

Name of the Student: _____

Max. Marks : 23 Marks

Time : 23 Minutes

Q1.

- (a) When insulin binds to receptors on liver cells, it leads to the formation of glycogen from glucose. This lowers the concentration of glucose in liver cells.

Explain how the formation of glycogen in liver cells leads to a lowering of blood glucose concentration.

(2)

People with type II diabetes have cells with low sensitivity to insulin. About 80% 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.

Doctors investigated whether GBS affected sensitivity to insulin. They measured patients' sensitivity to insulin before and after GBS. About half of the patients had type II diabetes. The other half did not but were considered at high risk of developing the condition.

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

Patients	Mean sensitivity to insulin / arbitrary units ($\pm$ SD)	
	Before gastric bypass surgery	1 month after gastric bypass surgery
Did not have diabetes	0.55 ($\pm$ 0.32)	1.30 ($\pm$ 0.88)
Had type II diabetes	0.40 ($\pm$ 0.24)	1.10 ($\pm$ 0.87)

- (b) The doctors concluded that many of the patients who did not have type II diabetes were at high risk of developing the condition.

Use the data in the table to suggest why they reached this conclusion.

(2)

- (c) The doctors also concluded that GBS cured many patients' diabetes but that some were not helped very much.

Do these data support this conclusion? Give reasons for your answer.

(3)

(Total 7 marks)

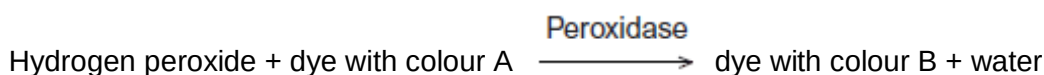
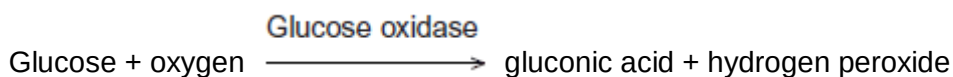
Q2.

A glucometer is a device used to measure blood glucose concentration. A person uses a test strip that goes into the glucometer. They put a drop of blood onto the test strip. There are substances on the test strip that produce a colour change with glucose. The higher the concentration of glucose, the deeper the colour produced. The glucometer measures the depth of colour produced and converts this into a glucose concentration. A new test strip is used for each blood test.

Figure – glucometer and test strip



The following equations show how the substances on the test strip produce a colour change.



Non-diabetics have no glucose in their urine. Diabetics have glucose in their urine if their blood glucose concentration rises above about $170 \text{ mg } 100 \text{ cm}^{-3}$.

Before the glucometer was available, diabetics used test strips to measure the concentration of glucose in their urine as a means of measuring their blood glucose concentration. When testing urine, the colour of the test strip is compared against a colour chart which gives a glucose concentration range for the colour produced.

- (a) Identify all the substances located at position X on the test strip before a drop of blood is added.

(2)

- (b) Before the glucometer was available, diabetics used test strips to measure the concentration of glucose in their urine as a means of measuring their blood glucose concentration.

Give **two** reasons why this method of testing urine would **not** give an accurate measurement of blood glucose concentration.

1.

2. _____

(2)
(Total 4 marks)

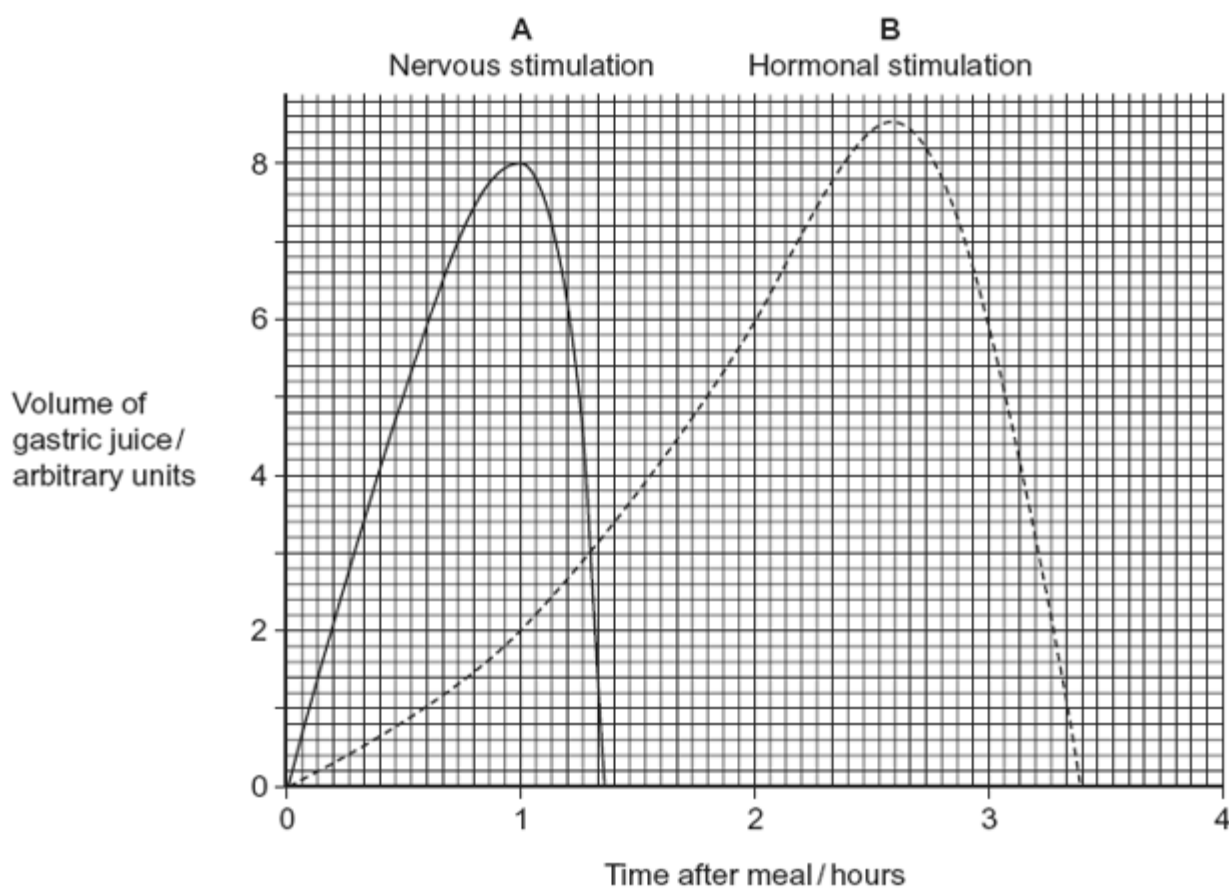
Q3.

Different substances are involved in coordinating responses in animals.

- (a) Synapses are unidirectional. Explain how acetylcholine contributes to a synapse being unidirectional.

(2)

- (b) Cells in the stomach wall release gastric juice after a meal. The graph shows how the volumes of gastric juice produced by nervous stimulation and by hormonal stimulation change after a meal.



- (i) Describe the evidence from the graph that curve **A** represents the volume of gastric juice produced by nervous stimulation.

(2)

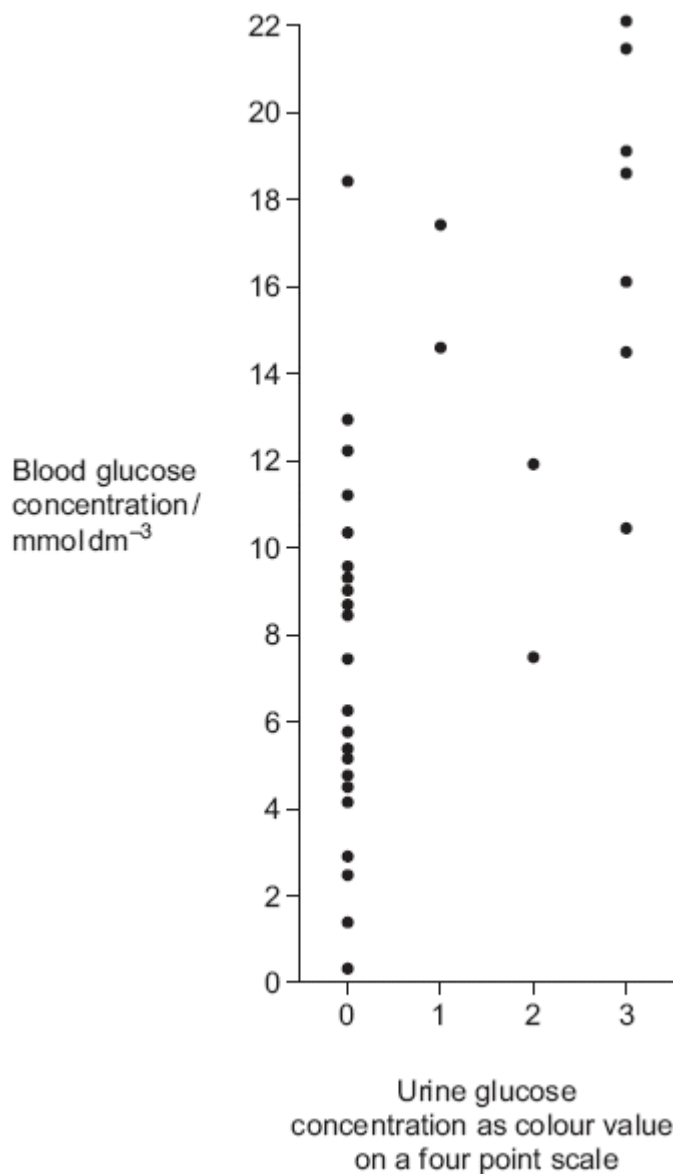
- (ii) Complete the table to show the percentage of gastric juice produced by nervous stimulation at the times shown.

	Time after meal / hours		
	1	2	3
Percentage of gastric juice produced by nervous stimulation			

(1)
(Total 5 marks)

Q4.

- (a) Technicians in a hospital laboratory tested urine and blood samples from a girl with diabetes at intervals over a one-year period. Each time the technicians tested her urine, they also measured her blood glucose concentration. Their results are shown in the graph.



- (i) The girl who took part in this investigation was being successfully treated with insulin. The graph shows that on some occasions, the concentration of glucose in her blood was very high. Suggest why.

(2)

- (ii) Use the graph to evaluate the use of the urine test as a measure of blood glucose concentration.

(3)

- (b) Diabetic people who do not control their blood glucose concentration may become unconscious and go into a coma. A doctor may inject a diabetic person who is in a coma with glucagon. Explain how the glucagon would affect the person's blood glucose concentration.

(2)

(Total 7 marks)