AQA GCSE Biology | 8461

SPECIFICATION POINT 4.5.3.2

Control of blood glucose concentration

Past-paper questions

Tier	**Foundation**
Question groups	**23**
Available paper years	**2007–2024**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.5.3.2 Control of blood glucose concentration

Question 01

March 2007 | BLY1A | Original Q2 | Legacy

QUESTION TWO

Disease can be caused by many different factors.

Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

A arthritis

B diabetes

C heart disease

D high blood pressure

	Factor
1	a disease in which the blood sugar level is high
2	a disease in which the joints become worn
3	a disease caused directly by too much cholesterol
4	a disease caused by too much salt in the diet

4.5.3.2 Control of blood glucose concentration

Question 02

January 2009 | BLY2F | Original Q7 | Legacy

7 Diabetes is a disease in which a person's blood glucose concentration rises to higher levels than normal.
Diabetes is caused by insufficient insulin being produced.

7 (a) (i) Which organ monitors blood glucose concentration?

.....

(1 mark)

7 (a) (ii) Insulin reduces the concentration of glucose in the blood.

Describe how insulin does this.

.....

.....

(1 mark)

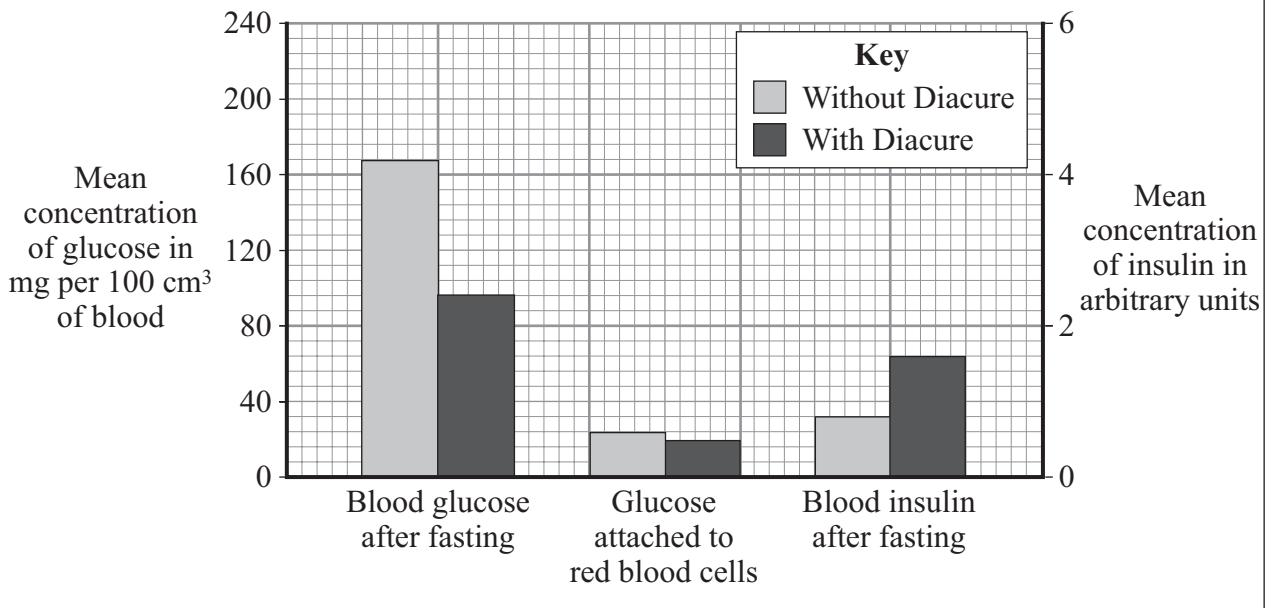
7 (b) A person with diabetes can be monitored in three ways:

- measuring the blood glucose concentration after fasting (going without food for 12 hours)
- measuring the amount of glucose attached to red blood cells: this is a measure of the average blood glucose concentration over the previous three months
- measuring the concentration of insulin in the blood after fasting

The manufacturer of a new treatment for diabetes, called Diacure, publishes the following two claims.

1. 98.6% of all people who used Diacure reported an improvement in their condition.

2. An independent study of 30 diabetic patients showed a significant reduction in blood glucose concentrations and a significant increase in insulin production, as shown by the graph.



4.5.3.2 Control of blood glucose concentration

Question 02 · continued

for mark

7 (b) (i) Which of the manufacturer's claims is **not** based on scientific evidence?

.....

.....

(1 mark)

7 (b) (ii) Why might the data in this study be unreliable?

.....

.....

.....

(1 mark)

7 (b) (iii) The manufacturer did **not** draw attention to the data for the amount of glucose attached to red blood cells.

Suggest an explanation for this.

.....

.....

.....

.....

.....

(2 marks)

7 (b) (iv) The study of diabetic patients was carried out by an independent company.

Why is it important that the study should be independent?

.....

.....

.....

(1 mark)

7

4.5.3.2 Control of blood glucose concentration

Question 03

March 2009 | BLY1AP | Original Q2 | Legacy

QUESTION TWO

What we eat affects our health.

Match diets, **A**, **B**, **C** and **D**, with the statements **1–4** in the table.

A a diet low in fat

B a diet high in sugar

C a diet high in salt

D a diet high in saturated fat

1	should be avoided by a person with diabetes
2	could lead to high blood pressure
3	is suitable for someone trying to lose weight
4	might raise the level of cholesterol in the blood

4.5.3.2 Control of blood glucose concentration

Question 04

March 2009 | BLY1BP | Original Q4 | Legacy

QUESTION FOUR

Insulin is a drug needed by some people suffering from diabetes.

Bacteria can be genetically engineered to produce insulin.

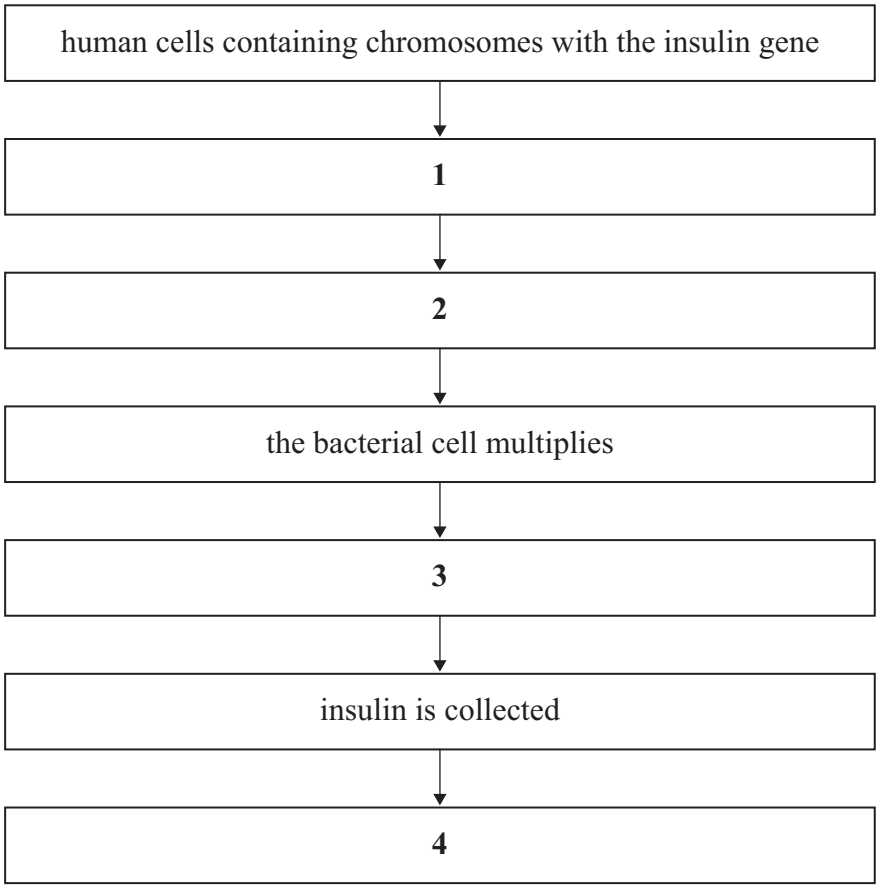
Match statements, **A**, **B**, **C** and **D**, with the labels **1–4** on the flow chart.

A insulin is produced by genetically engineered bacteria

B diabetics inject insulin to control diabetes

C the insulin gene is 'cut out' using enzymes

D the insulin gene is transferred into a bacterium



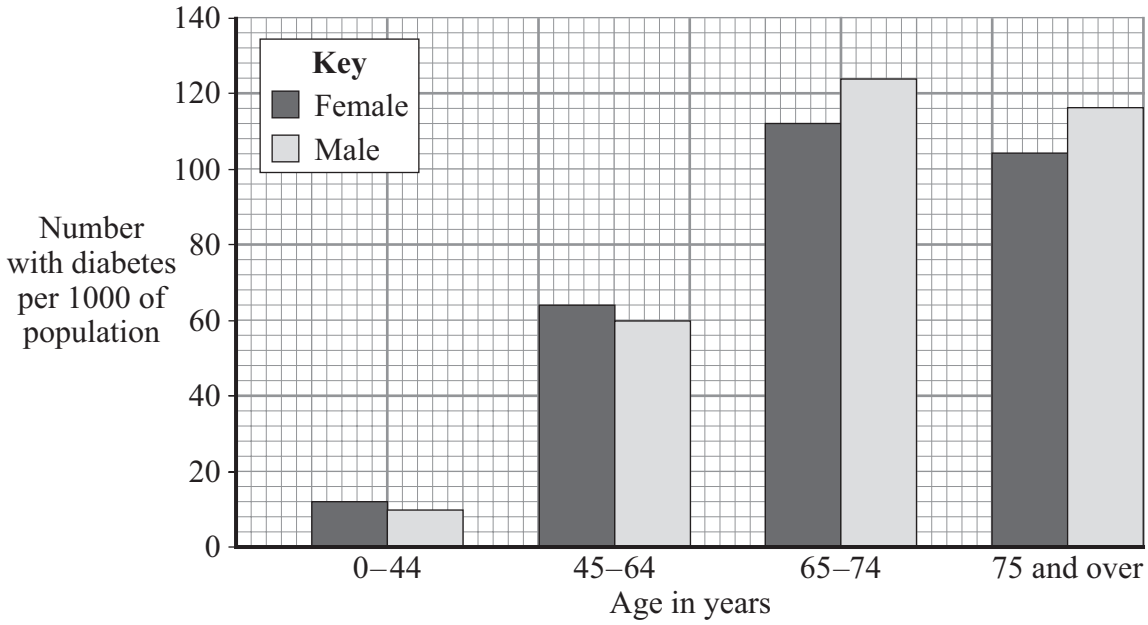
4.5.3.2 Control of blood glucose concentration

Question 05

June 2009 | BLY2F | Original Q6 | Legacy

6 Diabetes is caused when the body does not produce enough insulin.

6 (a) The bar graph shows the number of people with diabetes per 1000 of population.



6 (a) (i) How many more males aged between 45 and 64 years of age have diabetes than males under 45 years of age?

Show clearly how you work out your answer.

.....

.....

Answer ..... per 1000 of population
(2 marks)

6 (a) (ii) Describe the way in which the number of females with diabetes changes with age.

.....

.....

.....

.....

.....
(2 marks)

4.5.3.2 Control of blood glucose concentration

Question 05 · continued

for mark

6 (b) One way of treating diabetes is by injecting insulin.

Insulin is a protein.

6 (b) (i) If insulin is taken by mouth, it is broken down in the digestive system.

Where in the digestive system would insulin be broken down?

Draw a ring around your answer.

liver **mouth** **stomach**

(1 mark)

6 (b) (ii) Give **one** way of treating diabetes instead of using insulin.

.....

.....

(1 mark)

6

4.5.3.2 Control of blood glucose concentration

Question 06

3 Diabetes is a disease in which blood glucose (sugar) concentration may rise more than normal.

3 (a) Which organ in the body monitors this rise in blood sugar?

Draw a ring around your answer.

liver **pancreas** **stomach**

(1 mark)

3 (b) One way of treating diabetes is by careful attention to diet.

Chart 1 shows the recommended diet for a person with diabetes.
Chart 2 shows a diet for a person without diabetes.

Chart 1 Person with diabetes

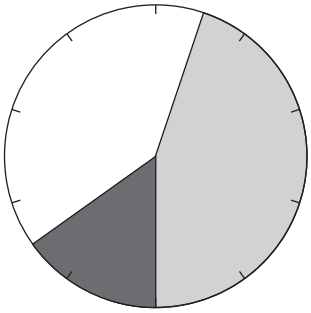
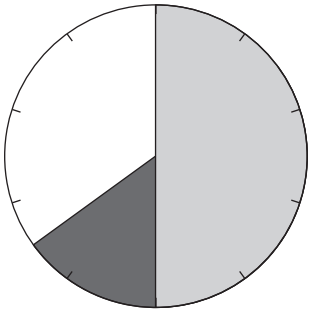


Chart 2 Person without diabetes



Key
Energy from: Carbohydrate Protein Fat

How is the recommended diet of a person with diabetes different from the diet of a person without diabetes?

Use information from the charts.

Tick (✓) **two** boxes.

The diabetic should get more energy from fat. ☐

The diabetic should get more energy from protein. ☐

The diabetic should get less energy from carbohydrate. ☐

The diabetic should get less energy from protein. ☐

(2 marks)

4.5.3.2 Control of blood glucose concentration

Question 06 · continued

for mark

3 (c) Other than diet, give **one** way in which diabetes may be treated.

.....

.....

(1 mark)

4

Turn over for the next question

4.5.3.2 Control of blood glucose concentration

Question 07

June 2010 | BLY1F | Original Q1 | Legacy

1 A healthy body needs a healthy diet.



Draw a ring around the correct answer to complete each sentence.

1 (a) To build cells we need large amounts of

mineral ions.
proteins.
vitamins.

(1 mark)

1 (b) Too much fat in the diet can lead to

heart disease.
leprosy.
lung cancer.

(1 mark)

1 (c) Too much salt in the diet can lead to

arthritis.
diabetes.
high blood pressure.

(1 mark)

1 (d) Not eating enough food can lead to

diabetes.
irregular periods.
leprosy.

(1 mark)

4

4.5.3.2 Control of blood glucose concentration

Question 08

June 2010 | BLY2F | Original Q5 | Legacy

5 Diabetes is a disease in which the concentration of glucose in a person's blood may rise to fatally high levels.
Insulin controls the concentration of glucose in the blood.

5 (a) Where is insulin produced?

Draw a ring around **one** answer.

gall bladder **liver** **pancreas**

(1 mark)

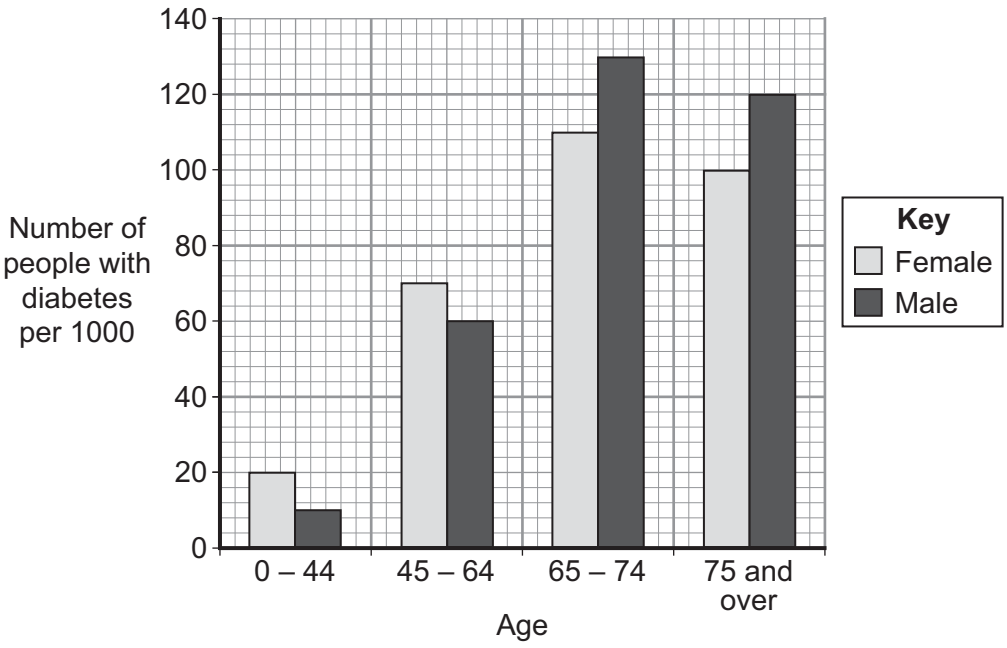
5 (b) Diabetics may control their blood glucose by injecting insulin.

Apart from using insulin, give **one** other way diabetics may reduce their blood glucose.

.....

(1 mark)

5 (c) The bar chart shows the number of people with diabetes in different age groups in the UK.



4.5.3.2 Control of blood glucose concentration

Question 08 · continued

5 (c) (i) Describe how the number of males with diabetes changes between the ages of 0–44 and 75 and over.

.....

.....

.....

.....

.....

.....

(3 marks)

5 (c) (ii) Compare the number of males and females with diabetes:

between the ages of 0 and 64 years

.....

.....

over the age of 65.

.....

.....

(2 marks)

7

4.5.3.2 Control of blood glucose concentration

Question 09

November 2010 | BLY1AP | Original Q1 | Legacy

QUESTION ONE

An unhealthy lifestyle may cause illness.

The table gives information about some conditions that affect the body.

Match conditions, **A**, **B**, **C** and **D**, with the statements **1–4** in the table.

A arthritis

B diabetes

C high blood pressure

D irregular periods

	Information
1	may be caused by the effect of too much weight on joints
2	may be caused by a diet that is high in sugars
3	may be caused by not enough food in the diet
4	may be caused by too much salt in the diet

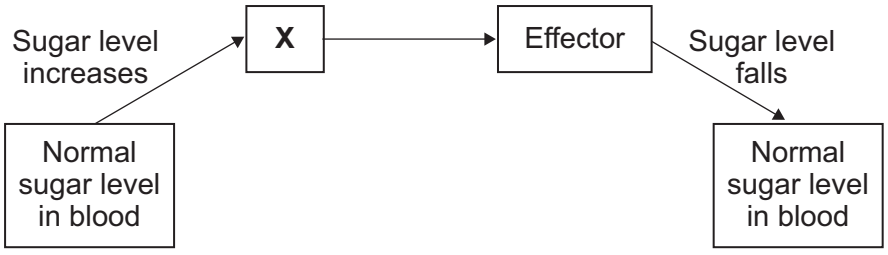
4.5.3.2 Control of blood glucose concentration

Question 10

June 2011 | BLY1AP | Original Q8 | Legacy

QUESTION EIGHT

The diagram shows what happens to sugar levels in the blood after a meal.



8A Structure **X** is sensitive to increases in blood sugar levels.

Structure **X** is a . . .

1 synapse.

2 relay neurone.

3 motor neurone.

4 receptor.

8B Structure **X** sends information to the effector in the blood stream.

This information is sent as . . .

1 a hormone.

2 an enzyme.

3 a synapse.

4 a nerve impulse.

8C All effectors are . . .

1 glands.

2 neurones.

3 target organs.

4 muscles.

4.5.3.2 Control of blood glucose concentration

Question 10 · continued

8D Sometimes, the organs controlling blood sugar concentration do not work properly and the sugar levels in the blood stay high.

This condition is called . . .

1 arthritis.

2 diabetes.

3 heart disease.

4 rubella.

Turn over for the next question

4.5.3.2 Control of blood glucose concentration

Question 11

June 2011 | BLY2F | Original Q3 | Legacy

3 Our bodies control the concentration of glucose in the blood.

Draw a ring around the correct answer to complete each sentence.

3 (a) The concentration of glucose in the blood is controlled by a

hormone called

carbohydrase.

insulin.

protease.

(1 mark)

3 (b) This hormone is produced by the

intestine.

stomach.

pancreas.

(1 mark)

3 (c) If the body does not produce enough of this hormone,

the person develops

diabetes.

cystic fibrosis.

Huntington's disease.

(1 mark)

3

4.5.3.2 Control of blood glucose concentration

Question 12

June 2013 | BL3FP | Original Q4 | Legacy

4 Type 1 diabetes develops when the body does not produce enough insulin.

4 (a) Which organ produces insulin?

.....

(1 mark)

4 (b) One treatment for diabetes is to inject insulin.

The table gives the properties of four different types of insulin, **A**, **B**, **C** and **D**.

Type of insulin	Time taken for the insulin to begin to work in minutes	Time taken for insulin to reach maximum concentration in the blood in minutes	Time when insulin is no longer effective in hours
A	15–20	30–90	3–4
B	30–60	80–120	4–6
C	120–240	360–600	14–16
D	240–360	600–960	18–20

4.5.3.2 Control of blood glucose concentration

Question 12 · continued June 2013 | BL3FP | Original Q4 | Legacy

4 (b) (i) Some people with diabetes need to inject insulin just before a meal to stop a big increase in blood sugar concentration.

Which type of insulin, **A**, **B**, **C** or **D**, should these people with diabetes inject just before a meal?

.....

Give the reason for your answer.

.....

.....

(2 marks)

4 (b) (ii) A person with diabetes is told to inject type **B** insulin immediately after breakfast at 09.00.
The person with diabetes is told to then inject a second type of insulin at lunchtime at 12.00.
The second type of insulin should keep the blood sugar level under control for the rest of the 24 hours.

Which type of insulin, **A**, **C** or **D**, should this person with diabetes inject at lunchtime?

.....

Give the reason for your answer.

.....

.....

(2 marks)

4 (b) (iii) Apart from injecting insulin, give **one** other way in which Type 1 diabetes can be controlled.

.....

(1 mark)

6

4.5.3.2 Control of blood glucose concentration

Question 13

June 2014 | BL3FP | Original Q2 | Legacy

2 Human body temperature must be kept within narrow limits.

Figure 4 shows a cyclist in a race.

Figure 4



2 (a) Use the correct answer from the box to complete each sentence.

[3 marks]

blood	**brain**	**kidney**	**sweat**	**urine**

The cyclist's body temperature is monitored by a centre in the ..... .

This centre is sensitive to the temperature of the cyclist's ..... .

If the cyclist's body temperature increases, his body increases

the production of ..... .

4.5.3.2 Control of blood glucose concentration

Question 13 · continued

2 (b) (i) Cyclists drink sports drinks after a race.

Table 1 shows the ratio of glucose to ions in three sports drinks, **A**, **B** and **C**.

Table 1

	Sports drink		
	A	**B**	**C**
Ratio of glucose (g per dm^3) to ions (mg per dm^3)	15:14	12:1	2:7

The closer this ratio of glucose to ions is to 1:1 in a sports drink, the faster the body replaces water.

Which sports drink, **A**, **B** or **C**, would replace water fastest in an athlete? ☐

[1 mark]

2 (b) (ii) Why should sports drinks contain ions?

[1 mark]

.....

.....

2 (b) (iii) Why should a person with diabetes **not** drink too much sports drink?

[1 mark]

.....

.....

6

4.5.3.2 Control of blood glucose concentration

Question 14

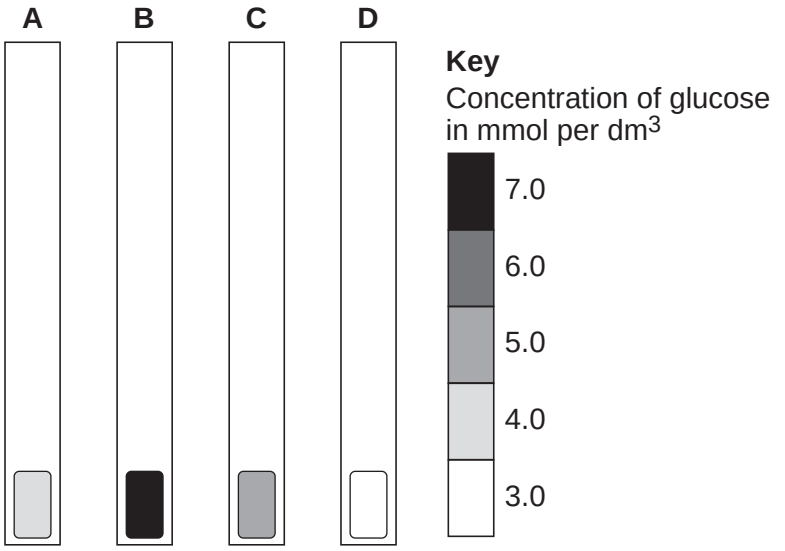
June 2015 | BL3FP | Original Q6 | Legacy

6 Blood glucose concentration in humans must be kept between 4.4 and 6.1 mmol per dm^3.

Four students, **A**, **B**, **C** and **D**, tested their blood glucose concentration with glucose testing strips.

Figure 7 shows the results of their tests and the key from the test strip bottle.

Figure 7



6 (a) (i) Which student, **A**, **B**, **C** or **D**, has diabetes and has eaten a large piece of cake? ☐

[1 mark]

6 (a) (ii) Which student, **A**, **B**, **C** or **D**, is in most need of eating carbohydrates? ☐

[1 mark]

6 (a) (iii) Which student, **A**, **B**, **C** or **D**, has a healthy blood glucose concentration? ☐

[1 mark]

6 (b) (i) Name the hormone that people with diabetes inject to prevent their blood glucose concentration from becoming too high.

[1 mark]

.....

6 (b) (ii) Blood glucose concentration is monitored in the body.

Which organ monitors blood glucose concentration?

Draw a ring around the correct answer.

[1 mark]

brain **liver** **pancreas**

5

4.5.3.2 Control of blood glucose concentration

Question 15

June 2016 | BL3FP | Original Q4 | Legacy

4 Some people with diabetes do not produce enough insulin to keep their blood glucose at the correct levels.

4 (a) (i) Which organ monitors blood glucose levels?

[1 mark]

Tick (✓) **one** box.

liver ☐

pancreas ☐

skin ☐

4 (a) (ii) What effect does insulin have on glucose in the blood?

[1 mark]

Tick (✓) **one** box.

Insulin causes glucose to move into the cells. ☐

Insulin increases the amount of glucose in the blood. ☐

Insulin converts glucose to starch. ☐

4.5.3.2 Control of blood glucose concentration

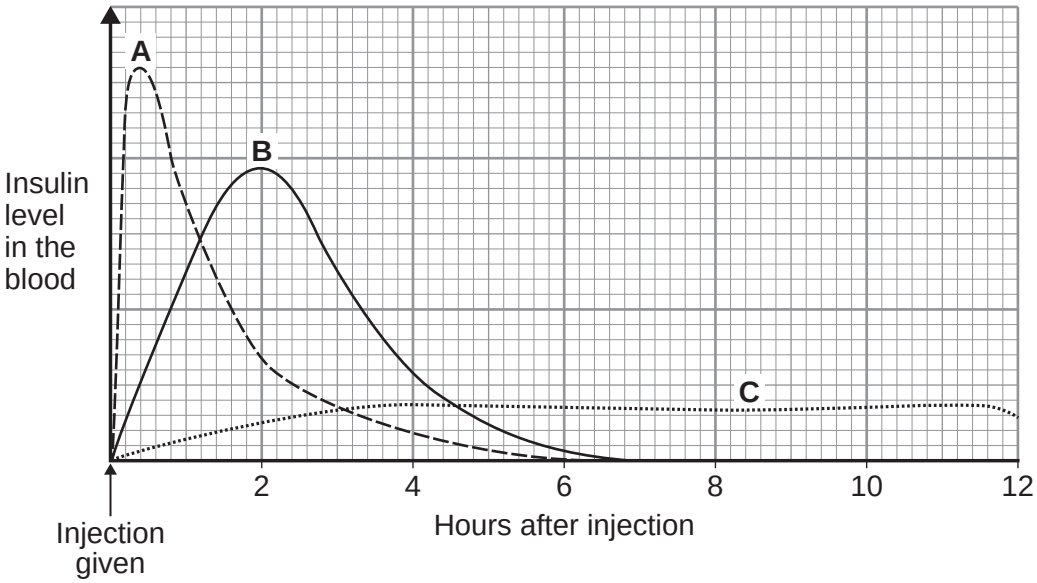
Question 15 · continued

4 (b) Some people with diabetes inject insulin several times a day.

There are different types of insulin.

Figure 6 shows some information about three different types of insulin, **A**, **B** and **C**.

Figure 6



4 (b) (i) Which type of insulin, **A**, **B** or **C**, should a person with diabetes inject just before eating a meal high in carbohydrates?

[2 marks]

_____

Give a reason for your answer.

_____

_____

Question 4 continues on the next page

4.5.3.2 Control of blood glucose concentration

Question 15 · continued

4 (b) (ii) A woman with diabetes has a blood glucose level of 12 mmol per dm^3 of blood.

The woman's normal blood glucose level is 6 mmol per dm^3.

The woman will need to inject insulin to lower her blood glucose level.

For each unit of insulin injected the blood glucose level will fall by 3 mmol per dm^3.

How many units of insulin does the woman need to inject to bring her blood glucose level down to the normal level?

[1 mark]

_____

Number of units = _____

4 (c) Some people have pancreas transplants to treat diabetes.

Give **one** possible disadvantage of a pancreas transplant.

[1 mark]

Tick (✓) **one** box.

The pancreas could be rejected. ☐

The patient will need to inject insulin every day. ☐

The patient's blood glucose levels may rise and fall too much. ☐

6

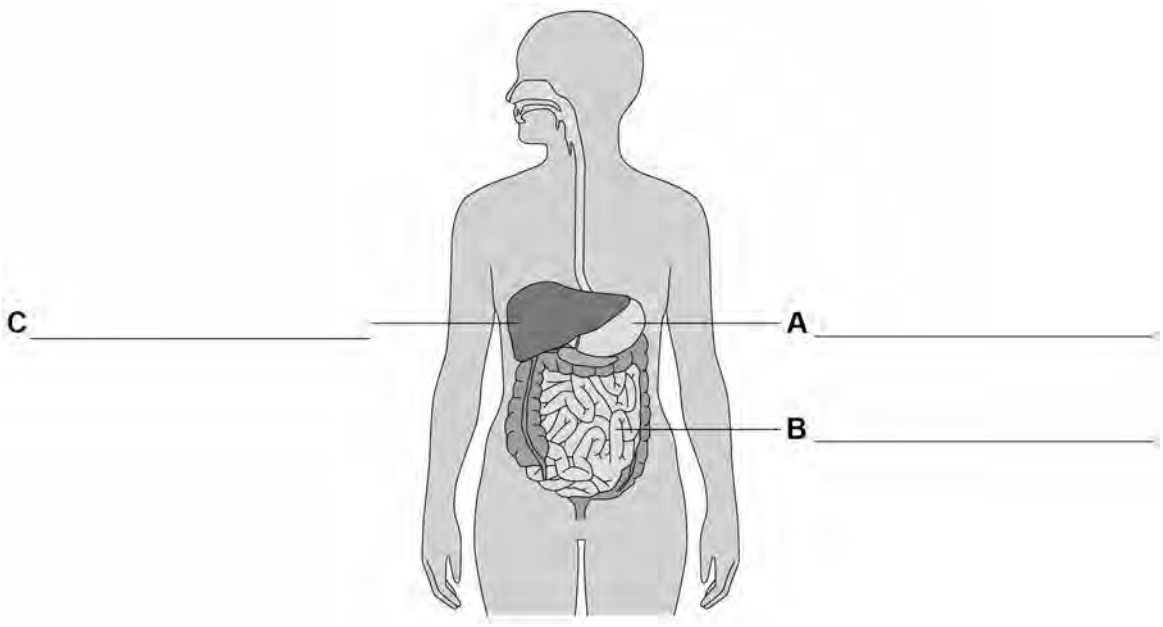
4.5.3.2 Control of blood glucose concentration

Question 16

June 2018 | 8461/1F | Original Q3

0 3 **Figure 5** shows the human digestive system.

Figure 5



0 3 . 1 Label organs **A**, **B** and **C**.

[3 marks]

0 3 . 2 Complete the sentences.

[3 marks]

Choose the answers from the box.

catalyse	**denatured**	**digest**	**energise**
excreted	**ingested**	**insoluble**	**soluble**

Digestion is the process of breaking down large food molecules into smaller molecules that are _____.

Enzymes help to break down food because they _____ chemical reactions.

If the temperature of an enzyme gets too high, the enzyme is _____.

4.5.3.2 Control of blood glucose concentration

Question 16 · continued

0 3 . 3 Protease is an enzyme.

Protease breaks down protein.

What is protein broken down into?

[1 mark]

Tick **one** box.

- Amino acids ☐
- Fatty acids ☐
- Glucose ☐
- Glycerol ☐

0 3 . 4 Why is protein needed by the body?

[1 mark]

_____

_____

0 3 . 5 Which organ in the human digestive system produces protease?

[1 mark]

Tick **one** box.

- Gall bladder ☐
- Large intestine ☐
- Liver ☐
- Stomach ☐

4.5.3.2 Control of blood glucose concentration

Question 16 · continued

0 3 . 6 Describe how you would test a sample of food to show it contains protein.

Give the reason for any safety precautions you would take.

[4 marks]

0 3 . 7 Complete the sentence.

[1 mark]

Choose the answer from the box.

fat	fibre	minerals	vitamins

Obesity can be caused by a diet high in _____.

0 3 . 8 Complete the sentence.

[1 mark]

Choose the answer from the box.

skin cancer	type 1 diabetes	type 2 diabetes

Obesity is a risk factor for _____.

15

4.5.3.2 Control of blood glucose concentration

Question 17

June 2018 | 8461/2F | Original Q5

0 5 A person with Type 1 diabetes cannot make enough insulin.

0 5 . 1 Which organ makes insulin?

[1 mark]

Tick **one** box.

- Adrenal gland ☐
- Pancreas ☐
- Pituitary gland ☐
- Thyroid ☐

0 5 . 2 A person with Type 1 diabetes can control the concentration of glucose in the blood by injecting insulin.

Complete the sentences.

[2 marks]

Choose answers from the box.

DNA	**glycogen**	**kidney**
liver	**protein**	**skin**

Insulin acts on an organ called the _____.

This organ then takes in excess glucose from the blood and changes the glucose into _____.

0 5 . 3 Insulin cannot be taken as a tablet. This is because insulin is a type of protein.

What would happen to the insulin in the tablet if it reached the stomach?

[1 mark]

_____

_____

4.5.3.2 Control of blood glucose concentration

Question 17 · continued

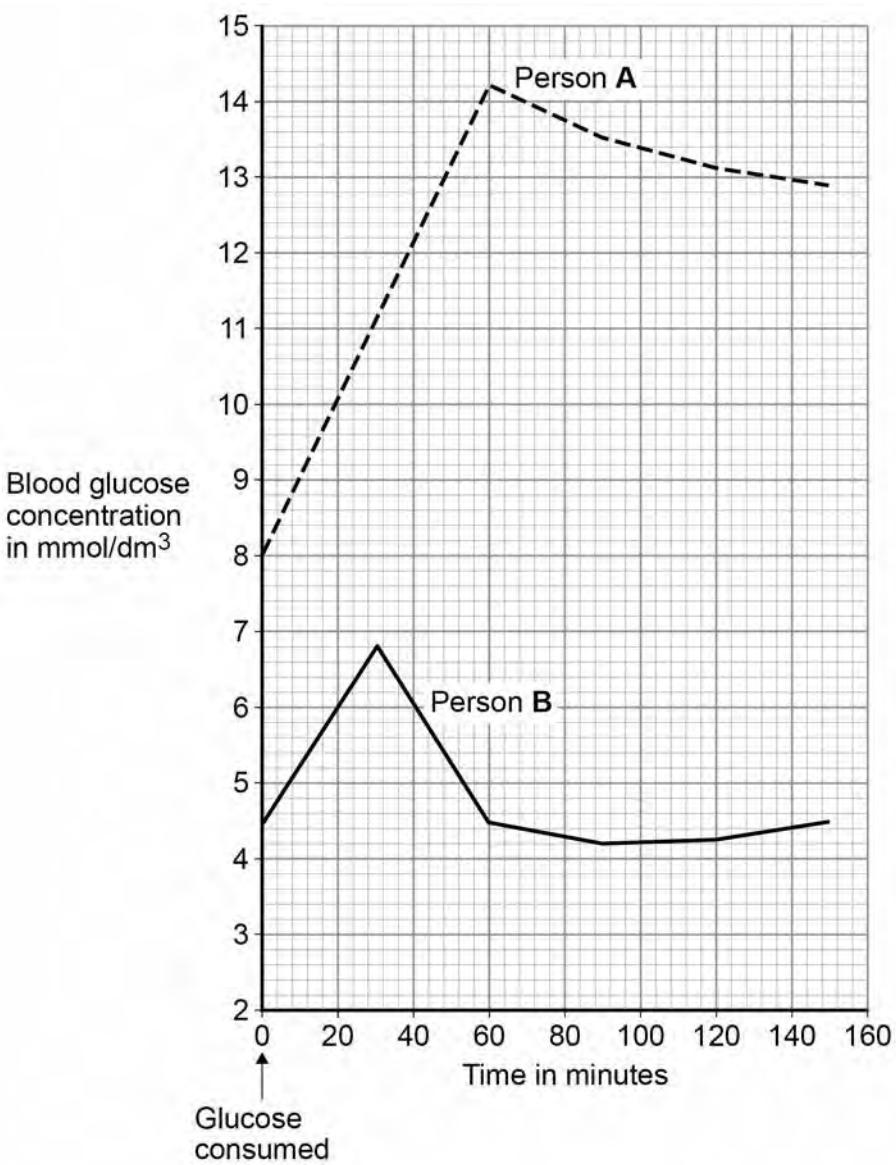
Two people each drank the same volume of a glucose drink.

Person **A** has Type 1 diabetes.

Person **B** does **not** have diabetes.

Figure 6 shows how the concentration of glucose in their blood changed.

Figure 6



4.5.3.2 Control of blood glucose concentration

Question 17 · continued

0 5 . 4 How much higher was the **highest** concentration of glucose in the blood of person **A** than the **highest** concentration in person **B**?

Use information from **Figure 6**.

[2 marks]

Answer = _____ mmol/dm^3

0 5 . 5 Describe **one** other way that the results for person **A** were different from the results for person **B**.

Use information from **Figure 6**.

[1 mark]

Question 5 continues on the next page

4.5.3.2 Control of blood glucose concentration

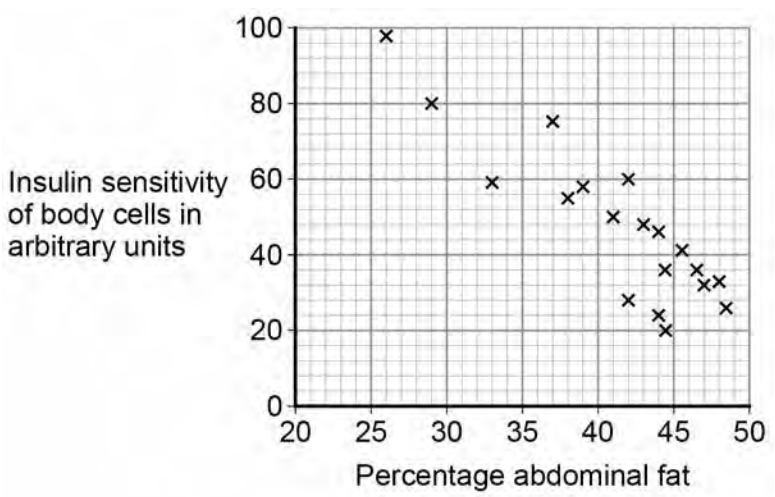
Question 17 · continued

Type 2 diabetes is another form of diabetes. Type 2 diabetes is common in obese people.

People with Type 2 diabetes make enough insulin, but still cannot control their blood glucose concentration. This is because the body cells are not sensitive to the insulin.

Figure 7 shows information about abdominal fat and insulin sensitivity in body cells.

Figure 7



0 5 . 6 What type of relationship is shown in **Figure 7**?

[1 mark]

Tick **one** box.

A negative correlation ☐

No correlation ☐

A positive correlation ☐

0 5 . 7 A person is at risk of developing Type 2 diabetes.

Suggest **two** ways the person could lower the chance of developing Type 2 diabetes.

[2 marks]

1 _____

_____

2 _____

_____

10

4.5.3.2 Control of blood glucose concentration

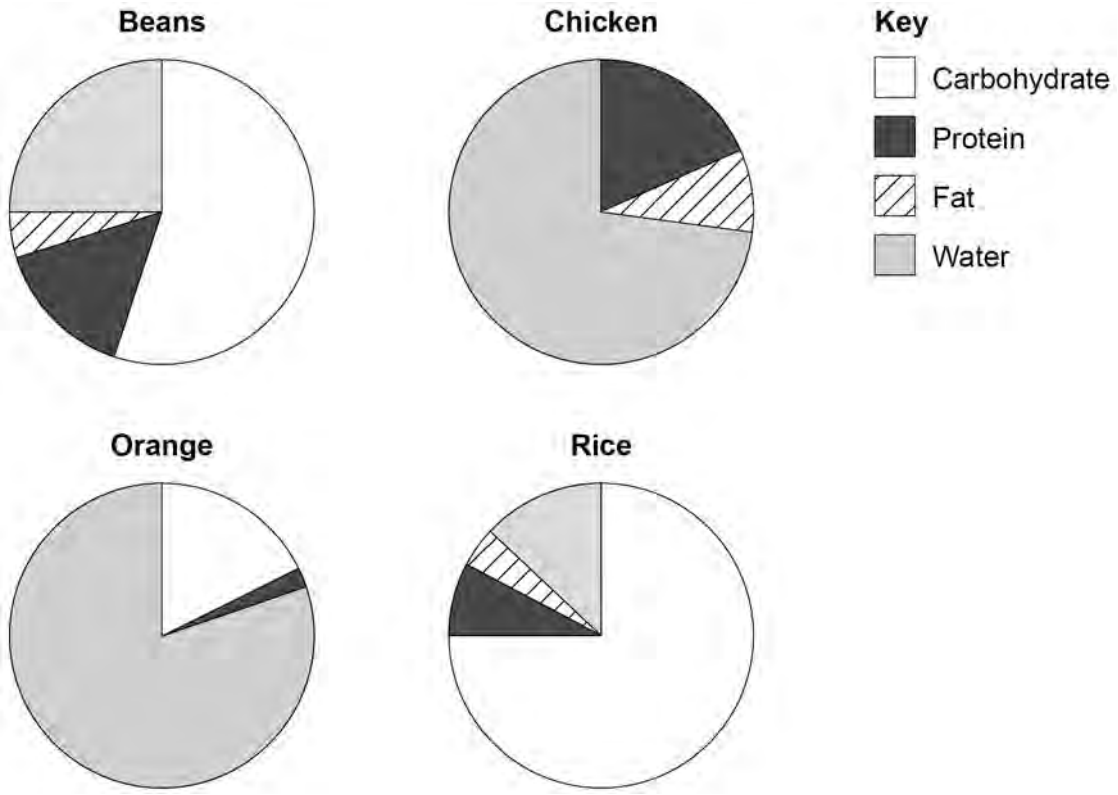
Question 18

June 2019 | 8461/1F | Original Q1

0 1 Many foods contain carbohydrates.

Figure 1 shows information about four different foods.

Figure 1



0 1 . 1 Which food contains the highest percentage of carbohydrate?

[1 mark]

Tick (✓) **one** box.

- Beans ☐
- Chicken ☐
- Orange ☐
- Rice ☐

4.5.3.2 Control of blood glucose concentration

Question 18 · continued

0 1 . 2 Estimate the percentage of water found in beans.

[1 mark]

Percentage = _____ %

0 1 . 3 Look at **Figure 1**.

Why would eating only beans provide a more balanced diet than eating only chicken?

[1 mark]

_____

_____

0 1 . 4 Sugars are produced when enzymes break down starch.

What is the name of the enzyme which breaks down starch to produce sugars?

[1 mark]

Tick (✓) **one** box.

- Amylase ☐
- Bile ☐
- Lipase ☐
- Protease ☐

0 1 . 5 Which chemical could be used to test for glucose?

[1 mark]

Tick (✓) **one** box.

- Benedict's reagent ☐
- Biuret reagent ☐
- Iodine solution ☐
- Sulfuric acid ☐

4.5.3.2 Control of blood glucose concentration

Question 18 · continued

0 1 . 6 What colour change would be seen in a positive test for glucose?

[1 mark]

From blue to _____.

0 1 . 7 People with diabetes have difficulty controlling the concentration of glucose in their blood.

The blood of four people was tested.

Table 1 shows the results.

Table 1

Person	Concentration of glucose in blood in arbitrary units
A	4.2
B	6.9
C	7.1
D	5.1

Table 2 shows the information used to help decide if a person has diabetes.

Table 2

Concentration of glucose in blood in arbitrary units	Conclusion
<5.6	No diabetes
5.6 to 7.0	Mild diabetes
>7.0	Severe diabetes

Which person has severe diabetes?

[1 mark]

Tick (✓) **one** box.

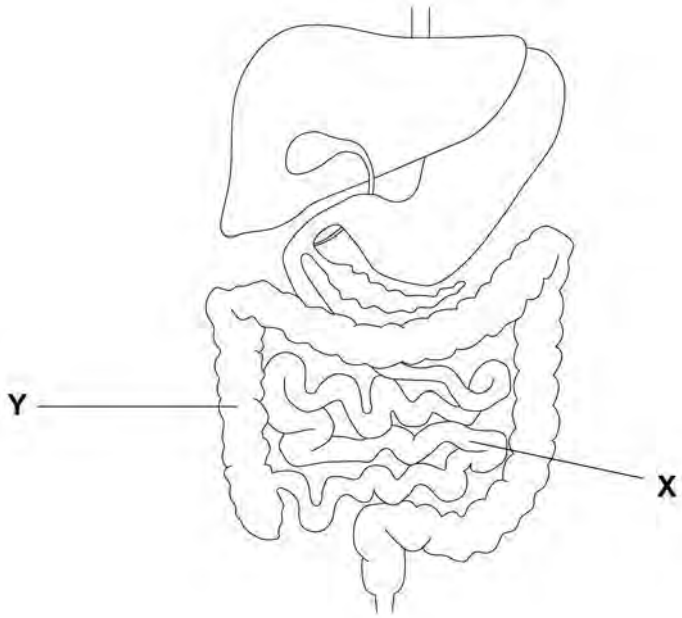
A ☐ **B** ☐ **C** ☐ **D** ☐

4.5.3.2 Control of blood glucose concentration

Question 18 · continued

Figure 2 shows part of the human digestive system.

Figure 2



0 1 . 8 Glucose is absorbed into the bloodstream in part **X**.

Name part **X**.

[1 mark]

_____

0 1 . 9 Complete the sentences.

[2 marks]

Choose answers from the box.

active transport	**digestion**	**excretion**
osmosis	**respiration**	

Some glucose is absorbed into the bloodstream against the concentration gradient by the process of _____.

Water moves out of part **Y** and into the bloodstream by the process of _____.

10

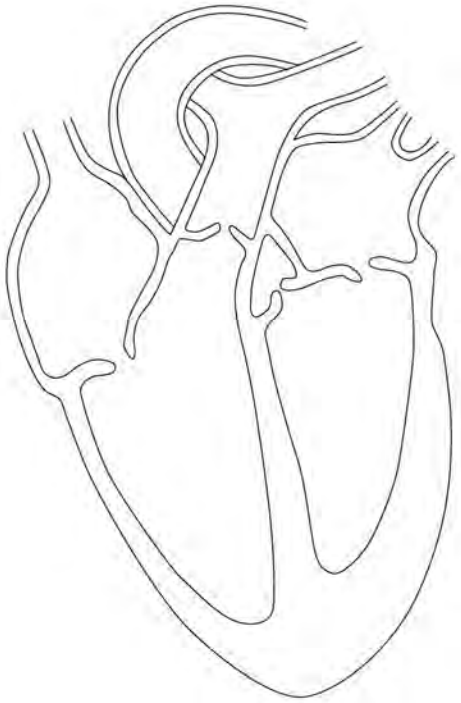
4.5.3.2 Control of blood glucose concentration

Question 19

June 2019 | 8461/1F | Original Q6

0 6 **Figure 11** shows the internal structure of the human heart.

Figure 11



0 6 . 1 Which organ system is the heart a part of?

[1 mark]

0 6 . 2 Draw a ring around **one** valve on **Figure 11**.

[1 mark]

0 6 . 3 What is the function of the valves in the heart?

[1 mark]

Question 6 continues on the next page

4.5.3.2 Control of blood glucose concentration

Question 19 · continued

0 6 . 4 Valves are also found inside some blood vessels.

Which type of blood vessel contains valves?

[1 mark]

Sometimes a valve in the heart can begin to leak.

A leaking heart valve may be replaced with either:

- a mechanical valve
- a biological valve from a pig.

Table 6 shows information about the replacement valves.

Table 6

Mechanical valve	Biological valve from a pig
Made of plastic or metal	Made from living tissue
Can cause the blood to clot around the valve	No risk of blood clotting around the valve
No need for another replacement valve after 5 years	Sometimes another replacement valve is needed after 5 years

0 6 . 5 Suggest **two** reasons why a patient may choose a mechanical valve and **not** a biological valve from a pig.

[2 marks]

1

2

4.5.3.2 Control of blood glucose concentration

Question 19 · continued

0 6 . 6 Suggest **one** reason why a patient may choose a biological valve from a pig and **not** a mechanical valve.

[1 mark]

0 6 . 7 A person may develop other medical conditions.

Draw **one** line from each medical condition to the correct treatment.

[2 marks]

Medical condition	Treatment
High blood cholesterol	Antibiotics
	Artificial pacemaker
Irregular heart rate	Insulin
	Statins

9

4.5.3.2 Control of blood glucose concentration

Question 20

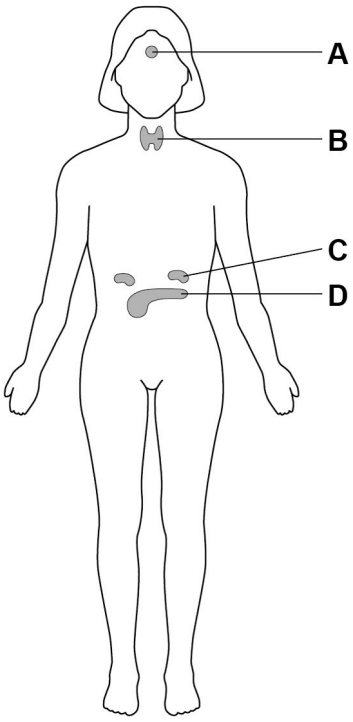
November 2021 | 8461/2F | Original Q2

0 2 Many internal processes of the human body are controlled by hormones.

Hormones are produced by glands.

Figure 2 shows glands in a woman's body.

Figure 2



0 2 . 1 Which gland is the pituitary gland?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 2 . 2 Which gland is the pancreas?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

4.5.3.2 Control of blood glucose concentration

Question 20 · continued

The hormone insulin helps to decrease the blood glucose concentration.

Insulin causes its target organs to take in glucose from the blood.

0 2 . 3 Which of the following is a target organ for insulin?

[1 mark]

Tick (✓) **one** box.

- Bladder ☐
- Heart ☐
- Liver ☐

0 2 . 4 The glucose is stored as an insoluble substance.

What is the insoluble storage substance that is formed from glucose?

[1 mark]

Tick (✓) **one** box.

- Glycogen ☐
- Protein ☐
- Urea ☐

Question 2 continues on the next page

4.5.3.2 Control of blood glucose concentration

Question 20 · continued

Scientists investigated the effect of a glucose drink on the concentration of glucose in a person's blood.

This is the method used.

1. Take a small sample of blood from the person.

2. Measure the concentration of glucose in the person's blood.

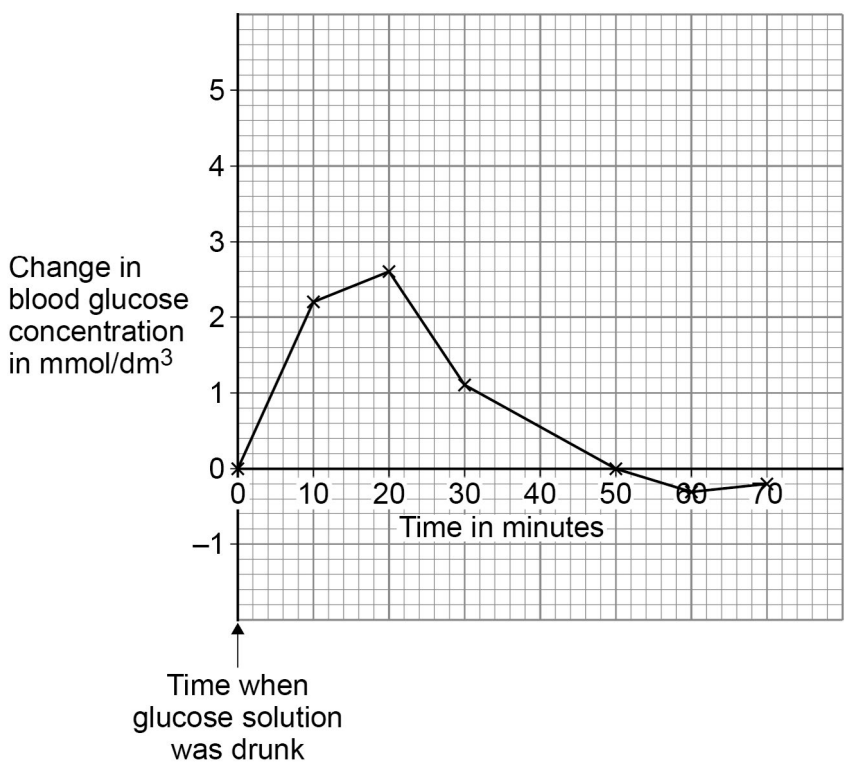
3. Give the person a drink containing 50 grams of glucose.

4. Measure the concentration of glucose in the person's blood at intervals.

5. Calculate the **change** in blood glucose concentration from the starting value.

Figure 3 shows the results.

Figure 3



4.5.3.2 Control of blood glucose concentration

Question 20 · continued

Figure 3 shows the **change** in blood glucose concentration.

0 2 . 5 At the start of the investigation, the blood glucose concentration was 5 mmol/dm^3.

Calculate the highest blood glucose concentration during the investigation.

Use information from **Figure 3** in your answer.

[2 marks]

Highest blood glucose concentration = _____ mmol/dm^3

0 2 . 6 What is the time taken for the blood glucose concentration to decrease from its highest value back to the starting value?

Use data from **Figure 3** in your answer.

[1 mark]

Time taken = _____ minutes

0 2 . 7 Why can you **not** be certain that your answer to Question **02.6** is accurate?

[1 mark]

0 2 . 8 **Figure 3** shows the results for a person who does **not have** Type 2 diabetes.

Sketch a line on **Figure 3** to show the results you would expect for a person who **has** Type 2 diabetes.

[2 marks]

10

4.5.3.2 Control of blood glucose concentration

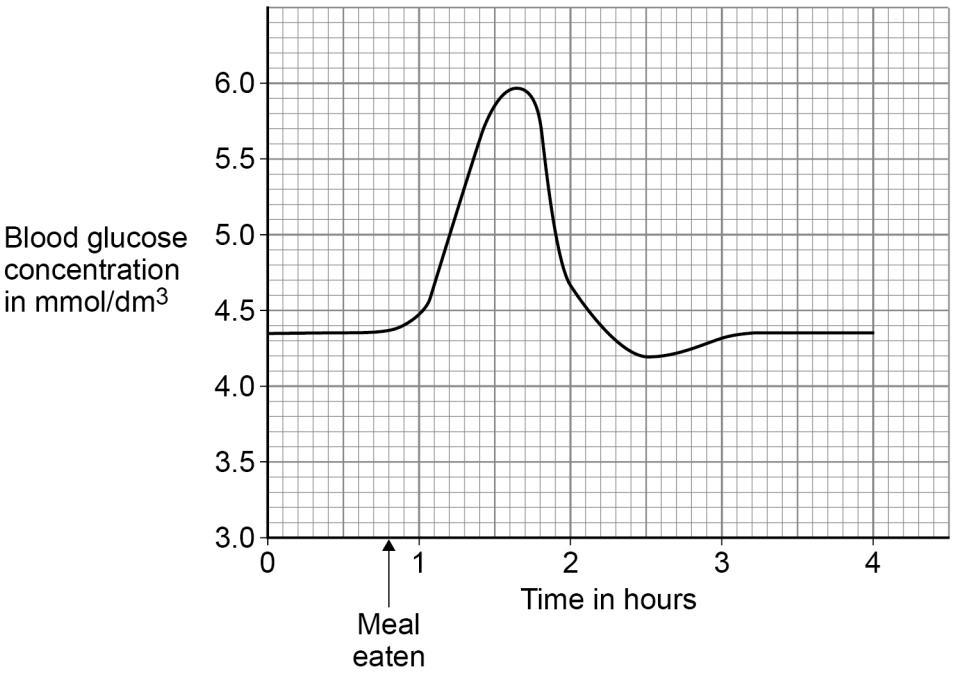
Question 21

June 2022 | 8461/2F | Original Q10

1 0 It is important to control the concentration of glucose in the blood.

Figure 13 shows how the concentration of glucose in the blood of a person changed over 4 hours.

Figure 13



1 0 . 1 Give **one** time when the concentration of **insulin** in the person's blood would be high.

Use **Figure 13**.

[1 mark]

Time = _____ hours

4.5.3.2 Control of blood glucose concentration

Question 21 · continued

1 0 . 2 Explain the effect a high concentration of insulin has on blood glucose concentration.

[3 marks]

Effect _____

Explanation _____

_____

_____

_____

Question 10 continues on the next page

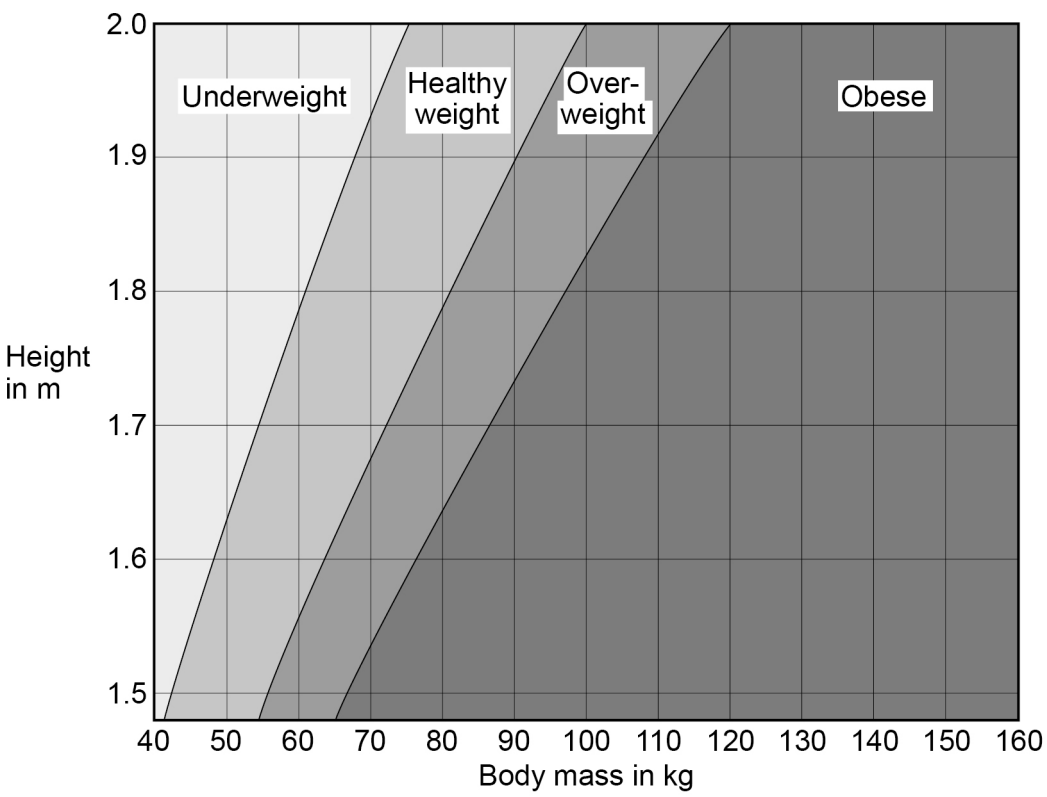
Question 21 · continued

People with diabetes have difficulty controlling the concentration of glucose in their blood.

Type 2 diabetes is linked to obesity.

Figure 14 shows how to find if an adult's body mass is healthy for their height.

Figure 14



4.5.3.2 Control of blood glucose concentration

Question 21 · continued

June 2022 | 8461/2F | Original Q10

1 0 . 3 Person **A**:

- is 1.75 m in height
- has a body mass of 52 kg.

What is person **A**'s weight category?

[1 mark]

Tick (✓) **one** box.

Underweight ☐

Healthy weight ☐

Overweight ☐

Obese ☐

1 0 . 4 Person **B** is 1.9 m in height.

Give the range of body masses that would put person **B** in the healthy weight category.

[1 mark]

Range from _____ kg to _____ kg

Question 10 continues on the next page

4.5.3.2 Control of blood glucose concentration

Question 21 · continued

1 0 . 5 Person **C** is obese.

A doctor thinks that person **C** has Type 2 diabetes.

The doctor tests a sample of blood from person **C**.

Table 5 shows:

- the results of the blood test
- the mean results for people who do **not** have diabetes.

Table 5

	Concentration in blood	
	Person C	**Mean for people who do not have diabetes**
Cholesterol in mmol/dm^3	6.21	5.20
Glucose in mmol/dm^3	9.56	4.51
Insulin in arbitrary units	24.32	14.83

Type 2 diabetes occurs when body cells have a reduced response to insulin.

Give **two** ways the results of the blood test show that person **C** might have Type 2 diabetes.

[2 marks]

1 _____

_____

2 _____

_____

4.5.3.2 Control of blood glucose concentration

Question 21 · continued

June 2022 | 8461/2F | Original Q10

1 0 . 6 Give **two** ways that a person can reduce the chance of developing Type 2 diabetes.

[2 marks]

1 _____

_____

2 _____

_____

10

4.5.3.2 Control of blood glucose concentration

Question 22

June 2023 | 8461/2F | Original Q1

0 1 Hormones are important for controlling many processes in the human body.

Hormones are produced by glands.

0 1 . 1 Which organ system has glands that produce hormones?

[1 mark]

Tick (✓) **one** box.

- The circulatory system ☐
- The endocrine system ☐
- The nervous system ☐

0 1 . 2 How are hormones transported around the body?

[1 mark]

Tick (✓) **one** box.

- By the blood ☐
- By the muscles ☐
- By the nerves ☐

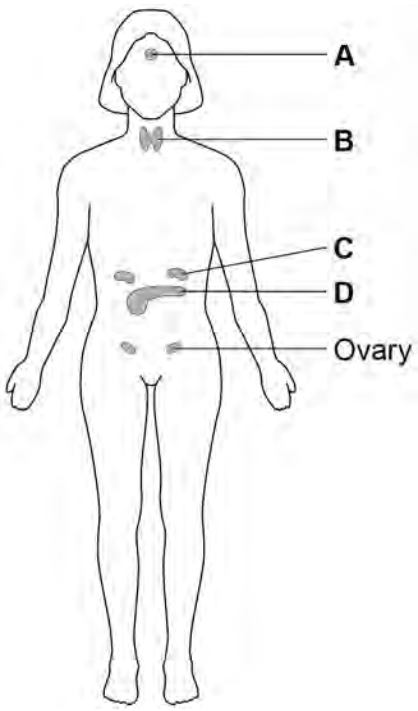
Question 1 continues on the next page

4.5.3.2 Control of blood glucose concentration

Question 22 · continued

Figure 1 shows glands in a woman's body.

Figure 1



0 1 . 3 Draw **one** line from each gland to the name of that gland.

[3 marks]

Gland	Name
A	Adrenal
B	Pituitary
C	Testes
	Thyroid

4.5.3.2 Control of blood glucose concentration

Question 22 · continued

0 1 . 4 Which gland in **Figure 1** produces insulin?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 1 . 5 Which organ does insulin mainly affect?

[1 mark]

Tick (✓) **one** box.

The brain ☐

The liver ☐

The ovary ☐

0 1 . 6 Give **one** effect of insulin.

[1 mark]

_____

_____

Question 1 continues on the next page

4.5.3.2 Control of blood glucose concentration

Question 22 · continued

Some hormones control a woman's menstrual cycle.

0 1 . 7 Which hormone causes an egg to mature in the ovary?

[1 mark]

Tick (✓) **one** box.

- Adrenaline ☐
- Follicle stimulating hormone (FSH) ☐
- Testosterone ☐

0 1 . 8 Which **two** are hormones that help to maintain the lining of the uterus during pregnancy?

[2 marks]

Tick (✓) **two** boxes.

- Amylase ☐
- Oestrogen ☐
- Progesterone ☐
- Protease ☐
- Thyroxine ☐

4.5.3.2 Control of blood glucose concentration

Question 22 · continued

0 1 . 9 Contraception prevents pregnancy.

Give **two** methods of contraception that use hormones.

[2 marks]

1 _____

_____

2 _____

_____

13

Turn over for the next question

4.5.3.2 Control of blood glucose concentration

Question 23

June 2024 | 8461/2F | Original Q5

0 5 The hormone insulin helps to control the concentration of glucose in the blood.

0 5 . 1 Which organ produces insulin?

[1 mark]

Tick (✓) **one** box.

Adrenal gland ☐

Pancreas ☐

Thyroid ☐

People with Type 2 diabetes:

- produce insulin
- have body cells that do **not** respond to insulin
- often have a high concentration of glucose in their blood.

0 5 . 2 Why do people with Type 2 diabetes often have a high concentration of glucose in their blood?

[1 mark]

Tick (✓) **one** box.

The body cells change glucose into glycogen for storage. ☐

The body cells have a high rate of respiration to release energy. ☐

The body cells take in a low amount of glucose from the blood. ☐

4.5.3.2 Control of blood glucose concentration

Question 23 · continued

June 2024 | 8461/2F | Original Q5

Drug **X** is used for treating people who have Type 2 diabetes.

Scientists investigated the effect of drug **X** on the concentration of glucose in the blood of mice.

This is the method used.

1. Give two groups of mice the same diet for 8 weeks.
2. Give each mouse in group **A** 2 cm^3 of water to drink.
3. Give each mouse in group **B** 2 cm^3 of drug **X** to drink.
4. After 30 minutes, give each mouse 1 cm^3 of glucose solution to drink.
5. Measure the concentration of glucose in the blood of each mouse at intervals for 3 hours.

0 5 . 3 Give **two** control variables used in the investigation.

[2 marks]

1 _____

_____

2 _____

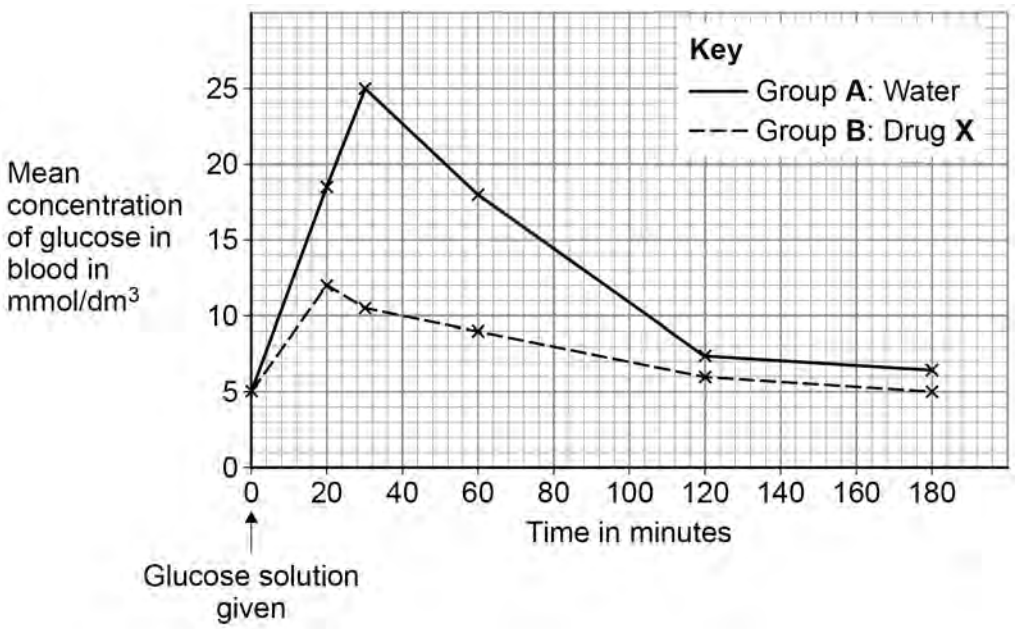
_____

Question 5 continues on the next page

Question 23 · continued

Figure 6 shows the results.

Figure 6



In each group of mice, the concentration of glucose increases to a maximum value and then decreases.

0 5 . 4 Group **B** reached a maximum value earlier than group **A**.

Determine how many minutes earlier.

[2 marks]

Number of minutes earlier = _____

4.5.3.2 Control of blood glucose concentration

Question 23 · continued

0 5 . 5 Give **two** conclusions about the effect of drug **X** on the concentration of glucose in the blood.

Do **not** refer to reaching the maximum value earlier.

[2 marks]

1 _____

_____

2 _____

_____

0 5 . 6 How could scientists find the best **dose** of drug **X** for controlling blood glucose concentration?

[1 mark]

Tick (✓) **one** box.

Repeat the investigation twice more. ☐

Use different concentrations of drug **X**. ☐

Use more mice in the investigation. ☐

9