Biology Sample Paper – 2022/2023

Please write clearly in block capitals

Forename:
Surname:

Materials

For this paper you must have:
- a ruler
- a scientific calculator

TOTAL

Instructions

- Write your name and other details in the spaces provided above.
- You must answer all sections of this exam.
- Additional sheets may be used.
- In all calculations, show clearly how you work out your answer.

Advice

- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

1

1(a) Explain how the structure of the gas exchange system in humans allows oxygen from the air to enter the blood.

You should include the names of the relevant structures in your answer.

[6 marks]

1(b) State **two** ways in which the gas exchange system in humans is adapted for its function.

[2 marks]

1.

2.

Question continued on next page

8

1(c) In an adult lung, 8 x10^6 alveoli cover an area of 1.0 m^2.

The alveoli in an adult human lung have a total surface area of 60 m^2.

At birth, there are only around 10% of the number of alveoli of an adult.

Calculate the number of alveoli that are present in a new born baby.

[2 marks]

Answer _____ million

Turn over for next question

2

2 The image below shows a giraffe in its natural habitat.

Explain how giraffes evolved to have long necks.

Use Darwin's theory of natural selection to support your answer.

[5 marks]

Turn over for next question

5

3 Photosynthesis is a process that occurs in plants.

Starch is a compound found in plants.

3(a) What is starch?

[1 mark]

3(b) Explain what a starch test in a leaf could be used for.

[1 mark]

3(c) Describe the process used to test a leaf for starch.

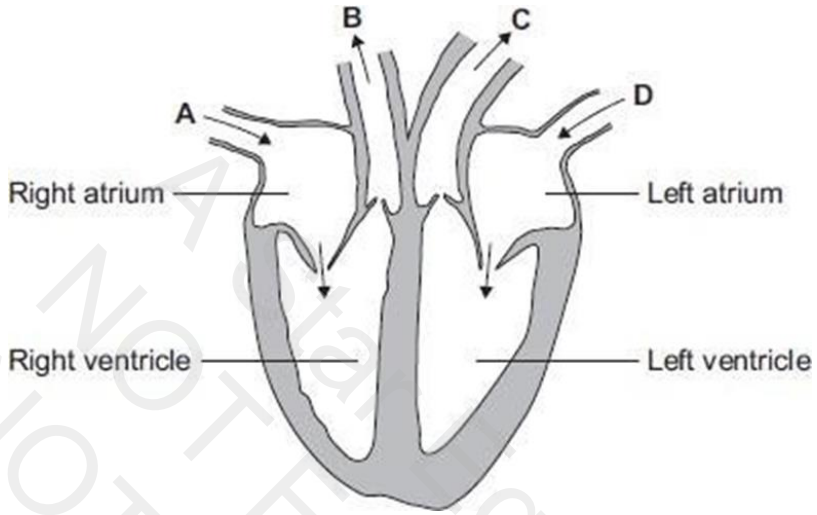
State any results you would expect to see.

[5 marks]

Turn over for next question

7

4 The diagram below shows a cross-section through the human heart.



4(a) Which arrow A, B, C or D, shows blood leaving the heart through the aorta?

Tick **one** box.

[1 mark]

- ☐ A
- ☐ B
- ☐ C
- ☐ D

4(b) Name the type of blood vessel that has valves and explain why valves are important.

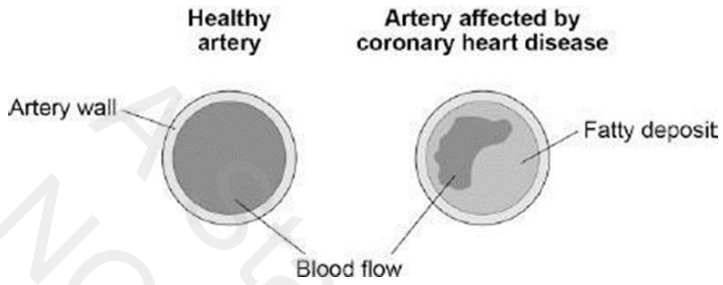
[2 marks]

Question continued on next page

3

The coronary artery supplies blood to the heart.

The image below shows two coronary arteries.



4(c) Explain how the healthy artery is different from the artery affected by coronary heart disease.

[2 marks]

4(d) Suggest **two** risk factors that make coronary heart disease more likely.

[2 marks]

1.

2.

Blood in the human body is composed of several main components.

Red blood cells are one main components of blood.

4(e) Name **two** other main components of blood

[2 marks]

1.

2.

Question continued on next page

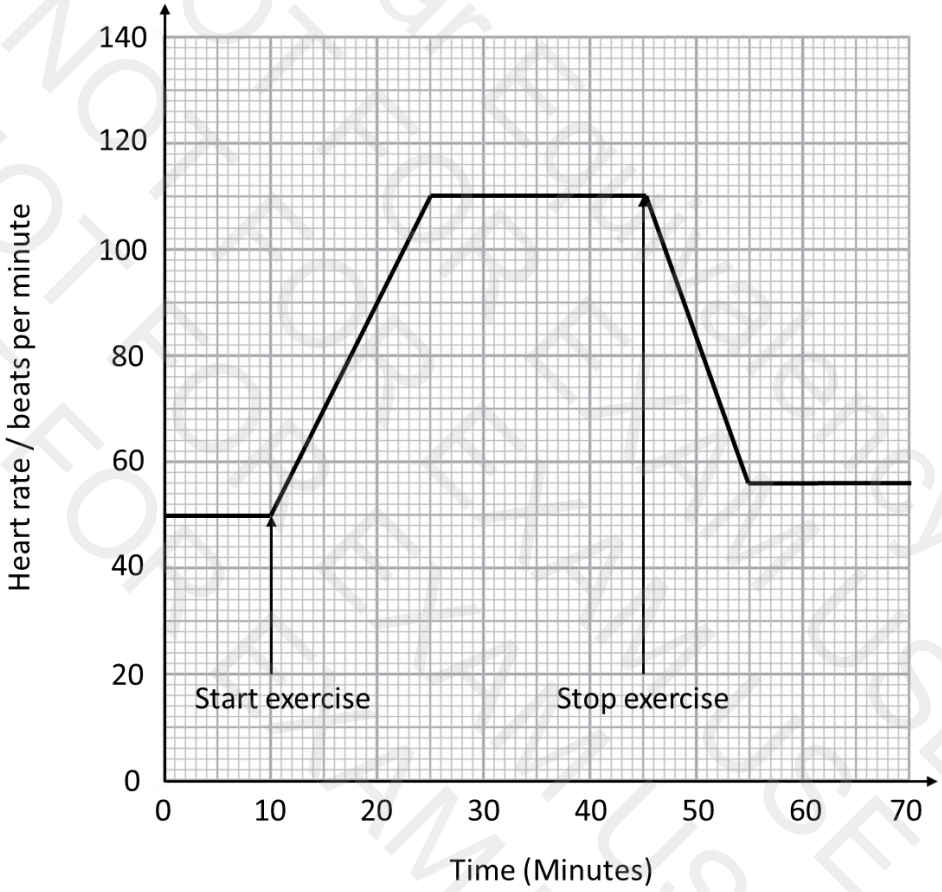
6

4(f) Explain how red blood cells are adapted for their function.

[2 marks]

An athlete investigates how their heart rate changes before, during and after exercise.

The graph shows their results.



4(g) How many minutes did the athlete exercise for?

[1 mark]

Answer _____ minutes

Question continued on next page

3

4(h) Describe the results seen in the graph.

[4 marks]

4(i) Explain the effect of exercise on heart rate.

[4 marks]

During the run, the athlete's body temperature increases.

4(j) Explain how the secretion of sweat from the sweat glands helps the athlete cool down.

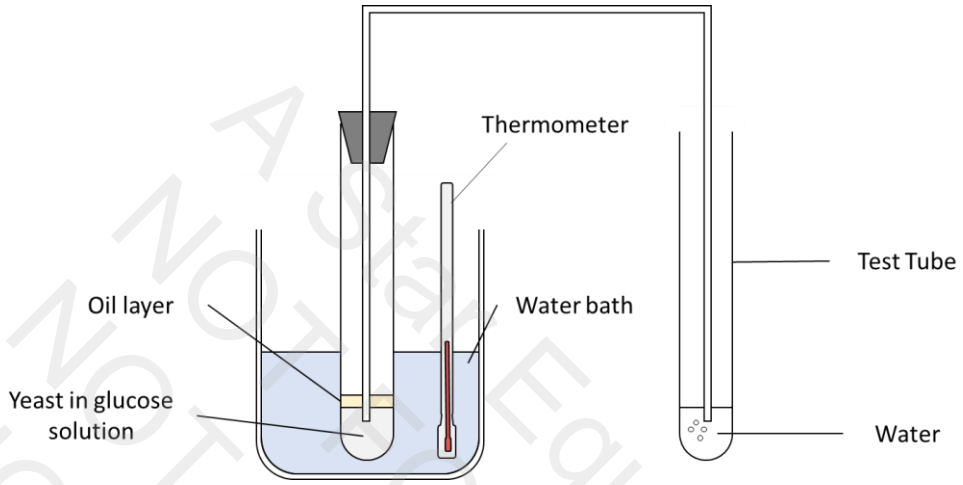
[3 marks]

Turn over for next question

11

5 A teacher investigates the effect of temperature on the rate of anaerobic respiration in yeast.

He sets up the following apparatus.



The teacher increases the temperature of the water bath at fixed intervals from 20°C to 60°C .

He measures the rate of respiration by counting the number of bubbles of carbon dioxide produced in one minute.

The table below shows his results.

Temperature (°C)	Number of bubbles in one minute			
	1st trial	2nd trial	3rd trial	Trial mean
20	12	13	13	13
30	28	27	23	26
40	32	31	34	32
50	21	17	19	
60	3	4	2	3

5(a) State the dependent variable in this investigation.

[1 mark]

Question continued on next page

1

5(b) State **two** control variables in this experiment.

[2 marks]

1. _____

2. _____

5(c) Calculate the mean number of bubbles produced in one minute at 50°C.

[2 marks]

_____

_____

Answer _____

5(d) Describe the change in the rate of respiration in yeast as the temperature increases from 20°C to 40°C .

[1 mark]

_____

_____

5(e) Explain the change in the rate of respiration in yeast as the temperature increases from 40°C to 60°C.

[3 marks]

_____

_____

5(f) Using the results only, state the optimum temperature of yeast respiration

[1 mark]

_____

Question continued on next page

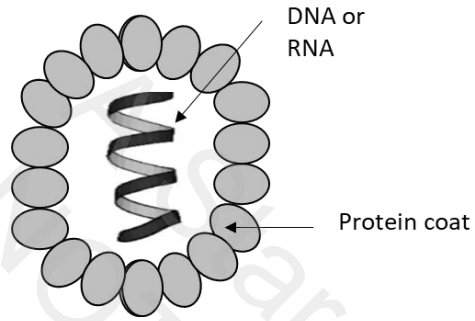
9

5(g) Identify which of the following diagrams shows the structure of a yeast cell?

Tick **one** box.

[2 marks]

☐



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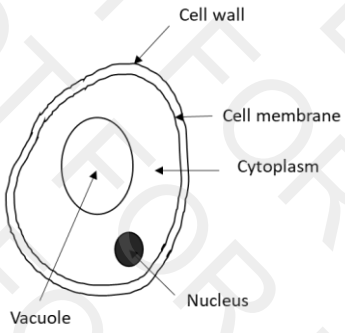

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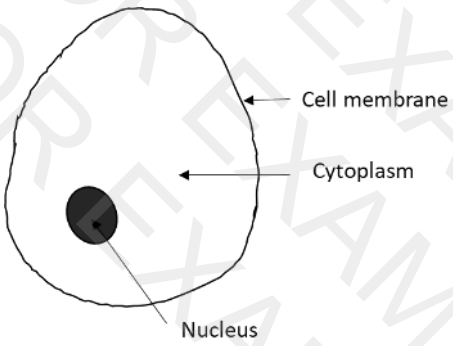

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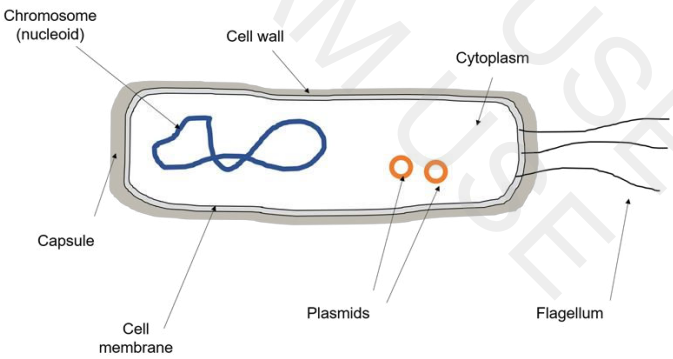
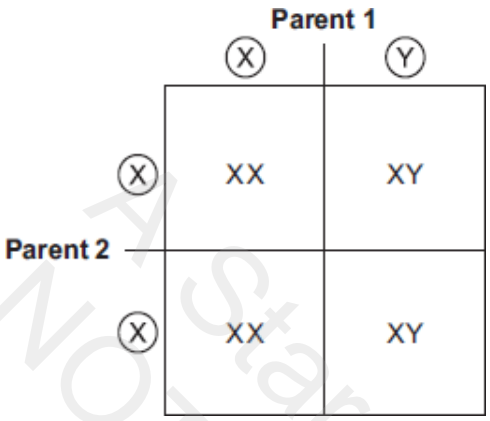


Turn over for next question

2

6 The diagram below shows the inheritance of X and Y chromosomes in humans.



6(a) Identify the male parent.

Tick **one** box.

[1 mark]

☐ Parent 1

☐ Parent 2

6(b) Calculate the probability of having a female child.

Give the reason for your answer

[2 marks]

Chromosomes are made up of DNA tightly coiled around proteins called histones.

6(c) Describe the structure of DNA.

[3 marks]

Question continued on next page

6

DNA and RNA are types of nucleic acid.

6(d) Explain how the structures of DNA and RNA are different.

[2 marks]

Turn over for next question

2

7 Feeding relationships within an ecosystem can be shown using food chains.

The food chain below comes from a marine ecosystem.

Plankton → Midge larvae → Salmon → Tuna

7(a) Name the producer in this food chain.

[1 mark]

Salmon are fished excessively to meet the need as a food supply, to the extent that their numbers are depleted. This is known as overfishing.

7(b) Suggest how overfishing salmon would impact the tuna population.

[1 mark]

Fish farming can be used as a solution to overfishing.

7(c) State **three** advantages of fish farming.

[3 marks]

1.

2.

3.

Question continued on next page

5

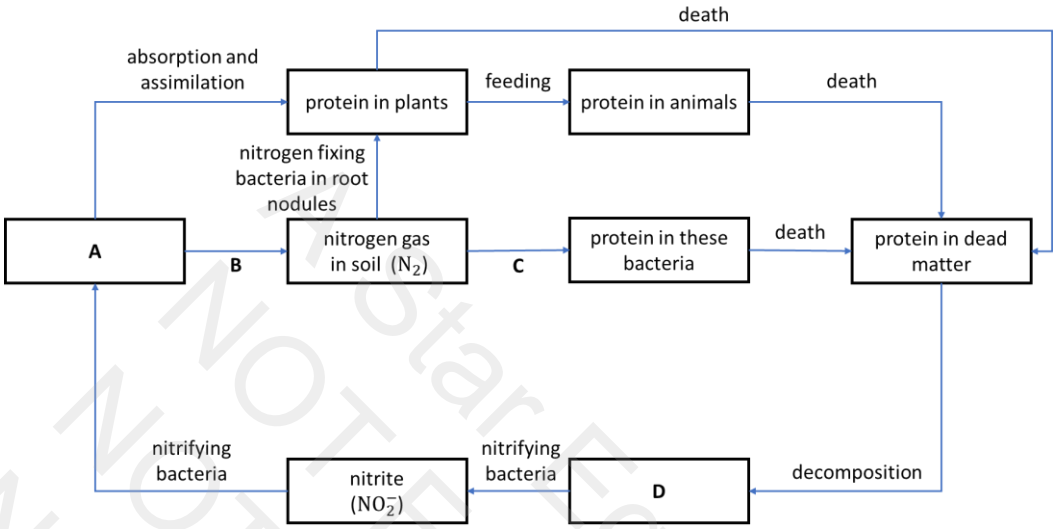
7(d) Explain why fish farming has been criticised by activists.

[3 marks]

Turn over for next question

3

8 The diagram below shows the main stages of the nitrogen cycle.



8(a) What do A, B, C and D represent?

[4 marks]

A: _____

B: _____

C: _____

D: _____

8(b) What are nitrogen-fixing bacteria?

[1 mark]

_____

_____

8(c) Give one way, not shown in the diagram, how animals return nitrogen to the soil.

[1 mark]

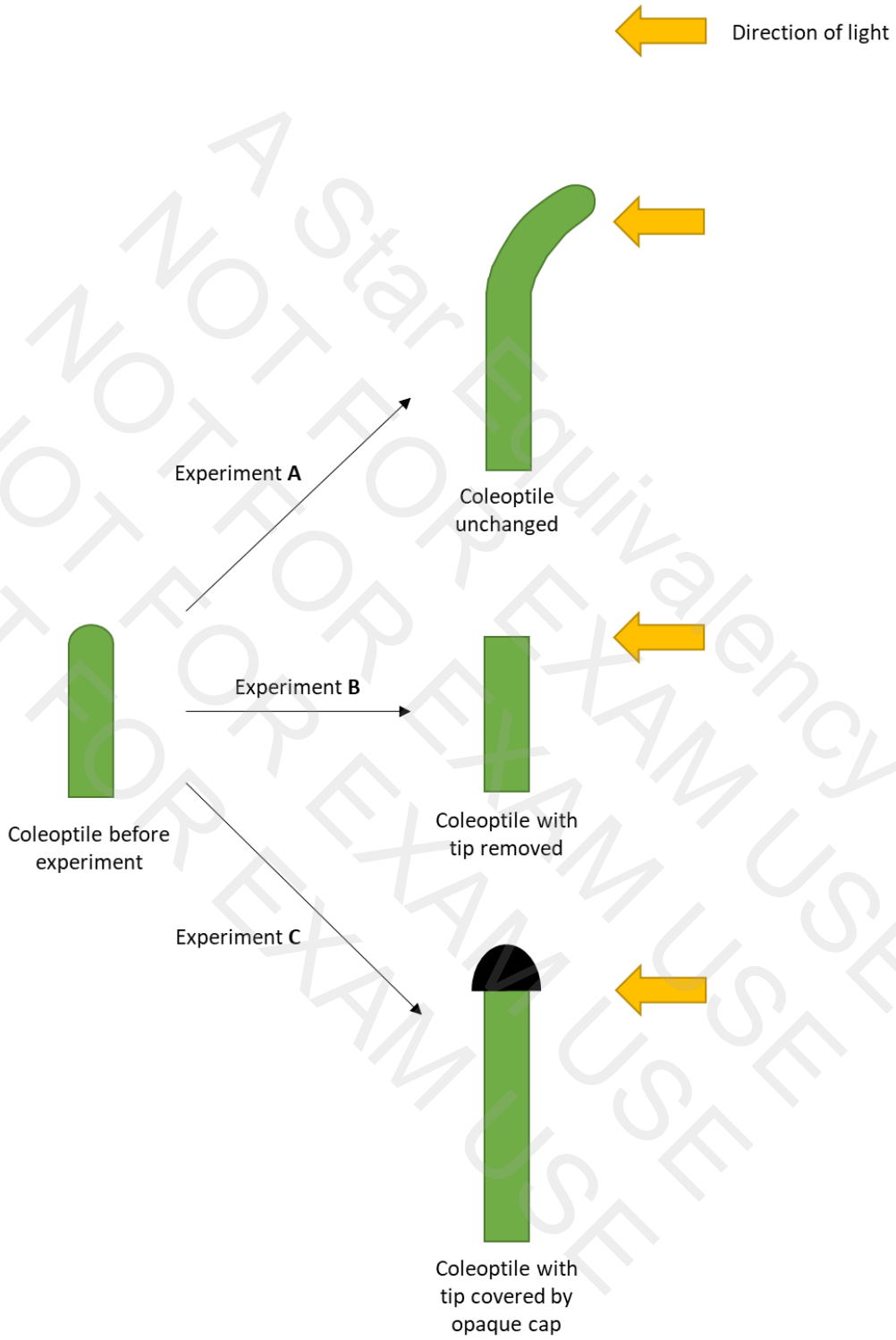
_____

_____

Turn over for next question

6

9 The diagram below shows three experiments A, B and C, used to investigate how the stimulus of unidirectional light effects the growth of coleoptiles.



Question continued on next page

9(a) Define the term 'coleoptile'?

[1 mark]

9(b) Describe the results seen in these experiments for each treatment.

[3 marks]

9(c) Explain what conclusions can be made from these experiments.

[2 marks]

9(d) State the name of the process seen in these experiments that causes plants to grow in response to directional light.

[1 mark]

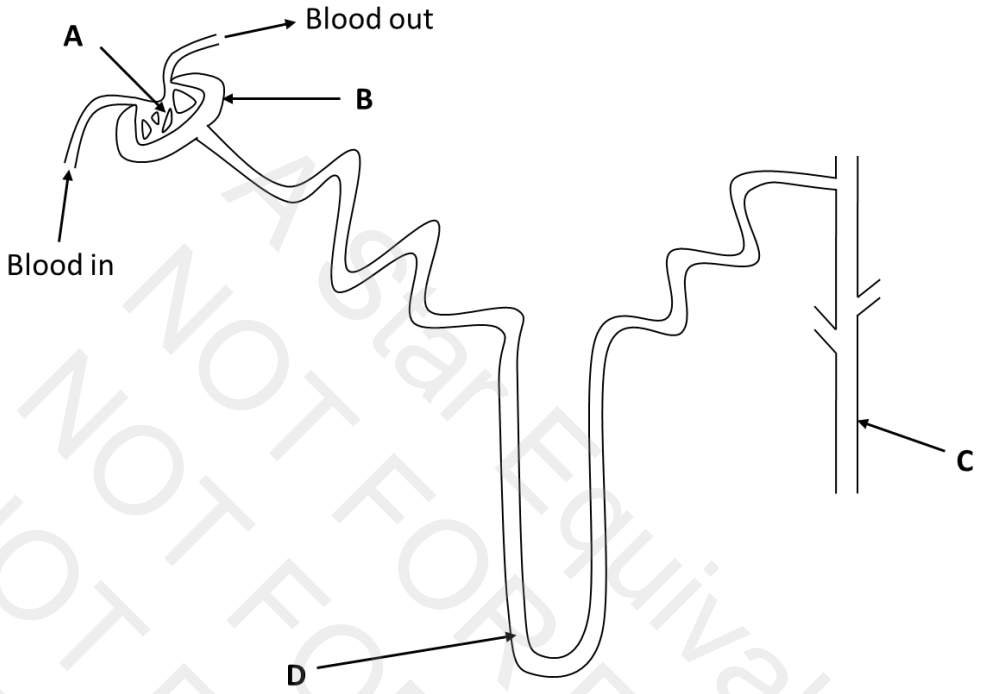
9(e) State the name of the hormone responsible for this process.

[1 mark]

Turn over for next question

8

10 The diagram below shows the structure of a nephron in the kidney.



10(a) State the names of structures A, B and C from the diagram.

[3 marks]

A: _____

B: _____

C: _____

The label D in the diagram is the loop of Henle.

10(b) Describe how the length of the loop of Henle effects the concentration of urine.

[1 mark]

_____

_____

Question continued on next page

4

10(c) The kidneys produce around 125 cm^3 of glomerular filtrate per minute.

The glomerular filtrate is either lost as urine or reabsorbed back into the blood.

A person loses 0.9 dm^3 of urine in one day.

Calculate the percentage of glomerular filtrate that is reabsorbed back into their blood.

[2 marks]

Answer _____ %

ADH is a hormone that controls how much water is in the blood.

10(d) Name the gland that releases ADH.

[1 mark]

10(e) Explain how ADH controls the body's water content when a person has not drunk enough water.

[4 marks]

Question continued on next page

7

The action of ADH is an example of negative feedback.

10(f) Explain what is meant by 'negative feedback'.

[2 marks]

End of questions

2

END

END