

Hormonal communication

Question Paper 1

Level	A Level
Subject	Biology
Exam Board	OCR
Module	Communication, homeostasis and energy
Topic	Hormonal communication
Booklet	Question Paper 1

Time allowed: 51 minutes

Score: /38

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E
>69%	56%	50%	42%	34%	26%

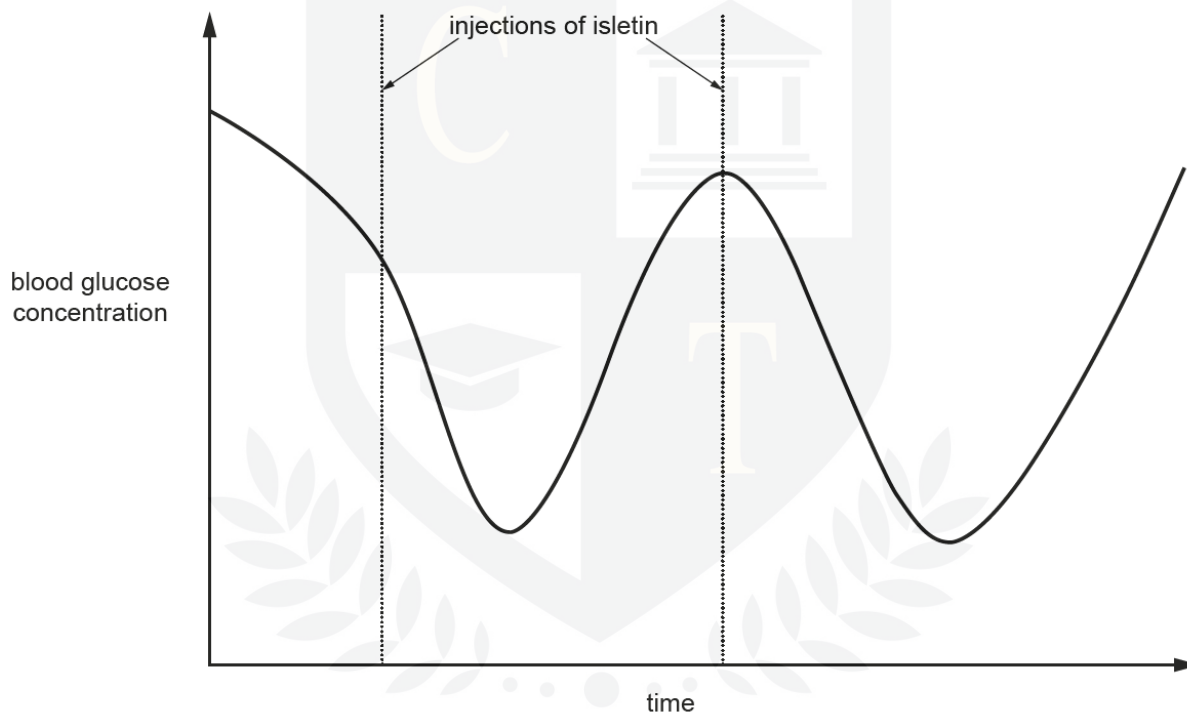
Question 1

Banting and Best pioneered experiments into the functions of the pancreas.

In one experiment, they removed the pancreas of dogs. Shortly afterwards, the dogs developed the symptoms of diabetes.

- Banting ground up the removed pancreas to produce an extract.
- He called the extract "isletin".
- The isletin was then injected into dogs that had had their pancreas removed.
- He then tested the blood glucose concentration.

The graph below is a summary of the results.



Which of the following statements correctly explains these results?

- 1 Isletin is made in the α cells in the islets of Langerhans.
- 2 Isletin reduces blood glucose concentration.
- 3 The effects of isletin are short-lived.

- A. 1, 2 and 3
- B. Only 1 and 2
- C. Only 2 and 3
- D. Only 1

[Total: 1]

Question 2

The hormone ecdysone is synthesised in the prothoracic glands found in the upper thorax of some invertebrates and is released into haemolymph. It is then transported to cells near the surface of the body and causes the loss of the exoskeleton so that a new exoskeleton can form.

Which of the following statements explains how ecdysone is able to act on cells near the surface of the body?

- 1 Ecdysone is synthesised by specialised neurosecretory cells.
- 2 Ecdysone is soluble in haemolymph because it is a polar molecule.
- 3 Ecdysone is complementary to cell surface receptors on cells throughout the body of some invertebrates.

- A. 1, 2 and 3
B. Only 1 and 2
C. Only 2 and 3
D. Only 1

[1]

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Question 3

Which of the following is/are interventions in the control of blood glucose concentration?

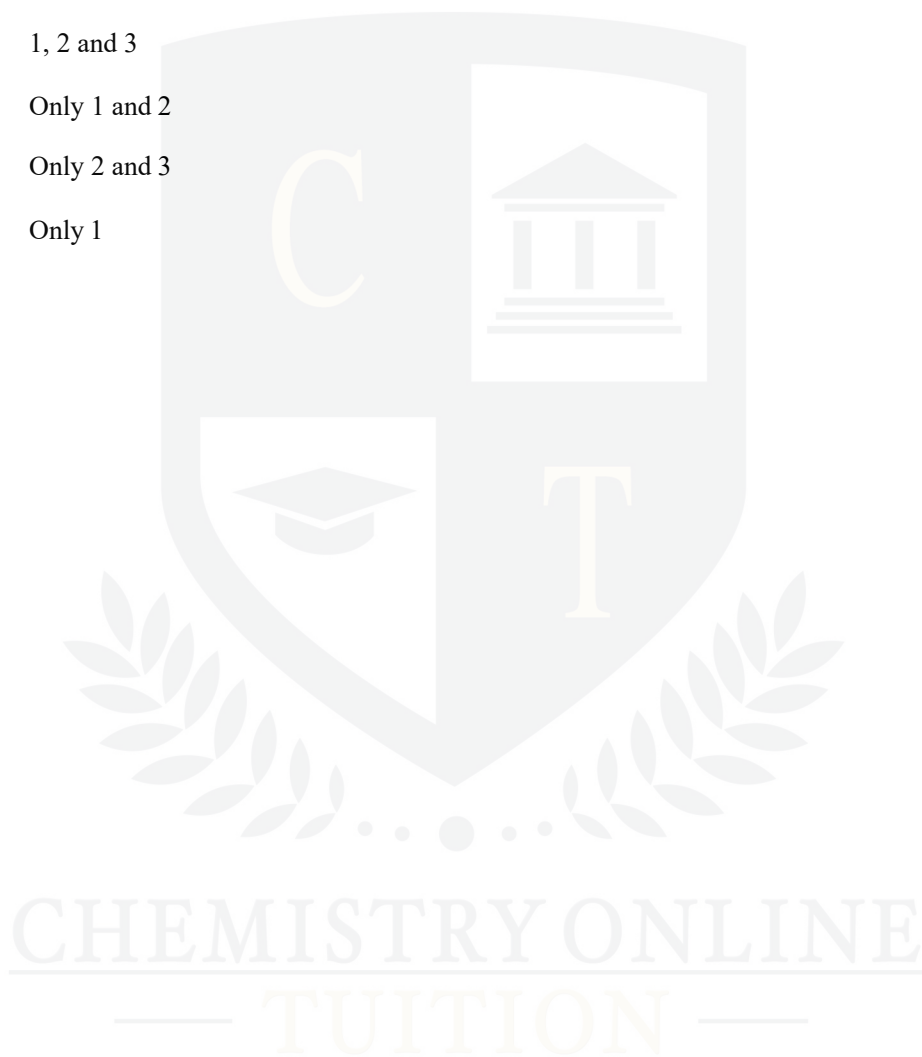
Statement 1: Insulin injection.

Statement 2: Regular cardiovascular exercise.

Statement 3: Glucagon injection.

- A** 1, 2 and 3
- B** Only 1 and 2
- C** Only 2 and 3
- D** Only 1

[Total: 1]



Question 4

(a) Fig. 1.1 is a diagram representing the mammalian pancreas and associated structures.

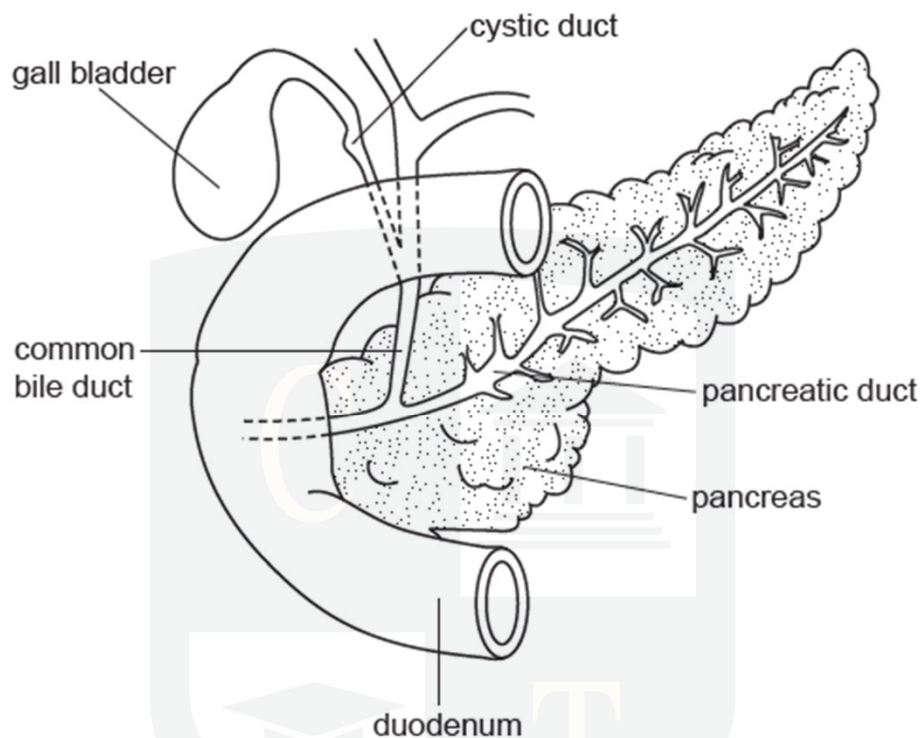


Fig. 1.1

The pancreas is an exocrine and an endocrine gland.

How does Fig. 1.1 indicate that the pancreas has an **exocrine** function?

[2]

(b) Fig. 1.2 represents a cross-section of part of the pancreas.

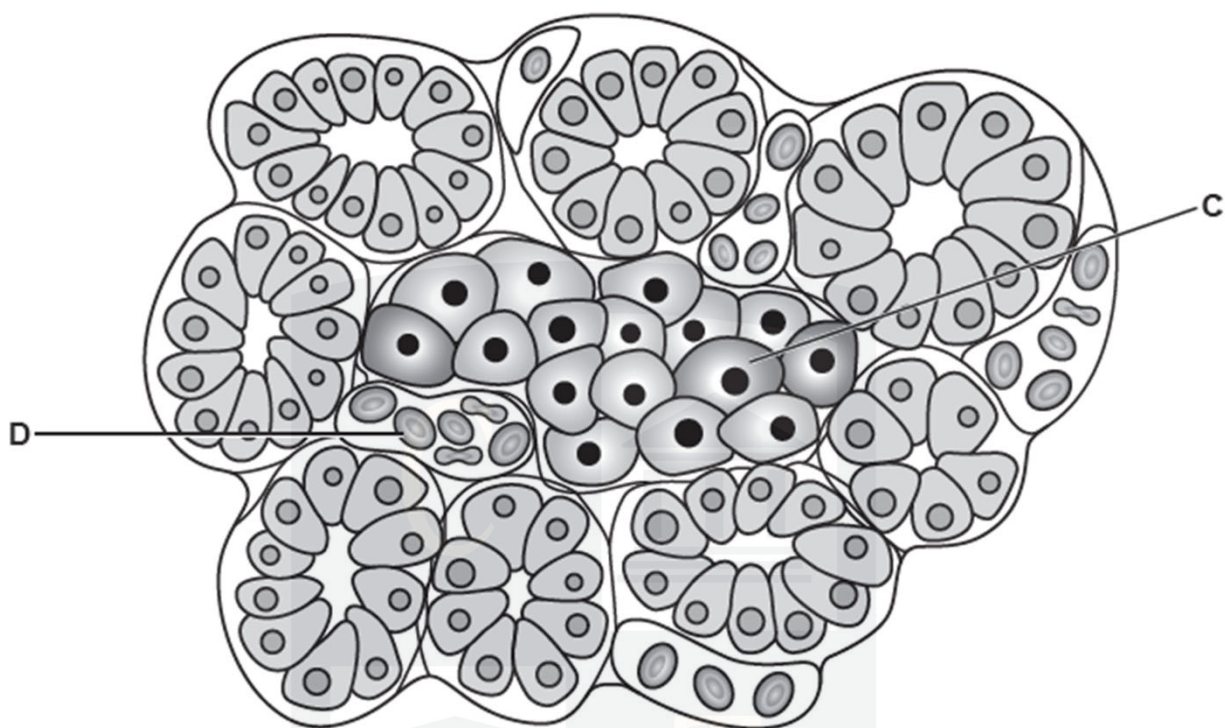


Fig. 1.2

(i) Name the **group** of cells that include the cell labelled **C**. [1]

(ii) Identify the structure labelled **D**. [1]

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(c) Fig. 1.3 shows the concentrations of glucose and insulin in the blood of an individual before and after a meal.

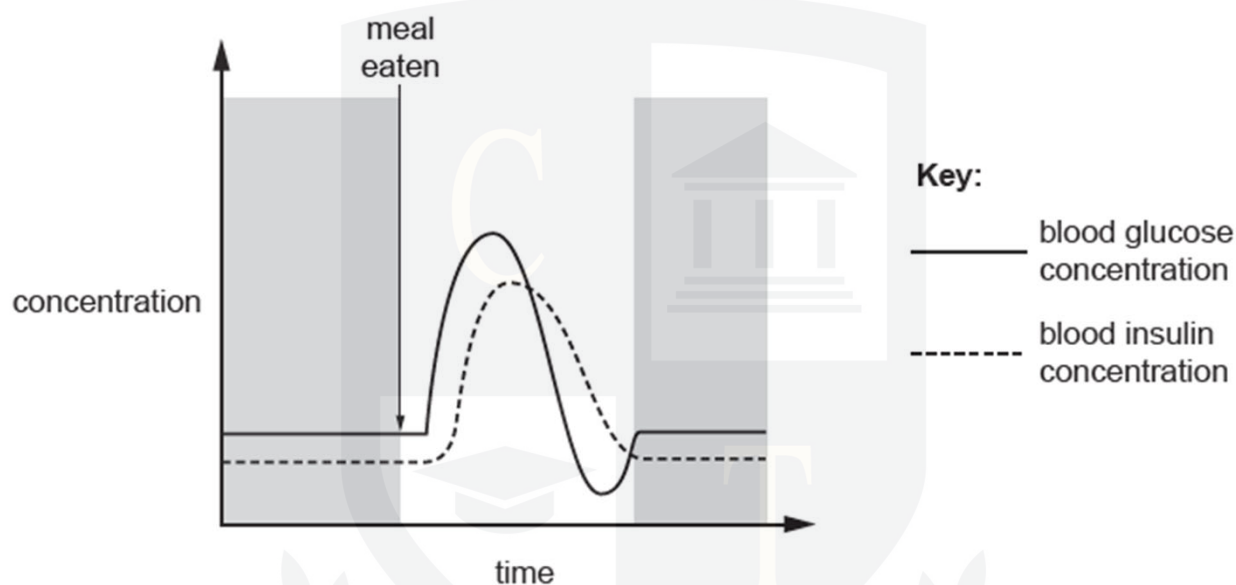


Fig. 1.3

(i) After the meal, the concentrations of glucose and insulin in the blood increase.

Explain why there is a delay in the increase of insulin concentration following the increase in blood glucose concentration. **[2]**

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- (ii) The shaded parts of the graph in Fig. 1.3 are over-simplified representations of the blood glucose and insulin concentrations.

Describe **and** explain how these concentrations should be represented on the graph accurately.



In your answer, you should use appropriate technical terms, spelled correctly.

[4]

The published Glycaemic Index value (GI) of a carbohydrate-containing food, rates the food on a scale from 0 to 100 according to how much it raises blood glucose concentration after it is eaten.

To determine the GI value of a test food:

- 10 healthy people fast overnight
- the test food containing 50 g of carbohydrate is eaten
- blood samples are taken every 15 minutes for the next two hours and blood glucose concentrations are measured
- a value known as the iAUC is obtained from these measurements
- the GI value is calculated by dividing the iAUC for the test food by the iAUC for glucose and multiplying by 100
- the mean of the GI values from all 10 people is the published GI value for that food

- (i) Why is it necessary for the people to fast overnight before the start of the test? [1]

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- (ii) The **iAUC for glucose** is used to calculate the GI value of the test food. For this calculation to be valid, a number of variables must be controlled when determining the iAUC for glucose.

Suggest **two** variables and **how** they may be controlled.

[2]

- (iii) Why does the procedure use the mean of the GI values to obtain the published GI value for the food?

[1]

[Total : 14]

Question 5

Within the mammalian body, different systems of communication are used to coordinate and control activities.

- (a) Complete the following passage by using the **most suitable** term in each case.

The pancreas and the adrenal glands are both examples of glands. Adrenaline is a that is secreted by the adrenal glands. These glands also secrete steroids such as corticosteroids from cells in the region. The chemicals secreted by these glands are transported by the blood to their cells and tissues. [4]

- (b) Insulin is secreted from the beta cells of the pancreas in response to increased blood glucose concentration.

Fig. 2.1 is a diagram representing the sequence of events leading to the secretion of insulin from the beta cell.

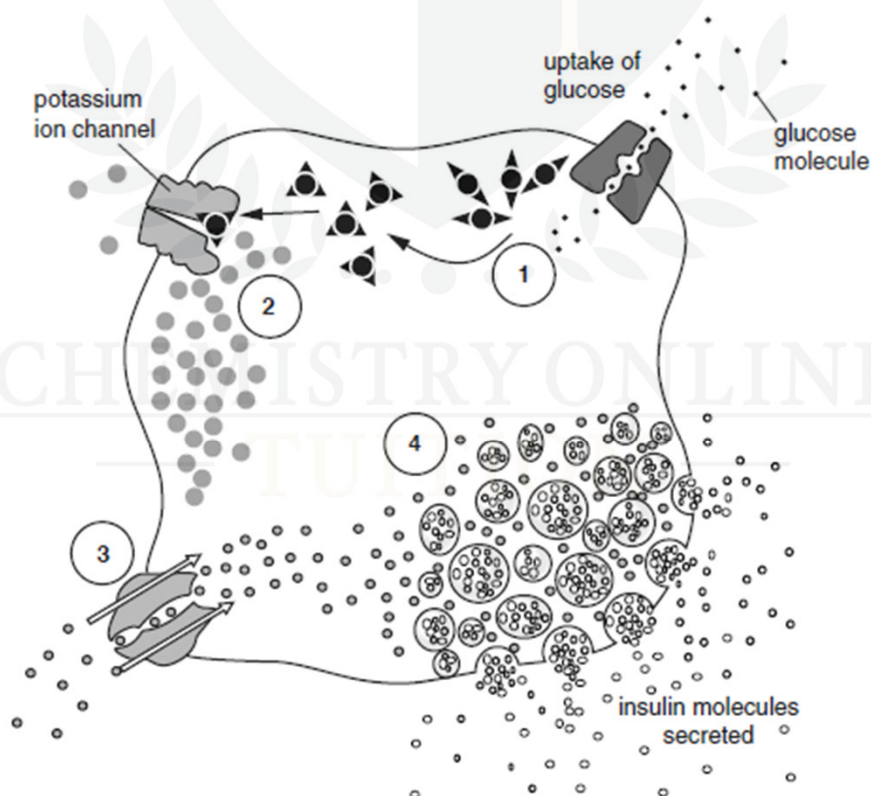


Fig. 2.1

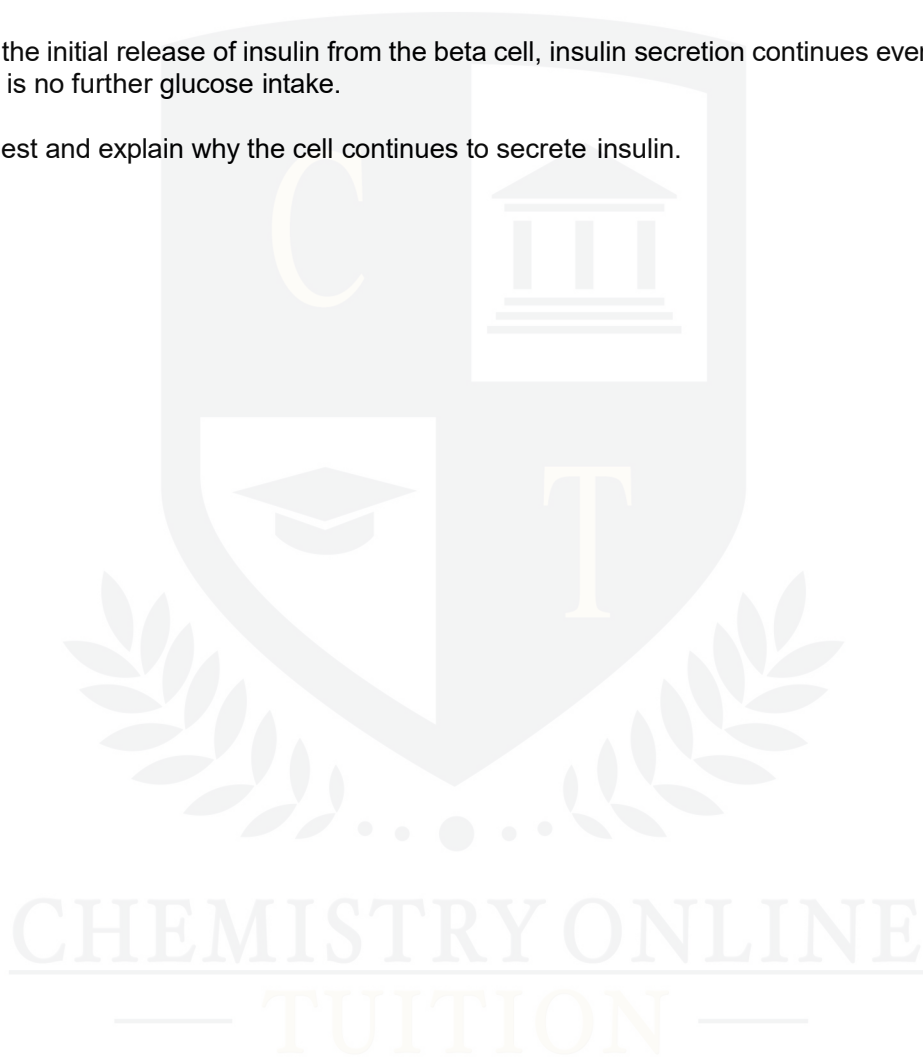
(i) With reference to Fig. 2.1, describe the events occurring at the stages labelled 1 to 4. [4]

(ii) After the initial release of insulin from the beta cell, insulin secretion continues even when there is no further glucose intake.

Suggest and explain why the cell continues to secrete insulin.

[2]

[Total : 10]



Question 6

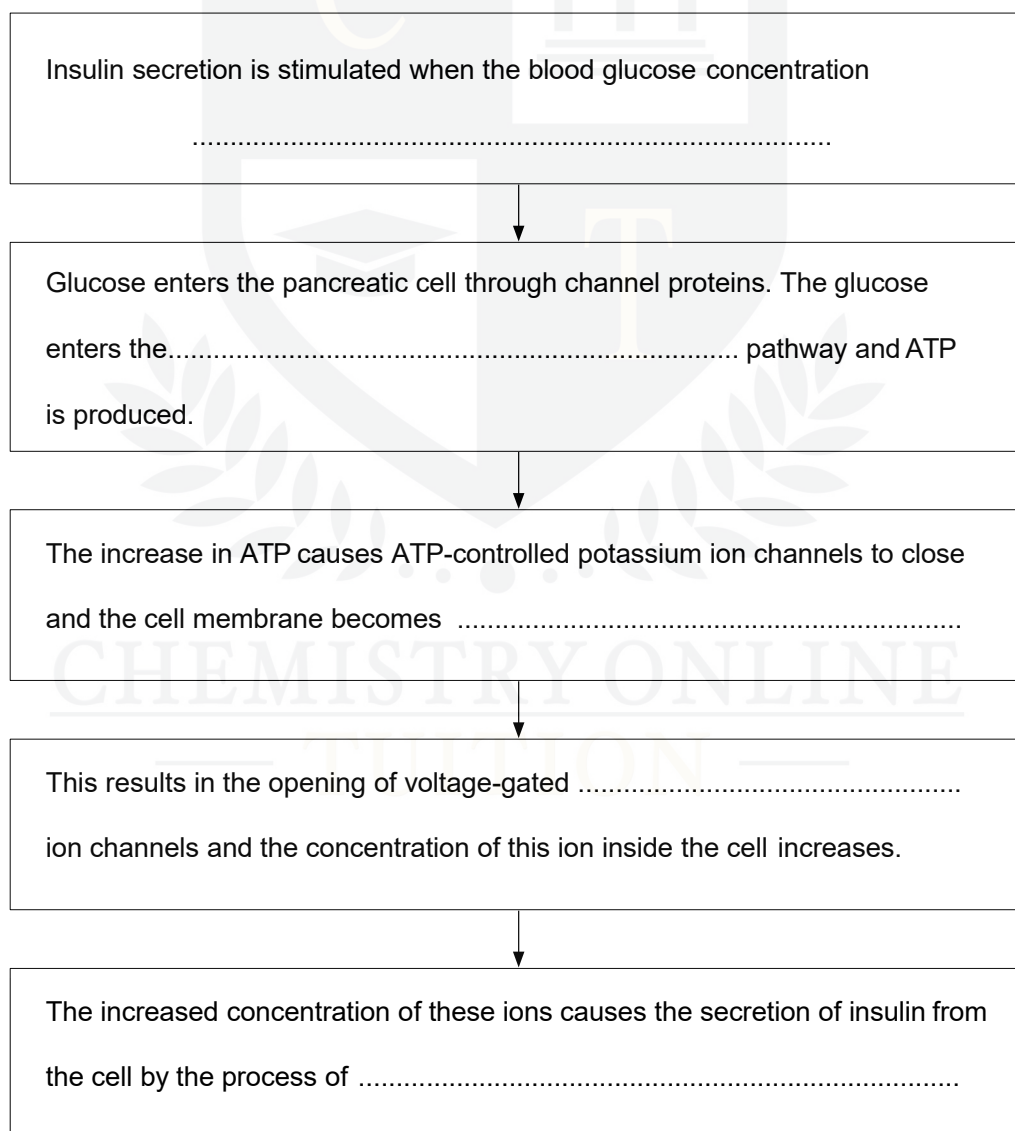
The regulation of blood glucose concentration is important for homeostasis and involves hormonal control.

(a) (i) Name the endocrine tissue in the pancreas that is responsible for secretion of hormones. [1]

(ii) Identify the **specific** cell type in pancreatic tissue that secretes the hormone insulin. [1]

(b) The incomplete flowchart below outlines the way in which the secretion of insulin from a pancreatic cell is controlled.

Complete the flowchart by inserting the most appropriate word(s) in the spaces provided.



[5]

- (c) (i) Insulin is a polypeptide molecule.

State where in a pancreatic **cell** insulin molecules are synthesised.

[1]

- (ii) Outline the events that occur after the synthesis of an insulin molecule until it is ready to be secreted from the pancreatic cell.

[3]

[Total: 11]

