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EDEXCEL GCSE BIOLOGY: QUESTIONS BY TOPIC

Animal Coordination, Control and Homeostasis (7)

GCSE Biology (Higher) Topic 7

19 questions · 203 marks · Mark schemes included

Pearson Edexcel GCSE (9-1) Biology 1BI0, Higher Tier, June 2018 - June 2025

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HOW TO USE THIS BOOKLET

Questions run from the lowest mark tariff to the highest, so similar questions sit together.

Click any row below to jump straight to that question.

On every question page, click ANSWER in the top-right corner to jump to its mark scheme.

Diagrams, graphs, tables and data are printed exactly as they appeared in the original papers.

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QUESTIONS

19 questions · 203 marks · lowest tariff first



7-MARK QUESTIONS

2 questions in this booklet



- 1 Blood is filtered in the kidney to remove unwanted substances.

Figure 1 shows part of a nephron.

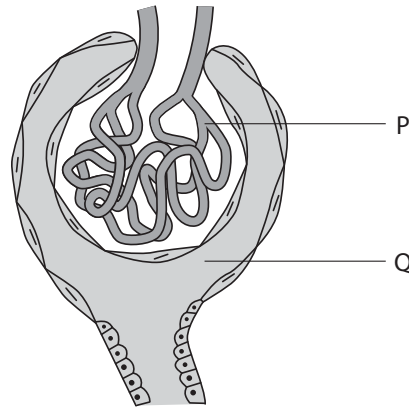


Figure 1

- (a) Name the structures labelled P and Q.

(2)

P.....

Q.....

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- (b) Figure 2 shows information about some of the components in the blood and in the filtrate in this part of the nephron.

component	concentration in the blood	concentration in the filtrate in the nephron
glucose	1.0mg per cm ³	1.0mg per cm ³
protein	47.0g per dm ³	0.0g per dm ³
red blood cells	4.5×10^6 per cm ³	0.0 per cm ³
white blood cells	8.0×10^3 per cm ³	0.0 per cm ³

Figure 2

- (i) Calculate the difference in the number of red blood cells and the number of white blood cells in 1 cm³ blood.

Give your answer in standard form.

(2)

- (ii) Explain why there are differences in the concentrations of some components in the blood and some components in this part of the nephron.

(2)

- (c) State the name of the hormone that regulates the water content of the blood.

(1)

(Total for Question 1 = 7 marks)



- 1 (a) Banting and Best were the first scientists to use the hormone insulin for the treatment of diabetes.

They extracted insulin from the body organs of animals.

- (i) Which body organ produces insulin?

(1)

- ☐ A liver
- ☐ B heart
- ☐ C kidney
- ☐ D pancreas

- (ii) How does insulin travel to its target organ?

(1)

- ☐ A by diffusion along neurones
- ☐ B dissolved in blood plasma
- ☐ C attached to red blood cells
- ☐ D by osmosis in white blood cells

(b) Tasting urine was one of the first ways doctors tested for diabetes.

If the urine tasted sweet, the patient may have diabetes.

Describe the chemical test we now use to test for glucose in urine.

(3)

(c) A scientist wanted to compare the glucose concentration in two urine samples.

State **two** variables that need to be controlled for the comparison to be valid.

(2)

1

2

(Total for Question 1 = 7 marks)



9-MARK QUESTIONS

2 questions in this booklet



- 2 People with diabetes cannot always control the concentration of glucose in their blood.

(a) Two people eat identical meals.

One person has diabetes, the other person does not have diabetes.

Figure 4 shows the concentration of glucose in the blood of these two people after eating the meals.

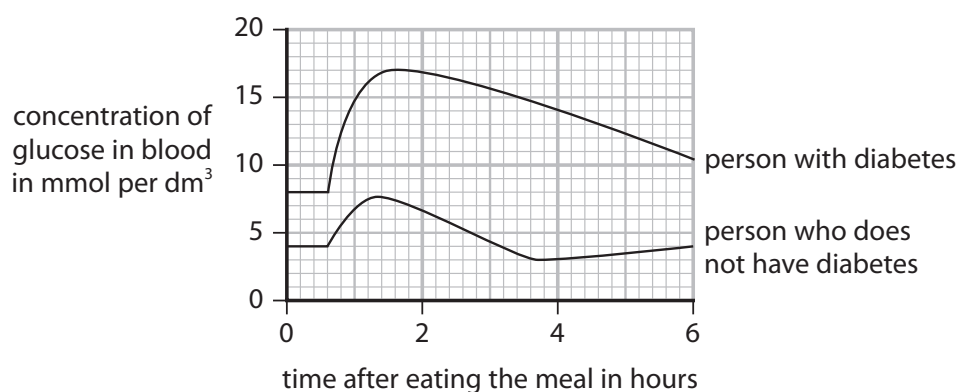


Figure 4

- (i) Calculate the maximum increase in the concentration of glucose in the blood of the person with diabetes.

(1)

..... mmol per dm³

- (ii) Water moved out of the red blood cells of the person with diabetes when the concentration of glucose in the blood was above 15 mmol per dm³.

Explain why water moved out of the red blood cells of the person with diabetes.

(2)

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(b) The pancreas produces a hormone that causes the concentration of glucose in the blood to decrease.

(i) Name this hormone.

(1)

(ii) State how this hormone is transported from the pancreas to its target organs.

(1)

(iii) Which is the target organ for the hormone that controls the concentration of glucose in the blood?

(1)

- ☐ A kidney
- ☐ B pancreas
- ☐ C liver
- ☐ D lung

(c) Explain how type 2 diabetes can be controlled.

(3)

(Total for Question 2 = 9 marks)



8 Figure 15 shows the changes in the levels of the hormones of the menstrual cycle.

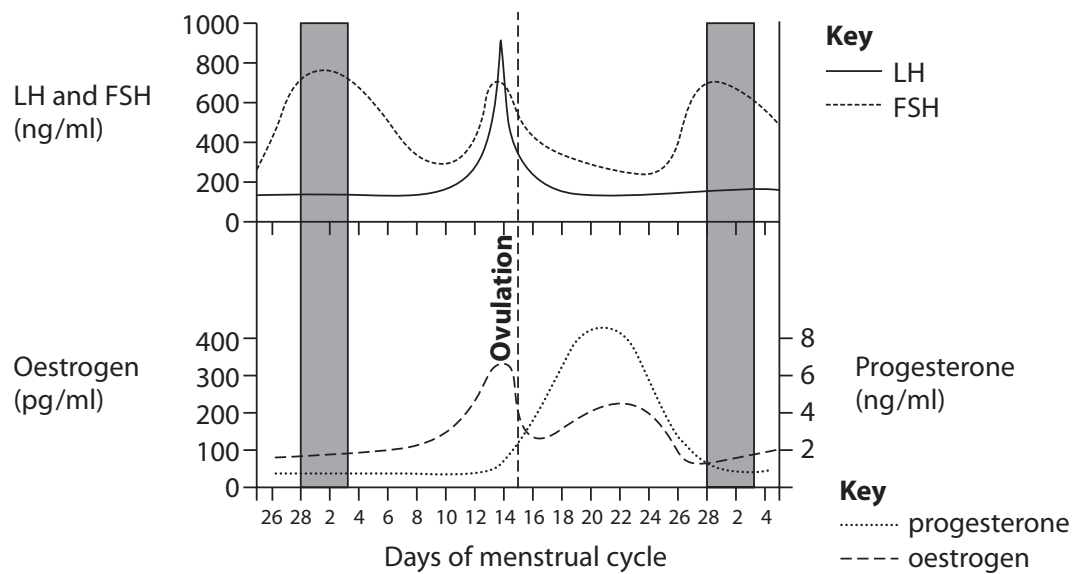


Figure 15

(a) (i) The maximum concentration of oestrogen is just before ovulation.

Which is the maximum concentration of oestrogen?

(1)

- ☐ A 8 ng/ml
- ☐ B 210 pg/ml
- ☐ C 320 pg/ml
- ☐ D 900 ng/ml

(ii) Explain how **two** of the hormones shown in Figure 15 cause ovulation.

(3)

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(iii) State the number of days for the first menstruation shown in Figure 15.

(1)

(iv) Explain how the levels of each hormone in the woman shown in Figure 15 would be different, if she was pregnant.

(4)

(Total for Question 8 = 9 marks)

10-MARK QUESTIONS

1 question in this booklet



6 (a) The combined contraceptive pill contains artificial versions of oestrogen and progesterone.

(i) Explain how the combined contraceptive pill prevents pregnancy.

(2)

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(ii) When taken correctly, the combined pill can be over 99% effective.

Taking the combined pill can lead to weight gain.

Give **one** other disadvantage of using the combined pill as the only method of contraception.

(1)

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(b) Excessive weight gain and obesity increase the likelihood of developing type 2 diabetes.

Explain the effect of type 2 diabetes on the body.

(3)

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11-MARK QUESTIONS

7 questions in this booklet



6 (a) Iguanas are lizards.

Some species of iguana live on hot islands in the Pacific Ocean and use the environment to regulate their body temperature.

Figure 11 shows an iguana on a rock in the sunshine.



© benjamint444/Getty Images

Figure 11

A marine biologist measured the oxygen consumption of an iguana at different temperatures.

Figure 12 shows the results.

body temperature of the iguana in °C	oxygen consumption in cm ³ per gram per hour
20	0.4
25	0.8
30	1.1
35	1.4

Figure 12

(i) Describe how the body temperature of the iguana affects its oxygen consumption. (1)

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(ii) Explain why the body temperature of the iguana affects its oxygen consumption. (3)

(iii) Iguanas do not have sweat glands.

When an iguana is too hot, it pants by opening its mouth to cool down.

Explain how this behaviour helps to cool the iguana down. (2)



15



(b) (i) Where in the human brain is the thermoregulatory centre?

(1)

- ☐ A cerebellum
- ☐ B cerebral cortex
- ☐ C hypothalamus
- ☐ D pituitary gland

(ii) Explain the role of vasodilation in thermoregulation.

(4)

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(Total for Question 6 = 11 marks)

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- 9 (a) Figure 17 shows the concentration of the hormones oestrogen and progesterone in the blood of women of different ages.

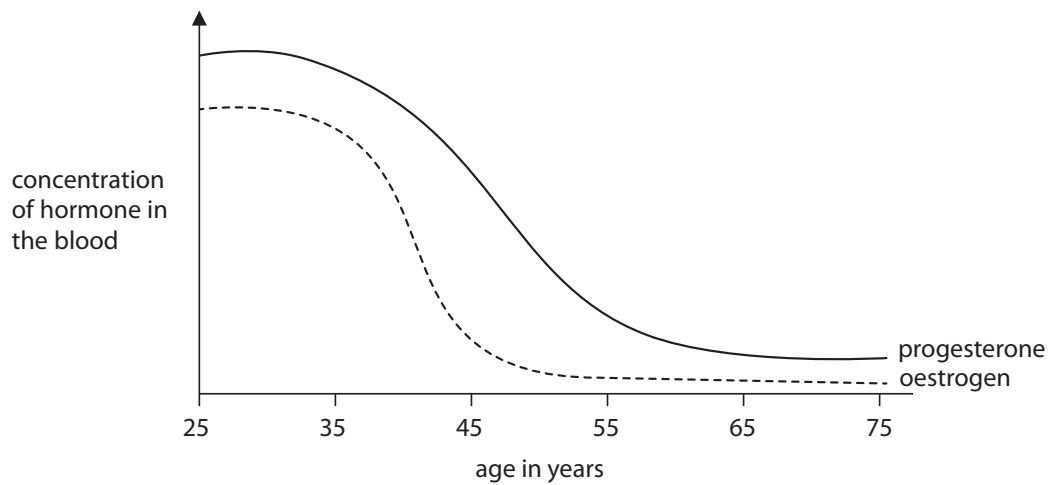


Figure 17

- (i) Use information from Figure 17 to explain why women over the age of 50 are less likely to ovulate.

(2)

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- (ii) Use information from Figure 17 to explain why women are less likely to menstruate after the age of 60.

(2)

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(iii) Explain how clomifene therapy may increase the chance of a woman over the age of 50 becoming pregnant.

(2)

(iv) The hormone progesterone is produced by the

(1)

- ☐ **A** corpus luteum
- ☐ **B** pituitary
- ☐ **C** thyroid
- ☐ **D** uterus

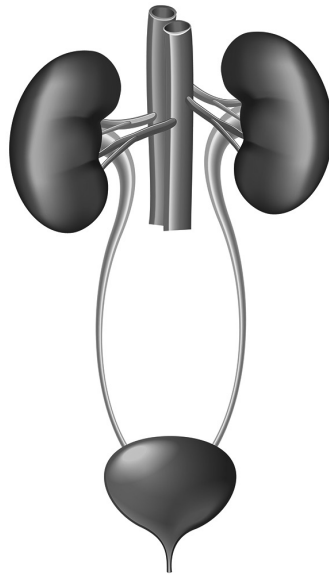
(b) Explain how the release of adrenalin can result in the improved performance of an athlete.

(4)

(Total for Question 9 = 11 marks)



4 Figure 7 shows the human urinary system.



(Source: © La Gorda/Shutterstock)

Figure 7

(a) Urine is made by removing water, urea and salts from the blood.

Use the letter X to label where urine is made.

(1)

(b) Which substance is converted to urea in the liver?

(1)

- ☐ **A** amino acids
- ☐ **B** sugars
- ☐ **C** lipids
- ☐ **D** potassium ions

- (c) A patient cannot remove enough urea from the blood when making urine.

Figure 8 shows a dialysis machine attached to the arm of this patient.

Their blood is pumped out of their arm, passed through the dialysis machine, and then put back into the patient.

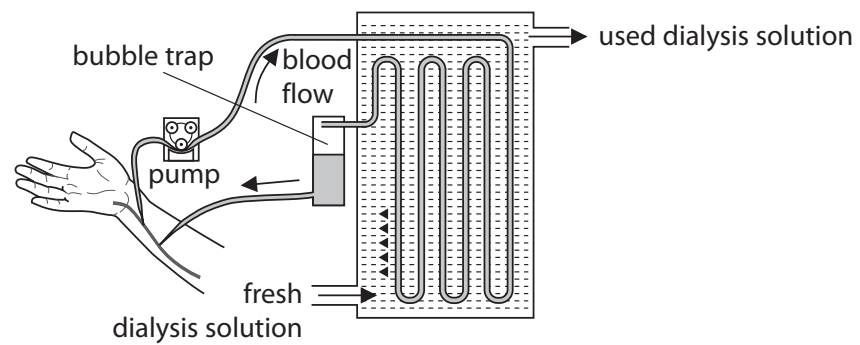


Figure 8

- (i) Describe what happens to urea as the blood passes through the dialysis machine.

(2)

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- (ii) Two patients need to have dialysis treatment.

Patient A needs this treatment three times a week.

Patient B needs this treatment once a week.

Give **one** reason why patient B needs dialysis treatment less often than patient A.

(1)

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(d) Describe how to test for glucose in the dialysis fluid.

(3)

(e) Urease is an enzyme that breaks down urea into smaller molecules.

Explain why urease will not break down starch into smaller molecules.

(3)

(Total for Question 4 = 11 marks)



6 (a) Methods of contraception include use of hormones and barrier methods.

(i) Which form of contraception is a barrier method?

(1)

- ☐ **A** oral contraception
- ☐ **B** female condom
- ☐ **C** rhythm (calendar) method
- ☐ **D** contraceptive implant

(ii) State why a barrier method of contraception may be used in addition to a hormonal method.

(1)

(b) The combined contraceptive pill contains the hormones oestrogen and progesterone.

(i) State the endocrine gland that releases oestrogen.

(1)

(ii) Explain how high levels of oestrogen and progesterone in the combined contraceptive pill work together to prevent pregnancy.

(4)

(c) Hormones can also be used to treat infertility.

Explain how clomifene therapy and IVF can improve female fertility.

(4)

clomifene therapy.....

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IVF.....

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(Total for Question 6 = 11 marks)



- 7 (a) A hospital patient was tested for diabetes.

A nurse recorded his mass and height.

Figure 10 shows these measurements.

mass in kg	height in metres
124	1.8

Figure 10

Calculate the BMI of this patient using the information in Figure 10.

(2)

BMI = ...



(b) Blood samples were taken from this patient every four hours.

The glucose concentrations were recorded in Figure 11.

time in hours	blood glucose concentration in milligrams per decilitre
0	100
4	131
8	139
12	90
16	92
20	134
24	137

Figure 11

(i) Describe the trends shown in this data.

(3)

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(ii) This patient was diagnosed as being type 2 diabetic.

Explain why the blood glucose concentration of this patient remained high from 4 hours to 8 hours.

(3)

(iii) This patient did some exercise during these 24 hours.

Explain how the data in Figure 11 shows that this exercise occurred after 8 hours but before 12 hours.

(3)

(Total for Question 7 = 11 marks)



- 4 (a) A student wanted to make a jacket to wear in cold weather.

The student compared the insulation properties of wool as a natural material with polyester as a synthetic material.

Each material was wrapped around a beaker containing hot water as shown in Figure 8.

The temperature was recorded every 2 minutes for 12 minutes.

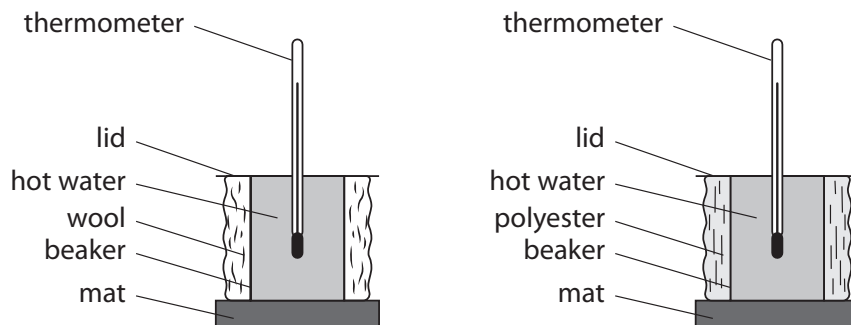


Figure 8

- (i) Which part of the body controls the regulation of body temperature?

(1)

- ☐ A kidney
- ☐ B pituitary gland
- ☐ C hypothalamus
- ☐ D pancreas

- (ii) State **one** variable that should be controlled in this investigation.

(1)

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- (iii) Describe a control that could be used for this investigation.

(2)

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(b) The results for this investigation are shown in Figure 9.

wool		polyester	
time in minutes	temperature in °C	time in minutes	temperature in °C
0	64	0	82
2	61	2	74
4	56	4	68
6	53	6	63
8	49	8	59
10	45	10	53
12	42	12	48

Figure 9

(i) Compare and contrast the temperature changes for wool and polyester in this investigation.

(2)

(ii) State **one** improvement to this investigation that would make the results more comparable.

(1)

(c) (i) Wearing an insulated jacket may cause a person to sweat.

Explain how sweating helps to regulate temperature in humans.

(2)

(ii) Sweat contains urea.

State where and how urea is produced in the human body.

(2)

(Total for Question 4 = 11 marks)



10 (a) Figure 11 shows the location of the liver and kidneys in the human body.



(Source: © Magic mine/Shutterstock)

Figure 11

(i) The liver breaks down substances in the body to form waste products.

Which row of the table is correct?

(1)

	substances broken down	waste products
☐ A	amino acids	urea
☐ B	amino acids	enzymes
☐ C	urea	enzymes
☐ D	urea	amino acids

(ii) State how the waste products travel from the liver to the kidneys.

(1)

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(b) A scientist investigated the effect of a high-protein, low-carbohydrate diet on a person’s body.

The scientist measured the concentration of substances found in the urine of a person on this diet (person A) and in the urine of a person not on this diet (person B).

The results are shown in Figure 12.

substance	concentration of substances in urine	
	person A	person B
protein	0 g per dm ³	0 g per dm ³
glucose	0 mmol per l	0.2 mmol per l
urea	28 g per dm ³	12 g per dm ³

Figure 12

(i) Evaluate the results shown in Figure 12.

(3)

*(ii) Explain how a nephron ensures that there is no protein and no glucose in the urine of person A.

(6)

(Total for Question 10 = 11 marks)



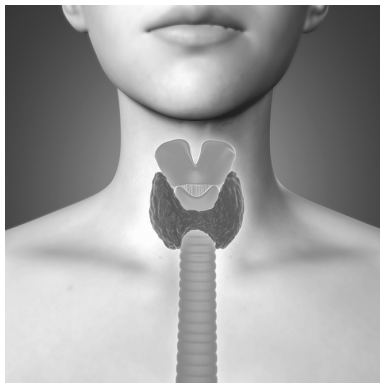
12-MARK QUESTIONS

7 questions in this booklet

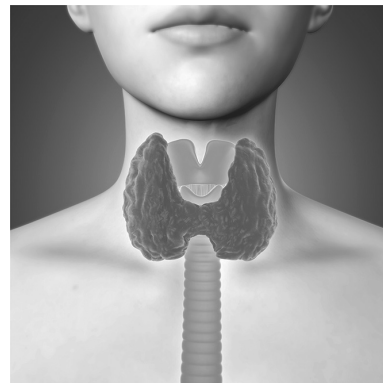


- 9 (a) Hyperthyroidism is caused by an overactive thyroid gland.

Figure 14 shows a person with a normal thyroid gland and a person with hyperthyroidism.



normal



hyperthyroidism

© medistock/Shutterstock

Figure 14

- (i) State **one** effect of hyperthyroidism on the thyroid gland.

(1)

- (ii) The thyroid gland is part of the

(1)

- ☐ A circulatory system
- ☐ B digestive system
- ☐ C endocrine system
- ☐ D urinary system

(b) Explain how negative feedback, involving the thyroid gland, controls metabolic rate.

(4)

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* (c) Explain how hormones control the menstrual cycle.

(6)

(Total for Question 9 = 12 marks)



10 (a) A person with kidney disease may need kidney dialysis treatment.

Figure 15 shows an experiment to show how a dialysis membrane works.

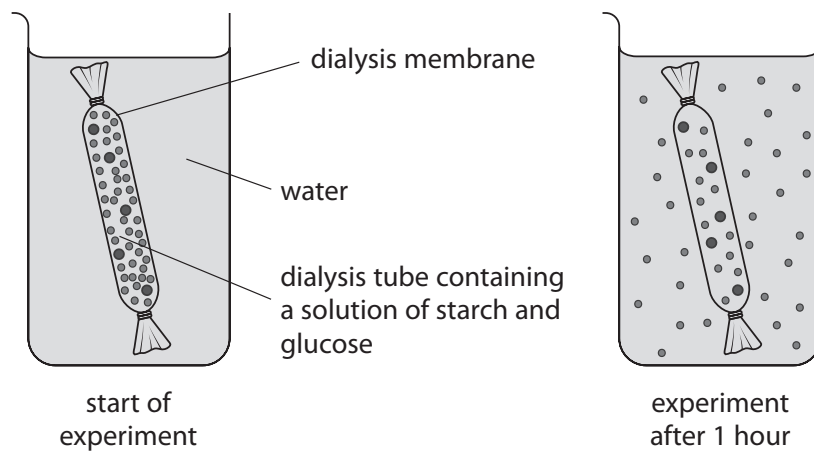


Figure 15

- (i) Describe the method that would be used to find out what is present in the solution in the beaker, after one hour.

(4)

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(ii) Explain how this experiment represents a simple model of kidney dialysis treatment. (2)

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*(b) The nephrons in the kidney remove unwanted substances from the blood.

Figure 16 shows the structure of a nephron.

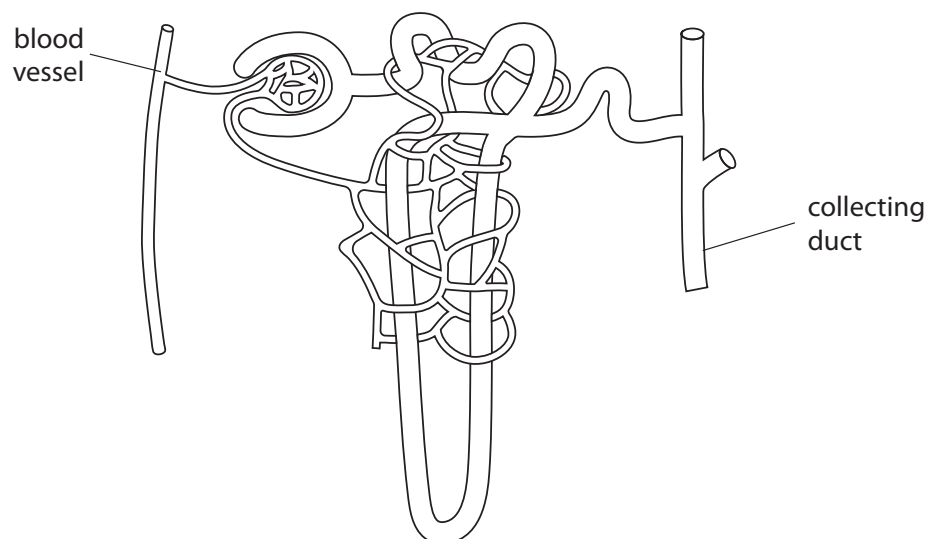


Figure 16

Explain how substances are exchanged between the blood entering the nephron and the filtrate leaving the collecting duct.

Include reference to named structures of the nephron in your answer.

(6)

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Handwriting practice area with 20 horizontal dotted lines.

(Total for Question 10 = 12 marks)

- 10** (a) When training, an athlete noticed some types of T-shirts became wetter and heavier due to sweating.

This athlete has three T-shirts, each made of a different material.

Devise a method this athlete could use to find the best T-shirt for training.

(3)

- (b) Athletes often eat a high protein diet.

- (i) Which is the test and result for a food containing protein?

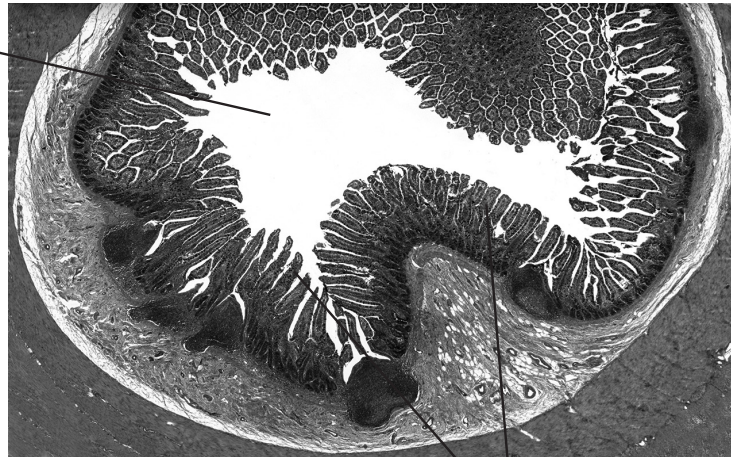
(1)

- ☐ **A** Benedict's reagent is used and the solution turns brick red
- ☐ **B** Benedict's reagent is used and the solution stays blue
- ☐ **C** biuret solution is used and the solution stays blue
- ☐ **D** biuret solution is used and the solution turns purple

(ii) Digested protein is absorbed in the small intestine by diffusion.

Figure 15 shows part of the small intestine.

lumen of the
small intestine



villi

(Source: © Science Photo Library C047/6177)

Figure 15

Using Figure 15 and Fick's law, explain the effect of the villi on the rate of diffusion.

(3)

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(iii) Digested protein enters the blood as amino acids.

State which component of the blood transports amino acids.

(1)

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(c) Explain how high levels of amino acids in the blood cause a high concentration of urea in urine.

(4)

(Total for Question 10 = 12 marks)



10 Blood is filtered in the kidney.

Figure 17 shows the diameter of some molecules found in human blood.

molecule	diameter in nanometres (nm)
X	0.6
Y	1.0
Z	15

Figure 17

(a) (i) Which part of the nephron is the site of ultrafiltration?

(1)

- ☐ **A** distal convoluted tubule
- ☐ **B** collecting duct
- ☐ **C** glomerulus
- ☐ **D** loop of Henle

(ii) Molecule Z is a protein.

Explain why protein is not usually found in urine.

(2)

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(iii) Haemolytic anaemia is a disease that causes red blood cells to burst.

Haemoglobin is not found in the urine of people who do not have haemolytic anaemia.

The diameter of a haemoglobin molecule is 5.5 nm.

Explain why haemoglobin can be found in the urine of people with haemolytic anaemia.

(3)

*(b) Describe how the water content of the blood is controlled in the nephron.

(6)

(Total for Question 10 = 12 marks)



9 (a) The female contraceptive pill contains hormones to prevent pregnancy.

(i) Which hormones are in the female combined contraceptive pill?

(1)

- ☐ A FSH and oestrogen
- ☐ B oestrogen and progesterone
- ☐ C progesterone and LH
- ☐ D LH and FSH

(ii) Explain how the hormones in contraceptive pills prevent ovulation.

(3)

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(iii) Explain how a barrier method of contraception prevents pregnancy.

(2)

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*(b) Hormones can be used as part of assisted reproductive technology.

Explain how assisted reproductive technology (ART) can be used to increase the chances of a woman becoming pregnant.

(6)

(Total for Question 9 = 12 marks)



9 (a) The menopause occurs when the menstrual cycle stops.

Figure 16 shows the hormone concentrations in the blood before the menopause and after the menopause.

hormone	mean hormone concentration before the menopause	mean hormone concentration after the menopause
oestrogen	33 pg/mL	23 pg/mL
progesterone	11 ng/mL	0.4 ng/mL
testosterone	35 ng/dL	16 ng/dL

Figure 16

(i) Compare and contrast the hormone concentrations before and after the menopause.

(3)

(ii) Explain the roles of FSH and LH in the menstrual cycle.

(3)



*(b) Figure 17 shows the blood glucose concentrations for a person who has type 2 diabetes and a person who does not have type 2 diabetes.

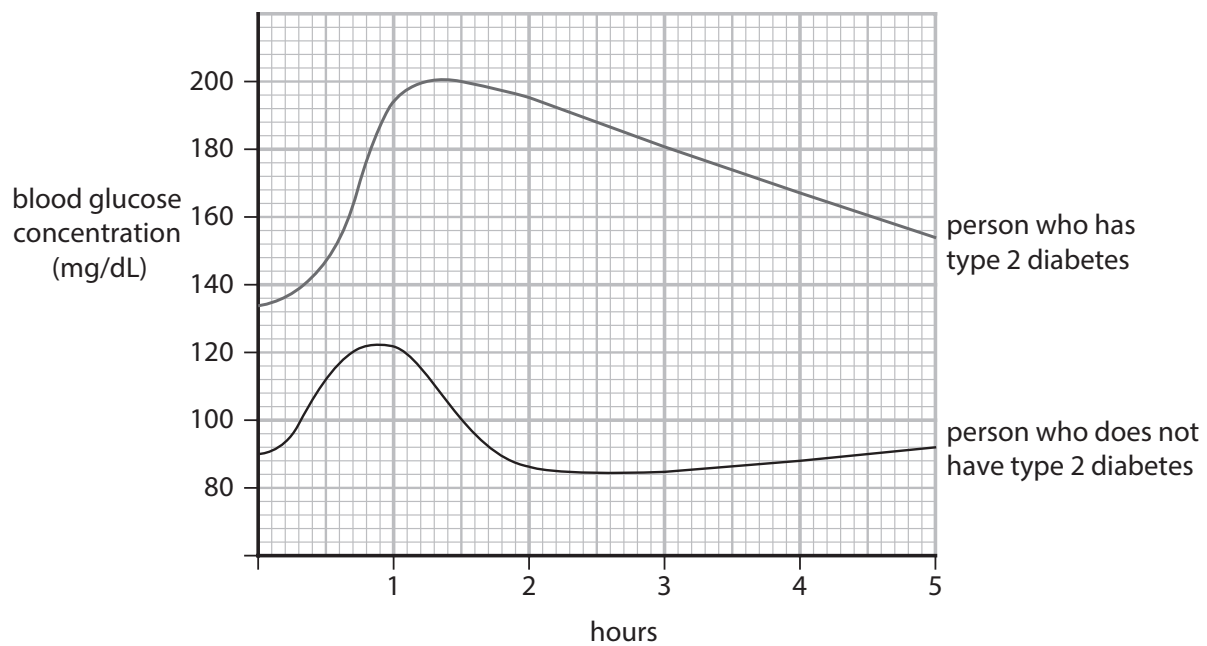


Figure 17

Explain how glucose concentrations are controlled for a person with type 2 diabetes and a person who does not have type 2 diabetes.

Include information from Figure 17 in your answer.

(6)

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(Total for Question 9 = 12 marks)



10 (a) Figure 18 shows a diagram of a nephron in the human kidney.

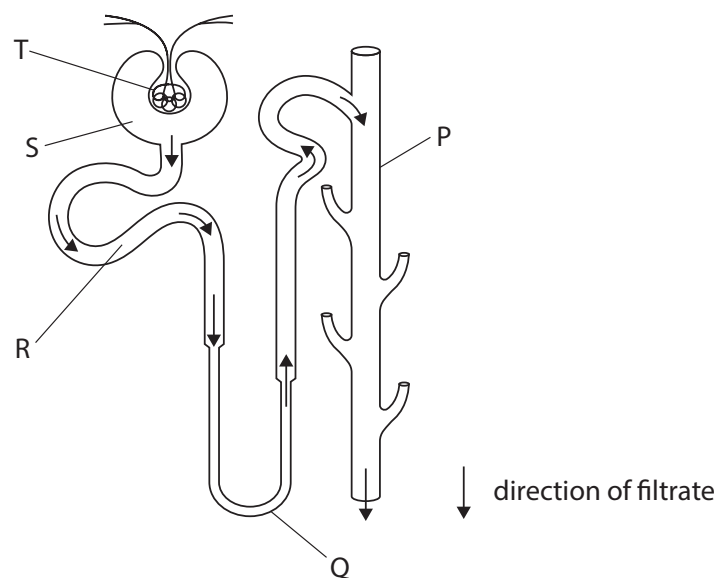


Figure 18

(i) Which letter indicates the glomerulus?

(1)

- ☐ A letter S
- ☐ B letter T
- ☐ C letter Q
- ☐ D letter P

(ii) Which letter indicates the Bowman's capsule?

(1)

- ☐ A letter T
- ☐ B letter S
- ☐ C letter R
- ☐ D letter P

(iii) Describe the process that occurs in the proximal convoluted tubule (PCT).

(2)

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(b) State the role of the ureters and the bladder in the urinary system.

(2)

ureters

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bladder

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*(c) Explain how the water content of the blood is regulated when a person has consumed a large volume of water and is now overhydrated.

(6)

(Total for Question 10 = 12 marks)



MARK SCHEMES

official Pearson Edexcel mark schemes



Question number	Answer	Additional guidance	Mark
1(a)	P glomerulus Q Bowman's capsule	accept capillary /capillaries accept renal capsule accept correct phonetic spelling	(2) AO 1 1

Question number	Answer	Additional guidance	Mark
1(b)(i)	Substitution: $4.5 \times 10^6 - 8.0 \times 10^3$ (1) Evaluation: $4.5 \times 10^6 / 4.492 \times 10^6$	accept 4492000 accept correct answer no working for full marks	(2) AO 2 1

Question number	Answer	Mark
1(b)(ii)	An explanation linking two of the following: {red blood cells/ white blood cells / proteins} {are not present in the filtrate / cannot be filtered into the nephron} (1) - because they are too large to pass {through the membrane/into the nephron} (1) OR - glucose is found in the filtrate (1) - because it is small enough to pass {through the membrane / into the nephron} (1)	(2) AO 2 1

Question number	Answer	Additional guidance	Mark
1(c)	ADH / Anti diuretic hormone / vasopressin	accept phonetic spellings of anti diuretic hormone	(1) AO 1 1

Total for Question 1 = 7 marks



Question Number	Answer	Mark
1(a)(i)	The only correct answer is D pancreas <i>A is incorrect because the liver is the target organ for insulin it does not produce it</i> <i>B is incorrect because the heart does not produce insulin</i> <i>C is not correct because the kidneys do not produce insulin</i>	(1) AO1 1

Question Number	Answer	Mark
1(a)(ii)	The only correct answer is B dissolved in blood plasma <i>A is incorrect because hormones do not travel along neurones</i> <i>C is incorrect because insulin does not attach to red blood cells</i> <i>D is not correct because hormones do not move by osmosis or in white blood cells</i>	(1) AO1 1

Question Number	Answer	Additional Guidance	Mark
1(b)	A description including: • (take a sample of urine and) add Benedict's reagent (1) • heat the solution (in a water bath) (1) • observe the colour change to (brick) red (1)	accept solution for reagent accept other colours yellow, green, orange, brown	(3) AO1 2

Question Number	Answer	Mark
1(c)	Any two from: • volume of urine (1) • volume of Benedict's (reagent) (1) • concentration of Benedict's (reagent) (1) • temperature (1) • time left (in the water bath) (1)	(2) AO1 2

(Total for question 1 = 7 marks)



Question number	Answer	Mark
2(a)(i)	9 (mmol per dm ³)	(1)

Question number	Answer	Additional guidance	Mark
2(a)(ii)	An explanation including: • (water moves out) by osmosis (1) • because the concentration of glucose is higher in the blood (plasma) (1) • across a partially permeable membrane (1)	accept from a high water potential inside the cell to a low water potential outside the cell	(2)

Question number	Answer	Mark
2(b)(i)	insulin	(1)

Question number	Answer	Additional guidance	Mark
2(b)(ii)	in the blood / plasma	accept dissolved / in solution	(1)

Question number	Answer	Mark
2(b)(iii)	The only correct answer is C liver A is incorrect because the target organ is not the kidney B is incorrect because the pancreas produces insulin D is incorrect because the target organ is not the lungs	(1)

Question number	Answer	Additional guidance	Mark
2(c)	An explanation including three from: • exercise (1) • control diet / lose weight (1) • to {reduce / control} blood glucose (1)	accept avoid {sugar / carbohydrate} in your diet accept methods of testing blood for signs of diabetes (1) accept take {medication / metformin / insulin} (1)	(3)

(Total for question 2 = 9 marks)

Question number	Answer	Mark
8(a)(i)	The only correct answer is C 320 pg/ml A is incorrect because this is the reading for progesterone B is incorrect because this is the second peak reading for oestrogen D is incorrect because this is the reading for LH	(1)

Question number	Answer	Mark
8(a)(ii)	An explanation including three of the following: • FSH causes the {egg / follicle} to mature (1) • FSH stimulates oestrogen (1) • high levels of oestrogen (1) • LH / LH surge (1) • causes the egg to be released (1)	(3)

Question number	Answer	Mark
8(a)(iii)	3 / three (days)	(1)

Question number	Answer	Mark
8(a)(iv)	An explanation including the following: • FSH levels remain low as no {egg / follicle} would mature (1) • LH levels remain low so ovulation would not occur (1) • progesterone inhibits {FSH / LH} / oestrogen inhibits FSH (1) • progesterone levels remain high to maintain the lining of the uterus (1) • high levels of oestrogen {build up / maintain} the lining of the uterus (1)	(4)

(Total for question 8 = 9 marks)



Question Number	Answer	Additional Guidance	Mark
6(a)(i)	An explanation linking: - inhibits {FSH / LH} (1) - which prevents {maturation of a follicle / ovulation} (1)	ignore prevents production of eggs accept thickens cervical mucus (1) accept thickens cervical mucus blocks the sperm / stops them reaching the egg for 2 marks	(2) AO2

Question Number	Answer	Additional guidance	Mark
6(a)(ii)	doesn't prevent STI	Accept STDs for STIs Accept named STIs accept still a chance of pregnancy	(1) AO1

Question Number	Answer	Additional Guidance	Mark
6(b)	An explanation linking: - blood glucose levels are not regulated / high (1) - because cells are resistant to insulin (1) (so the liver) does not convert glucose to glycogen (1)	accept blood sugar levels accept there is insulin resistance / unresponsive to insulin reject immune accept hyperglycaemia / symptoms of hyperglycaemia (1)	(3) AO1

Question Number	Answer	Additional Guidance	Mark
6(c)	An answer including four from: • {TSH / thyroxine} levels are higher than normal (1) • TSH stimulates the thyroid gland / TSH stimulates the release of thyroxine (1) • increases metabolic rate (1) • {red blood cells / glucose} are within the normal range (1) • suggesting oxygen is carried as normal (1) • the symptoms are not due to diabetes (1)	accept the hormones levels are high / above average accept digests / breaks down food faster accept hyperthyroidism / overactive thyroid accept RBC / glucose are not high accept is not anaemic	(4) AO3 1a, 1b, 2a, 2b

(Total for question 6 = 10 marks)



Question number	Answer	Mark
6(a)(i)	As body temperature rises the oxygen consumption of the iguana is increased	(1) AO 3 1a

Question number	Answer	Mark
6(a)(ii)	An explanation linking the following: • {chemical/enzyme/metabolic} reactions are increased at higher temperatures (1) • (more) respiration occurs (1) • (more respiration) requires oxygen (1)	(3) AO 3 2a AO 3 2b

Question number	Answer	Mark
6(a)(iii)	An explanation linking the following: • (panting) causes water loss (1) • causing evaporation / removal of latent heat (so reduction in temperature) (1)	(2) AO 1 1

Question number	Answer	Mark
6(b)(i)	C hypothalamus 1. The only correct answer is C A is not correct because the cerebellum is the main centre for balance not thermoregulation B is not correct because the cerebral cortex is the main area for higher thinking skills and logic not thermoregulation D is not correct because the pituitary gland releases hormones it is not the thermoregulatory centre	(1) AO 1 1

Question number	Answer	Additional guidance	Mark
6(b)(ii)	An explanation linking the following: • vasodilation acts to cool the body down (1) • more blood flows near the surface of the skin (1) • less blood flows through the shunt valve (1) • causing increased thermal energy loss (1)	accept capillaries widen near the surface of the skin. reject moving blood vessels. accept energy loss by radiation	(4) AO 1 1

Total for Question 6 = 11 marks

Question number	Answer	Mark
9(a)(i)	An explanation linking two of the following: - women over the age of 50 have low levels of oestrogen (1) (high levels of) oestrogen are needed for LH to be released / levels of oestrogen are too low for LH to be released (1) (a surge of) LH is needed for ovulation to occur (1)	(2) AO 3 1a AO 3 1b

Question number	Answer	Additional guidance	Mark
9(a)(ii)	An explanation linking: - low levels of oestrogen (1) (low levels of oestrogen) stops the lining of the uterus building up / so no lining to be lost (1)	reject progesterone	(2) AO3 2a AO3 2b

Question number	Answer	Additional guidance	Mark
9(a)(iii)	An explanation linking the following: - causes the release of FSH (1) - stimulating eggs to develop (in the follicles/ovary) (1) OR - causes the release of LH (1) - stimulating ovulation (1)	accept stimulates follicles to mature	(2) AO 2 1

Question number	Answer	Mark
9(a)(iv)	A corpus luteum 1. The only correct answer is A <i>B is not correct because The pituitary gland releases the hormones LH and FSH not progesterone</i> <i>C is not correct because the thyroid gland releases TSH and thyroxine not progesterone</i> <i>D is not correct because the uterus does not release any hormones it is the site of the action of progesterone</i>	(1) AO 1 1

Question number	Answer	Additional guidance	Mark
9(b)	An explanation linking four of the following: • adrenalin acts to increase heart rate / blood pressure (1) • so there is increased blood flow (1) • causes the release of glucose from glycogen (1) • so increased {oxygen/glucose} (1) • increased the rate of respiration (1) • to release energy (for the working muscles/body) (1)	accept more glucose released from liver/muscles accept ATP for energy	(4) AO 1 2

Total for Question 9 = 11 marks



Question Number	Answer	Additional guidance	Mark
4(a)	a labelled line X to either kidney	accept X written on a kidney	(1) AO2 1

Question Number	Answer	Mark
4(b)	A amino acids The only correct answer is A <i>B is not correct because sugars are not converted to urea in the liver</i> <i>C is not correct because lipids are not converted to urea in the liver</i> <i>D is not correct because potassium ions are not converted to urea in the liver</i>	(1) AO1 1

Question Number	Answer	Additional guidance	Mark
4(c)(i)	A description including two from: • blood is filtered (in a dialysis machine) (1) • urea moves {out of the blood / into dialysis solution} (1) • by diffusion (1)	accept tube for blood	(2) AO2 1

Question Number	Answer	Additional guidance	Mark
4(c)(ii)	Any one from: - patient B has {kidney failure / disease} which is less advanced than patient A (1) - patient B may have a {better diet / low protein diet} (1)	accept patient B only just developed kidney disease	(1) AO2 1

Question Number	Answer	Additional guidance	Mark
4(d)	A description including: - add Benedict's solution (to some dialysis fluid) (1) {heat / boil / put in water bath} (1) - see if it turns {green / yellow / orange / red} (1)	accept brown	(3) AO2 2

Question Number	Answer	Additional guidance	Mark
4(e)	An explanation linking three from: - enzymes are specific (1) - their shape is complementary to their substrate (1) - so starch will not fit into the active site (of urease) (1) - so no reaction can take place (1)	accept amylase only acts on starch	(3) AO2 1

(Total for question 4 = 11 marks)

Question Number	Answer	Mark
6(a)(i)	B female condom The only correct answer is B <i>A is incorrect because oral contraception contains hormones</i> <i>C is incorrect because the rhythm (calendar) method does not involve a barrier</i> <i>D is incorrect because the contraceptive implant contains hormones</i>	(1) AO1 1

Question Number	Answer	Additional guidance	Mark
6(a)(ii)	barrier methods prevent the transmission of STIs	accept STDs / accept named STIs accept for extra protection against pregnancy	(1) AO2 1

Question Number	Answer	Mark
6(b)(i)	ovary / ovaries	(1) AO1 1

Question Number	Answer	Additional guidance	Mark
6(b)(ii)	An explanation linking four from: • inhibits the production of FSH (1) • FSH causes eggs to mature in the follicle / (no FSH means) no eggs will be matured (1) • high levels of progesterone inhibit the production of LH (1) • LH causes ovulation / (no LH) prevents ovulation (1) • if eggs are not matured and released they cannot be fertilised (1)	accept thicker cervical mucus to prevent the sperm from reaching the egg (2)	(4) AO1 1

Question Number	Answer	Additional guidance	Mark
6(c)	An explanation linking four from: Clomifene (maximum two marks) - clomifene therapy introduces hormones into the body / stimulates hormones {LH / FSH} (1) - to allow (more) eggs to {develop / be released} (1) IVF (maximum two marks) - IVF involves fertilisation outside the body (1) - so a fertilised egg cell can be implanted directly into the uterus (1) - so if Fallopian tubes are blocked there can still be pregnancy (1)	accept womb for uterus accept alternative reasons for using IVF	(4) AO1 1

(Total for question 6 = 11 marks)

Question Number	Answer	Additional guidance	Mark
7(a)	substitution $124 \div 1.8^2$ (1) evaluation $BMI = 38.27$	award 2 marks for correct answer with no working accept 38 / 38.3 accept 68.9 / 68.89 for 1 mark accept answers correctly rounded to any number of decimal places	(2) AO1 1

Question Number	Answer	Additional guidance	Mark
7(b)(i)	A description including: • blood glucose concentration increased from {0 – 8 hours / from 100 to 139 / by 39 mg/dL} (1) • then blood glucose concentration decreased [at 12 hours / to 90 mg/dL / by 49 mg/dL] (1) • blood glucose concentration increased {at 20 hours / after 12 hours / to 134 mg/dL / by 44 mg/dL} (1)	accept blood glucose concentration increased {at 24 hours / to 137 mg/dL / by 47 mg/dL} accept other calculated increases between 12 and 24 hours	(3) AO3 1 a + b

Question Number	Answer	Additional guidance	Mark
7(b)(ii)	An explanation linking: - the pancreas produced insulin (1) - but the cells in the {liver / muscles} were resistant to insulin (1) - so glucose was not taken up by the {liver / muscles / cells} (1)	accept but there is insulin resistance accept so the glucose is not converted to glycogen in the {liver / muscles}	(3) AO2 1

Question Number	Answer	Additional guidance	Mark
7(b)(iii)	An explanation linking: - the blood glucose concentration decreased (at 12 hours) (1) - because the patient has used up the glucose in his blood (1) - due to increased respiration (during exercise) (1)	accept glucose used by {muscles / cells}	(3) AO3 2ab

(Total for question 7 = 11 marks)

Question number	Answer	Mark
4(a)(i)	The only correct answer is C hypothalamus A is incorrect because the kidney does not control body temperature B is incorrect because the pituitary gland does not control body temperature D is incorrect because the pancreas does not control body temperature	(1)

Question number	Answer	Mark
4(a)(ii)	Any one from • volume of water in each beaker (1) • {size / shape} of container (1) • {mass / weight / thickness} of material (1) • starting temperature (1)	(1)

Question number	Answer	Additional guidance	Mark
4(a)(iii)	A description including the following: • repeat the experiment / set the apparatus up as shown in Figure 8 (1) • without the insulating material (1)	accept set up a beaker and a thermometer	(2)

Question number	Answer	Mark
4(b)(i)	An answer which compares and contrasts the two materials including the following: • with both materials the temperature drops over time (1) • the drop in temperature for polyester was faster / greater than wool (1)	(2)

Question number	Answer	Mark
4(b)(ii)	Any one from: - begin with the same starting temperature (1) - continue the investigation until the temperature stops dropping (1)	(1)

Question number	Answer	Mark
4(c)(i)	An explanation linking the following: - sweat is released onto (the surface of) the skin (1) - which evaporates (1) - that cools the body / removes heat (1)	(2)

Question number	Answer	Additional guidance	Mark
4(c)(ii)	A statement including the following: (urea) is produced in the liver (1) - from (excess) amino acids / protein (1)	accept by (the process of) deamination	(2)

(Total for question 4 = 11 mark)

Question number	Answer	Mark
10(a)(i)	The only correct answer is A amino acids urea B is incorrect because enzymes are not a waste product C is not correct because enzymes are not a waste product D is not correct because urea is not a substance to be broken down and amino acids are not a waste product	(1) AO1 1

Question number	Answer	Mark
10(a)(ii)	In the blood/ in the bloodstream / in the plasma / in the renal artery	(1) AO1 1

Question number	Answer	Additional guidance	Mark
10(b)(i)	An evaluation including the following: - protein levels are zero for both because protein cannot pass through the {kidney / nephron} (1) - glucose levels are lower for person A because {they have fewer carbohydrates / glucose is selectively reabsorbed} (1) - urea levels are higher for person A because urea is a breakdown product from protein (1)	accept reverse argument accept glucose levels are higher for person B as they have diabetes	(3) AO1 1

Question number	Indicative content	Mark
10 *(b)(ii)	AO1 and AO2 6 marks protein - protein cannot pass into the nephron - during ultrafiltration - the glomerulus puts pressure on the blood - and the liquid part of the blood passes into the Bowman's capsule - protein molecules are too large to pass through glucose - glucose is selectively reabsorbed - back into the blood - in the PCT / proximal convoluted tubule / first convoluted tubule - by active transport - against the concentration gradient	(6)

Level	Mark	Descriptor
	0	no rewardable material.
Level 1	1-2	- demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. - presents an explanation with some structure and coherence.
Level 2	3-4	- demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and /or developed. - presents an explanation that has a structure which is mostly clear, coherent and logical.
Level 3	5-6	- demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. - presents an explanation that has a well-developed structure which is clear, coherent and logical.



Additional information

Level 1	1-2	• a named structure of the nephron • linked to one of the substances correctly
Level 2	3-4	• more than one named structure of the nephron • linked to both substances
Level 3	5-6	• the main parts of the nephron named including the glomerulus, Bowman's capsule and PCT in the correct order • correctly linked to proteins not entering the nephron because they are too large and glucose being selectively reabsorbed.

(Total marks for Question 10 = 11 marks)



Question number	Answer	Additional guidance	Mark
9(a)(i)	causes the thyroid gland to enlarge / swell / increase thyroxine production (1)		(1)

Question number	Answer	Mark
9(a)(ii)	C endocrine system The only correct answer is C endocrine system A is incorrect because the circulation involves the movement of blood around the body B is incorrect because the digestive system involves the breakdown of food D is incorrect because the urinary system deals with the removal of excretory products	(1)

Question number	Answer	Mark
9(b)	An explanation including four of the following: • Low levels of thyroxine cause TRH to be produced (1) • (TRH is produced) in the hypothalamus (1) • this causes TSH to be released (1) • (TSH is released) from the pituitary (1) • (TSH causes the) thyroid gland to produce thyroxine (1) • As thyroxine levels increase it inhibits the {release of TRH / production of TSH} (1)	(4)

Question number	Indicative content	Mark
*9(c)	• There are four hormones involved in the menstrual cycle oestrogen, progesterone, LH and FSH • At the start of the cycle FSH causes the egg to develop in the follicle • FSH is released from the pituitary gland • As progesterone and oestrogen levels are low • Oestrogen levels start to rise • Oestrogen is released from the ovaries • This causes the lining of the uterus to build up • High levels cause a surge of LH • Released from the pituitary gland • Causing ovulation • An egg is released from the ovary • Progesterone is produced • From the corpus luteum • This caused the lining of the uterus to be maintained • If an egg is fertilised oestrogen and progesterone levels remain high • To maintain the lining of the uterus	(6)

Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3-4	• Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5-6	• Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)



Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-2	- Either a list of two or more hormones or a hormone linked to its role in the menstrual cycle/or the endocrine gland it is released from - There must be a coherent flow to the answer linking the correct hormone with the correct role
Level 2	3-4	- At least two hormones of the menstrual cycle linked to their role or the endocrine they are released from - Answer must be correctly linked and in a logical order although the candidate may start at any point within the menstrual cycle
Level 3	5-6	- Links at least three hormones of the menstrual cycle to their role and endocrine gland they are released from - Answer must be logically ordered and links must be correctly made only minor errors are acceptable

Level	Mark	Examples of possible responses
	0	No rewardable material.
Level 1	1	FSH and LH control the menstrual cycle / LH controls ovulation and the uterus thickening (note an error here)
	2	LH controls ovulation
Level 2	3-4	- Oestrogen causes the uterus lining to thicken and LH to be released which causes ovulation - Oestrogen causes the uterus lining to thicken and LH to be released from the pituitary gland
Level 3	5-6	- FSH causes the egg to mature in the follicle, oestrogen causes the thickening of the uterus lining and causes LH to be released which results in ovulation. - FSH and LH are released from the pituitary gland, Oestrogen and progesterone are released from the ovaries. FSH causes the egg to mature in the follicle, oestrogen causes the thickening of the uterus lining and causes LH to be released which results in ovulation.

Total for question 9 = 12 marks



Question number	Answer	Additional guidance	Mark
10(a)(i)	A description that combines the following points to provide a logical description of the method: • use Benedict's reagent to test for glucose (1) • add it to the solution and heat, if glucose is present it turns green/brick red (1) • use iodine to test for starch (1) • add it to the solution and if starch is present it turns blue/black (1)	accept orange/brown for brick red	(4)

Question number	Answer	Additional guidance	Mark
10(a)(ii)	An explanation linking two from the following: • (substances) move through the membrane by diffusion (1) • from where they are in high concentration to where they are in low concentration / down a concentration gradient (1) OR • the dialysis membrane acts as a cell membrane (1) • shows small molecules /glucose moving through the membrane (1)	accept dialysis machine for cell membrane	(2)

Question number	Indicative content	Mark
*10(b)	Ultrafiltration • Blood enters the nephron into the glomerulus • Then is filtered under pressure into the Bowman's capsule/renal capsule Selective reabsorption • The filtrate enters the (proximal convoluted tubule • Where glucose is reabsorbed • By selective reabsorption • Active transport • Using energy from respiration • Through the loop of Henlé • Where water and ions are exchanged • Into the (distal convoluted) tubule Urine formation • The filtrate enters the collecting duct • Where waste products/urea and excess water are removed from the body • Urine is formed from water and urea	(6)

Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3-4	• Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5-6	• Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)



Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-2	- Gives at least one structure of the nephron or a simple description of a process occurring in the nephron - Links one structure of the nephron to its function e.g. glomerulus filters the blood or links two parts of the nephron in the correct order e.g. filtrate travels from glomerulus to Bowman's capsule
Level 2	3-4	- Links at least two structures to their function or process - Both structures must be correctly linked to their function in the correct order
Level 3	5-6	- Describes the flow of filtrate through the kidney linking at least three structures linked to their function or process - Three structures must be linked to their function in the correct logical order to include two of ultrafiltration, selective reabsorption and urine formation

Level	Mark	Example responses
	0	No rewardable material.
Level 1	1-2	- The blood enters in the glomerulus - The blood is filtered in the glomerulus
Level 2	3-4	- The blood is filtered in the glomerulus and enters the Bowman's capsule where the filtrate moves into the rest of the nephron - The blood is filtered in the glomerulus and enters the Bowman's capsule where the filtrate moves into the rest of the nephron and urine is collected in the collecting duct
Level 3	5-6	- The blood is filtered into the nephron through the glomerulus and the Bowman's capsule. It enters the first tubule and substances are reabsorbed by diffusion. The waste products pass to the collecting duct where urine is formed. - The blood is filtered into the nephron through the glomerulus and the Bowman's capsule this is called ultrafiltration. It enters the first tubule and substances are reabsorbed by diffusion and substances like glucose are selectively reabsorbed. The filtrate moves through the loop of Henlé where some water is reabsorbed. The waste products pass to the collecting duct where urine is formed.

Total for question 10 = 12 marks



Question Number	Answer	Additional Guidance	Mark
10(a)	An answer including three from: - complete the same exercise (1) - in the same environmental conditions (1) - measure the change in mass for each T-shirt (1) - the {least / most} weight gain is the best for exercise (1) OR - wet each T-shirt (1) - with the same volume of water (1) - measure the change in mass for each T-shirt (1) - the {least / most} weight gain is the best for exercise (1)	accept the same time of day / weather / temperature	(3) AO3 3a

Question Number	Answer	Mark
10 (b)(i)	D biuret solution is used and the solution turns purple The only correct answer is D <i>A is not correct because Benedict's is not used to test for protein</i> <i>B is not correct because Benedict's is not used to test for protein</i> <i>C is not correct because biuret solution does not stay blue with protein</i>	(1) AO1 2

Question Number	Answer	Additional Guidance	Mark
10(b)(ii)	An explanation linking: • (Fick's law states) the rate of diffusion is proportional to surface area x concentration gradient (1) • and inversely proportional to the thickness if the membrane (1) • increased rate of diffusion (1) • because the villi increase surface area / because the membrane is thinner (1)	accept equation accept shorter diffusion distance for membrane is thinner	(3) AO2 1

Question Number	Answer	Mark
10(b)(iii)	(blood) plasma	(1) AO1 1

Question Number	Answer	Additional guidance	Mark
10(c)	An explanation linking four from: • because excess amino acids are broken down into urea (1) • amino acids broken down in the liver (1) • it is then transported in the blood to the kidney (1) • enter the nephron (1) • during ultrafiltration (1) • pass through the nephron / not reabsorbed back into the blood (1) • (so urine with a high concentration of urea) forms in the collecting duct (1)	accept deamination accept named blood vessels accept Bowman's capsule / renal capsule / glomerulus accept bladder for collecting duct	(4) AO1 1

(Total for question 10 = 12 marks)

Question number	Answer	Mark
10(a)(i)	The only correct answer is C glomerulus A is incorrect because the distal convoluted tubule is part of the main body of B is incorrect because the collecting duct is where water reabsorption takes place D is incorrect because the loop of Henle is where salts are reabsorbed	(1)

Question number	Answer	Additional guidance	Mark
10(a)(ii)	An answer including: - the protein molecule is large / 15nm (1) - so will not fit through the glomerulus / will not enter the bowman's capsule (1)	accept cannot enter the nephron	(2)

Question number	Answer	Additional guidance	Mark
10(a)(iii)	An explanation linking three from: - haemoglobin is inside red blood cells (1) - red blood cells are too big to pass into the nephron (1) - haemoglobin is small enough to pass into the nephron (1) - and so travel to the collecting duct where urine is formed (1)	accept through {glomerulus / Bowman's capsule} for nephron accept haemoglobin is not (selectively) reabsorbed and so passes in the urine	(3)

Question number	Indicative content	Mark
*10(b)	AO1 water content too low • hypothalamus detects there is too little water in the blood • ADH released • from the pituitary gland • into the blood • As the collecting duct becomes more permeable • more water is reabsorbed into the blood • by osmosis • more concentrated urine • smaller volume urine produced water content too high • hypothalamus detects there is too much water in the blood • ADH lowered / not released • from the pituitary gland • collecting duct is less permeable • less water reabsorbed into the blood • more dilute urine • larger volume urine produced	(6)

Level	Mark	Indicative content
	0	No rewardable material.
Level 1	1–2	• a simple description of how the kidney acts to low or high water levels in the blood • linked to hormonal control
Level 2	3–4	• A detailed description of how the kidney acts to low or high water levels in the blood OR a simple description of both • Linked to the hormone ADH
Level 3	5–6	• A detailed description of how the kidney controls both high and low water concentrations • Linked to the hormone ADH released from the pituitary gland and the effect on the permeability of the collecting duct OR of the nephron

(Total for question 10 = 12 marks)



Question number	Answer	Mark
9(a)(i)	The only correct answer is B oestrogen and progesterone A is incorrect FSH causes the egg to develop in the follicle C is not correct because LH causes ovulation D is not correct because FSH causes the egg to develop in the follicle and LH causes ovulation	(1) AO1 1

Question number	Answer	Additional guidance	Mark
9(a)(ii)	An explanation linking: - oestrogen inhibits FSH (1) - so the {egg / follicle} cannot mature (1) - progesterone inhibits {LH / FSH} (1)	reject oestrogen inhibits LH accept FSH causes the {egg / follicle} to mature ignore no eggs are released / ovulation	(3) AO1 1

Question number	Answer	Additional guidance	Mark
9(a)(iii)	An explanation including: - stops the sperm and the egg from meeting (1) - so there will be no fertilisation (1)	accept gametes for sperm and ovum accept prevents sperm entering the vagina / cervix / uterus	(2) AO2 1

Question number	Indicative content	Mark
9 *(b)	A01 6 marks Clomifene therapy • Clomifene is a fertility drug • that causes the pituitary gland • to release more FSH and LH • so more eggs are matured in the follicle • more chance of the egg being released IVF (<i>in vitro</i> fertilisation) • eggs are removed from the mother's ovary • sperm are taken from the father • the sperm and the eggs are mixed / the sperm is injected into the egg • in a <i>Petri</i> dish • the fertilised egg is allowed to divide • the {fertilised egg / ball of cells / zygote / embryo} is placed into the uterus	(6)

Level	Mark	Descriptor
	0	• no rewardable material.
Level 1	1-2	• demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. • presents an explanation with some structure and coherence.
Level 2	3-4	• demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and /or developed. • presents an explanation that has a structure which is mostly clear, coherent and logical.
Level 3	5-6	• demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. • presents an explanation that has a well-developed structure which is clear, coherent and logical.

Additional Guidance

Level 1	1-2	• A brief explanation of either IVF OR Clomifene therapy OR other ART techniques • The response links the method to a hormone, named process or the idea of external fertilisation
Level 2	3-4	• A brief explanation of how IVF AND Clomifene therapy work OR a detailed explanation of one method • The response links one method to the type of ART either Clomifene OR IVF
Level 3	5-6	• A detailed explanation of BOTH IVF and Clomifene therapy • The response links both methods to the type of ART, Clomifene AND IVF

(Total for question 9 = 12 marks)

Question number	Answer	Additional guidance	Mark
9(a)(i)	An answer including three from - all three hormones are lower after the menopause (1) - oestrogen levels went down by 10pg/mL (1) - progesterone levels went down by 10.6ng/mL (1) - testosterone levels went down by 19 ng/dL (1)	oestrogen down by 30% progesterone down by 96% testosterone down by 54%	(3)

Question number	Answer	Additional guidance	Mark
9(a)(ii)	An explanation linking three from: FSH linked to - stimulates the follicle (to mature) (1) - causes the ovum to mature (1) - stimulates the production of oestrogen (1) LH linked to - causes ovulation (1) - corpus luteum (1)	accept egg for ovum accept causes the egg to be released	(3)

Question number	Indicative content	Mark
9 *(b)	AO1 and AO3 6 marks Healthy person • glucose is regulated insulin and glucagon • insulin released from the pancreas • lowers blood glucose • by converting glucose to glycogen • to be stored in the liver • glucagon released from the pancreas • raises blood glucose • by converting glycogen to glucose Type 2 diabetic • cells are resistant to insulin • so blood glucose levels remain high • control through diet and exercise • medication (metformin) given • inject insulin • to lower blood glucose concentration • Graph • glucose concentrations are higher for the person with type 2 diabetes • the range for a person who does not have type 2 diabetes is 90 – 125 mg/dL • the range for a person with type 2 diabetes is 135 – 200 mg/dL • there is a steeper rise in glucose concentrations for the person with type 2 diabetes • takes longer for glucose concentrations to drop in the person with type 2 diabetes	(6)

Level	Mark	Descriptor
	0	no rewardable material.
Level 1	1-2	- demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. - presents an explanation with some structure and coherence.
Level 2	3-4	- demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and /or developed. - presents an explanation that has a structure which is mostly clear, coherent and logical.
Level 3	5-6	- demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. - presents an explanation that has a well-developed structure which is clear, coherent and logical.

Additional Guidance

Level 1	1-2	- A brief comment of how blood glucose is regulated in either type 2 or a healthy person or a valid comment from the graph - At least 2 comments from the graph OR a comment on glucose regulation and a comment on the graph
Level 2	3-4	- A brief description of either healthy blood glucose regulation OR Type 2 diabetes blood glucose regulation OR a comment on both - The response links to data on the graph
Level 3	5-6	- A detailed explanation of the control of blood glucose for both people including the role of either insulin or glucagon - The response links this to data on glucose levels on the graph and both insulin and glucagon

Total for Question 9 = 12 marks



Question number	Answer	Mark
10(a)(i)	The only correct answer is B letter T A is incorrect as letter S represents the Bowmans capsule C is incorrect as letter Q represents the loop of Henle D is incorrect as letter P represents the collecting duct	(1)

Question number	Answer	Mark
10(a)(ii)	The only correct answer is B letter S A is incorrect as letter T represents the glomerulus C is incorrect as letter R represents the PCT D is incorrect as letter P represents the collecting duct	(1)

Question number	Answer	Additional guidance	Mark
10(a)(iii)	A description linking two from: - by the process of selective reabsorption (1) - of glucose (1) - using active transport (1)	accept where glucose is reabsorbed (back into the blood) (1)	(2)

Question number	Answer	Additional guidance	Mark
10(b)	An answer linking: (ureters) transports urine from the kidney to the bladder (1) (bladder) stores urine (1)	accept waste material or urea for urine	(2)

Question number	Indicative content	Mark
10 *(c)	AO1 6 marks Nephron - water passes through the nephron - it is not reabsorbed - osmoregulation is controlled by the hypothalamus - message is sent to the pituitary gland - to release less ADH - less ADH travels in the bloodstream to the kidney - It acts on the collecting duct / loop of henle - Making it less permeable - By closing aquaporin channels / protein channels - To allow less water to be reabsorbed into the bloodstream - increasing the amount of urine production - urine is more dilute	(6)

Level	Mark	Descriptor
	0	no rewardable material.
Level 1	1-2	- demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. - presents an explanation with some structure and coherence.
Level 2	3-4	- demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and /or developed. - presents an explanation that has a structure which is mostly clear, coherent and logical.
Level 3	5-6	- demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. - presents an explanation that has a well-developed structure which is clear, coherent and logical.

Additional Guidance

Level 1	1-2	• A brief explanation of how water levels are controlled in the blood • Linked to hormonal control (hormones do not need to be named)
Level 2	3-4	• A brief explanation of how the nephron acts to cause more water to be reabsorbed • Linked to the hormone ADH
Level 3	5-6	• A detailed explanation of how water levels are controlled including the role of the collecting duct becoming less permeable OR not reabsorbing water • Linked to the hormone ADH AND the role of the hypothalamus OR pituitary gland

Total for Question 10 = 12 marks