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Student number

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Name _____

Date _____

Attempt/Time taken _____

GCSE BIOLOGY

Topic Paper: 5 Homeostasis and response Section 2
Part 1

Time allowed: 45 minutes

Materials

For this paper you must have:

- the Periodic Table/Data Sheet, provided as an insert (enclosed)
- a ruler with millimetre measurements
- a calculator, which you are expected to use where appropriate.

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.
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The Periodic Table/Data Sheet is provided as in insert.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions 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.



39 Marks



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

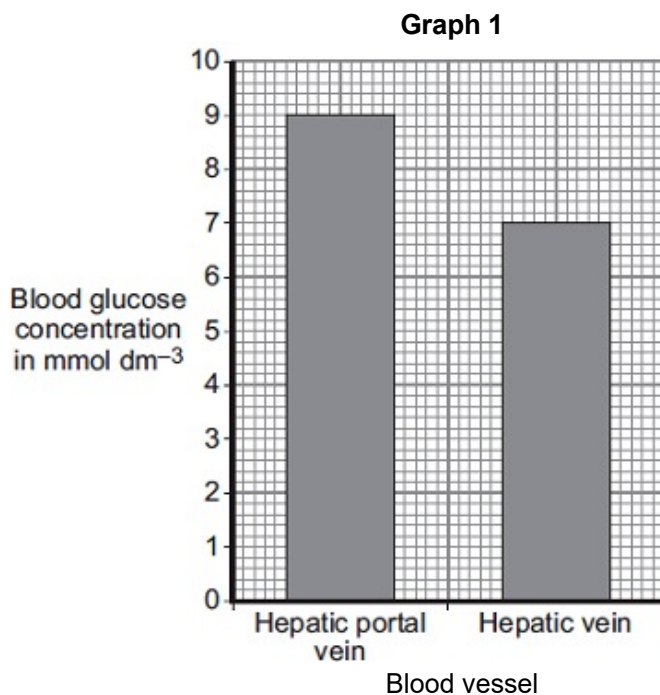
The liver has two veins:

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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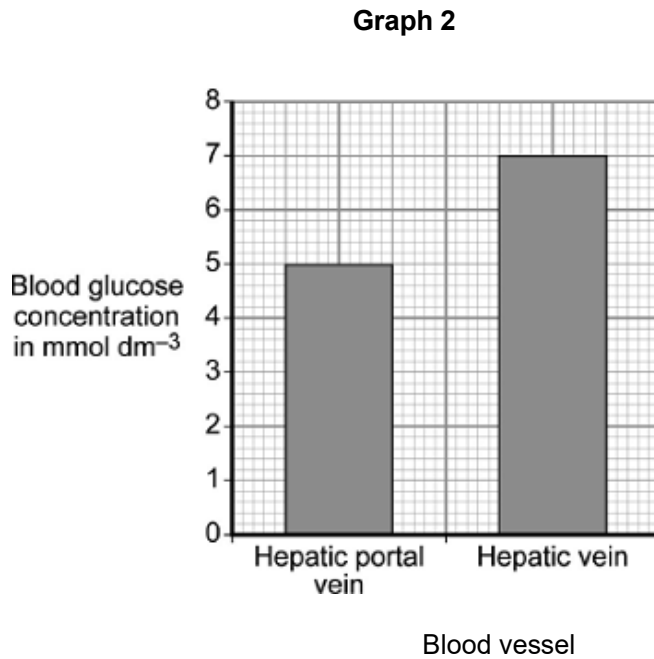
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(3)



- (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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(3)

(Total 7 marks)



Q2. A walker falls through thin ice into very cold water.



The walker's core body temperature falls. He may die of hypothermia (when core body temperature falls too low).

(a) (i) Which part of the brain monitors the fall in core body temperature?

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(1)

(ii) How does this part of the brain detect the fall in core body temperature?

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(2)

(b) While in the water the walker begins to shiver.

Shivering helps to stop the core body temperature falling too quickly.

Explain how.

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(2)

(c) The walker had been drinking alcohol.

Alcohol causes changes to the blood vessels supplying the skin capillaries, making the skin look red.

(i) Describe the change to the blood vessels.

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(1)



- (ii) The walker is much more likely to die of hypothermia than someone who has not been drinking alcohol.

Explain why.

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(2)
(Total 8 marks)

Q3. Urine consists of water, ions and other substances such as urea.
 Urine is formed in the kidney by filtering the blood.
 The diameter of the pores in the filter is about 6 nanometres.

The table shows the diameters of the molecules of some of the substances in the blood.

Substance	Diameter of molecule in nanometres
A	10 to 20
B	1.0
C	0.6
D	0.5
E	0.2

Use information from the table and your own knowledge to answer the questions.

- (a) (i) Which substance, **A**, **B**, **C**, **D** or **E**, is protein?

(1)

- (ii) Explain why protein is **not** found in the urine of a healthy person.

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(1)



- (b) Haemolytic anaemia is a disease in which some of the red blood cells burst open.

Small amounts of haemoglobin may be found in the urine of a person suffering from haemolytic anaemia.

The diameter of a haemoglobin molecule is 5.5 nanometres.

Haemoglobin is **not** found in the urine of a healthy person, but can be found in the urine of a person with haemolytic anaemia.

Explain why.

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(3)
(Total 5 marks)

- Q4.** The temperature in a sauna is much hotter than core body temperature.

A woman sits in a sauna.

The high temperature of the sauna causes the woman's core body temperature to rise.

- (a) When the woman's core body temperature rises, the woman's rate of sweating increases.

Explain why.

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(2)



- (b) The woman comes out of the sauna.
The woman's skin looks redder than when she went into the sauna.

Describe what happened to the blood circulation in her skin to cause this change in colour.

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(2)

- (c) After coming out of the sauna the woman gets into a bath of icy water.
This makes the woman shiver.

- (i) What process brings about shivering?

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(1)

- (ii) Shivering increases body temperature.

Explain how.

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(2)

(Total 7 marks)

Q5. Blood plasma is a solution of glucose, and many other substances, in water.

The urine of a healthy person contains water but does not contain glucose.

- (a) Name **two** more substances found in the urine of a healthy person.

1

2

(2)



- (b) (i) Describe what happens to the glucose in the blood of a healthy person when the blood enters the kidney.

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(3)

- (ii) A diabetic person's blood often contains a high concentration of glucose.

The urine of a diabetic person may contain glucose.

Suggest an explanation why.

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(2)

(Total 7 marks)



Q6. One group of scientists is working in a hot desert and another group is working in a tropical rainforest.

The table shows information about the scientists and the conditions in the desert and the rainforest.

Information	Hot desert	Rainforest
Mean core body temperature of scientists in °C	37.3	38.9
Air temperature in °C	36.0	35.5
Mean percentage concentration of moisture in the air	9.0	92.0
Mean wind speed at ground level in metres per second	12.0	3.0

(a) Both groups of scientists are doing similar jobs. The jobs cause the scientists to sweat a lot.

Use information from the table to explain the difference in the mean core body temperature of the two groups of scientists.

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(2)

(b) Changes to blood vessels in the skin help to decrease body temperature.

Explain how.

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(2)

(Total 4 marks)