AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
ADDITIONAL SCIENCE
BIOLOGY

F

Foundation Tier Unit Biology B2

Friday 9 June 2017 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 7 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	
TOTAL	

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

1 Green plants make their own food.

1 (a) (i) What is the name of the process that plants use to make food?

[1 mark]

Draw a ring around the correct answer.

digestion **growth** **photosynthesis** **respiration**

1 (a) (ii) Plants need energy to make food.

Where does this energy come from?

[1 mark]

Draw a ring around the correct answer.

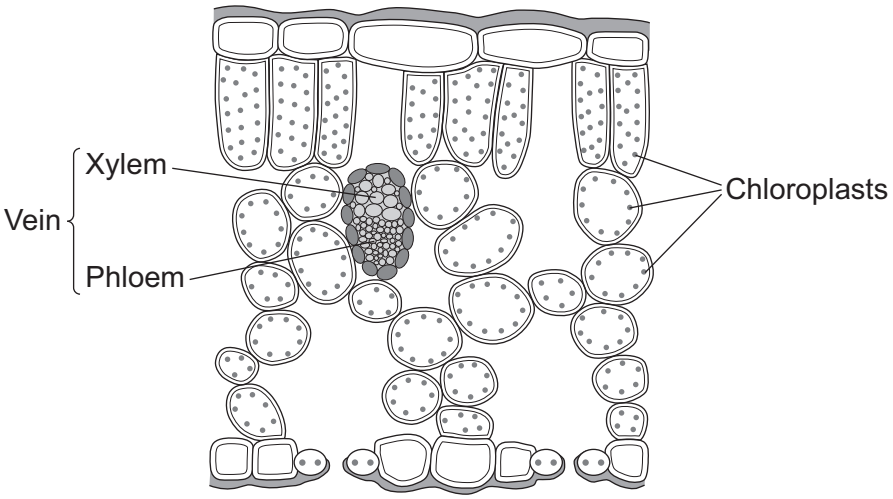
light **oxygen** **soil** **water**

1 (b) In plants, most of the food is made by the leaves.

Figure 1 shows a section through a plant leaf.

In the leaf, many of the cells contain chloroplasts.

Figure 1



1 (b) (i) Chloroplasts contain a green substance.

Name this green substance.

[1 mark]

_____

1 (b) (ii) How does this green substance help chloroplasts to make food?

[1 mark]

_____

_____

1 (b) (iii) What is the function of the vein shown in **Figure 1**?

[1 mark]

_____

_____

1 (b) (iv) Plants make glucose.

Name **two** substances a plant must take in to make glucose.

[2 marks]

1 _____

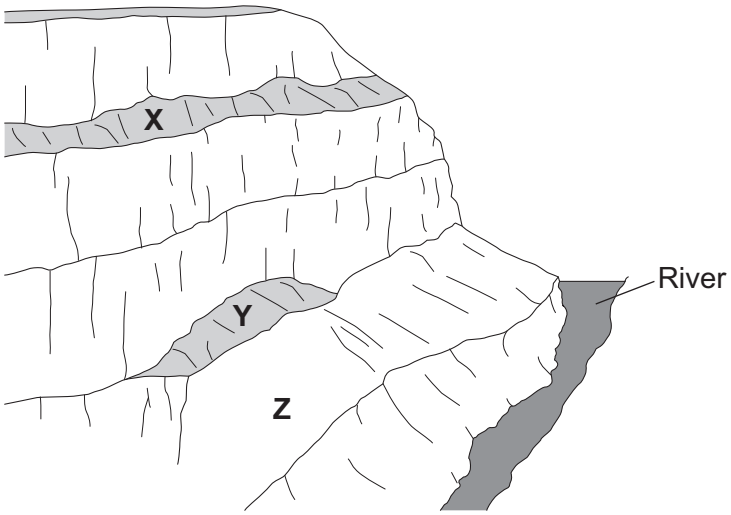
2 _____

7

Turn over for the next question

2 (a) **Figure 2** shows layers of rock in the Grand Canyon.

Figure 2



Scientists found fossils of three different species of animal, **X**, **Y** and **Z**, at the positions shown in **Figure 2**.

2 (a) (i) What is a fossil?

[2 marks]

2 (a) (ii) Scientists think that animal **Y** was alive at an earlier time than animal **X**.

How does **Figure 2** provide evidence for this?

[1 mark]

2 (a) (iii) Which **two** of the following are evidence that animal **Y** may have evolved from animal **Z**?

[2 marks]

Tick (✓) **two** boxes.

The fossils of animals **X**, **Y** and **Z** are the same size. ☐

The fossils of animals **Y** and **Z** have many features in common. ☐

The fossils of animals **Y** and **Z** have the same skin colour. ☐

The fossil of animal **Y** is more complex than the fossil of animal **Z**. ☐

The fossil of animal **Y** is more similar to the fossil of animal **X** than to the fossil of animal **Z**. ☐

2 (b) Animals **X**, **Y** and **Z** are all now extinct.

2 (b) (i) Give **two** possible causes of extinction.

[2 marks]

1 _____

_____

2 _____

_____

2 (b) (ii) Scientists cannot be sure about what caused animals **X**, **Y** and **Z** to become extinct.

Suggest why.

[1 mark]

_____

_____

8

Turn over for the next question

3 (a) What is an enzyme?

[2 marks]

3 (b) Enzymes are sometimes used in the home and in industry.

Draw **one** line from each enzyme to the correct use of that enzyme.

[3 marks]

Enzyme	**Use of enzyme**
	Removes grease stains from clothes
Protease	
	Pre-digests protein in some baby foods
Lipase	
	Breaks down DNA in genetic fingerprinting
Isomerase	
	Changes glucose syrup into fructose syrup

3 (c) Fructose and glucose are two types of sugar.

Fructose tastes much sweeter than glucose. This means that a smaller amount of fructose can be used to give the same sweetness.

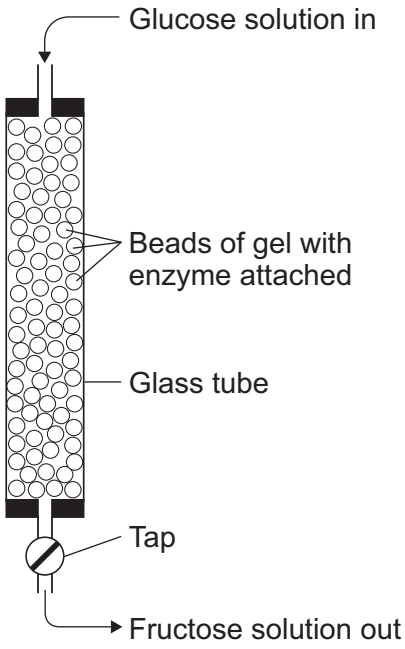
3 (c) (i) Why is it an advantage to use fructose instead of glucose in **slimming** foods?

[1 mark]

3 (c) (ii) **Figure 3** shows how an enzyme can be used to change glucose into fructose.

The enzyme molecules are firmly attached to beads of gel in a glass tube.

Figure 3



Give **two** advantages of attaching the enzyme to beads of gel.

[2 marks]

Tick (✓) **two** boxes.

The enzyme can be used for more than one type of reaction. ☐

The enzyme can easily be used again. ☐

The enzyme would be denatured. ☐

The fructose solution produced does not have any enzyme in it. ☐

There is less contact between the enzyme and the glucose. ☐

8

Turn over for the next question

4 Alkaptonuria (AKU) is a rare, inherited condition.

4 (a) The allele that causes AKU is on chromosome number 3.

4 (a) (i) How many chromosomes are there in most human cells?

[1 mark]

Draw a ring around the correct answer.

23 **24** **46** **48**

4 (a) (ii) The allele for AKU is recessive.

What is a recessive allele?

[1 mark]

Tick (✓) **one** box.

An allele that causes a genetic disorder. ☐

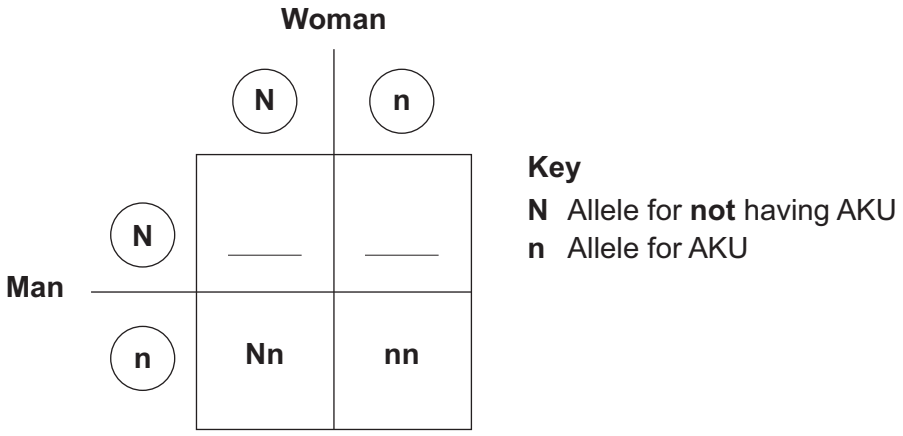
An allele that shows its effect only if the dominant allele is not present. ☐

An allele that shows its effect when only one chromosome carries it. ☐

4 (b) Two parents, who do **not** have AKU, have a child with AKU.

Figure 4 shows how this can happen.

Figure 4



4 (b) (i) **Figure 4** is incomplete.

Complete **Figure 4** to show the missing combinations of alleles.

[2 marks]

Write the correct letters in the **two** empty boxes.

4 (b) (ii) Draw a ring around **one** pair of alleles in **Figure 4** to show a child with AKU.

[1 mark]

4 (b) (iii) The man and woman in **Figure 4** want to have another child.

What is the chance that their next child will have AKU?

[1 mark]

Draw a ring around the correct answer.

0 in 4 **1 in 4** **2 in 4** **3 in 4**

6

Turn over for the next question

5 A 20-year-old student investigated the effect of exercise on his heart rate.

The student:

- measured his resting pulse rate for 15 seconds
- pedalled a stationary exercise bike at a fast pace
- stopped at various time intervals during the exercise to measure his pulse rate for 15 seconds.

5 (a) The student measured his pulse rate each time for 15 seconds.
He calculated his pulse rate per minute at the end of the investigation.

5 (a) (i) Suggest why the student measured his pulse rate for only 15 seconds instead of for a full minute.

[1 mark]

_____

_____

5 (a) (ii) **Table 1** shows the student's results.

Table 1

Time spent exercising in minutes	Measured pulse rate in beats per 15 seconds	Calculated pulse rate in beats per minute
0 (resting)	15	
1	38	152
2	44	176
4	47	188

One of the results is missing from **Table 1**.

Calculate the missing result.

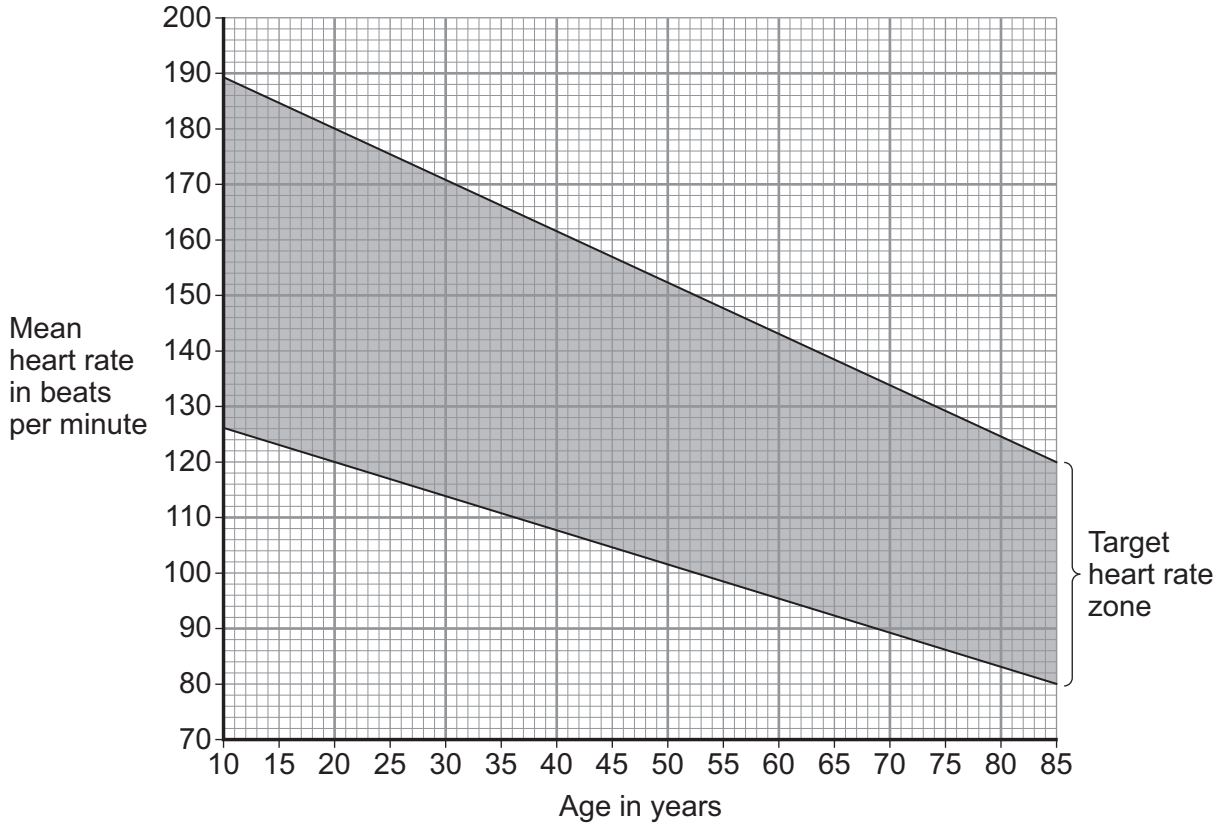
[1 mark]

Calculated pulse rate = _____ beats per minute

5 (b) Doctors recommend that people of different ages should exercise at different intensities.

Figure 5 shows the range of target heart rates during exercise recommended for people of different ages.

Figure 5



5 (b) (i) Describe **two** ways that the target heart rate zone changes as age increases.

[2 marks]

1 _____

_____

2 _____

_____

5 (b) (ii) What range of heart rates during exercise is recommended for the 20-year-old student?

[1 mark]

Use information from **Figure 5**.

From _____ to _____ beats per minute

Question 5 continues on the next page

5 (b) (iii) At 4 minutes, the 20-year-old student was cycling at a pace that caused his heart rate to be 188 beats per minute. This was higher than the upper limit of the target heart rate for exercising.

How much higher?

[1 mark]

Use your answer to part **(b)(ii)**.

_____ beats per minute

5 (b) (iv) The student continued to exercise at this rate for a further 30 minutes.

Suggest **one** reason why the student should **not** continue to exercise above the recommended range for 30 minutes.

[1 mark]

_____

_____

5 (b) (v) The student took part in a training programme for 6 months.

He exercised within the recommended range.

Suggest what effect the training programme would have on his resting heart rate.

[1 mark]

_____

5 (c) Muscles need extra energy during exercise. This energy comes from glucose. Some glucose is stored in the muscles.

5 (c) (i) In what form do muscles store glucose?

[1 mark]

Draw a ring around the correct answer.

fructose **glycogen** **protein** **starch**

5 (c) (ii) The increased heart rate during exercise supplied more glucose to the student's muscle cells.

Which other substance is needed to release energy from glucose?

[1 mark]

_____

5 (c) (iii) Name the process that releases energy from glucose in cells.

[1 mark]

_____

11

Turn over for the next question

6 There are many different types of cell in the human body.

6 (a) (i) Describe where epithelial cells are found in the human body.

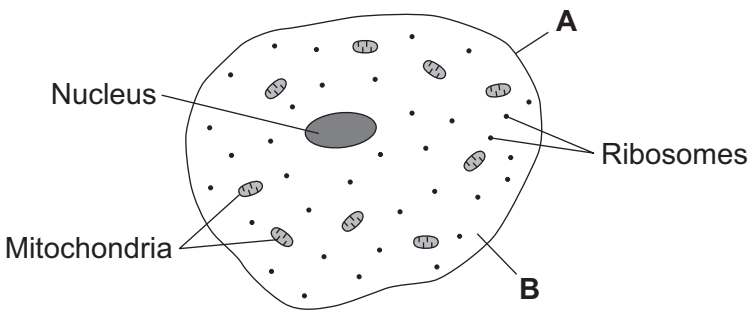
[1 mark]

_____

_____

6 (a) (ii) **Figure 6** shows an epithelial cell.

Figure 6



Name part **A** and part **B**.

[2 marks]

A _____

B _____

6 (b) What is the function of ribosomes?

[1 mark]

Tick (✓) **one** box.

Aerobic respiration ☐

Digestion ☐

Photosynthesis ☐

Protein synthesis ☐

6 (c) Carbon dioxide moves out of an epithelial cell by diffusion.

[2 marks]

What is diffusion?

_____

_____

_____

_____

6

Turn over for the next question

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

Figure 7 shows part of a plant called cross-leaved heath.

Figure 7

A student noticed that some areas of marshland contained cross-leaved heath plants and some areas did not.

The student made the following hypothesis:

'Soil pH affects the amount of cross-leaved heath plants that grow in an area.'

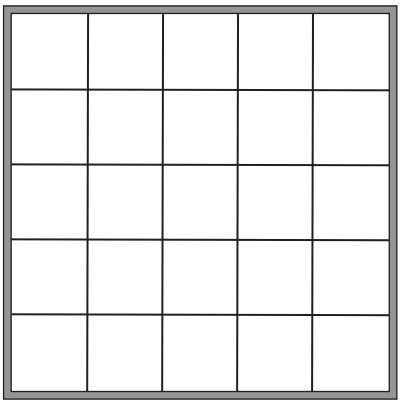
How could the student use apparatus, including the quadrat and pH meter shown in **Figure 8**, to find the range of pHs where the cross-leaved heath plants grew best?

You should include details of how the student could make sure the results are valid.

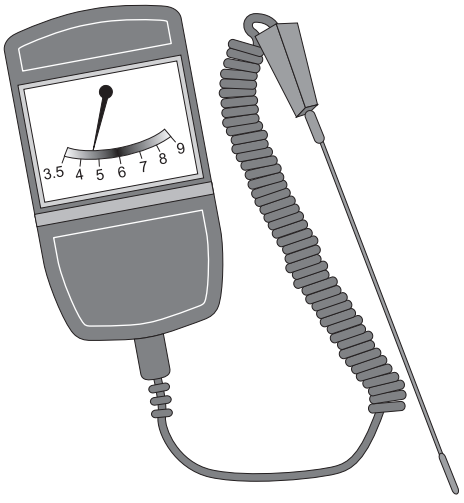
[6 marks]

Figure 8

1 m x 1 m quadrat



Soil pH meter



Not to scale

Extra space

6

Turn over for the next question

8 Amylase is an enzyme that breaks down starch.

8 (a) Complete the equation to show the breakdown of starch.

[1 mark]

Starch $\xrightarrow{\text{amylase}}$ _____

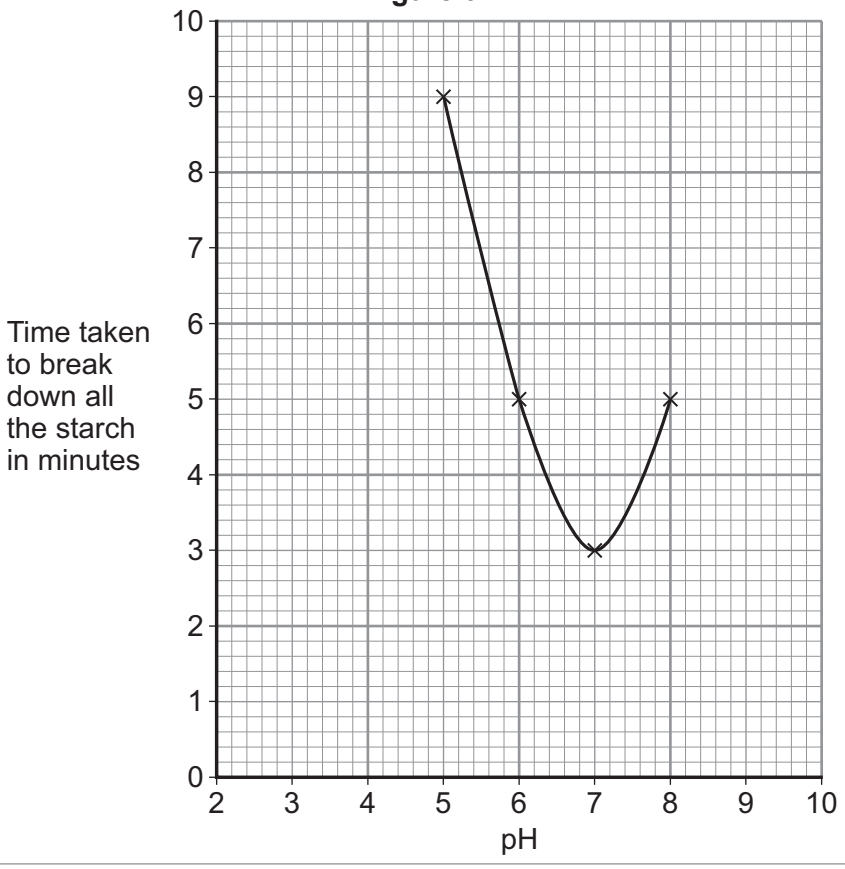
8 (b) Some students investigated the effect of pH on the activity of amylase.

The students:

- put 5 cm^3 of pH5 solution + 1 cm^3 of amylase solution into a test tube
- put 4 cm^3 of starch suspension into a second test tube
- left both test tubes at room temperature for 5 minutes
- mixed the contents of the two test tubes
- removed a small sample of the mixture at 1-minute intervals
- tested each sample for starch
- timed how long it took to break down all the starch
- repeated each of the above steps at pH6, pH7 and pH8.

Figure 9 shows the students' results.

Figure 9



8 (b) (i) Give **two** variables which were controlled in this investigation.

[2 marks]

1 _____

_____

2 _____

_____

8 (b) (ii) The students tested samples of the reaction mixture for starch.
In each test, they added one drop of the reaction mixture to one drop of iodine solution on a white tile.

- Iodine solution = light brown colour
- Iodine solution + starch = dark blue colour

Predict the colour seen in the iodine test on the samples of the pH6 reaction mixture at 4 minutes and at 6 minutes.

[1 mark]

4 minutes _____

6 minutes _____

8 (b) (iii) The students concluded that amylase works best at pH7.
This may **not** be a valid conclusion.

Suggest **two** improvements to the investigation that would increase the validity of the students' conclusion.

[2 marks]

1 _____

_____

2 _____

_____

Question 8 continues on the next page

8 (b) (iv) The students repeated the investigation at pH3.

What result would you expect at pH3?

Give a reason for your answer.

[2 marks]

_____

_____

_____

_____

8

END OF QUESTIONS