

Please write clearly in block capitals.

Centre number

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Candidate number

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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

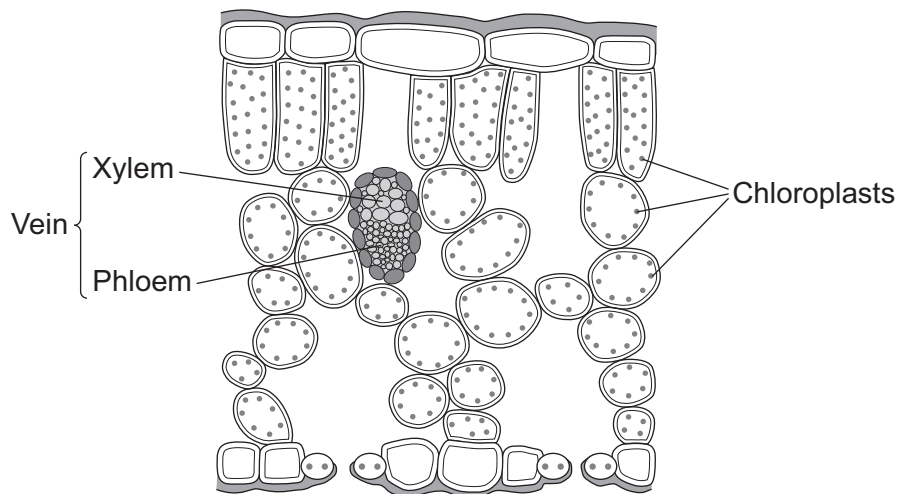
water

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

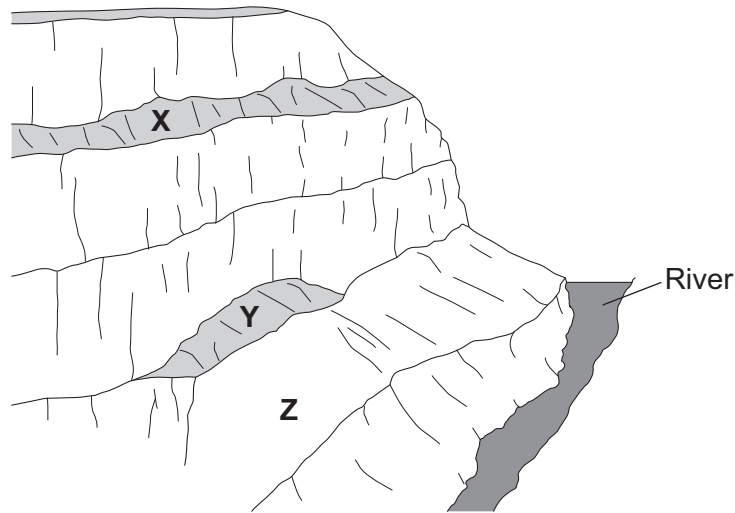
Turn over for the next question

Turn over ►



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]

Turn over for the next question

Turn over ►



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
Protease	Removes grease stains from clothes
Lipase	Pre-digests protein in some baby foods
Isomerase	Breaks down DNA in genetic fingerprinting
	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?

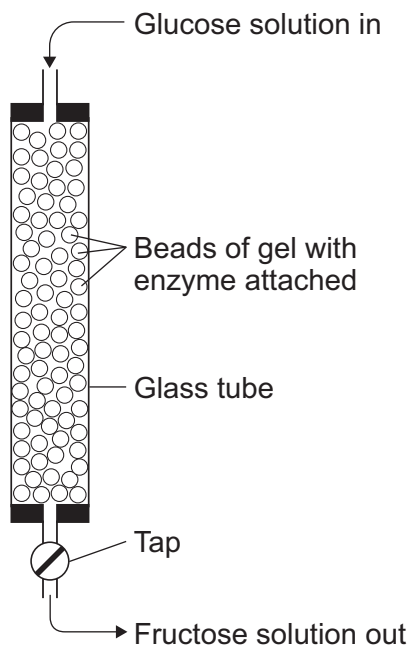
[1 mark]



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

Turn over ►



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.

☐

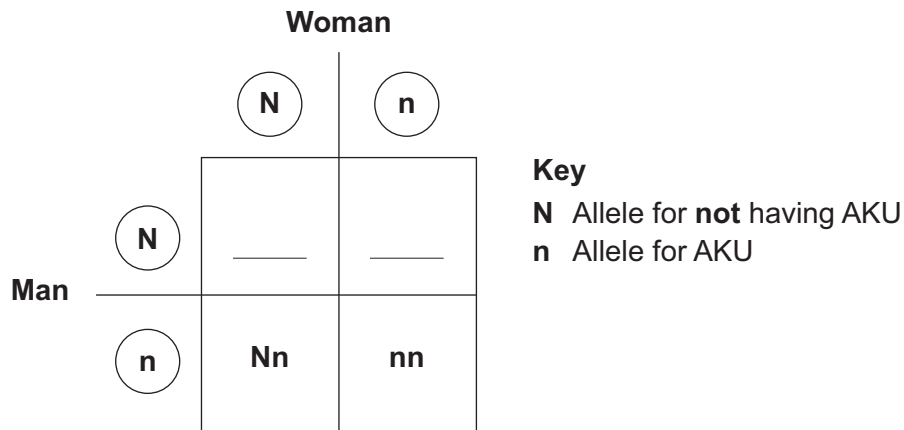
An allele that shows its effect when only one chromosome carries it.

☐

- 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

Turn over ►



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]

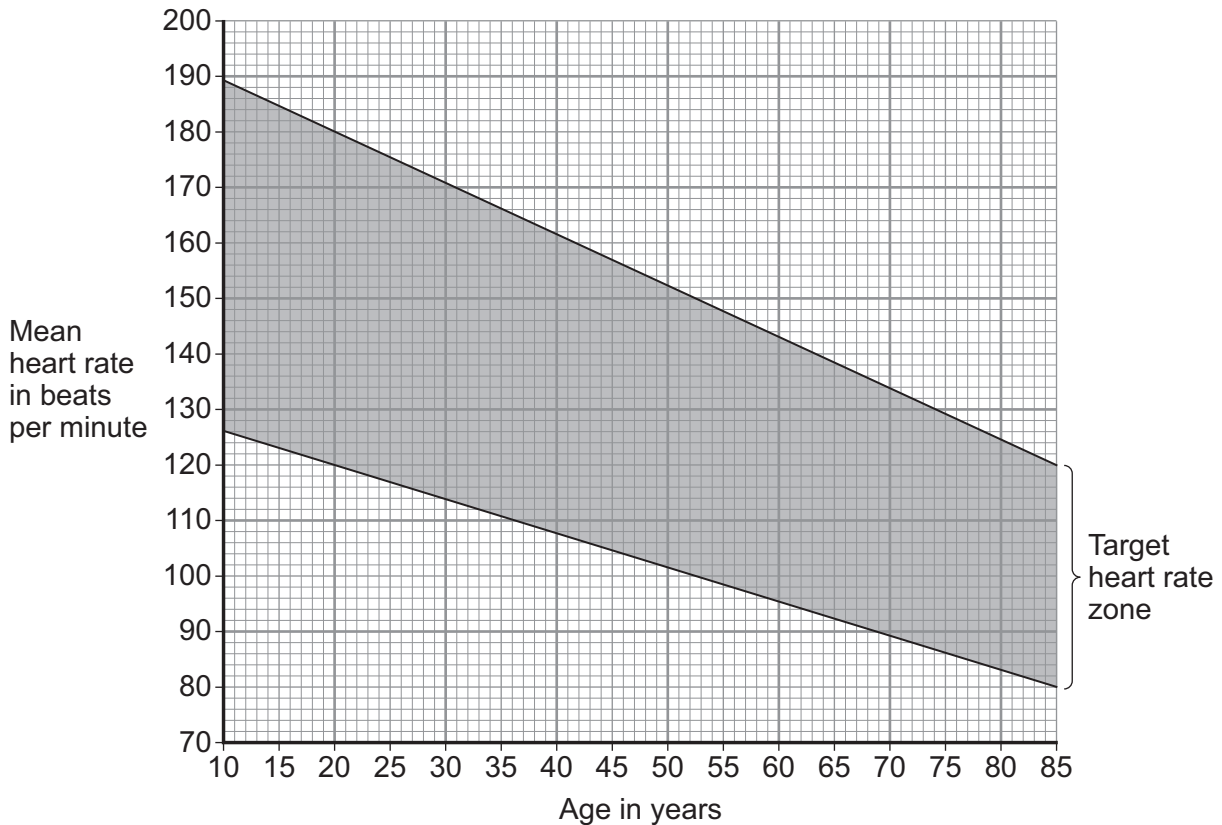
Calculated pulse rate = _____ beats per minute



- 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

Turn over ►



- 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

Turn over ►



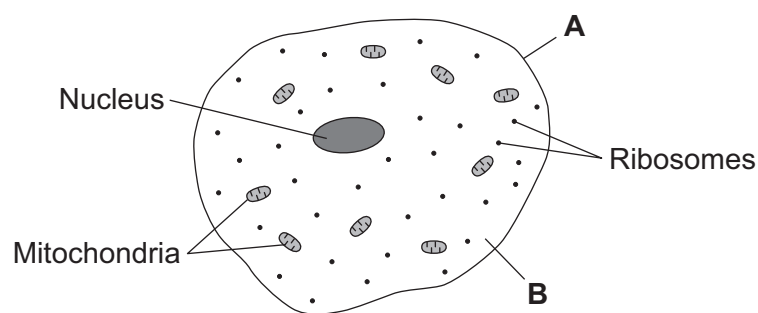
6 There are many different types of cell in the human body.

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

Turn over ►



- 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.’

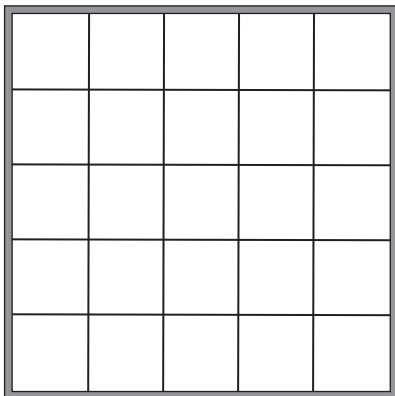
How could the student use apparatus, including the quadrat and pH meter shown in Figure 8, to find the range of pHs where the cross-leaved heath plants grew best?

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

[6 marks]

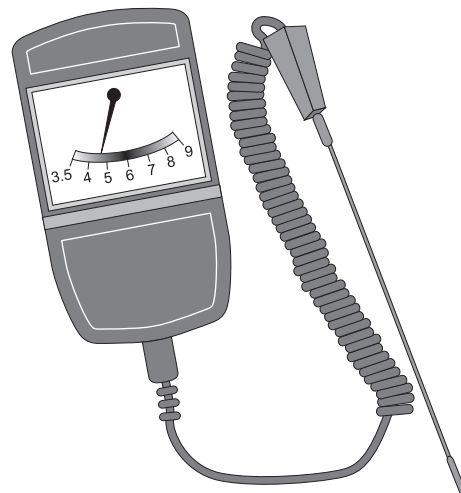
Figure 8

1 m x 1 m quadrat



Not to scale

Soil pH meter



[illegible]

Extra space _____

6

Turn over for the next question

Turn over ►



8 Amylase is an enzyme that breaks down starch.

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

[1 mark]

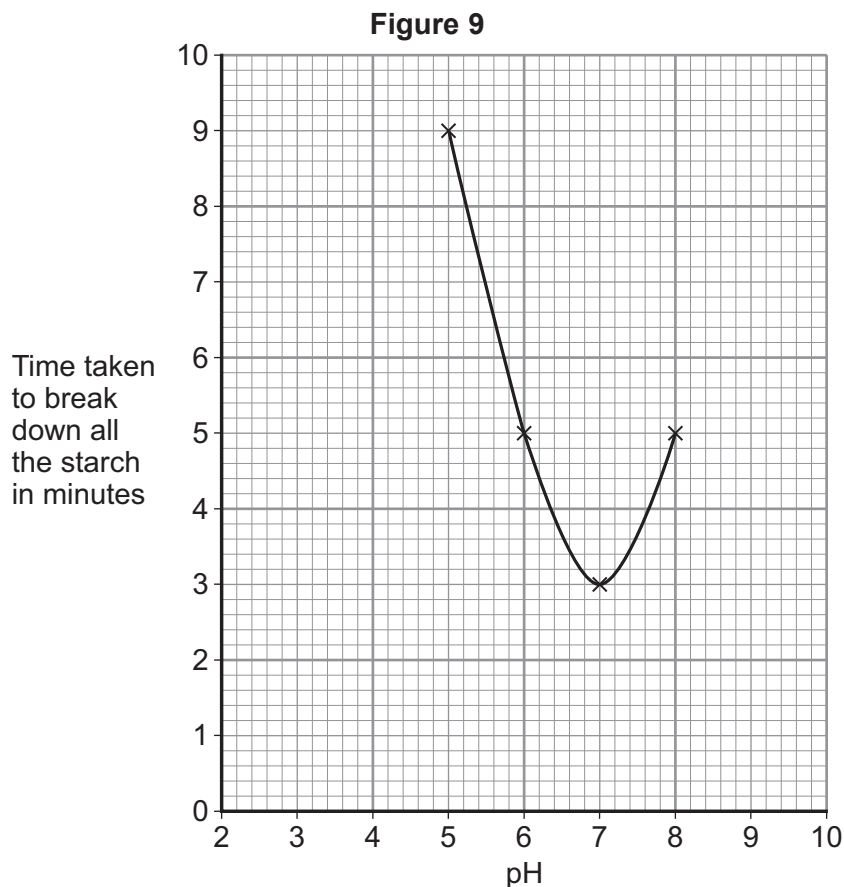
Starch $\xrightarrow{\text{amylase}}$ _____

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

The students:

- put 5 cm³ of pH5 solution + 1 cm³ of amylase solution into a test tube
- put 4 cm³ 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.



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

Turn over ►



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

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