SPECIMEN MATERIAL

GCSE BIOLOGY

H

Higher Tier Paper 2H

Specimen 2018 Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:
- a ruler
- a calculator.

Instructions
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- There are 100 marks available on this paper.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions 01.3, 02.4, 03.3, 04.2 and 08.2 you need to make sure that your answer:
  - is clear, logical, sensibly structured
  - fully meets the requirements of the question
  - shows that each separate point or step supports the overall answer.

Advice

In all calculations, show clearly how you work out your answer.

Please write clearly, in block capitals, to allow character computer recognition.

Centre number ☐☐☐☐☐ Candidate number ☐☐☐☐

Surname ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Forename(s) ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Candidate signature _____

0 1 Charles Darwin proposed the theory of natural selection.

Many people at the time did not accept his theory.

0 1 . 1 There was a different theory at the same time as Darwin's theory.

The different theory said that changes in an organism during its life could be inherited.

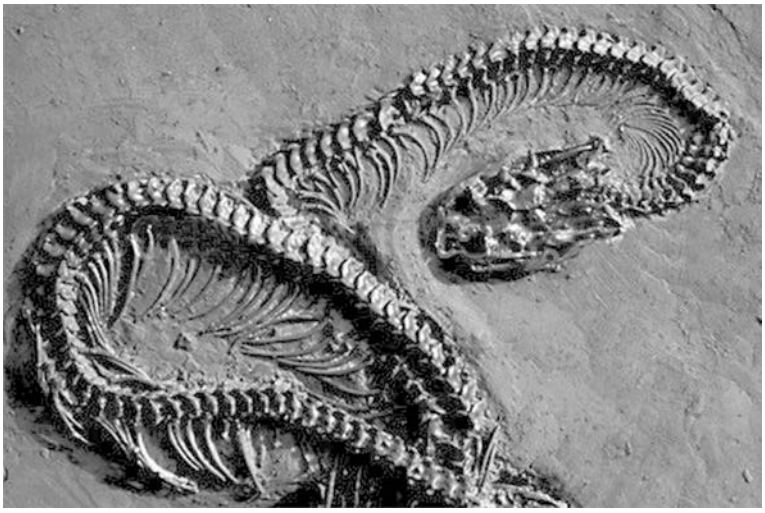
Who proposed this theory?

[1 mark]

0 1 . 2 Studying fossils helps scientists understand how living things have evolved.

Figure 1 shows a fossilised snake.

Figure 1



Explain how the fossil in **Figure 1** may have formed.

[3 marks]

Question 1 continues on the next page

There are many types of rat snake in the world.

Table 1 shows two types of rat snake

Table 1

Type of snake	Japanese rat snake	Texas rat snake
Colour of snake	Green	Pale brown
Type of environment	Grass	Dry and dusty

0 1 . 3 The different types of rat snake have evolved from similar ancestors.

The rat snakes have evolved to suit their environments.

Explain how the Japanese rat snake evolved to be different from the Texas rat snake.

[4 marks]

0 1 . 4 Many species of snake have become extinct.

Give **one** reason why a species might become extinct.

[1 mark]

Turn over for the next question

0 2 A gardener wants to add compost to the soil to increase his yield of strawberries.

The gardener wants to make his own compost.

0 2 . 1 An airtight compost heap causes anaerobic decay.

Explain why the gardener might be against producing compost using this method.

[2 marks]

The gardener finds this research on the internet:

'A carbon to nitrogen ratio of 25:1 will produce fertile compost.'

Look at **Table 2**.

Table 2

Type of material to compost	Mass of carbon in sample in g	Mass of nitrogen in sample in g	Carbon:nitrogen ratio
Chicken manure	8.75	1.25	7:1
Horse manure	10.00	0.50	20:1
Peat moss	9.80	0.20	**X**

0 2 . 2 Determine the ratio **X** in **Table 2**.

[1 mark]

Ratio _____

0 2 . 3 Which type of material in **Table 2** would be **best** for the gardener to use to make his compost?

Justify your answer.

[1 mark]

_____

_____

Question 2 continues on the next page

0 2 . 4 Some of the leaves from the gardener's strawberry plant die.

The dead leaves fall off the strawberry plant onto the ground.

The carbon in the dead leaves is recycled through the carbon cycle.

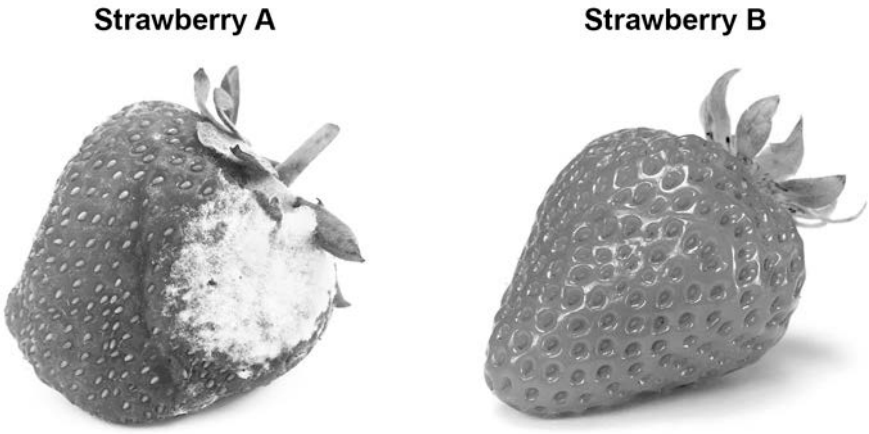
Explain how the carbon is recycled into the growth of new leaves.

[6 marks]

0 2 . 5 **Figure 2** shows two strawberries.

- Both strawberries were picked from the same strawberry plant.
- Both strawberries were picked 3 days ago.
- The strawberries were stored in different conditions.

Figure 2



Give **three** possible reasons that may have caused strawberry **A** to decay.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

Turn over for the next question

0 3 Many different types of animals are produced using selective breeding.

Some cats are selectively bred so that they do not cause allergies in people.

0 3 . 1 Suggest **two other** reasons why people might selectively breed cats.

[2 marks]

1 _____

_____

2 _____

_____

0 3 . 2 Selective breeding could cause problems of inbreeding in cats.

Describe **one** problem inbreeding causes.

[1 mark]

_____

_____

0 3 . 3 Many people have breathing problems because they are allergic to cats.

The allergy is caused by a chemical called Fel D1.

Different cats produce different amounts of Fel D1.

A cat has been bred so that it does not produce Fel D1.

The cat does **not** cause an allergic reaction.

Explain how the cat has been produced using selective breeding.

[4 marks]

Turn over for the next question

There are no questions printed on this page

0 4 A student plans an investigation using mould.

0 4 . 1 Mould spores are hazardous.

Give **one** safety precaution the student should take when doing this investigation.

[1 mark]

A student made the following hypothesis about the growth of mould:

'**The higher the temperature, the faster the growth of mould**'.

The student planned to measure the amount of mould growing on bread.

The student used the following materials and equipment:

- slices of bread
- sealable plastic bags
- a knife
- a chopping board
- mould spores.

0 4 . 2 Describe how the materials and equipment could be used to test the hypothesis.

[4 marks]

Question 4 continues on the next page

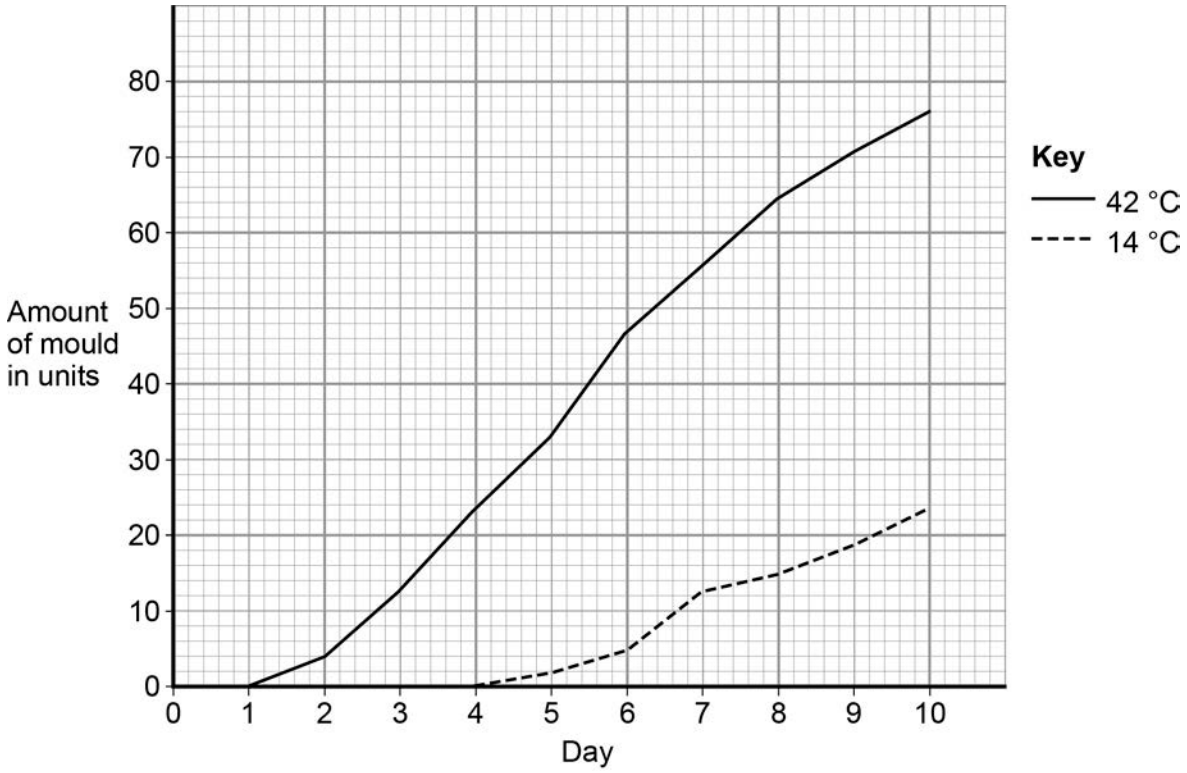
0 4 . 3 Give **one** variable the student should control in the investigation.

[1 mark]

Another student did a similar investigation.

Figure 3 shows the results.

Figure 3



0 4 . 4 Determine the rate of mould growth at 42 °C between day 2 and day 7.

[2 marks]

Rate of mould growth = _____ units per day

0 4 . 5 The growth of mould shows decomposition of the bread.

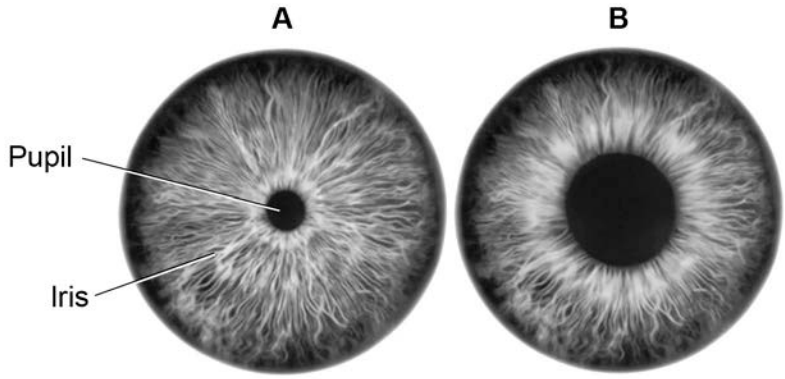
Give a conclusion about decomposition from the results in **Figure 3**.

[1 mark]

Turn over for the next question

0 5 **Figure 4** shows a reflex in the iris of the human eye in response to changes in light levels.

Figure 4



0 5 . 1 Describe the changes in the pupil and iris going from **A** to **B** in **Figure 4**.

Explain how these changes occur.

Refer to the changes in light level in your answer.

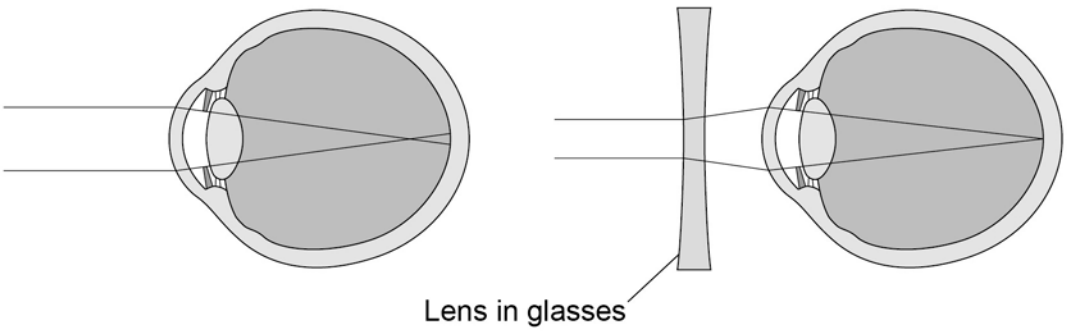
[4 marks]

0 5 . 2 Some people wear glasses to improve their vision.

Figure 5 shows light entering the eye in a person with blurred vision.

Figure 6 shows how this condition is corrected with glasses.

Figure 5 **Figure 6**



Compare **Figure 5** and **Figure 6**.

Explain how the blurred vision is corrected.

[2 marks]

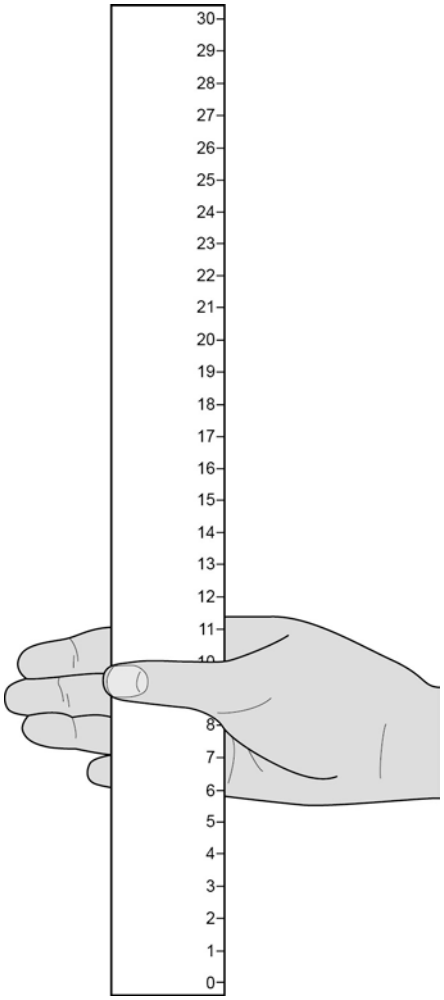
Turn over for the next question

0 6 Two students investigated reflex action times.

This is the method used.

1. Student **A** sits with her elbow resting on the edge of a table.
2. Student **B** holds a ruler with the bottom of the ruler level with the thumb of Student **A**.
3. Student **B** drops the ruler.
4. Student **A** catches the ruler and records the distance, as shown in **Figure 7**.
5. Steps **1** to **4** were then repeated.

Figure 7



0 6 . 1 Suggest **two** ways the students could improve the method to make sure the test would give valid results.

[2 marks]

1 _____

_____

2 _____

_____

Question 6 continues on the next page

Table 3 shows Student **A**'s results.

Table 3

Test Number	Distance ruler dropped in mm
1	117
2	120
3	115
4	106
5	123
6	125
7	106

0 6 . 2 What is the **median** result?

[1 mark]

Tick **one** box.

106 ☐

115 ☐

116 ☐

117 ☐

123 ☐

0 6 . 3 The mean distance the ruler was dropped is 116 mm.

Calculate the mean reaction time.

[3 marks]

Use the equation:

$$\text{reaction time in s} = \sqrt{\frac{\text{mean drop distance in cm}}{490}}$$

Give your answer to 3 significant figures

Mean reaction time = _____ s

0 6 . 4 The students then measured Student **A**'s reaction time using a computer program.

This is the method used.

1. The computer shows a red box at the start.
2. As soon as the box turns green the student has to press a key on the keyboard as fast as possible.
3. The test is repeated five times and a mean reaction time is displayed.

Student **A**'s mean reaction time was 110 ms.

Using a computer program to measure reaction times is likely to be more valid than the method using a dropped ruler.

Give **two** reasons why.

[2 marks]

1 _____

2 _____

Question 6 continues on the next page

0 6 . 5 A woman has a head injury.

Her symptoms include:

- finding it difficult to name familiar objects
- not being able to remember recent events.

Suggest which part of her brain has been damaged.

[1 mark]

0 6 . 6 A man has a head injury.

He staggers and sways as he walks.

Suggest which part of his brain has been damaged.

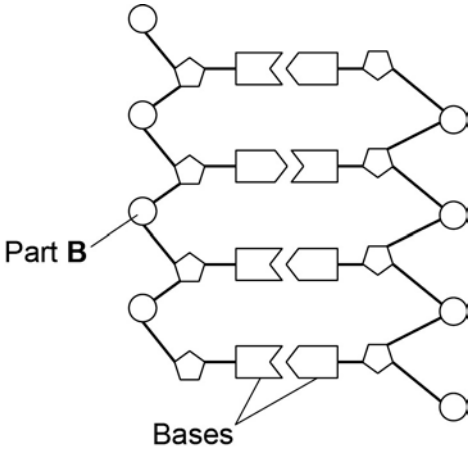
[1 mark]

0 7 **Figure 8** shows an image of a small section of DNA.

Figure 9 shows the structure of a small section of DNA.

Figure 8

Figure 9



0 7 . 1 What is Part **B**?

[1 mark]

0 7 . 2 In **Figure 8** the structure of DNA shows four different bases.

There are four different bases and they always pair up in the same pairs.

Which bases pair up together?

[1 mark]

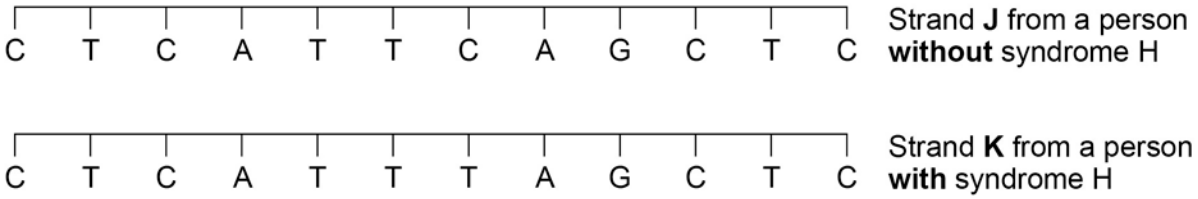
Question 7 continues on the next page

Syndrome H is an inherited condition.

People with syndrome H do **not** produce the enzyme IDUA.

Figure 9 shows part of the gene coding for the enzyme IDUA.

Figure 9



Strand **K** shows a mutation in the DNA which has caused syndrome H.

0 7 . 3 The enzyme IDUA helps to break down a carbohydrate in the human body.

The enzyme IDUA produced from Strand **K** will not work.

Explain how the mutation could cause the enzyme **not** to work.

[5 marks]

0 7 . 4 A recessive allele causes syndrome H.

A heterozygous woman and a homozygous recessive man want to have a child.

Draw a Punnett square diagram to determine the probability of the child having syndrome H.

Identify any children with syndrome H.

[5 marks]

Use the following symbols:

A = dominant allele

a = recessive allele

Probability = _____

Turn over for the next question

0 8 Food security is when a population has enough food to stay healthy.

Lack of food security is a global problem.

One way to maintain food security is to increase the efficiency of food production.

Figure 10 shows how some pigs are farmed using intensive methods.

Figure 10

0 8 . 1 Some people think the farming methods shown in **Figure 10** are unethical.

Suggest **two** other possible disadvantages of intensive farming methods.

[2 marks]

1 _____

_____

2 _____

_____

0 8 . 2 Explain how the intensive farming of pigs increases the efficiency of food production.

[4 marks]

Question 8 continues on the next page

A newspaper reported that:

'Food security is a serious problem in remote communities in Canada. This is because Aboriginal communities are eating fewer traditional foods.'

One traditional food eaten by Aboriginal communities in Canada is seal.

Look at **Table 4**.

Table 4

Year	Number of seals caught in thousands
2004	362
2005	316
2006	348
2007	224
2008	215
2009	91
2010	67

0 8 . 3 Calculate the percentage (%) decrease in the number of seals caught from 2004 to 2010.

[2 marks]

Decrease in seals = _____ %

0 8 . 4 The conclusion in the newspaper might **not** be correct.

Suggest **two** reasons why.

[2 marks]

1 _____

_____

2 _____

_____

Turn over for the next question

0 9 Homeostasis controls the internal conditions of the body.

0 9 . 1 Explain how blood glucose levels are controlled in the body of someone who does **not** have diabetes.

[4 marks]

0 9 . 2 Compare how each type of diabetes is caused.

Suggest how each type of diabetes can be treated.

[4 marks]

0 9 . 3 Look at **Table 5**.

Table 5

Population of UK in 2015	6.5×10^7
Number of people diagnosed with diabetes	3.45×10^6
Estimated number of people with undiagnosed diabetes	5.49×10^5

Calculate the percentage (%) of the UK population estimated to have diabetes.

You should include both diagnosed and undiagnosed people in your calculation.

Give your answer to 2 significant figures.

[3 marks]

Estimated percentage of population with diabetes = _____ %

Question 9 continues on the next page

0 9 . 4 A urine test can be used to check for the presence of glucose in the urine.

Diabetes can also be diagnosed with a blood test to measure the concentration of blood glucose.

Suggest why a blood test is more reliable than a urine test.

[1 mark]

0 9 . 5 A blood test called the glucose tolerance test checks how well the body processes glucose.

Concentrations of glucose in the blood are measured before and after drinking a glucose drink.

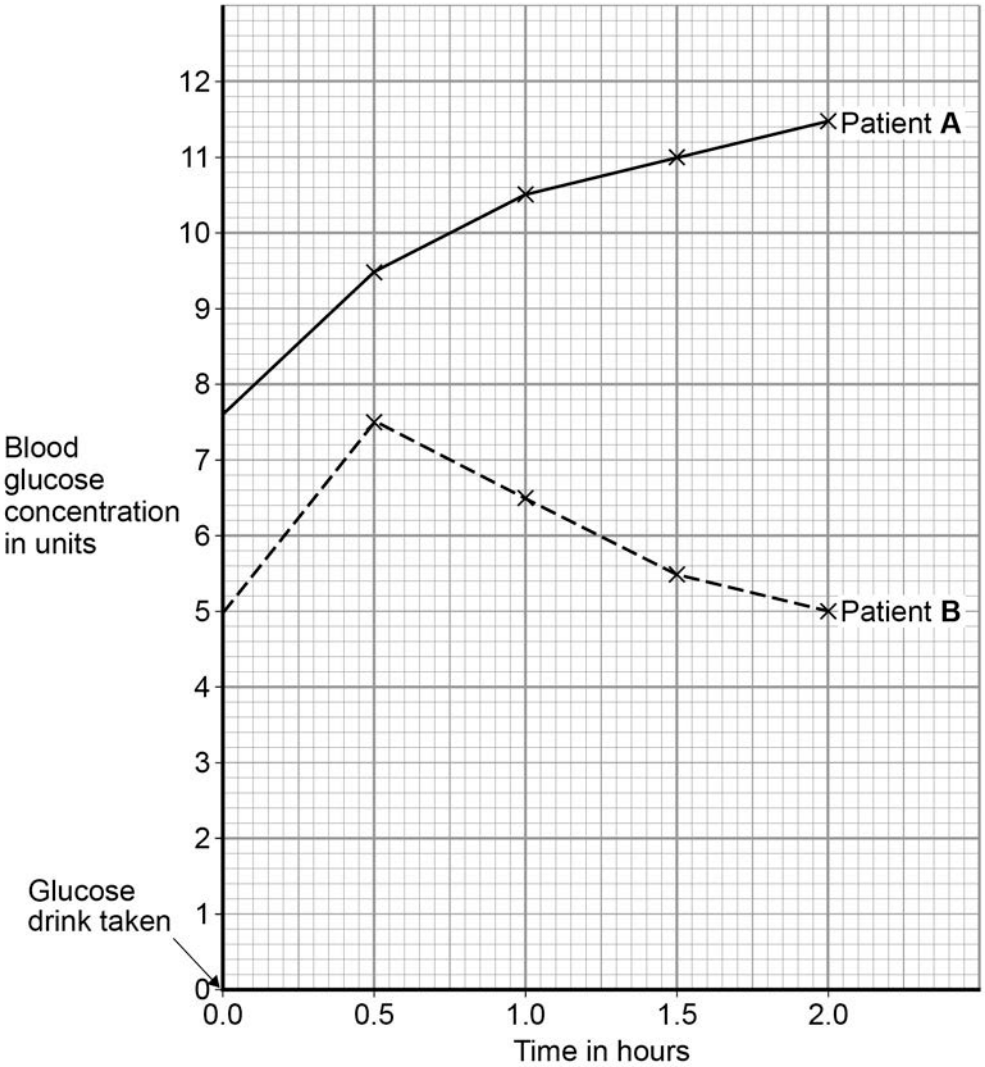
Patients are not allowed to eat food for 8 hours before the glucose tolerance test.

Suggest why patients are **not** allowed to eat for 8 hours before the test.

[1 mark]

0 9 . 6 **Figure 11** shows the results of a glucose tolerance test for two patients, **A** and **B**.

Figure 11



Which patient has diabetes?

Justify your answer.

[2 marks]

Patient _____

Justification _____

_____

_____

_____

1 0 Endocrine glands produce hormones.

1 0 . 1 Hyperthyroidism is caused by an overactive thyroid gland.

Suggest what would happen in the body of a person with hyperthyroidism.

[3 marks]

1 0 . 2 Describe the roles of FSH and LH in the menstrual cycle.

[2 marks]

1 0 . 3 The combined pill is a contraceptive that contains progesterone **and** oestrogen.

The 'mini-pill':

- is a contraceptive that **only contains** the progesterone hormone
- has to be taken at the same time each day to prevent pregnancy.

The success rate of the mini-pill in preventing pregnancy is lower than that of the combined pill.

Explain why missing a dose of the mini-pill would reduce the success rate of the mini-pill.

[4 marks]

END OF QUESTIONS

There are no questions printed on this page

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