PSY.BIO3 The Endocrine System: Glands and Hormones

Total Marks

AQA 7182 · Calculators not allowed · about 50 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Identify a hormone produced by the anterior pituitary gland and briefly state one function of that hormone in the human body. Name the gland as the pituitary and give one hormone and one function, in the context of endocrine gland regulation.

(Total for Question 1 is 2 marks)

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2 Identify the main hormone produced by the thyroid gland and outline one effect this hormone has on metabolic rate or development in the body. Name the gland and the effect in the context of endocrine control of metabolism.

(Total for Question 2 is 2 marks)

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3 Identify two hormones produced by the adrenal glands and state a brief function for each, in the context of the endocrine response to stressors and everyday regulation.

(Total for Question 3 is 2 marks)

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4 Identify the main sex hormones produced by the gonads in human males and females and give one role of these hormones in puberty or reproduction, naming the gland and hormone for each sex.

(Total for Question 4 is 2 marks)

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5 Briefly outline how negative feedback controls levels of thyroxine in the blood. Your answer should describe the sequence linking the hypothalamus and pituitary to the thyroid and explain how rising thyroxine affects further secretion.

(Total for Question 5 is 4 marks)

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6 State which gland is often called the 'master gland' of the endocrine system and give one reason why it is described that way, in the context of regulation of other glands.

(Total for Question 6 is 1 mark)

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7 Identify a specific anterior pituitary hormone that stimulates another endocrine gland, name the gland it stimulates and state the effect of that stimulation. Give hormone, target gland and one effect in your answer.

(Total for Question 7 is 2 marks)

8 Identify two physiological effects commonly associated with the hormone cortisol, naming the hormone and giving one effect per mark in the context of longer term stress regulation.

(Total for Question 8 is 2 marks)

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9 Distinguish between hormonal communication via the endocrine system and neural communication via the nervous system in terms of speed of onset and duration of effect. Give two clear contrasts and link each contrast to why it matters for behaviour regulation.

(Total for Question 9 is 4 marks)

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10 Compare how the endocrine system and the nervous system work together to regulate a behaviour such as feeding, stress response or reproductive behaviour. Your answer should discuss complementary roles, coordination pathways and why both systems are needed. This is a 6-mark compare question marked using levels of response.

(Total for Question 10 is 6 marks)

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11 Define 'negative feedback' as a general regulatory principle of the endocrine system, and give one concise example other than thyroxine where negative feedback operates to restore hormone levels.

(Total for Question 11 is 2 marks)

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12 Identify one way gonadal hormones such as testosterone or oestrogen can influence behaviour and give a brief supporting explanation or example, in the context of puberty or reproduction.

(Total for Question 12 is 2 marks)

Mark scheme · PSY.BIO3 The Endocrine System: Glands and Hormones

Question 1

- **B1** names a pituitary hormone, for example growth hormone (GH) or adrenocorticotropic hormone (ACTH) oe
- **B1** states a correct function linked to that hormone, for example GH stimulates body growth and protein synthesis, ACTH stimulates the adrenal cortex to release cortisol oe
- **Answer: Example: Pituitary hormone = growth hormone (GH). Function = stimulates body growth and protein synthesis.**

Question 2

- **B1** identifies thyroxine (T4) or thyroid hormone oe
- **B1** outlines an effect, for example increases basal metabolic rate, increases rate of cellular respiration, or supports growth and brain development oe
- **Answer: Thyroid hormone = thyroxine (T4). Effect = increases basal metabolic rate and therefore increases cellular respiration.**

Question 3

- **B1** identifies hormones such as adrenaline (epinephrine) and cortisol from the adrenal glands oe
- **B1** states a function for each identified hormone, for example adrenaline increases heart rate and alertness for immediate action, cortisol helps mobilise energy stores and supports longer term stress response oe
- **Answer: Example: Adrenal hormones = adrenaline and cortisol. Adrenaline increases heart rate and alertness for immediate action; cortisol helps mobilise energy and regulates longer term stress responses.**

Question 4

- **B1** identifies testosterone for the testes and oestrogen for the ovaries oe
- **B1** states a role, for example testosterone promotes development of male secondary sexual characteristics and sperm production; oestrogen regulates the menstrual cycle and promotes female secondary sexual characteristics oe
- **Answer: Testosterone from the testes promotes male secondary sexual characteristics and sperm production; oestrogen from the ovaries regulates the menstrual cycle and promotes female secondary sexual characteristics.**

Question 5

- **M1** states that the hypothalamus releases TRH and the pituitary releases TSH to stimulate the thyroid when thyroxine is low oe
- **A1** states that the thyroid secretes thyroxine in response to TSH oe
- **A1** states that when thyroxine levels rise they inhibit the release of TRH and TSH from the hypothalamus and pituitary oe
- **A1** explains that this negative feedback reduces stimulation of the thyroid, restoring thyroxine toward the set level oe
- **Answer: Hypothalamus releases TRH which stimulates the pituitary to release TSH; TSH stimulates the thyroid to secrete thyroxine. When thyroxine levels rise they act to inhibit TRH and TSH release, reducing stimulation of the thyroid and returning thyroxine toward the set level.**

Question 6

- **B1** pituitary gland is named as the 'master gland' because it secretes hormones such as TSH and ACTH that regulate other endocrine glands oe
- **Answer: The pituitary gland is the 'master gland' because it secretes hormones like TSH and ACTH that stimulate and regulate other endocrine glands.**

Question 7

- **B1** identifies a pituitary tropic hormone, for example adrenocorticotropic hormone (ACTH) or thyroid-stimulating hormone (TSH) oe
- **B1** states the correct target gland and effect, e.g. ACTH -> adrenal cortex, stimulates cortisol release; TSH -> thyroid, stimulates thyroxine release oe
- **Answer: Example: TSH from the anterior pituitary stimulates the thyroid gland to release thyroxine.**

Question 8

- **B1** identifies cortisol and states an effect, e.g. helps mobilise energy by increasing blood glucose or promoting gluconeogenesis oe
- **B1** states a second effect, e.g. suppresses non-essential functions like immune responses or helps maintain blood pressure oe
- **Answer: Cortisol effects include mobilising energy by increasing blood glucose and suppressing some immune functions to prioritise resources during longer term stress.**

Question 9

- **M1** contrast: hormonal communication is generally slower to begin because hormones travel in the bloodstream to target organs, whereas neural communication is very rapid because it relies on electrical impulses along neurons oe
- **A1** explain why it matters: slow hormonal onset suits sustained, longer term responses such as growth, development or prolonged stress regulation, whereas fast neural onset suits immediate rapid reactions like reflexes oe
- **M1** contrast: hormonal effects are generally longer lasting because hormones can remain in the bloodstream and trigger prolonged changes, whereas neural effects are brief and precise due to fast synaptic transmission oe
- **A1** explain why it matters: long-lasting hormonal effects support ongoing physiological states and regulation, while brief neural signals allow fine-grained, moment-to-moment control of behaviour oe
- **Answer: Hormonal signals are slower to start but longer lasting, fitting sustained regulation such as metabolism or chronic stress, while neural signals are very fast and short-lived, fitting immediate, precise control such as reflexes.**

Question 10

- **Level 3** (5-6): Detailed comparison showing understanding of both systems and their interaction. Clearly explains complementary roles and coordination, with appropriate examples and reasoned evaluation of why both systems are necessary for regulating the chosen behaviour. Uses specialist terms accurately and applies knowledge to the behaviour throughout.
- **Level 2** (3-4): Some comparison with a correct explanation of at least one way the systems interact. Some use of example behaviour and partial evaluation of complementary roles. Specialist terms used but may be imprecise at times.
- **Level 1** (1-2): Simple, limited statements about the endocrine and nervous systems, possibly presented as a list. Little or no applied example and weak or missing explanation of interaction or complementarity.
- **Level 0** (0): No creditworthy content.
- **Indicative content:**
  - AO1: endocrine system releases hormones into the bloodstream; nervous system transmits electrical impulses and uses neurotransmitters at synapses.
  - AO1: endocrine effects are generally slower and longer lasting, neural effects are rapid and short-lived.
  - AO2: example of feeding: neural signals from hypothalamus detect blood glucose and send rapid signals to initiate eating, endocrine hormones like insulin and ghrelin modulate hunger and longer term energy balance.
  - AO2: example of stress response: neural activation provides immediate alerting and behavioural responses, the endocrine system releases hormones that sustain physiological changes; both systems coordinate via the hypothalamus and pituitary.
  - AO3: reasoned evaluation, for example neural precision allows immediate behavioural adjustment while hormonal signals sustain the internal state, so both are necessary for adaptive regulation.
  - AO3: limitations or challenges, for example the two systems can overlap or produce conflicting signals and timing differences must be carefully coordinated, which the brain and hypothalamic control help to manage.

Question 11

- **B1** defines negative feedback: a process where a rise in a hormone's level reduces further secretion, or a fall increases secretion, to maintain homeostasis oe
- **B1** gives an example, e.g. insulin and blood glucose regulation where rising blood glucose stimulates insulin which lowers glucose and thus reduces further insulin release, or cortisol regulation via the HPA axis oe
- **Answer: Negative feedback is when changes in a hormone level reduce further secretion to maintain balance. Example: blood glucose and insulin, where high glucose stimulates insulin release which lowers glucose and so reduces insulin secretion.**

Question 12

- **B1** identifies an influence, e.g. testosterone associated with increased aggression or sexual drive, or oestrogen associated with regulation of menstrual cycle and influence on mood and sexual behaviour oe
- **B1** gives a brief explanation or example linking the hormone to the behaviour, e.g. testosterone rises at puberty and contributes to the development of male sexual behaviour and secondary sexual characteristics which affect mating behaviour oe
- **Answer: Example: Testosterone can increase sexual drive and contribute to development of male secondary sexual characteristics at puberty, affecting reproductive behaviour.**