

Endocrine System – Hormones

Mark Scheme



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1. The endocrine system is a chemical communication network that uses glands to produce hormones, which travel in the bloodstream to control and coordinate the body's functions.

Circle the letter of the correct answer for each question below.

- a) Which statement best describes a hormone?

C – is the only correct answer.	1 mark
	Total: 1 mark

- b) A person is suddenly frightened. Which gland releases a hormone to prepare the body for 'fight or flight', and what is one effect of this hormone?

D – is the only correct answer.	1 mark
	Total: 1 mark

- c) After a person eats a meal rich in carbohydrates, their blood glucose level rises. Which hormone is released to bring the level back down to the normal range, and which organ releases it?

A – is the only correct answer.	1 mark
	Total: 1 mark

- d) The level of thyroxine in the blood is controlled by a negative feedback mechanism. What happens in this system if the level of thyroxine becomes too high?

A – is the only correct answer.	1 mark
	Total: 1 mark

(Total for Question 1 is 4 marks)

2. The endocrine system uses hormones to control functions in the body.
The control of blood glucose concentration is an important example of this.

a) Name the organ that monitors and controls blood glucose concentration.

Pancreas	1 mark
	Total: 1 mark

A student drank a sugary drink. A doctor measured the student's blood glucose concentration at regular intervals for 180 minutes. The results are shown in the table below.

Time after sugary drink (minutes)	Blood glucose concentration (mmol/L)
0	5.0
30	7.8
60	9.0
90	7.5
120	6.0
180	5.0

b) Calculate the mean rate of decrease of blood glucose concentration between 60 minutes and 180 minutes. You **must** show your working and give the units in your answer.

Step 1: Find change in glucose	$9.0 - 5.0 = 4.0$	1 mark
Step 2: Correct calculation of rate	$4.0 \div 120$ (minutes)	1 mark
Step 3: Correct answer with units	0.033 (mmol/L per minute)	1 mark
Correct answer with no working scores 0 marks.		
		Total: 3 marks

c) Explain the hormonal control that causes the blood glucose concentration to decrease between 60 minutes and 180 minutes.

An explanation to include the following:	
High blood glucose is detected by the pancreas which releases the hormone insulin .	1 mark
Insulin travels in the blood to the liver (and muscles).	1 mark
Insulin causes glucose to be taken up from the blood and converted into glycogen for storage.	1 mark
	Total: 3 marks

(Total for Question 2 is 7 marks)

3. The concentration of thyroxine in the blood is controlled by a negative feedback system involving the pituitary gland and Thyroid Stimulating Hormone (TSH).

a) State the gland that produces TSH.

Pituitary (gland)	1 mark
	Total: 1 mark

- b) The concentration of thyroxine in the blood is carefully controlled by a negative feedback system involving the pituitary gland and another hormone called TSH.

Explain how this negative feedback system controls the concentration of thyroxine in the blood.

Marking guidance		
Level	Marks	Descriptor
Level 1	1 - 2	Simple statements are made, identifying at least one hormone and one gland involved.
Level 2	3 - 4	A good explanation is provided, with the key glands and hormones identified.
Level 3	5 - 6	A detailed and coherent explanation of the negative feedback loop is given. Both the response to low and high thyroxine levels are clearly described, correctly linking the pituitary gland, TSH, and the thyroid gland. The concept of inhibition is clearly explained.

Indicative content:	
When thyroxine levels are low: - Low thyroxine is detected by the pituitary gland. - The pituitary gland releases more TSH. - TSH travels in the blood to the thyroid gland. - TSH stimulates the thyroid gland to release more thyroxine. - This causes the blood thyroxine level to rise back to normal. When thyroxine levels are high (the negative feedback): - High thyroxine inhibits (stops/reduces) the release of TSH from the pituitary gland. Less TSH means there is less stimulation of the thyroid gland. - The thyroid gland releases less thyroxine. - This causes the blood thyroxine level to fall back to normal.	
	Total: 6 marks

- c) The person with hypothyroidism is treated with a daily dose of synthetic thyroxine. After 8 weeks of treatment, their blood thyroxine concentration is measured again. The results are shown in the table.

Calculate the percentage increase in the person's blood thyroxine concentration after 8 weeks of treatment. Show your working.

Step 1: Find the change	$117 - 45 (= 72)$	1 mark
Step 2: Correct substitution	$(72 \div 45) \times 100$	1 mark
Step 3: Final answer	160 (%)	1 mark
		Total: 3 marks

(Total for Question 3 is 10 marks)

4. The endocrine system coordinates many of the body's responses to internal and external changes.

a) State the name of the gland that regulates blood glucose and name **one** hormone it produces.

Gland: Pancreas	1 mark
Hormone: Insulin or Glucagon Allow one hormone only.	1 mark
	Total: 2 marks

b) Adrenaline is a hormone released in response to fear or excitement.

Describe **three** effects of adrenaline on the body that prepare it for 'fight or flight'.

A description to include any three of the following:	
Increases heart rate Allow: makes the heart beat faster.	1 mark
Increases breathing rate / depth. Allow: makes you breathe faster.	1 mark
Increases blood glucose levels. Allow: stimulates the liver to convert glycogen into glucose.	1 mark
Diverts blood flow to muscles. Allow: widens blood vessels to muscles / narrows them to gut.	1 mark
Dilates pupils	1 mark
	Total: 3 marks

c) The nervous system and the endocrine system both coordinate responses in the body.

Compare these **two** systems.

Max 2 marks for separate, non-comparative lists. A valid comparison <u>must</u> be made for each marking point.	
Nervous system uses electrical impulses, whereas endocrine system uses chemical hormones.	1 mark
Nervous system transmission is very fast, whereas endocrine system is slower.	1 mark
Nervous system response is short-lived, whereas endocrine response is longer-lasting.	1 mark
Nervous system signals travel along neurones, whereas endocrine signals travel in the bloodstream.	1 mark
Nervous system acts on a very precise area, whereas endocrine system acts on a wider area (target organs).	1 mark
	Total: 4 marks

(Total for Question 4 is 9 marks)