

Homeostasis

Question Paper

Level	GCSE (9-1)
Subject	Combined Science – Trilogy - Biology
Exam Board	AQA
Topic	4.5 Homeostasis and Response
Sub-Topic	Homeostasis
Difficulty Level	Gold Level
Booklet	Question Paper

Time Allowed: 56 minutes

Score: / 56

Percentage: /100

Grade Boundaries:

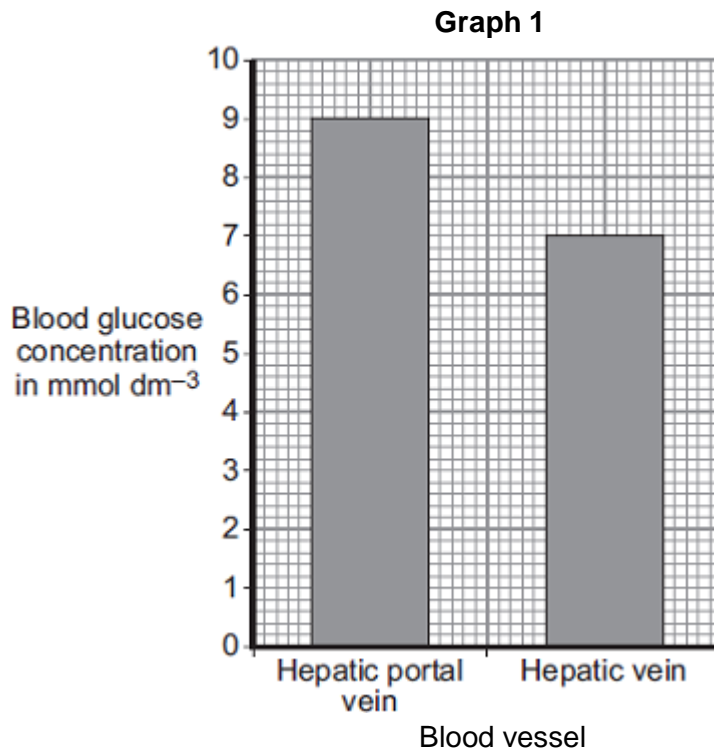
Q1. The pancreas and the liver are both involved in the control of the concentration of glucose in the blood.

The liver has two veins:

- the hepatic portal vein taking blood from the small intestine to the liver
- the hepatic vein taking blood from the liver back towards the heart.

Scientists measured the concentration of glucose in samples of blood taken from the hepatic portal vein and the hepatic vein. The samples were taken 1 hour and 6 hours after a meal.

Graph 1 shows the concentration of glucose in the two blood vessels 1 hour after the meal.



- (a) The concentration of glucose in the blood of the two vessels is different. Explain why.

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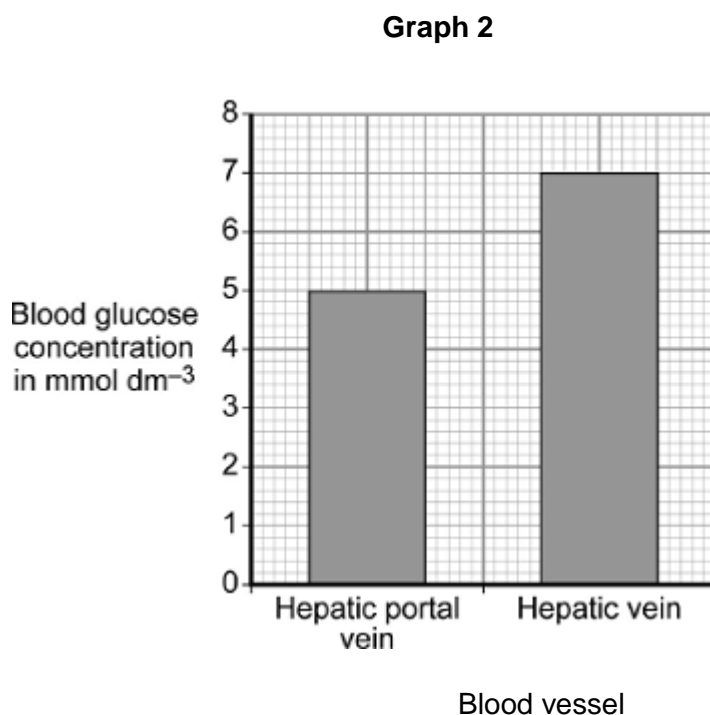
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- (b) **Graph 2** shows the concentration of glucose in the two blood vessels 6 hours after the meal.



- (i) The concentration of glucose in the blood in the hepatic portal vein 1 hour after the meal is different from the concentration after 6 hours.

Why?

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(1)

- (ii) The person does **not** eat any more food during the next 6 hours after the meal.

However, 6 hours after the meal, the concentration of glucose in the blood in the hepatic vein is higher than the concentration of glucose in the blood in the hepatic portal vein.

Explain why.

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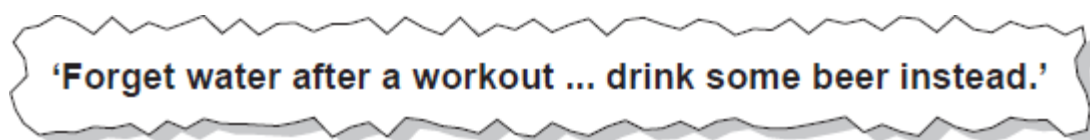
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(Total 7 marks)

Q2. Drinking after exercise to replace the water lost in sweat is called rehydration. Scientists at a Spanish university investigated rehydration after exercise.

- 24 students took part in the investigation.
- All the students ran on a treadmill in a temperature of 40 °C until they were exhausted.
- 12 of the students were each given half a litre of beer to drink.
- The other 12 students were each given half a litre of tap water to drink.
- Both groups of students were then allowed to drink as much tap water as they wanted.
- The scientists measured how quickly each student rehydrated.
- The students who had been given beer rehydrated 'slightly better' than the ones given only water.

A newspaper reported the investigation.

The headline was



The newspaper headline was **not** justified.

Explain why.

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(Total 3 marks)

Q3. Insulin controls blood glucose concentration.

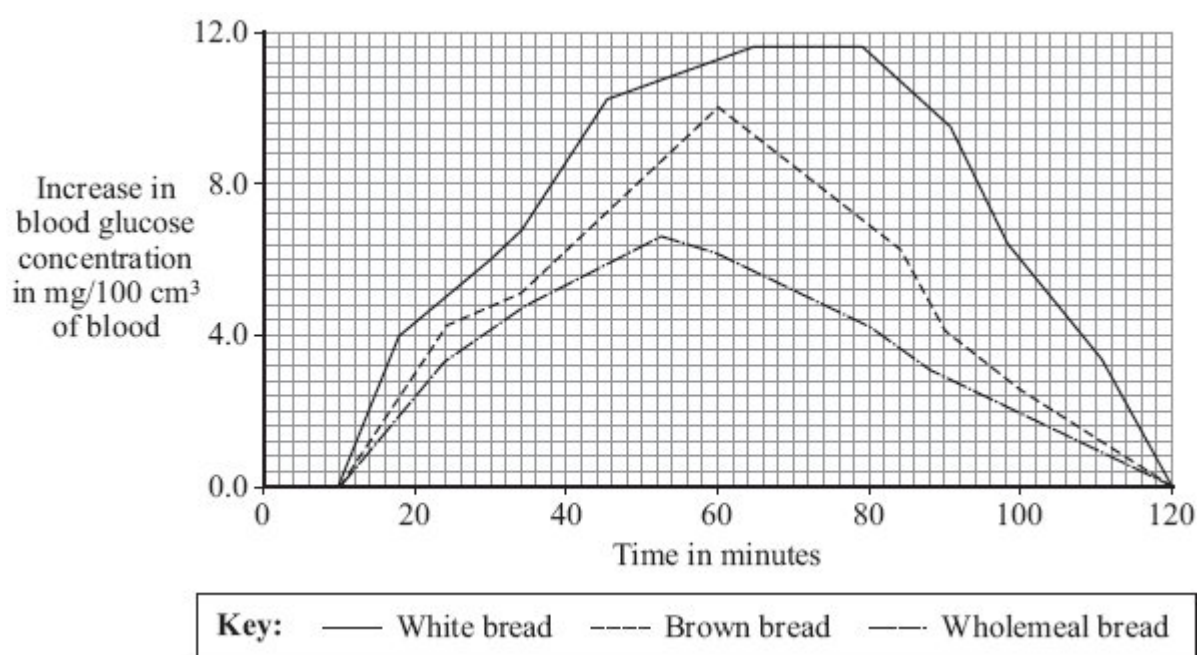
- (a) The rate at which blood glucose concentration changes is affected by the food eaten.

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.



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

Type of bread

Give **two** reasons for your answer.

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(2)

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

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(4)

- (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.

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(3)
(Total 9 marks)

Q4. 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?

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(1)

- (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.

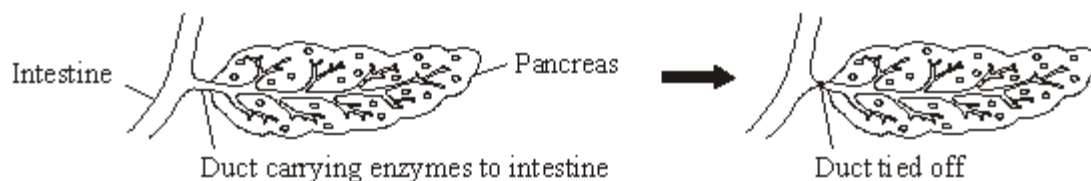
Banting thought that an enzyme produced in the pancreas of dog **A** had digested the hormone before it was injected.

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

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(1)

- (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.



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

Explain why the dog survived.

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(1)

- (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.

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- (d) Evaluate the use of dogs in experiments of this type.

Remember to include a conclusion to your evaluation.

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(3)
(Total 7 marks)

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Read the following passage which is from an advice book for diabetics.



Insulin Reactions

Hypoglycaemia or 'hypo' for short, occurs when there is too little sugar in the blood.

It is important always to carry some form of sugar with you and take it immediately you feel a 'hypo' start. A hypo may start because:

- you have taken too much insulin, or
- you are late for a meal, have missed a meal altogether, have eaten too little at a meal, or
- you have taken a lot more exercise than usual.

The remedy is to take some sugar.

An insulin reaction usually happens quickly and the symptoms vary – sweating, trembling, tingling of the lips, palpitations, hunger, pallor, blurring of the vision, slurring of speech, irritability, difficulty in concentration.

Do not wait to see if it will pass off, as an untreated 'hypo' could lead to unconsciousness.

(a) Many diabetics need to take insulin.

(i) Explain why.

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(2)

(ii) Explain why there is too little sugar in the blood if too much insulin is taken.

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(3)

(iii) Explain why there is too little sugar in the blood if the person exercises more than usual.

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(3)

(b) Suggest why sugar is recommended for a 'hypo', rather than a starchy food.

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- (c) Explain how the body of a healthy person restores blood sugar level if the level drops too low.

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- (d) Explain, using insulin as an example, what is meant by negative feedback.

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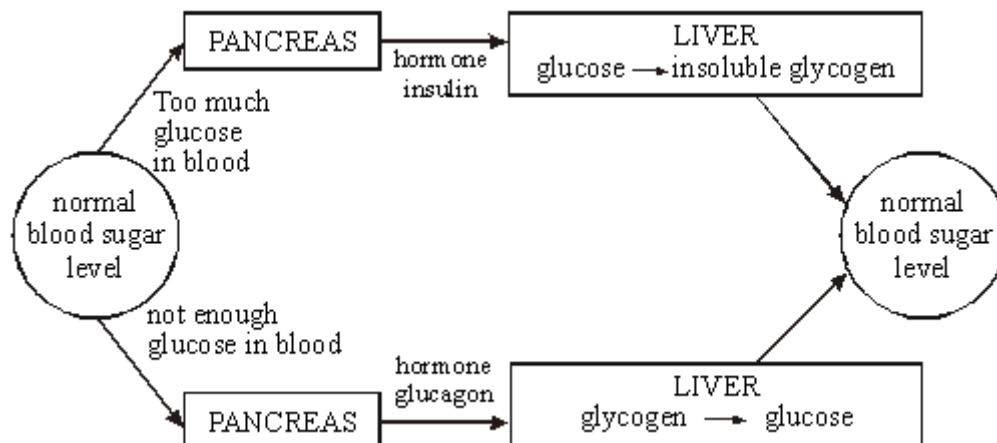
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Q6.



The diagram shows how the blood sugar level is controlled in the body.

Explain fully what would happen if somebody ate some glucose tablets.

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(Total 4 marks)

Q7. The figures below show the levels of carbon dioxide in air from 150 000 years ago.

TIME	CARBON DIOXIDE CONCENTRATION
1500 years ago	270 parts per million
1800 AD	290 parts per million
1957	315 parts per million
1983	340 parts per million

(a) Explain why carbon dioxide levels in the atmosphere are changing.

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(3)

- (b) It is suggested that the increased level of carbon dioxide in the air is causing the atmosphere to warm up (the “Greenhouse Effect”).

Describe, as fully as you can, **two** major effects of global warming and how these may affect the human population.

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(Total 9 marks)