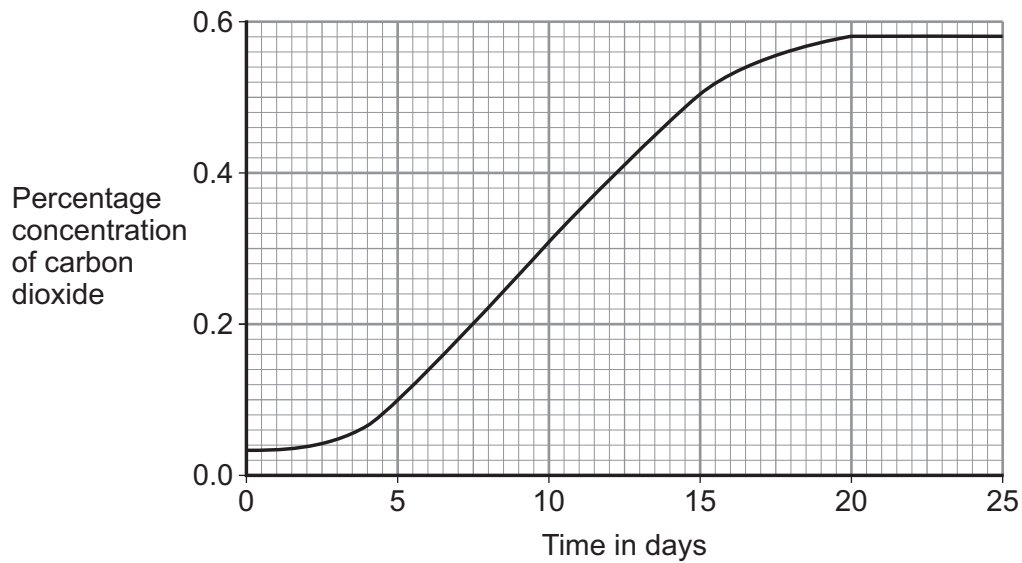
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- 3 (b)** Figure 3 shows the results from the data logger for carbon dioxide concentration in the flask for the next 25 days.

**Figure 3**



- 3 (b) (i)** Why did the concentration of carbon dioxide in the flask increase?

**[3 marks]**

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- 3 (b) (ii)** Suggest what has happened in the flask to cause the carbon dioxide concentration to level off after 20 days.

**[1 mark]**

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**4** This question is about the nervous system.

**4 (a)** Describe the difference between the function of a receptor and the function of an effector.

In your answer you should give **one** example of a receptor and **one** example of an effector.

**[4 marks]**

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**4 (b)** Synapses are important in the nervous system.

**4 (b) (i)** What is a synapse?

**[2 marks]**

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**4 (b) (ii)** Describe how information passes across a synapse.

**[2 marks]**

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4 (c) Reflexes may be co-ordinated by the brain or by the spinal cord.

4 (c) (i) The reflexes from sense organs in the head are co-ordinated by the brain.

Name a sense organ involved in a reflex co-ordinated by the spinal cord.

[1 mark]

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4 (c) (ii) **Table 1** shows information about reflexes co-ordinated by the brain and reflexes co-ordinated by the spinal cord.

**Table 1**

Organ co-ordinating the reflex	Mean length of neurones involved in cm	Mean time taken for reflex in milliseconds	Mean speed of impulse in cm per millisecond
Brain	12	4	3
Spinal cord	80	50	

Calculate the mean speed of the impulse for the reflex co-ordinated by the spinal cord.

[1 mark]

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Mean speed = \_\_\_\_\_ cm per millisecond

4 (c) (iii) In reflexes co-ordinated by the brain there are **no** relay neurones.

Suggest why there is a difference in the mean speed of the impulse for the two reflexes.

[2 marks]

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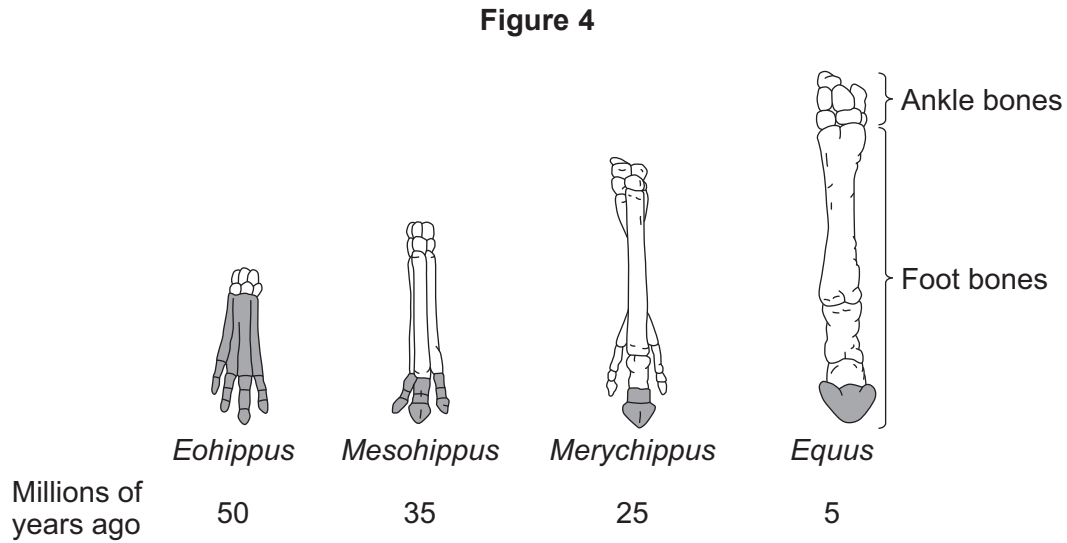
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5 **Figure 4** shows changes in the foot bones of four ancestors of modern horses over the past 50 million years.



**Key:** The shaded bones are the bones which touched the ground.

5 (a) Describe **two** changes to the bones in the feet of horses that have taken place over the past 50 million years.

[2 marks]

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5 (b) *Eohippus* lived in swampy areas with soft mud.

Since this time the ground in the habitat has become drier and harder.

All of the horse ancestors were preyed upon by other animals.

5 (b) (i) Explain **one** advantage to *Eohippus* of the arrangement of bones in its feet.

[2 marks]

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**5 (b) (ii)** The changes in the arrangement of the foot bones of horses support Darwin's theory of evolution by natural selection.

Explain how the arrangement of the foot bones of *Eohippus* could have evolved into the arrangement of the foot bones of *Equus*.

**[4 marks]**

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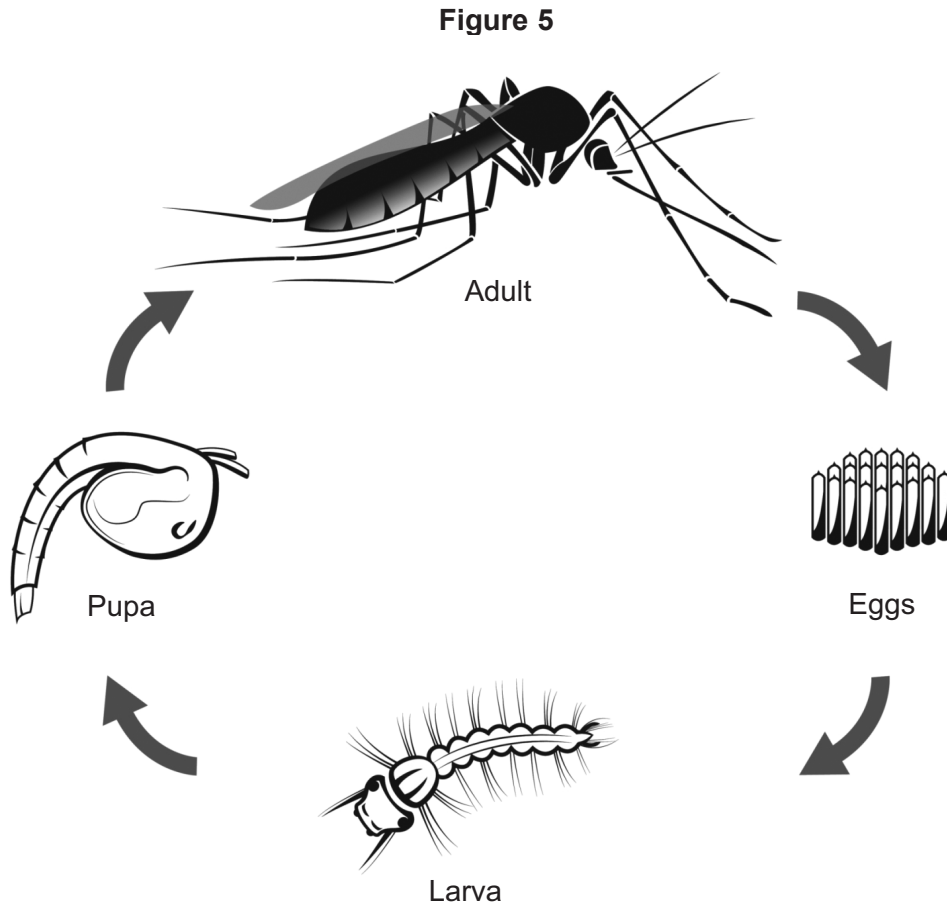
**Turn over for the next question**

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- 6 Malaria is a disease caused by a microorganism carried by mosquitoes. The microorganism is transferred to humans when adult female mosquitoes feed on human blood.

Figure 5 shows the life cycle of a mosquito.



The World Health Organisation estimates that  $3 \times 10^8$  people are infected with malaria every year.

Scientists estimate that malaria kills  $2 \times 10^6$  people every year.

The people who are infected with malaria but do not die, may be seriously ill and need health care for the rest of their lives.

- 6 (a) Based on the estimated figures, what percentage of people infected with malaria die from the disease?

[2 marks]

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- 6 (b)** An internet article states:
- 1 Mosquito larvae are at the start of the food chain for some fish.
  - 2 Adult mosquitoes provide food for bats and birds.
  - 3 Mosquitoes are also important in plant reproduction because they feed from flowers of crop plants.

**6 (b) (i)** The first sentence in the article is **not** correct.

Explain why.

**[2 marks]**

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**6 (b) (ii)** A company plans to produce genetically modified (GM) adult male mosquitoes. The GM mosquitoes will carry a gene from bacteria. The gene causes the death of offspring before they become adults.

Male mosquitoes do **not** feed on blood.

Scientists are considering releasing millions of adult male GM mosquitoes into the wild.

Do you think scientists should release millions of male GM mosquitoes into the wild?

In your answer you should give advantages and disadvantages of releasing GM mosquitoes into the wild.

**[4 marks]**

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**Question 6 continues on the next page**

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**6 (b) (iii)** Describe the process for creating a GM mosquito.

**[3 marks]**

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11



7 Students investigated a food chain in a garden.

lettuce     $\longrightarrow$     snail     $\longrightarrow$     thrush (bird)

The students:

- estimated the number of lettuce plants in the garden
- estimated the number of snails feeding on the lettuces
- counted two thrushes in the garden in 5 hours.

**Table 2** shows the students' results and calculations.

**Table 2**

Organism	Population size	Mean mass of each organism in g	Biomass of population in g	Biomass from previous organism that is lost in g	Percentage of biomass lost
Lettuce	50	120.0	6000		
Snail	200	2.5	500	5500	91
Thrush	2	85.0	170	330	66

7 (a) (i) Give **two** ways that biomass is lost along a food chain.

**[2 marks]**

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7 (a) (ii) Scientists estimate that about 90% of the biomass in food is lost at each step in a food chain.

Suggest **one** reason why the students' value for the percentage of biomass lost between the snails and the thrushes is only 66%.

**[1 mark]**

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**Question 7 continues on the next page**

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7 (b) (i) **Figure 7** is a scatter graph.

Why is a scatter graph used for this data?

[1 mark]

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7 (b) (ii) Compare the general appearance of snails that live in woodlands with the general appearance of snails that live in grasslands.

[2 marks]

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7 (b) (iii) Suggest a reason for the general appearance of snails that live in woodlands.

[1 mark]

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7 (c) Snails are **not** used as indicator species as they cannot give us information about pollution levels.

7 (c) (i) Name **one** type of animal that can be used as an indicator species.  
State the environmental factor that the animal indicates.

[1 mark]

Indicator species \_\_\_\_\_

Environmental factor \_\_\_\_\_

7 (c) (ii) Give **one** different method of measuring the environmental factor you gave in part (c)(i).  
[1 mark]

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END OF QUESTIONS



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