

Controlling Blood Glucose 2

Q:1(a)(i) Which organ in the body monitors the concentration of glucose (sugar) in the blood?

(1 mark)

(a)(ii) In a healthy person, insulin prevents high levels of glucose in the blood. How does it do this?

(1 mark)

(b) There are two forms of diabetes.

In type 1 diabetes, the body produces little or no insulin.

In type 2 diabetes, the body cells do not respond to insulin.

There are two ways in which diabetes can be treated.

Draw lines to join the type of diabetes to the way or ways in which it can be treated.

Type of diabetes	Treatment
Type 1	Careful attention to diet only
Type 2	Careful attention to diet and injection of insulin
	Injection of insulin only

(2 marks)

(c) To make insulin, cells in the pancreas need amino acids.

A small section of DNA in the pancreas cells is involved in making insulin from the amino acids.

(c)(i) Insulin is a hormone.

What type of substance is insulin? Draw a ring around one answer.

carbohydrate lipid protein

(1 mark)

(c)(ii) What term is used to describe the small section of DNA which controls the production of insulin?

(1 mark)

(c)(iii) Amino acids cannot be stored in the body.

Describe, as fully as you can, what happens to the excess amino acids.

You may wish to use the following words in your explanation:

liver kidneys bladder

(3 marks)

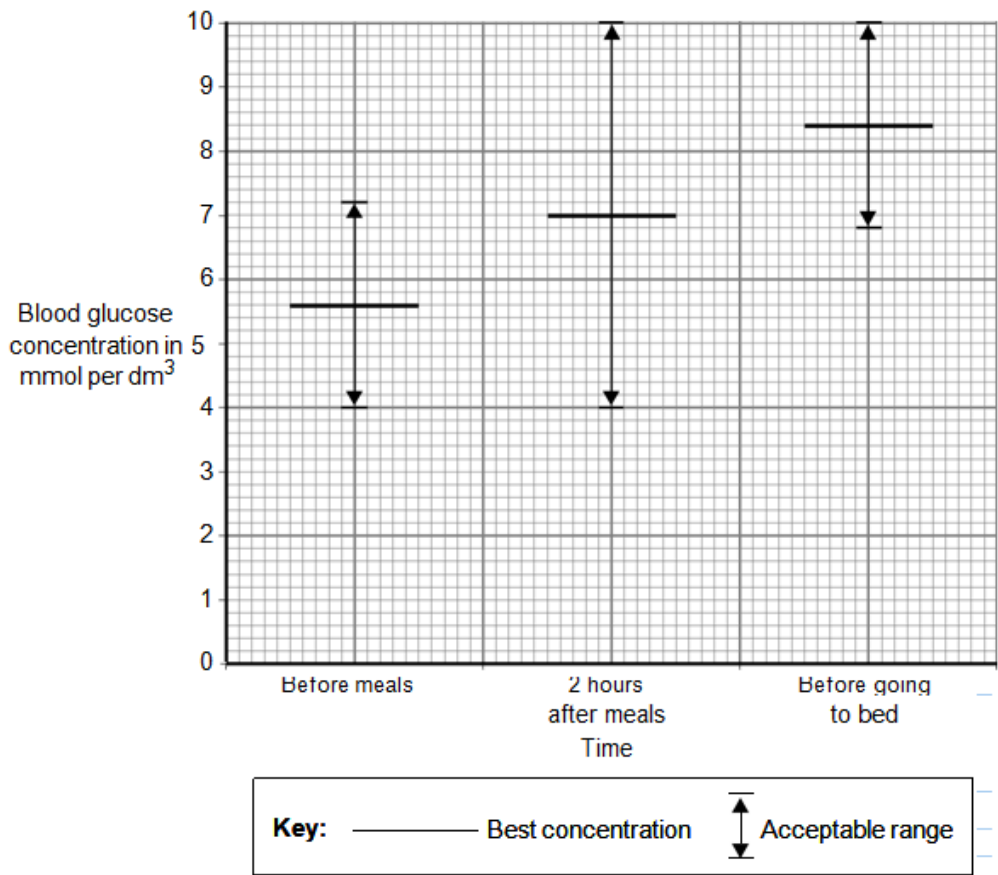
Q:2 In diabetics blood glucose concentrations are sometimes abnormal.

(a) Name the organ that monitors the concentration of glucose in the blood.

(1 mark)

(b) Diabetics can measure their blood glucose concentration.

The graph shows the best blood glucose concentration and the acceptable range of blood glucose concentration at different times.



What is the acceptable range for the blood glucose concentration before meals?

From _____ to _____ mmol per dm³

(1 mark)

(c) The amount of insulin a diabetic injects can be changed so that blood glucose concentration is kept near to the best level.

Two hours after eating breakfast a diabetic measures his blood glucose concentration.

His blood glucose concentration is 13 mmol per dm³.

He reads these instructions: "for every 2 mmol per dm³ of blood glucose above the best concentration, inject 1 unit more of insulin

"for every 2 mmol per dm³ of blood glucose below the best concentration, inject 1 unit less of insulin.

How should he change his normal insulin injection to bring his blood glucose level to the best concentration?

Show clearly how you work out your answer.

Answer = _____

(3 marks)

Q:3 The hormone insulin is a protein. Insulin is produced in the pancreas and controls blood glucose concentration.

(a) Which organ in the body monitors blood glucose concentration?

(1 mark)

(b) We now know that a lack of the hormone insulin causes diabetes. In the early twentieth century there was no known cure for diabetes.

Frederick Banting and Charles Best carried out a number of experiments on dogs.

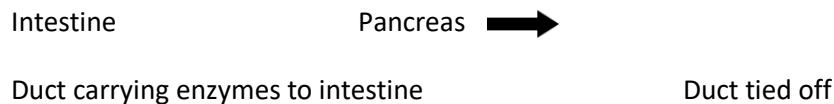
In the first experiment they removed part of the pancreas from a healthy dog (dog A). They ground up the pancreas tissue and injected an extract into dog B, whose pancreas had been removed to make it diabetic. Dog B's diabetes was not cured.

Banting thought that an enzyme produced in the pancreas of dog A had digested the hormone before it was injected.

Name the enzyme that might have been responsible for digesting the hormone.

(1 mark)

(c) In the second experiment with another healthy dog, Banting and Best tied off the duct which normally carries digestive enzymes out of the pancreas. This did not kill the dog.



(c)(i) The dog survived even though enzymes from the pancreas could not digest food in the intestine.

Explain why the dog survived.

(1 mark)

(c) (ii) As a result of these experiments, a method was developed to extract insulin from the pancreas.

Insulin is used to treat humans with diabetes.

The amount of insulin injected needs to be carefully controlled.

Explain why.

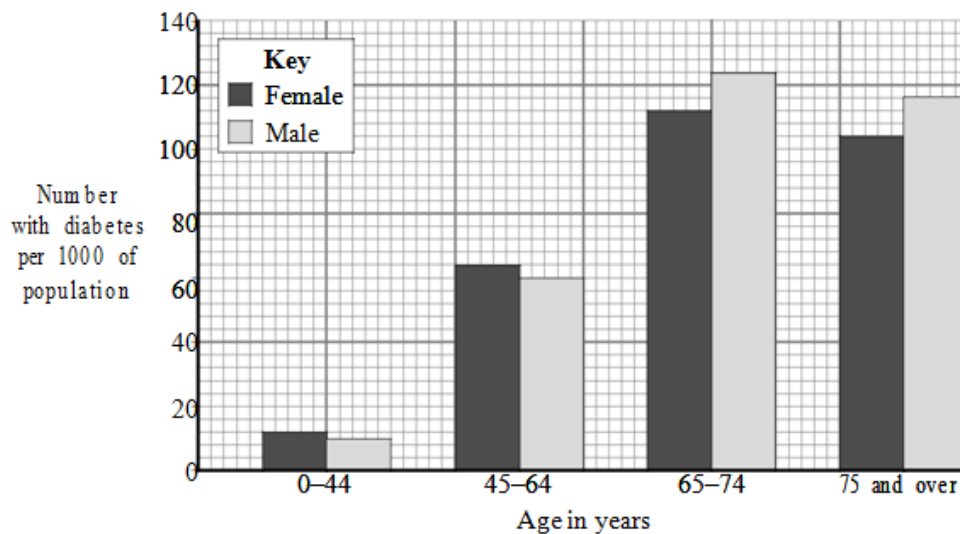
(1 mark)

(d) Evaluate the use of dogs in experiments of this type. Remember to include a conclusion to your evaluation.

(3 marks)

Q:3 Diabetes is caused when the body does not produce enough insulin.

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



(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)

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

(2 marks)

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

Insulin is a protein.

(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)

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

(1 mark)

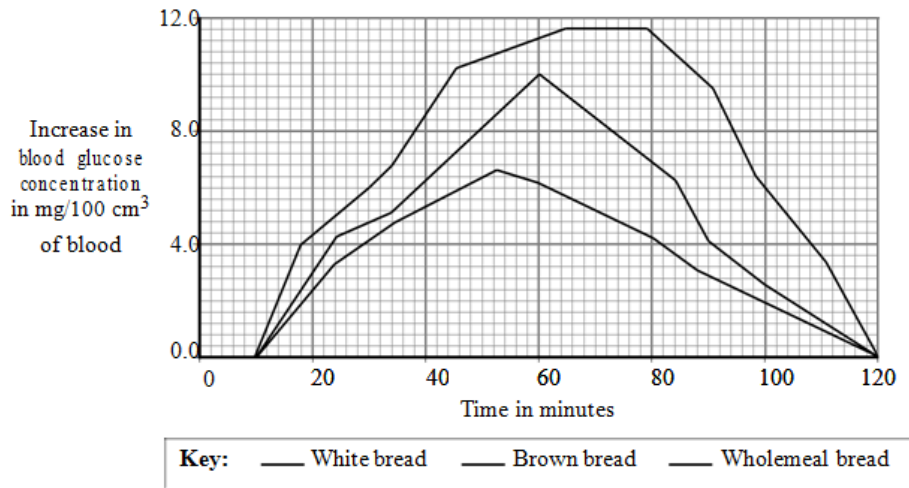
Q:4 Insulin controls blood glucose concentration.

The rate at which blood glucose concentration changes is affected by the food eaten.

In an experiment a person who does not have diabetes ate two slices of white bread. The change in her blood glucose concentration was recorded over the next 120 minutes.

The experiment was repeated; first with two slices of brown bread and then with two slices of wholemeal bread.

The graph shows the results of the three experiments.



(a)(i) Which type of bread would be most suitable for a person with diabetes?

Type of bread _____

Give two reasons for your answer.

1. _____

2. _____

(2 marks)

(a) (ii) Explain, as fully as you can, the reasons for the changes in blood glucose concentration when the person ate the brown bread.

(4 marks)

(b) Pancreatic-cell transplantation is a new treatment for diabetes. Insulin-making cells are taken from up to three dead donors. The cells are kept alive before being injected into the diabetic in a small operation. The cells soon begin to make insulin.

In one recent study 58 % of recipients of pancreatic-cell transplants no longer needed insulin injections.

Give the advantages and disadvantages of the new treatment for diabetes compared with using insulin injections.

(3 marks)

Q: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.

(a) Where is insulin produced?

Draw a ring around one answer.

gall bladder liver pancreas

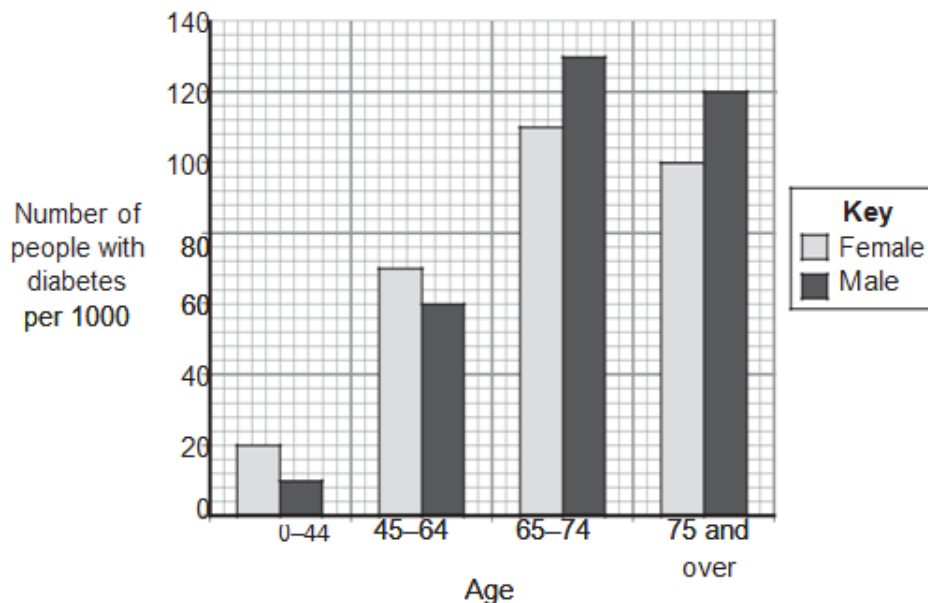
(1 mark)

(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)

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



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

(3 marks)

(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)

Q:6 Our bodies control the concentration of glucose in the blood.

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

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

hormone called

carbohydrase.
insulin.
protease.

(1 mark)

(b) This hormone is produced by the

intestine.
stomach.
pancreas.

(1 mark)

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

the person develops

diabetes.
cystic fibrosis.
Huntington's disease.

(1 mark)

TOTAL MARKS=47