Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

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

AQA

General Certificate of Secondary Education
Higher Tier
June 2015

Additional Science
Unit Biology B2

BL2HP

H

Biology
Unit Biology B2

Tuesday 12 May 2015 1.30 pm to 2.30 pm

For this paper you must have:
- a ruler.

You may use a calculator.

A

Time allowed
- 1 hour

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 Lipase is an enzyme that digests fat.

1 (a) (i) Complete the equation to show the digestion of fat.

Use the correct answer from the box.

[1 mark]

glucose	**glycerol**	**glycogen**

fat $\xrightarrow{\text{lipase}}$ fatty acids + ...

1 (a) (ii) Name **one** organ that makes lipase.

[1 mark]

.....

1 (b) Some students investigated the effect of bile on the digestion of fat by lipase.

The students:
1 mixed milk and bile in a beaker
2 put the pH sensor of a pH meter into the beaker
3 added lipase solution
4 recorded the pH at 2-minute intervals
5 repeated steps 1 to 4, but used water instead of bile.

Suggest **two** variables that the students should have controlled in this investigation.

[2 marks]

1 .....

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2 .....

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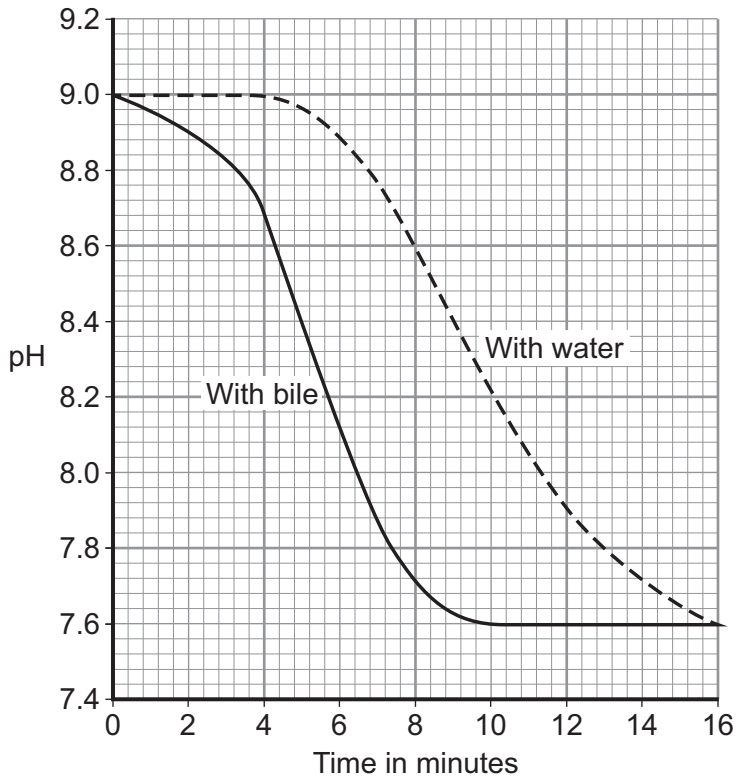
1 (c) **Figure 1** shows the students' results.

Figure 1



1 (c) (i) Why did the pH decrease in both investigations?

[1 mark]

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1 (c) (ii) Bile helps lipase to digest fat.

What evidence is there in **Figure 1** to support this conclusion?

[1 mark]

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1 (c) (iii) Suggest **one** reason why the contents of both beakers had the same pH at the end of the investigations.

[1 mark]

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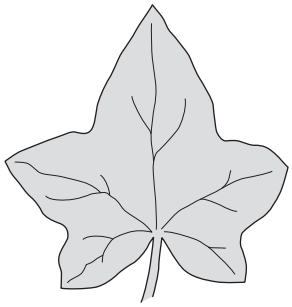
7

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

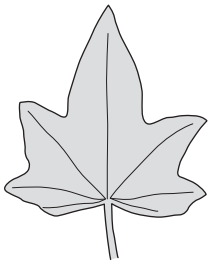
Ivy plants can grow up trees and walls.

Figure 2 shows two ivy leaves. One leaf is from an ivy plant growing up a tree in the centre of a shady woodland area. The other leaf is from an ivy plant growing up a tree in a sunny area at the edge of the woodland.

Figure 2



Ivy leaf from shady woodland area (centre of woodland)



Ivy leaf from sunny area (edge of woodland)

A student makes the following hypothesis.

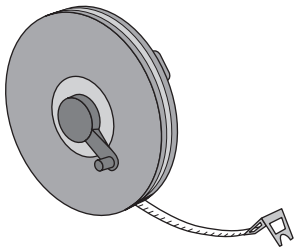
"The size of ivy leaves decreases as light intensity increases."

How would you use the apparatus shown in **Figure 3** to test this hypothesis?

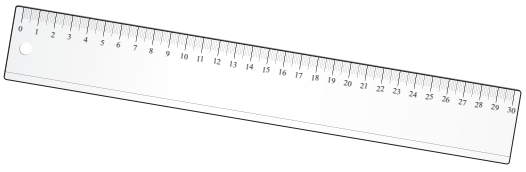
You should include details of how you would make sure the results are valid.

[6 marks]

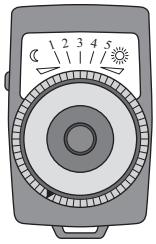
Figure 3



100 m tape measure



Ruler



Light meter

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Extra space .....

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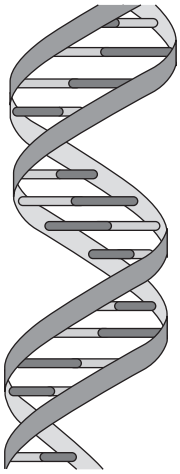
Turn over for the next question

3 DNA is the genetic material of human cells.

Figure 4 shows the structure of part of a DNA molecule.

Figure 4



3 (a) (i) Describe where DNA is found in a human cell.

[2 marks]

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3 (a) (ii) When a cell divides by mitosis the new cells are genetically identical.

What causes the cells to be genetically identical?

[1 mark]

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3 (b) Many genes have different forms called alleles.

3 (b) (i) A person has polydactyly (extra fingers or toes). Polydactyly is caused by a dominant allele.
What is the smallest number of copies of the dominant allele for polydactyly that could be found in a body cell of this person?

[1 mark]

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3 (b) (ii) Another person has cystic fibrosis. Cystic fibrosis (CF) is caused by a recessive allele.
How many copies of the recessive CF allele are there in a body cell of this person?

[1 mark]

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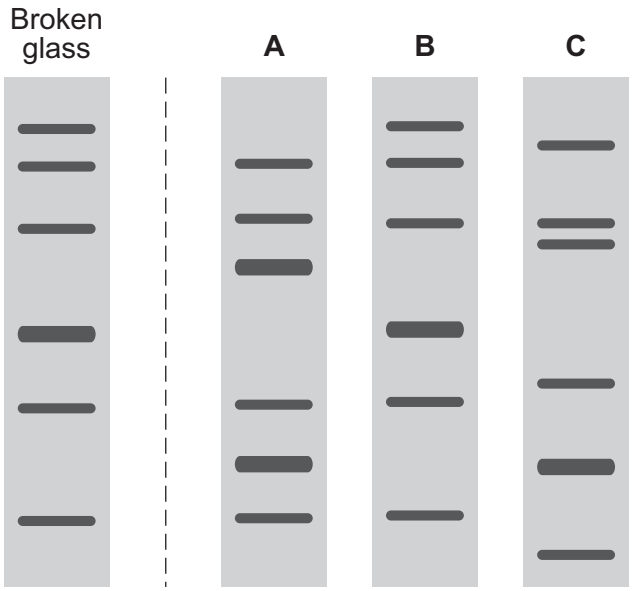
3 (c) A burglar broke into a house. The burglar cut his hand on some broken glass. Scientists extracted DNA from the blood on the broken glass.

The scientists analysed the DNA from the glass and DNA from three suspects, **A**, **B** and **C**. The scientists used a method called DNA fingerprinting.

Figure 5 shows the scientists' results.

Figure 5



Which suspect, **A**, **B** or **C**, is most likely to have been the burglar?

[1 mark]

Tick (✓) **one** box.

A ☐

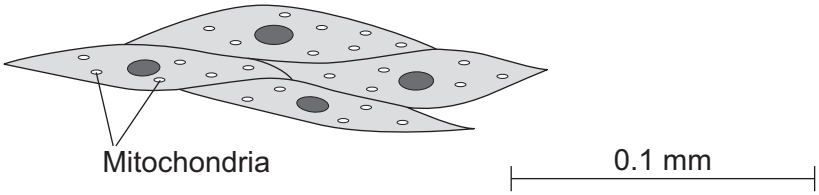
B ☐

C ☐

6

4 **Figure 6** shows some muscle cells from the wall of the stomach, as seen through a light microscope.

Figure 6



4 (a) Describe the function of muscle cells in the wall of the stomach.

[2 marks]

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4 (b) **Figure 6** is highly magnified.

The scale bar in **Figure 6** represents 0.1 mm.

Use a ruler to measure the length of the scale bar and then calculate the magnification of **Figure 6**.

[2 marks]

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Magnification = ... times

4 (c) The muscle cells in **Figure 6** contain many mitochondria.

What is the function of mitochondria?

[2 marks]

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4 (d) The muscle cells also contain many ribosomes. The ribosomes cannot be seen in **Figure 6**.

4 (d) (i) What is the function of a ribosome?

[1 mark]

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4 (d) (ii) Suggest why the ribosomes **cannot** be seen through a light microscope.

[1 mark]

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8

Turn over for the next question

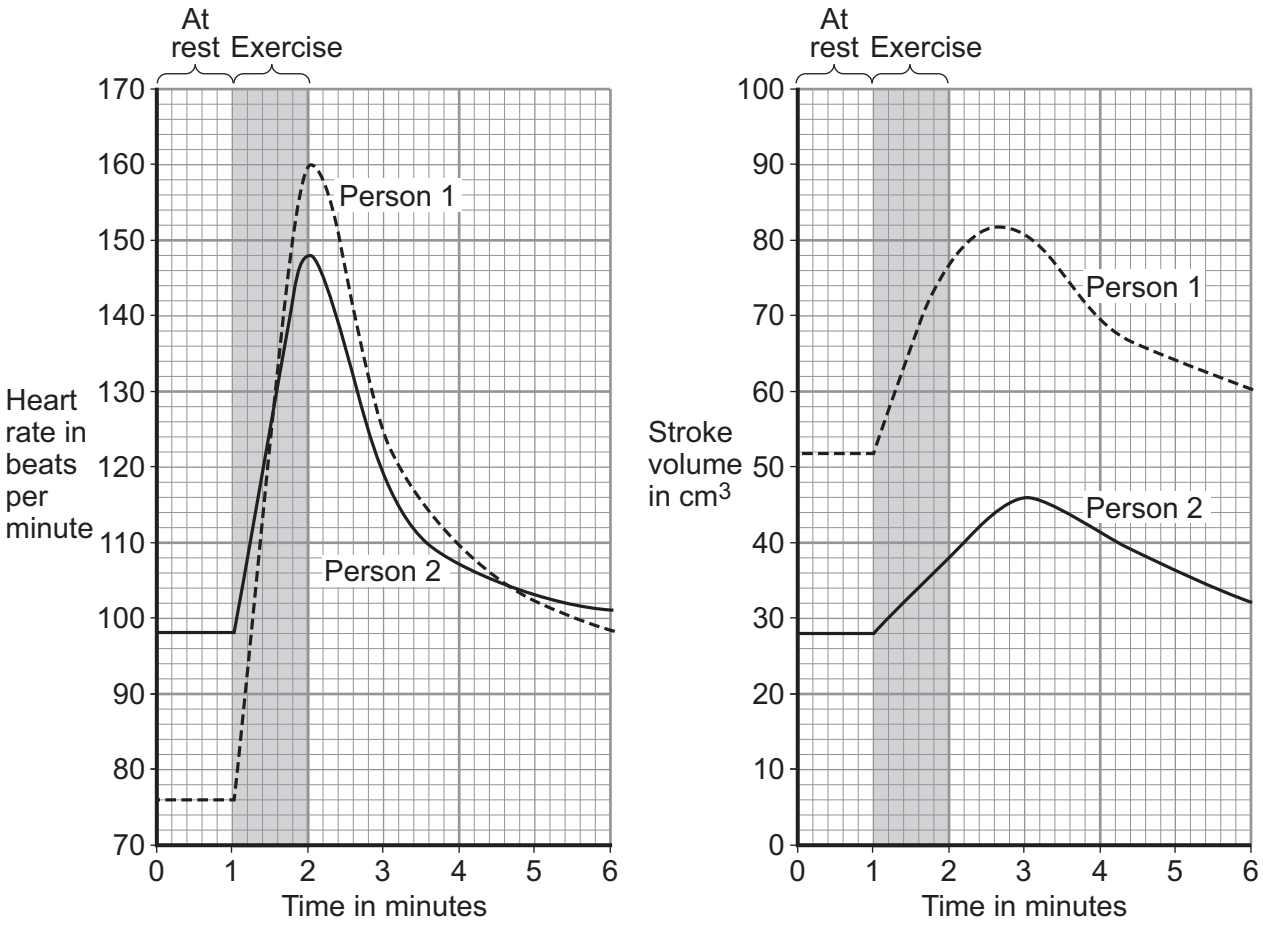
5 During exercise, the heart beats faster and with greater force.

The 'heart rate' is the number of times the heart beats each minute.
The volume of blood that travels out of the heart each time the heart beats is called the 'stroke volume'.

In an investigation, **Person 1** and **Person 2** ran as fast as they could for 1 minute. Scientists measured the heart rates and stroke volumes of **Person 1** and **Person 2** at rest, during the exercise and after the exercise.

Figure 7 shows the scientists' results.

Figure 7



5 (a) The 'cardiac output' is the volume of blood sent from the heart to the muscles each minute.

Cardiac output = Heart rate × Stroke volume

At the end of the exercise, **Person 1**'s cardiac output = 160 × 77 = 12 320 cm^3 per minute.

Use information from **Figure 7** to complete the following calculation of **Person 2**'s cardiac output at the end of the exercise.

[3 marks]

At the end of the exercise:

Person 2's heart rate = ... beats per minute

Person 2's stroke volume = ... cm^3

Person 2's cardiac output = ... cm^3 per minute

5 (b) **Person 2** had a much lower cardiac output than **Person 1**.

5 (b) (i) Use information from **Figure 7** to suggest the **main** reason for the lower cardiac output of **Person 2**.

[1 mark]

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5 (b) (ii) **Person 1** was able to run much faster than **Person 2**.

Use information from **Figure 7** and your own knowledge to explain why.

[5 marks]

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9

6 (a) Evidence about extinct species of animals and plants comes from fossils.

Figure 8 is a photograph of a fossil of a bird-like animal called *Archaeopteryx*. *Archaeopteryx* lived about 150 million years ago.

Figure 8

6 (a) (i) Suggest how the fossil of *Archaeopteryx* was formed.

[2 marks]

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6 (a) (ii) Scientists have found other fossils of the ancestors of modern birds, but the fossil record is very incomplete.

Suggest **two** reasons why there are gaps in the fossil record.

[2 marks]

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2 .....

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6 (b) There are many different species of bird on the Earth today.

Describe how these different species may have evolved from an ancestor such as *Archaeopteryx*.

[4 marks]

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8

Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

7 Green plants can make glucose.

7 (a) Plants need energy to make glucose.

How do plants get this energy?

[2 marks]

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7 (b) Plants can use the glucose they have made to supply them with energy.

Give **four** other ways in which plants use the glucose they have made.

[4 marks]

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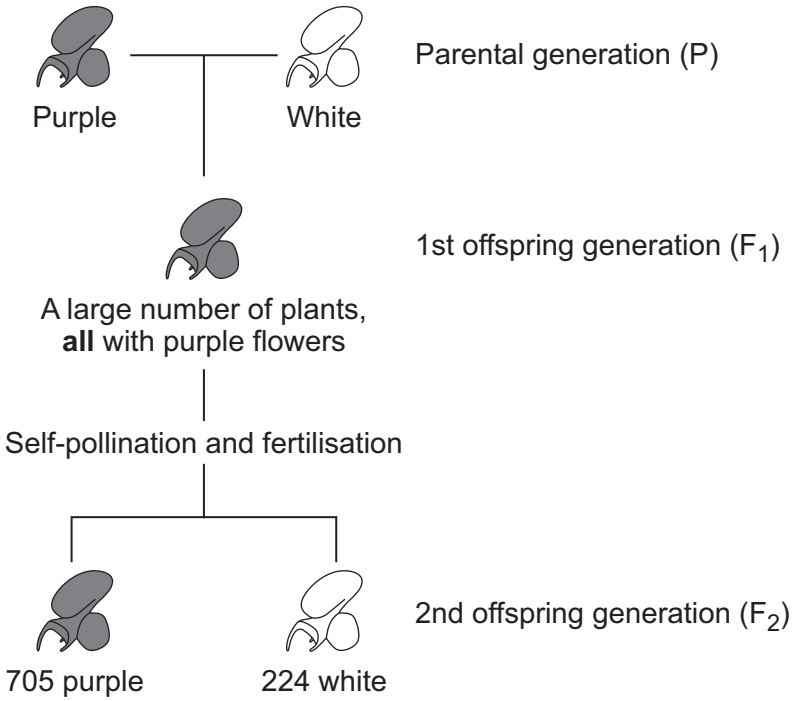
6

Turn over for the next question

8 In 1866, Gregor Mendel published the results of his investigations into inheritance in garden pea plants.

Figure 9 shows the results Mendel obtained in one investigation with purple-flowered and white-flowered pea plants.

Figure 9



8 (a) (i) Calculate the ratio of purple-flowered plants to white-flowered plants in the F_2 generation.

[1 mark]

Ratio of purple : white = ...

8 (a) (ii) There was a total of 929 plants in the F_2 generation.

Mendel thought that the production of a large number of offspring plants improved the investigation.

Explain why.

[2 marks]

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8 (b) (i) Some of the plants in **Figure 9** are homozygous for flower colour and some are heterozygous.

Complete **Table 1** to show whether each of the plants is homozygous or heterozygous. For each plant, tick (✓) **one** box.

[2 marks]

Table 1

	Homozygous	**Heterozygous**
Purple-flowered plant in the P generation		
White-flowered plant in the P generation		
Purple-flowered plant in the F_1 generation		

8 (b) (ii) Draw a genetic diagram to show how self-pollination of the F_1 purple-flowered plants produced mainly purple-flowered offspring in the F_2 generation together with some white-flowered offspring.

Use the following symbols:

N = allele for purple flower colour
n = allele for white flower colour

[3 marks]

8 (c) When Mendel published his work on genetics, other scientists at the time did not realise how important it was.

Suggest **two** reasons why.

[2 marks]

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2 .....

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10

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED

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Question 6, Figure 8: © Getty Images