

Please write clearly in block capitals.

Centre number

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Candidate number

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Candidate signature

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# GCSE ADDITIONAL SCIENCE BIOLOGY

# H

Higher Tier Unit Biology B2

Friday 10 June 2016

Morning

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.



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ANSWER IN THE SPACES PROVIDED**

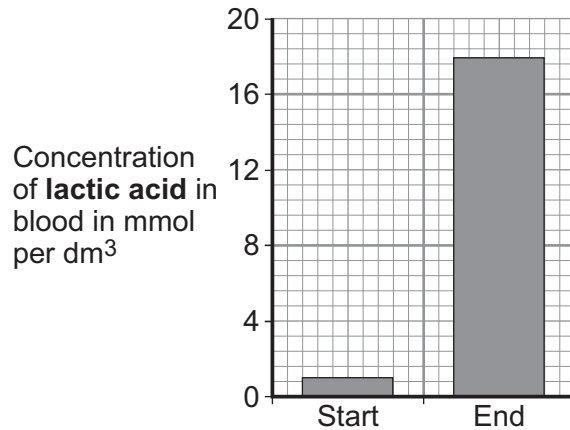
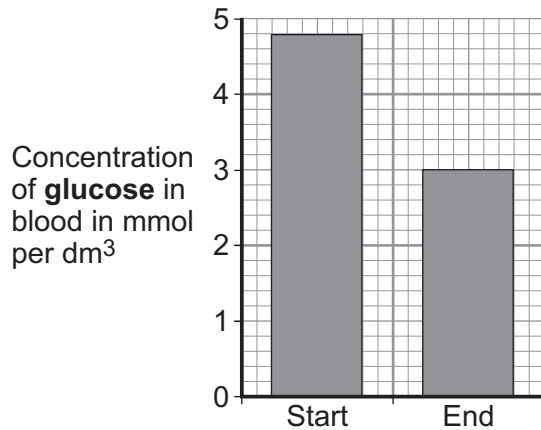


Answer **all** questions in the spaces provided.

**1** An athlete ran as fast as he could until he was exhausted.

**1 (a)** **Figure 1** shows the concentrations of glucose and of lactic acid in the athlete's blood at the start and at the end of the run.

**Figure 1**



**1 (a) (i)** Lactic acid is made during anaerobic respiration.

What does anaerobic mean?

[1 mark]

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**1 (a) (ii)** Give evidence from **Figure 1** that the athlete respired anaerobically during the run.

[1 mark]

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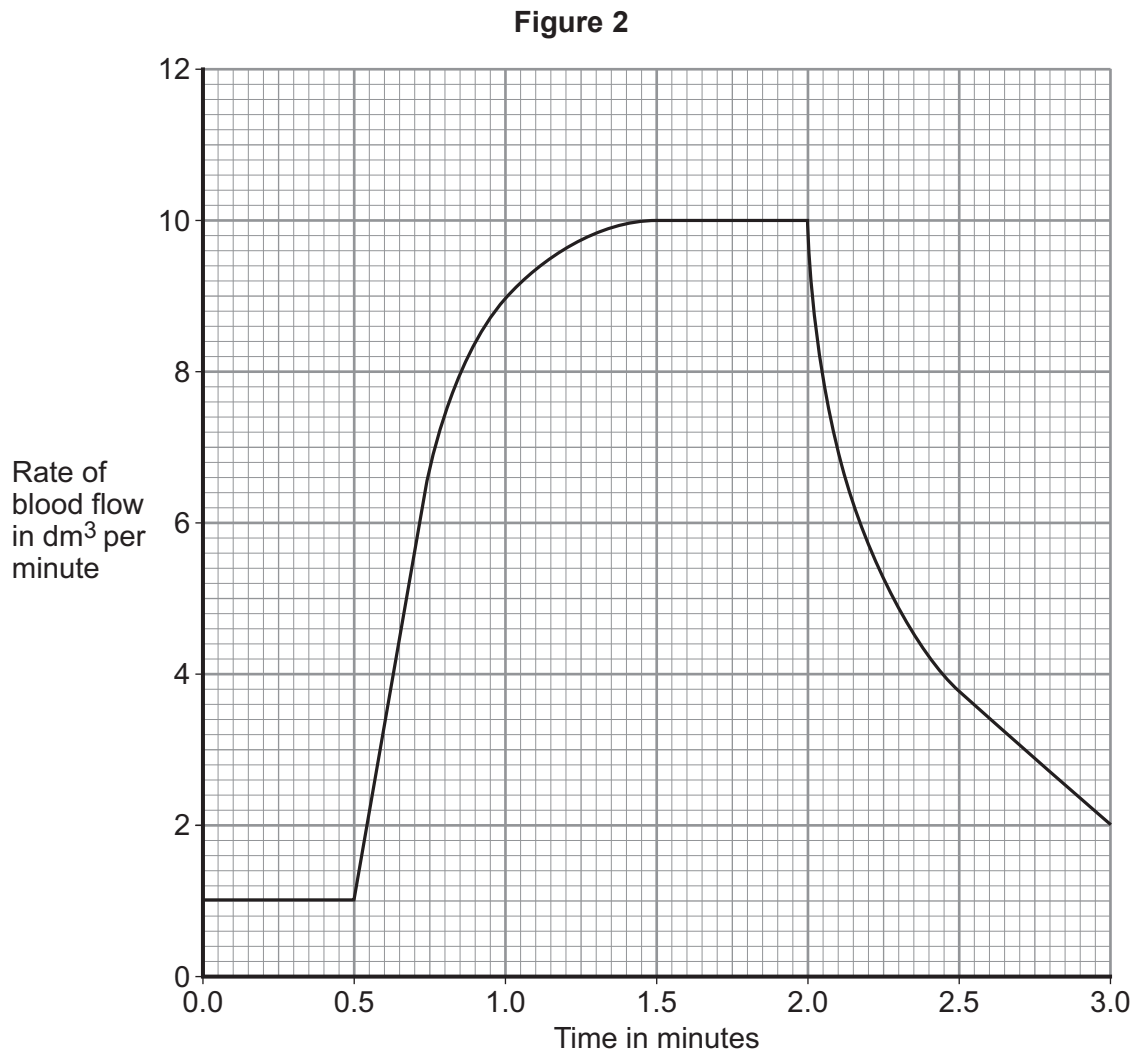
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**Question 1 continues on the next page**

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- 1 (b) **Figure 2** shows the effect of running on the rate of blood flow through the athlete's muscles.



- 1 (b) (i) For how many minutes did the athlete run?

[1 mark]

Time = \_\_\_\_\_ minutes

- 1 (b) (ii) Describe what happens to the rate of blood flow through the athlete's muscles during the run.

Use data from **Figure 2** in your answer.

[2 marks]

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**1 (b) (iii)** Explain how the change in blood flow to the athlete's muscles helps him to run.

**[4 marks]**

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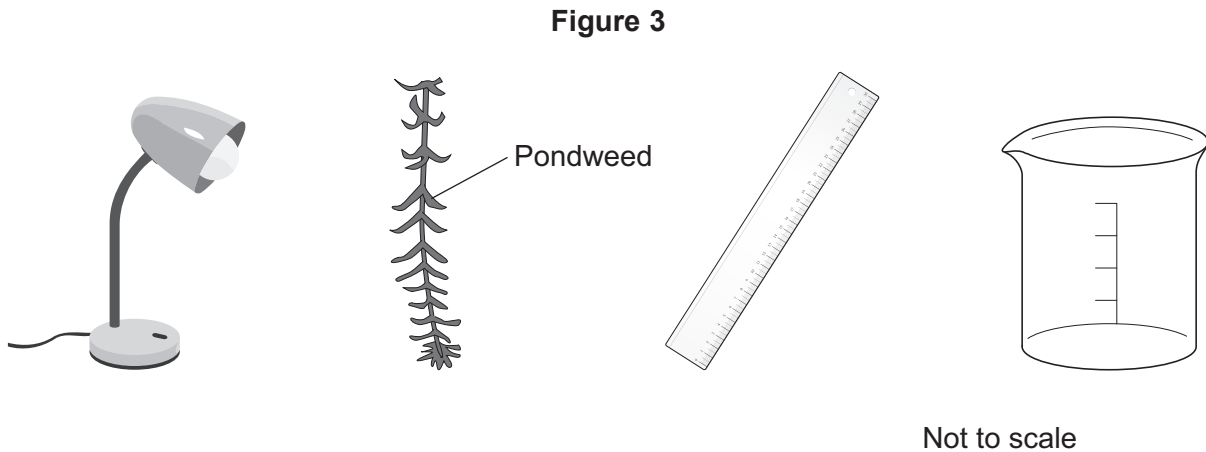


2 In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Light intensity, carbon dioxide concentration and temperature are three factors that affect the rate of photosynthesis.

How would you investigate the effect of **light intensity** on the rate of photosynthesis?

Figure 3 shows some of the apparatus you might use.



You should include details of:

- how you would set up the apparatus and the materials you would use
- the measurements you would make
- how you could make this a fair test.

**[6 marks]**

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3 Enzymes are made and used in all living organisms.

3 (a) What is an enzyme?

[2 marks]

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3 (b) Many enzymes work inside cells.

In which part of a cell will most enzymes work?

[1 mark]

Draw a ring around the correct answer.

cell membrane

cytoplasm

nucleus

3 (c) We can also use enzymes in industry.

Hydrogen peroxide is a chemical that can be used to preserve milk.

Adding a small amount of hydrogen peroxide to the milk kills the bacteria that cause decay. Hydrogen peroxide does not kill all disease-causing bacteria.

The enzyme catalase can be added later to break down the hydrogen peroxide to oxygen and water.

A different way of preserving the milk is by heating it in large machines to 138 °C for a few seconds.

Suggest **one** advantage and **one** disadvantage of using hydrogen peroxide and catalase to preserve milk instead of using heat treatment.

[2 marks]

Advantage of hydrogen peroxide and catalase \_\_\_\_\_

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Disadvantage of hydrogen peroxide and catalase \_\_\_\_\_

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4 The stomach is an organ.

4 (a) To which organ system does the stomach belong?

[1 mark]

The \_\_\_\_\_ system

4 (b) The stomach wall contains the following types of tissue:

- epithelial tissue
- glandular tissue
- muscular tissue.

4 (b) (i) What is the function of epithelial tissue in the stomach?

[1 mark]

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4 (b) (ii) Describe the functions of glandular tissue in the stomach.

[3 marks]

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4 (b) (iii) Describe how muscular tissue helps the stomach to function.

[2 marks]

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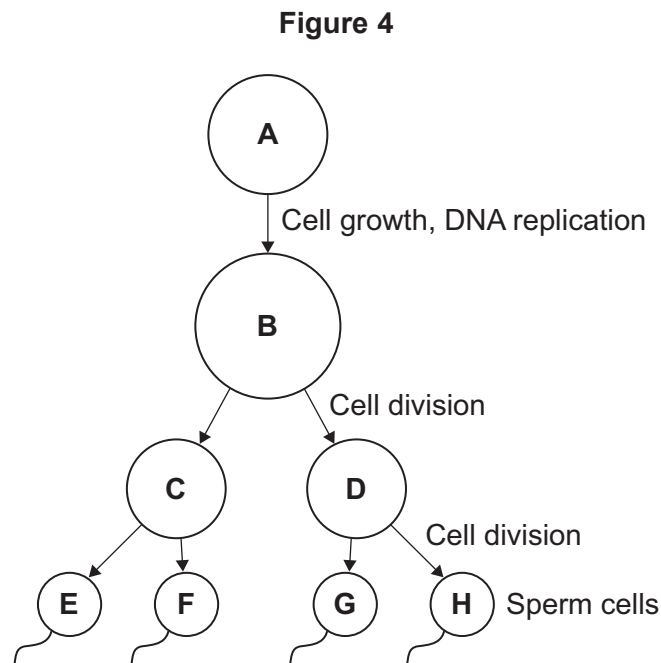
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5 **Figure 4** shows the production of human sperm cells.



5 (a) Name the organ where the processes shown in **Figure 4** take place.

[1 mark]

\_\_\_\_\_

5 (b) (i) Not every cell in **Figure 4** contains the same amount of DNA.

Cell **A** contains 6.6 picograms of DNA (1 picogram =  $10^{-12}$  grams).

How much DNA is there in each of the following cells?

[2 marks]

Cell **B** \_\_\_\_\_ picograms

Cell **C** \_\_\_\_\_ picograms

Cell **E** \_\_\_\_\_ picograms

5 (b) (ii) How much DNA would there be in a fertilised egg cell?

[1 mark]

\_\_\_\_\_ picograms

5 (b) (iii) A fertilised egg cell divides many times to form an embryo.

Name this type of cell division.

[1 mark]

\_\_\_\_\_



**5 (c)** After a baby is born, stem cells may be collected from the umbilical cord. These can be frozen and stored for possible use in the future.

**5 (c) (i)** What are stem cells?

**[2 marks]**

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**5 (c) (ii)** Suggest why it is ethically more acceptable to take stem cells from an umbilical cord instead of using stem cells from a 4-day-old embryo produced by In Vitro Fertilisation (IVF).

**[1 mark]**

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**5 (c) (iii)** Stem cells taken from a child's umbilical cord could be used to treat a condition later in that child's life.

Give **one** advantage of using the child's own umbilical cord stem cells instead of using stem cells donated from another person.

**[1 mark]**

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**5 (c) (iv)** Why would it **not** be possible to treat a genetic disorder in a child using his own umbilical cord stem cells?

**[1 mark]**

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**6 (a)** Polydactyly is an inherited condition caused by a dominant allele.

**Figure 5** shows the hand of a man with polydactyly. The man has an extra finger on each hand.

The man's mother also has polydactyly but his father does not.

**Figure 5**



**6 (a) (i)** The man is **heterozygous** for polydactyly.

Explain how the information given above shows that the man is **heterozygous** for polydactyly.

**[3 marks]**

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**6 (a) (ii)** The man marries a woman who does **not** have polydactyly.

What is the probability that their first child will have polydactyly?

**[1 mark]**

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**6 (b)** The man has red hair. His sister has brown hair.

Both of their parents have brown hair.

Brown hair is caused by the dominant allele, **B**.

Red hair is caused by a recessive allele, **b**.

Complete the genetic diagram below to show how the man's parents were able to have some children with red hair and some with brown hair.

**[5 marks]**

	<b>Father</b>	<b>Mother</b>
Parental phenotypes:	_____	_____
Parental genotypes:	_____	_____
Gametes:	_____	_____

Offspring genotypes: \_\_\_\_\_

Offspring phenotypes: \_\_\_\_\_

_____
<b>9</b>

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7 Some students wanted to estimate the number of plantain plants in a grassy field.

The field measured 100 metres  $\times$  50 metres.

The students:

- chose areas where plantains were growing
- placed 10 quadrats in these areas
- counted the number of plantains in each of the 10 quadrats.

Each quadrat measured 25 cm  $\times$  25 cm.

**Table 1** shows the students' results.

**Table 1**

Quadrat number	Number of plantain plants
1	2
2	1
3	4
4	1
5	3
6	2
7	4
8	1
9	1
10	1

7 (a) Complete the following calculation to estimate the number of plantain plants in the field.

Use the students' results from **Table 1**.

**[3 marks]**

Total number of plantains in 10 quadrats = \_\_\_\_\_

Total area of 10 quadrats = \_\_\_\_\_ m<sup>2</sup>

Mean number of plantains per m<sup>2</sup> = \_\_\_\_\_

Area of field = \_\_\_\_\_ m<sup>2</sup>

Therefore estimated number of plantains in field = \_\_\_\_\_



**7 (b)** The students' method would **not** give a valid estimate of the number of plantain plants in the field.

Describe **three** improvements you could make to the students' method.

For each improvement, give the reason why your method would produce more valid results than the students' method.

**[3 marks]**

Improvement 1 \_\_\_\_\_

Reason \_\_\_\_\_

\_\_\_\_\_

Improvement 2 \_\_\_\_\_

Reason \_\_\_\_\_

\_\_\_\_\_

Improvement 3 \_\_\_\_\_

Reason \_\_\_\_\_

\_\_\_\_\_

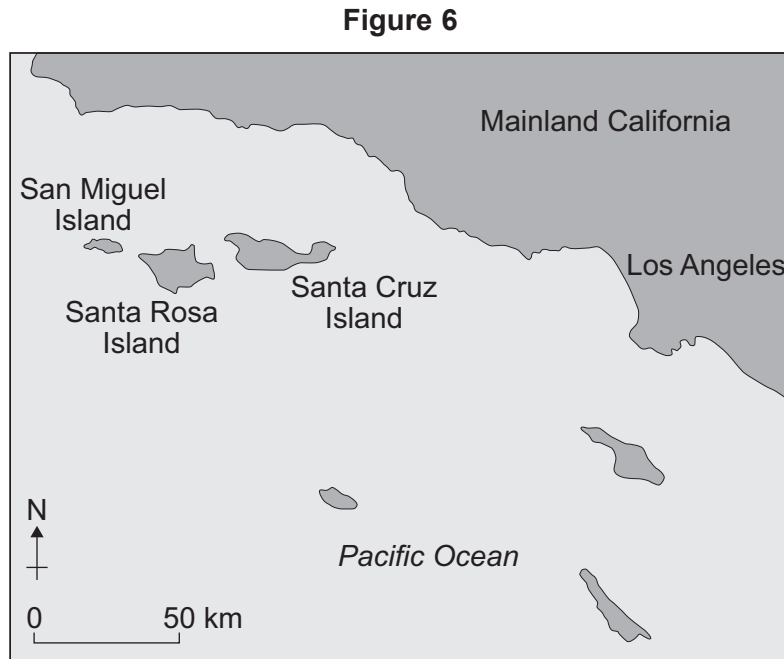
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- 8 **Figure 6** is a map showing a group of islands in the Pacific Ocean, near the coast of California, USA.



A species of fox, called the Island Fox, lives on each of the six islands shown in **Figure 6**.

**Figure 7** shows an Island Fox.

**Figure 7**



The foxes on each island are slightly different from those on the other islands.

The Island Foxes are similar to another species of fox, called the Grey Fox.

The Grey Fox lives in mainland California.





**8 (a)** Suggest how scientists could prove that the six types of Island Fox belong to the same species.

**[2 marks]**

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**8 (b)** Scientists believe that ancestors of the modern Island Fox first colonised what is now Santa Cruz Island during the last Ice Age, approximately 16 000 years ago. At that time, lowered sea levels made the three northernmost islands into a single island and the distance between this island and the mainland was reduced to about 8 km.

**8 (b) (i)** How could the Island Fox have developed into a completely different species from the mainland Grey Fox?

**[5 marks]**

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**8 (b) (ii)** Suggest why the Island Foxes have developed into different varieties of the same species instead of six different species.

[1 mark]

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**END OF QUESTIONS**



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