1.22 Hormonal Coordination and Homeostasis: Test Pack

Total Marks

AQA 8464 · Calculator allowed · about 45 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Blood glucose concentration is controlled by hormones released from the pancreas, as part of a negative feedback system.

(a) Name the hormone that lowers blood glucose concentration, and the hormone that raises it. **(2)**

(b) State what is meant by 'negative feedback'. **(1)**

(Total for Question 1 is 3 marks)

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2 Elena took part in a school play and measured her heart rate immediately before walking on stage, and again while she was speaking her opening lines, using a heart-rate monitor. Before: 72 beats per minute. During: 117 beats per minute.

(a) Calculate the percentage increase in Elena's heart rate. **(2)**

.....

(b) Name the hormone responsible for this rapid increase in heart rate, and the gland that releases it. **(2)**

(c) Explain why an increased heart rate is a useful response for the body to have in this situation. **(1)**

.....

(Total for Question 2 is 5 marks)

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3 Tomasz has type 1 diabetes. He uses an insulin-to-carbohydrate ratio of 1 unit of insulin for every 8 g of carbohydrate he eats. His correction factor is that 1 unit of insulin lowers his blood glucose concentration by 2.5 mmol/L. His target blood glucose concentration before a meal is 7 mmol/L.

(a) Tomasz is about to eat a meal containing 56 g of carbohydrate. Calculate the units of insulin he needs for the carbohydrate in this meal. **(2)**

.....

(b) Before this meal, Tomasz's blood glucose concentration is 14.5 mmol/L. Calculate the extra correction dose of insulin he needs to bring it down to his target of 7 mmol/L. **(2)**

.....

(c) Calculate the total dose of insulin Tomasz should inject before this meal. **(1)**

.....

(Total for Question 3 is 5 marks)

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4 A student investigated the effect of gravity on the growth of newly germinated cress seedlings. She placed one group of seedlings on their sides in a lined Petri dish, so their roots and shoots were growing horizontally, and kept them in constant darkness so that light could not affect their growth. She set up a second, control group of seedlings on a slowly rotating clinostat, also lying on their sides in the dark, so that the effect of gravity was evenly distributed on all sides.

(a) Explain why the student kept the seedlings in constant darkness during this investigation. **(1)**

(b) Explain the purpose of using a rotating clinostat for the control group. **(1)**

(c) Predict and describe the direction of growth of the root and the shoot of a seedling placed on its side (not on the clinostat) after several days. **(2)**

(d) Explain, in terms of the distribution and effect of auxin, why the root and shoot grow in these different directions. **(3)**

(e) The student measured the angle of curvature of each root using a protractor, to the nearest degree. Suggest one way she could improve the precision of this measurement. **(1)**

(Total for Question 4 is 8 marks)

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5 A fertility clinic published data on the success rate of one cycle of IVF treatment, grouped by the age of the woman being treated.

Age group	Number of IVF cycles	Number resulting in a live birth
Under 35	400	132
35 to 39	300	63
40 and over	200	14

(a) Calculate the percentage of IVF cycles that resulted in a live birth for women aged under 35. **(2)**

.....

(b) Calculate the percentage of IVF cycles that resulted in a live birth for women aged 40 and over. **(2)**

.....

(c) Suggest a biological reason why the success rate of IVF treatment decreases as the age of the woman being treated increases. **(1)**

(Total for Question 5 is 5 marks)

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6 Higher tier only. Kofi runs a marathon on a hot day. He sweats heavily throughout the race but only drinks small amounts of water at drink stations.

(a) Name the hormone that controls how much water is reabsorbed by the kidneys, and the gland that releases it. **(2)**

(b) Explain what will happen to the concentration of ADH released into Kofi's blood during the marathon, and why. **(2)**

(c) Explain the effect of this change in ADH concentration on Kofi's kidneys, and on the volume and concentration of urine he produces during the race. **(3)**

(Total for Question 6 is 7 marks)

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Mark scheme · 1.22 Hormonal Coordination and Homeostasis: Test Pack

Question 1

(a) insulin lowers it **B1**

(a) glucagon raises it **B1**

(a) Answer: Insulin lowers blood glucose concentration; glucagon raises it.

(b) a control system that detects when a level in the body moves away from its normal range, and triggers a response that brings it back towards normal, oe **B1**

(b) Answer: A control system that detects when a level in the body moves away from normal, and triggers a response that brings it back towards normal.

Question 2

(a) (117 - 72) / 72 x 100 **M1**

(a) 62.5% cao **A1**

(a) Answer: 62.5%

(b) adrenaline **B1**

(b) adrenal glands **B1**

(b) Answer: Adrenaline, released by the adrenal glands.

(c) an increased heart rate delivers blood (carrying oxygen and glucose) to the muscles more quickly, supplying them with what they need for increased respiration, preparing the body for action ('fight or flight'), oe **B1**

(c) Answer: An increased heart rate delivers oxygen and glucose to the muscles more quickly, supplying what they need for increased respiration and preparing the body for rapid action.

Question 3

(a) 56 / 8 **M1**

(a) 7 units cao **A1**

(a) Answer: 7 units

(b) (14.5 - 7) / 2.5 **M1**

(b) 3 units cao **A1**

(b) Answer: 3 units

(c) 10 units (their (a) + their (b), ft), cao **B1**

(c) Answer: 10 units

Question 4

(a) so that the seedlings' growth response is caused only by gravity, and not also by light (an uncontrolled variable would make the test unfair), oe **B1**

(a) Answer: So that any growth response seen is caused only by gravity, and not also by light, which would make the investigation an unfair test.

(b) rotating the seedlings evenly distributes the effect of gravity on all sides of the root and shoot, so they experience no net directional response to gravity, allowing a comparison with the seedlings that experienced gravity from one direction only, oe **B1**

(b) Answer: Rotating the seedlings evenly distributes the effect of gravity around the root and shoot, so they experience no net directional response, giving a fair comparison for the seedlings that were not rotated.

(c) the root bends and grows downwards, towards the direction of gravity, oe **B1**

(c) the shoot bends and grows upwards, away from the direction of gravity, oe **B1**

(c) Answer: The root bends and grows downwards, towards the direction of gravity. The shoot bends and grows upwards, away from the direction of gravity.

(d) when a seedling is placed on its side, auxin accumulates on the lower side of both the root and the shoot, oe **B1**

(d) in the shoot, the higher concentration of auxin on the lower side causes greater cell elongation there, so the shoot bends upwards, oe **B1**

(d) in the root, the higher concentration of auxin on the lower side inhibits cell elongation there, so the upper side elongates more and the root bends downwards, oe **B1**

(d) Answer: Auxin accumulates on the lower side of both the root and the shoot. In the shoot, this higher auxin concentration increases cell elongation on the lower side, so the shoot bends upwards. In the root, the higher auxin concentration on the lower side inhibits cell elongation there instead, so the upper side elongates more and the root bends downwards.

(e) e.g. use a protractor with smaller, finer divisions, photograph the seedlings and measure the angle from an enlarged image, or use digital image analysis software, oe **B1**

(e) Answer: For example, photograph the seedlings and measure the angle from an enlarged image, or use a protractor with finer divisions.

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Question 5

(a) 132 / 400 x 100 **M1**

(a) 33% cao **A1**

(a) Answer: 33%

(b) 14 / 200 x 100 **M1**

(b) 7% cao **A1**

(b) Answer: 7%

(c) as a woman gets older, both the number and the quality of the eggs remaining in her ovaries decreases, reducing the chance of a viable embryo forming and developing successfully, oe **B1**

(c) Answer: As a woman gets older, both the number and the quality of the eggs remaining in her ovaries decreases, reducing the chance of a viable embryo forming and developing successfully.

Question 6

(a) ADH (antidiuretic hormone) **B1**

(a) pituitary gland **B1**

(a) Answer: ADH (antidiuretic hormone), released by the pituitary gland.

(b) the concentration of ADH released will increase, oe **B1**

(b) because sweating heavily while drinking only small amounts of water reduces the water content of his blood, and this is detected as needing correction, oe **B1**

(b) Answer: The concentration of ADH released will increase, because sweating heavily while drinking only small amounts of water reduces the water content of his blood, which needs to be corrected.

(c) the increased ADH concentration makes the kidney tubules more permeable to water, oe **B1**

(c) so more water is reabsorbed back into the blood from the kidney tubules, oe **B1**

(c) producing a smaller volume of more concentrated urine, oe **B1**

(c) Answer: The increased ADH concentration makes the kidney tubules more permeable to water, so more water is reabsorbed back into the blood. This means a smaller volume of more concentrated urine is produced.

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