

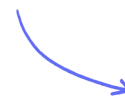
## Structured Questions

# Homeostasis

Homeostasis: Maintaining the Internal Environment / Regulation of Blood Glucose / Thermoregulation

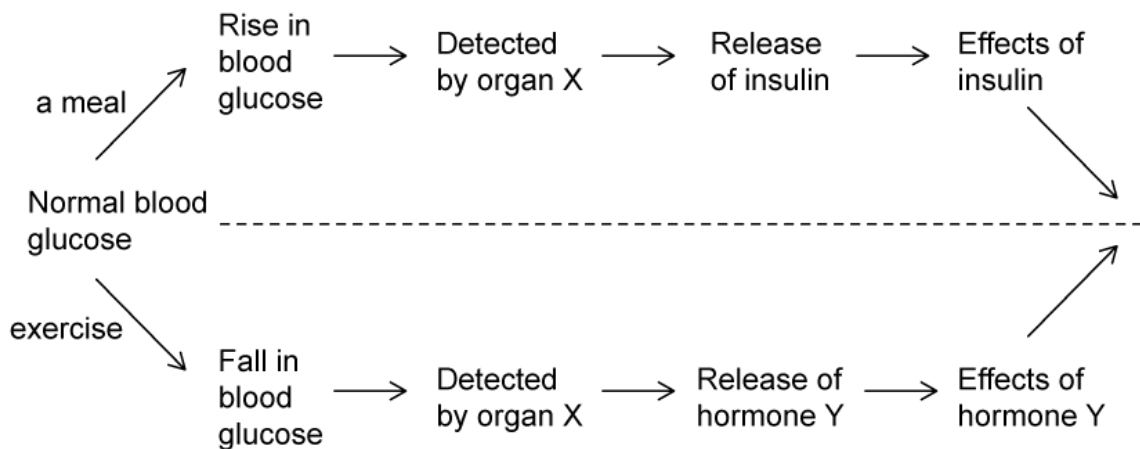
Easy (2 questions)	/11
Medium (2 questions)	/14
Hard (1 question)	/10
<b>Total Marks</b>	<b>/35</b>

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# Easy Questions

1 (a) The diagram below shows some of the events that take place during the regulation of blood glucose.



Identify organ X.

.....  
(1 mark)

(b) Insulin is released when organ X detects a rise in blood glucose levels.

Describe the effects of insulin that restore blood glucose to normal levels.

.....  
(2 marks)

(c) When blood glucose levels fall after exercise organ **X** releases another hormone, hormone **Y**.

(i) Name hormone **Y**.

[1]

(ii) State one mechanism by which hormone **Y** causes blood glucose levels to return to normal.

[1]

.....  
.....  
(2 marks)

(d) The table below shows some doctor's notes for a patient with diabetes.

<b>Patient age:</b>	9
<b>Patient symptoms:</b>	More thirsty than usual Increased urine production Weight loss Fatigue
<b>White blood cell activity:</b>	High
<b>Suggested treatment:</b>	Monitoring blood glucose levels Insulin injections

Identify, with a reason, whether the patient is likely to have type I or type II diabetes.

.....  
.....  
(2 marks)

2 Compare and contrast type 1 and type 2 diabetes.

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**(4 marks)**

# Medium Questions

- 1 (a) Each year, a few people with type I diabetes are given a pancreas transplant. Pancreas transplants are not used to treat people with type II diabetes.

Give **two** reasons why pancreas transplants are not used for the treatment of type II diabetes.

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(2 marks)

- (b) About 85% of people with type II diabetes are overweight or obese. Some people who are obese have gastric bypass surgery (GBS) to help them to lose weight.

Scientists investigated whether having GBS affects sensitivity to insulin. They measured patients' sensitivity to insulin before and after GBS. Some of the patients had type II diabetes. The others did not but were considered to be at high risk of developing the condition.

The table below shows the scientists' results. The higher the number, the greater the sensitivity to insulin.

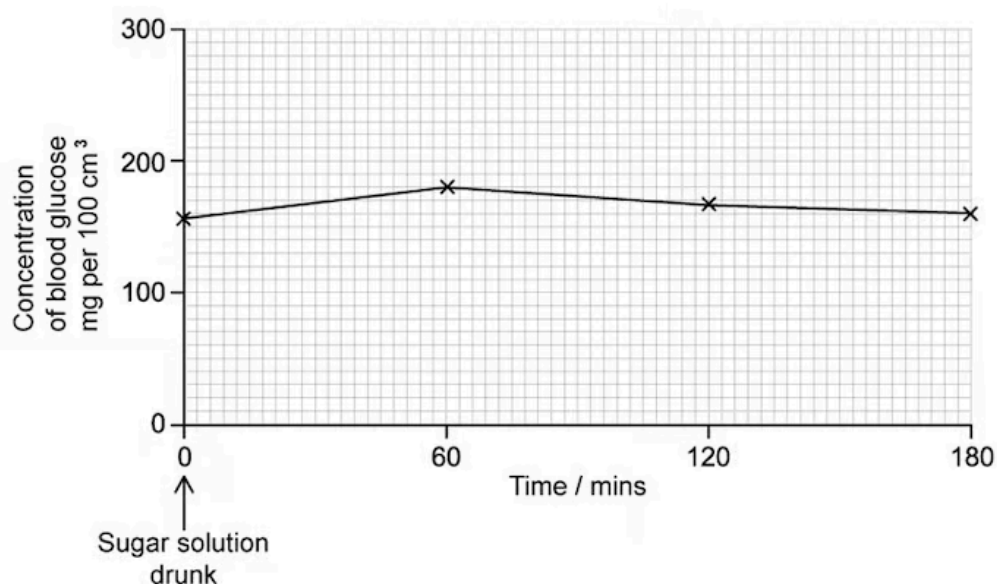
Patient type	Mean sensitivity to insulin / arbitrary units ± Standard Deviation (SD)	
	Before the gastric bypass	After the gastric bypass
Does not have diabetes	0.89 ± 0.29	1.35 ± 0.90
Has type II diabetes	0.45 ± 0.22	1.17 ± 0.92

The scientists concluded that GBS cured many patients' diabetes.

Use the data in the table to evaluate this conclusion.

(2 marks)

- (c) Some diabetic individuals do not produce insulin. In an experiment, a person with diabetes drank a sugary solution and then the glucose concentration in their blood was measured at regular intervals. The results are shown in the graph below.



Suggest **two** reasons why the concentration of glucose decreased after 60 minutes even though this person's blood contained no insulin.

(2 marks)

- (d) The same experiment was repeated on a non-diabetic person. The glucose concentration in their blood prior to drinking the sugary solution was 75 mg per 100 cm<sup>3</sup>.

Sketch a curve on the graph in part (b) to show the results you would predict.

(1 mark)

2 Describe the role of the pancreas and associated hormones in the control of blood glucose concentration.

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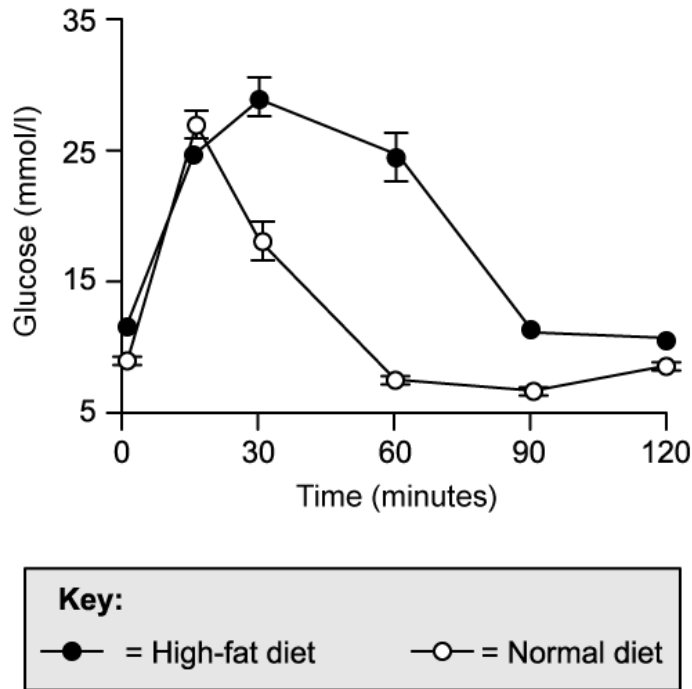
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**(7 marks)**

# Hard Questions

1 (a) A group of scientists wanted to investigate the control of blood glucose in mice. They fed one group of mice with a normal diet and another group with a 'high fat' diet containing a high level of both fat and sugar for three weeks beforehand. They then measured their blood glucose over a period of 2 hours directly after a meal. Their results are shown below.



Explain the change in blood glucose levels for the **normal diet** mice during the first 90 minutes after the meal.

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(4 marks)



- (b) After the first 90 minutes, the normal diet mice show an increase in blood glucose despite no more food being eaten.

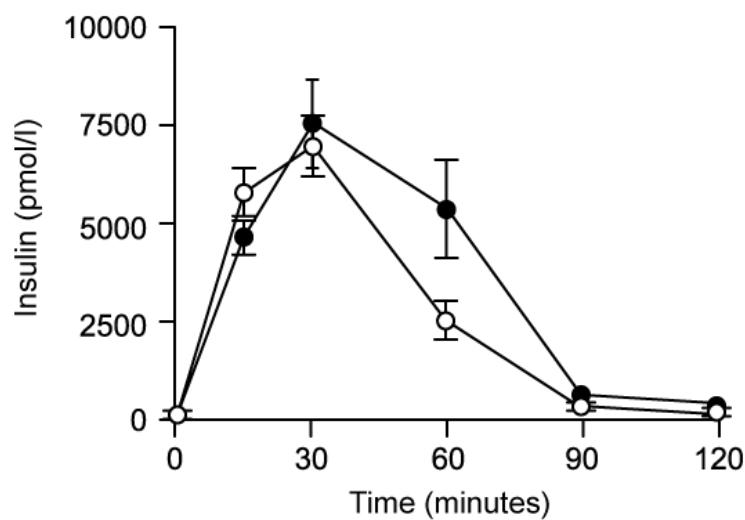
Explain why blood glucose increases despite no food being consumed.

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(2 marks)

- (c) At the same time as measuring blood glucose the scientists in part a) also measured blood insulin levels. Their results are shown below.



With reference to the changes in insulin, suggest an explanation for the difference in the blood glucose changes between the two groups of mice shown in part a).

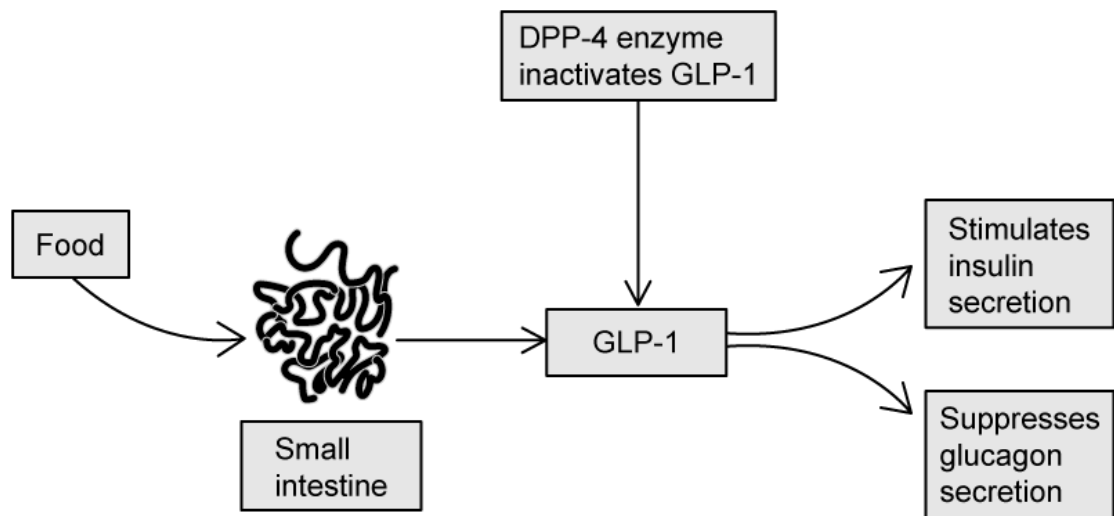
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(2 marks)

- (d) After carrying out the investigation detailed in parts a) and c), the scientists gave the high fat diet mice supplements of a drug called a DDP-4 inhibitor in their drinking water. The

effects of the functional DPP-4 enzyme in the body are shown below.



Suggest, with a reason, how the administration of DPP-4 inhibitors might affect the blood-glucose levels of the high fat diet mice.

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(2 marks)