

Surname	Centre Number	Candidate Number
Other Names		0



GCSE

4483/02



S15-4483-02

BIOLOGY

**BIOLOGY 3
HIGHER TIER**

P.M. TUESDAY, 12 May 2015

1 hour

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	4	
2.	6	
3.	8	
4.	6	
5.	6	
6.	5	
7.	4	
8.	6	
9.	9	
10.	6	
Total	60	

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

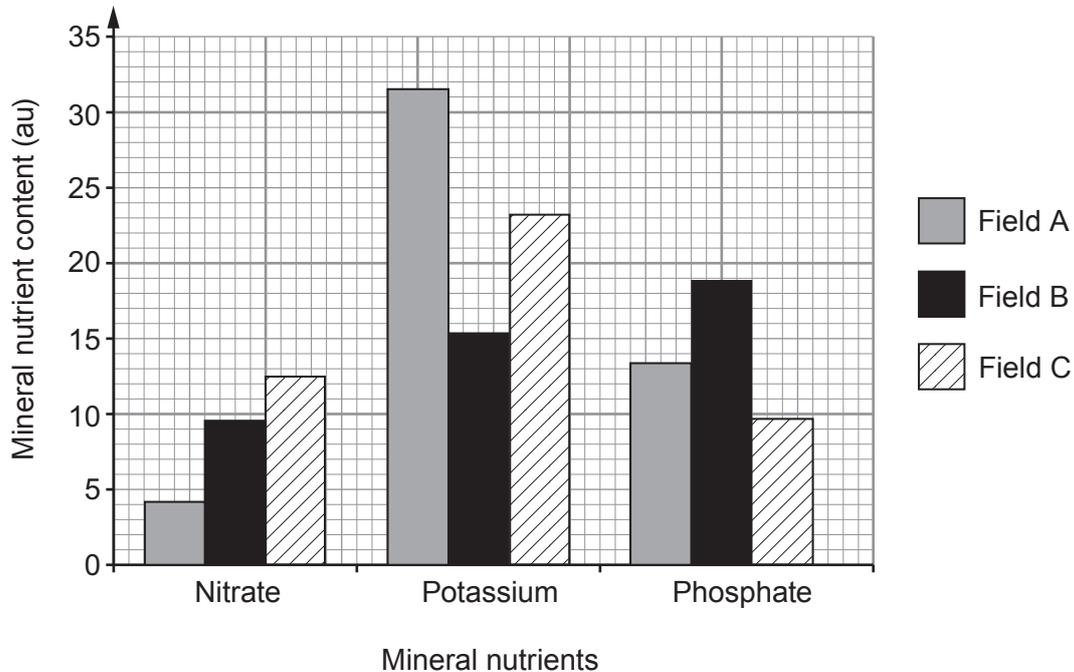
INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (QWC) used in your answer to questions **4** and **10**.

Answer **all** questions.

1. A farmer wanted to grow a wheat crop on three of his fields. Before doing so he took soil samples and analysed them for the content of the three mineral nutrients: nitrate, potassium and phosphate. The results he obtained are shown below.



In wheat crops the threshold soil values for nitrate, potassium and phosphate are shown below.

Mineral nutrient	Threshold value (au)
Nitrate	6.0
Potassium	17.0
Phosphate	12.0

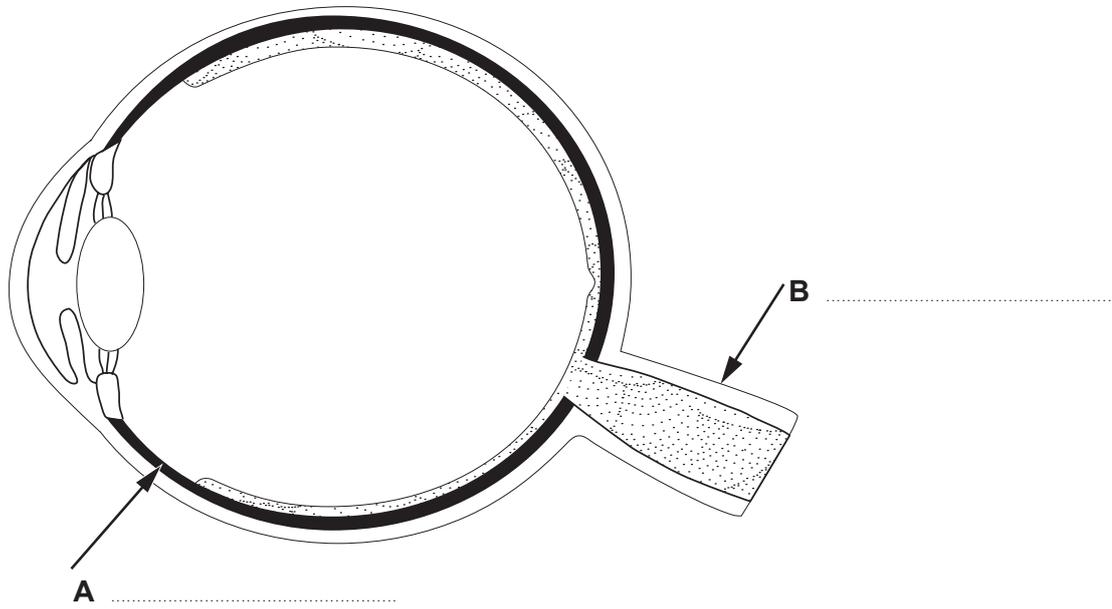
Above the threshold value the wheat plants will show healthy growth. Below the value the plants will show signs of mineral nutrient deficiencies.

- (a) Complete the table below to show the **symptoms** of mineral nutrient deficiencies that will be shown by the wheat plants in each of the three fields, A, B and C. [3]

Field	Symptoms of mineral nutrient deficiencies shown by the wheat plants
A
B
C

- (b) How could the farmer ensure that his wheat plants do not suffer from mineral nutrient deficiencies? [1]
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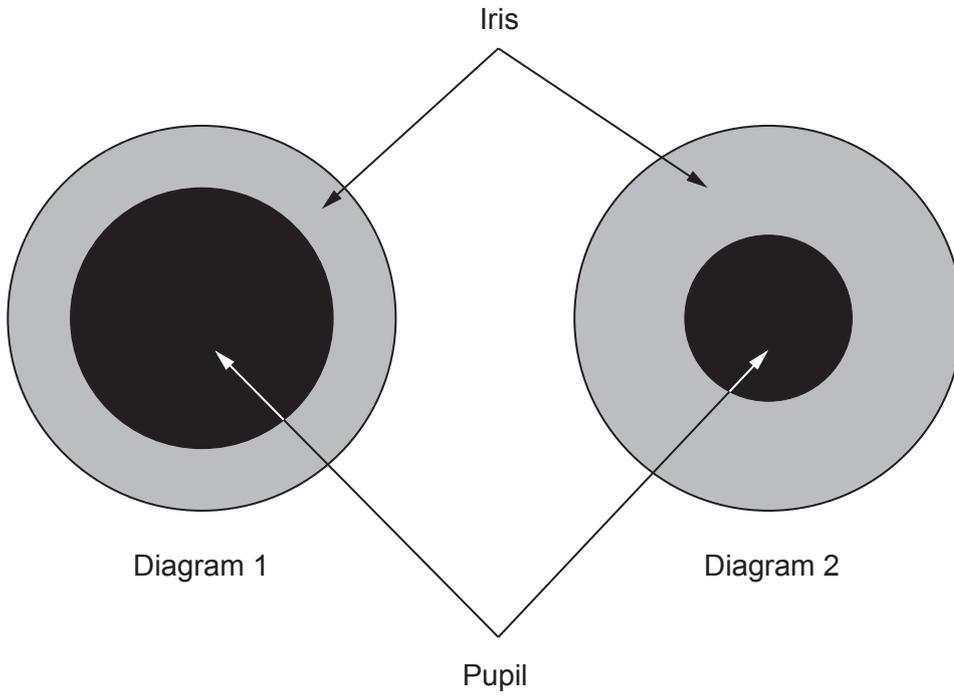
2. The diagram below shows a section through the eye.



(a) Label parts **A** and **B** on the diagram.

[2]

(b) The diagrams below show a front view of the iris in different light intensities.



Explain how the appearance of the iris and pupil change in different light intensities. [4]

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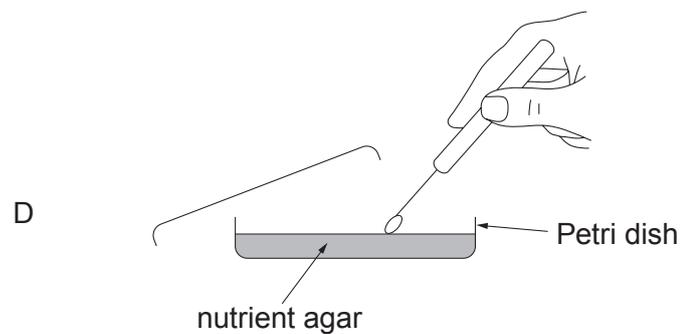
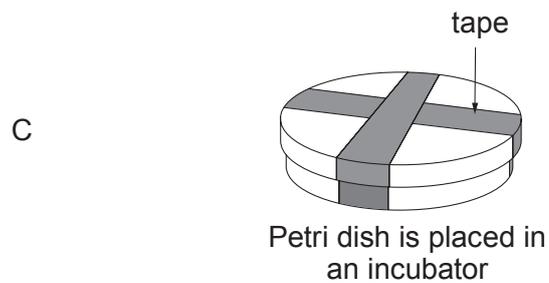
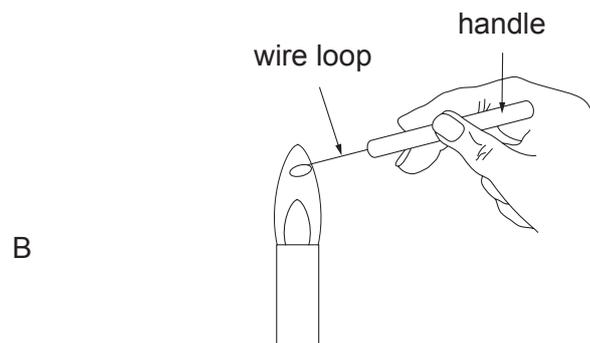
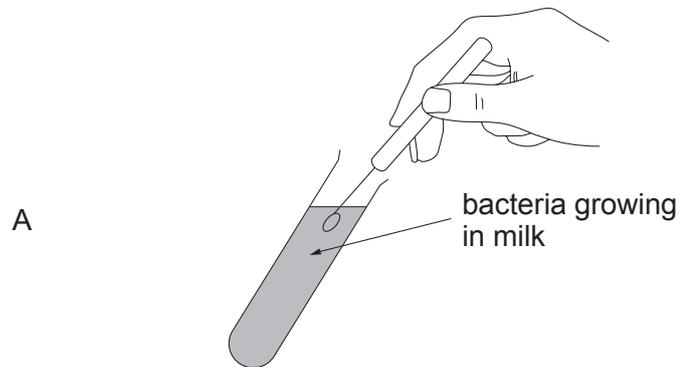
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3. (a) The series of diagrams below, labelled A – D, show stages in the aseptic techniques involved in inoculating and plating bacteria from milk samples. The stages shown are not in the correct order.

Stage

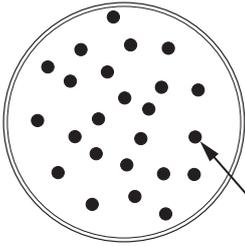
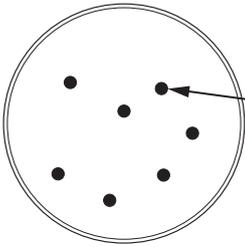
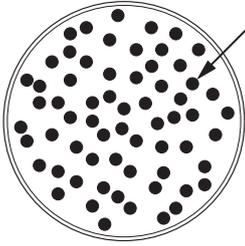


- (i) Place the stages in order by underlining the correct sequence of events. [1]

A	C	D	B
B	A	D	C
B	C	D	A
D	A	B	C

- (ii) Give a reason why the Petri dish is sealed in stage **C**. [1]

- (b) Students kept fresh pasteurised milk at three **different** temperatures for five days. At the end of this time they spread milk samples onto sterile agar plates, which were then incubated at 25 °C. After three days incubation the agar plates were examined. The results obtained are shown below.

PLATE 1 Temperature °C		Colonies of bacteria
PLATE 2 Temperature °C		
PLATE 3 Temperature °C		

- (i) Using temperatures from the list below. Complete the table above by inserting the most likely temperature at which the milk was kept for the five days **before** the milk samples were spread onto the agar. [3]

10 °C -10 °C 35 °C 4 °C 150 °C

- (ii) Each of the colonies of bacteria on the agar plates on page 7 is made up of many thousands of bacteria. How many bacteria were in the original milk sample spread onto plate **2**? [1]

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- (iii) Explain the possible consequences to this investigation if Stage **B** shown in part (a) of this question had not been carried out. [2]

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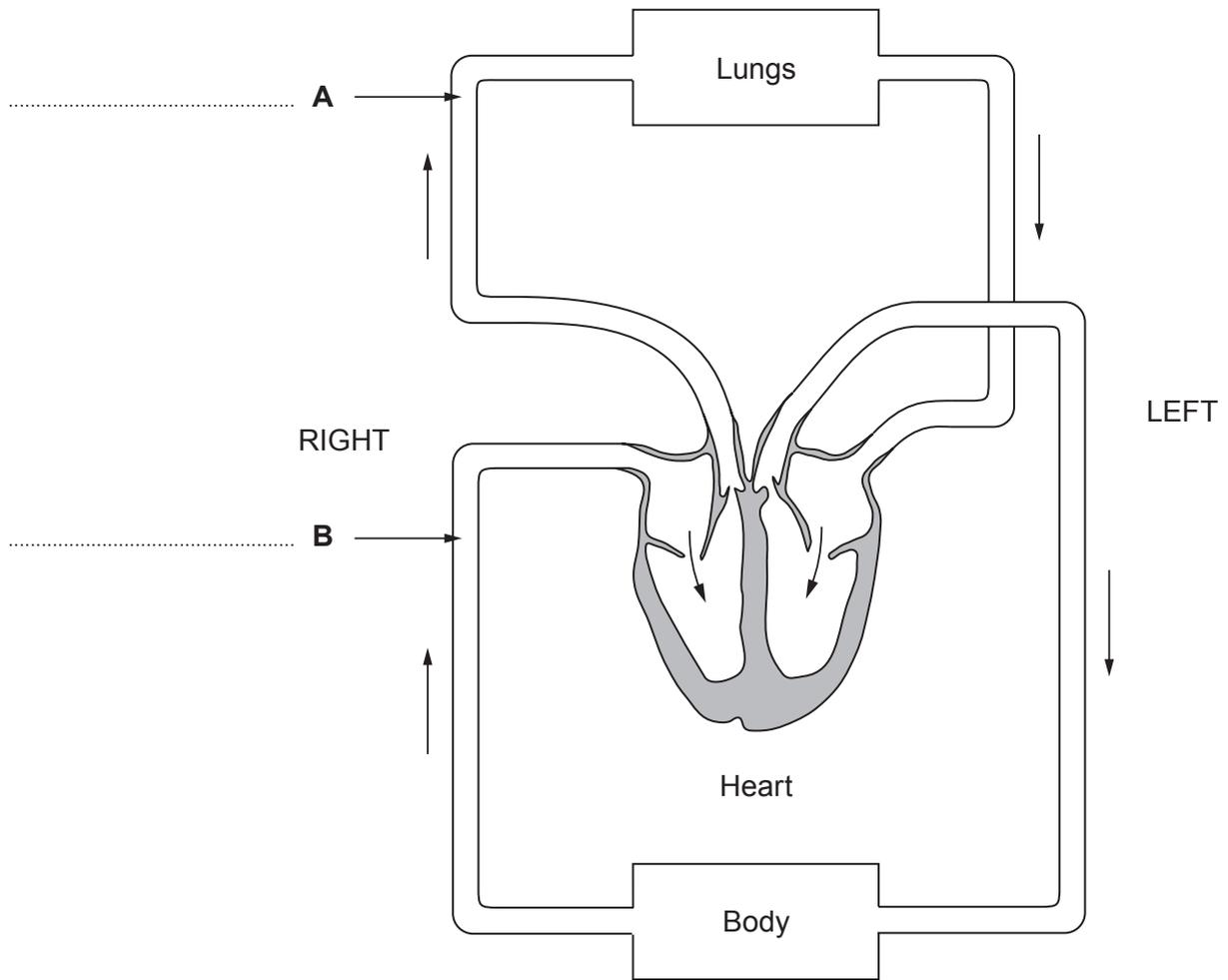
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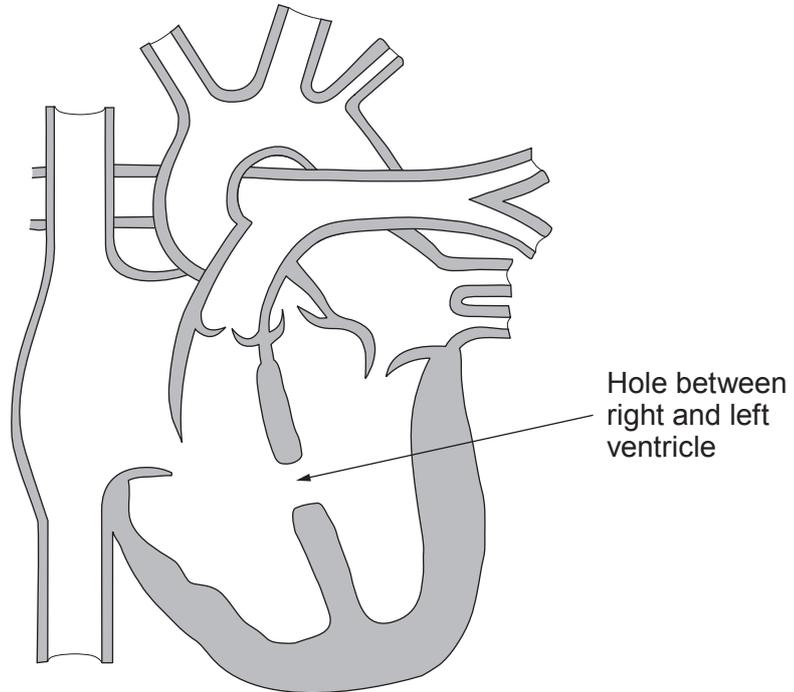
5. The diagram below shows the double circulation of blood found in humans.



(a) Label blood vessels **A** and **B** on the diagram above.

[2]

- (b) Occasionally a baby is born with a hole in the wall that separates the left and right sides of the heart. In the diagram below this hole is shown in the wall separating the right and left ventricles.



Using the diagram of the double circulation of blood shown opposite and your knowledge of blood circulation, explain the consequences to a person suffering from a hole between the right and left ventricles of the heart. [4]

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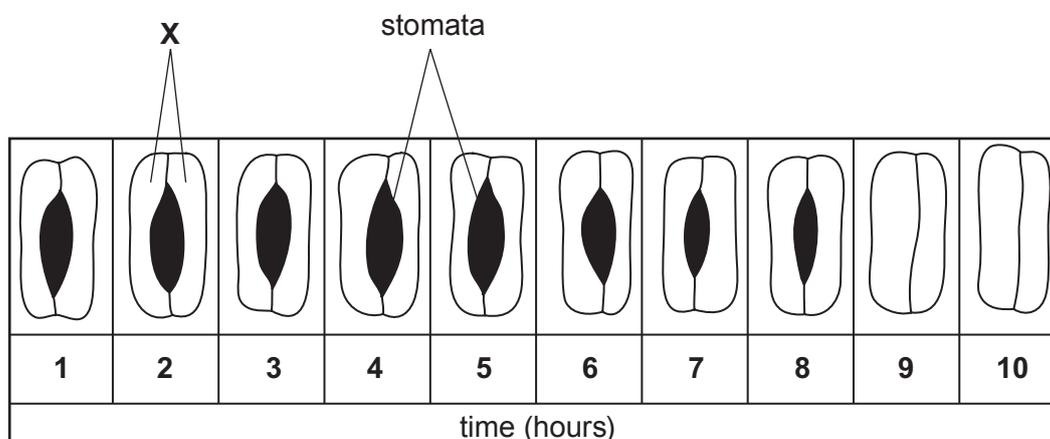
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6. A potted plant was left in a hot, brightly lit room for ten hours. The plant was not watered during this period. The drawings below show how the mean width of the stomata (pores) changed over the ten hour period.



- (a) Give **two** functions of stomata.

[1]

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- (b) Name the cells labelled **X** on the drawing above.

[1]

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- (c) The width of the stomata changed over the ten hour period. State the advantage to the plant of this change.

[1]

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- (d) Suggest how the time taken for the change in width to occur would be affected by:

(i) an increase in airflow over the plant;

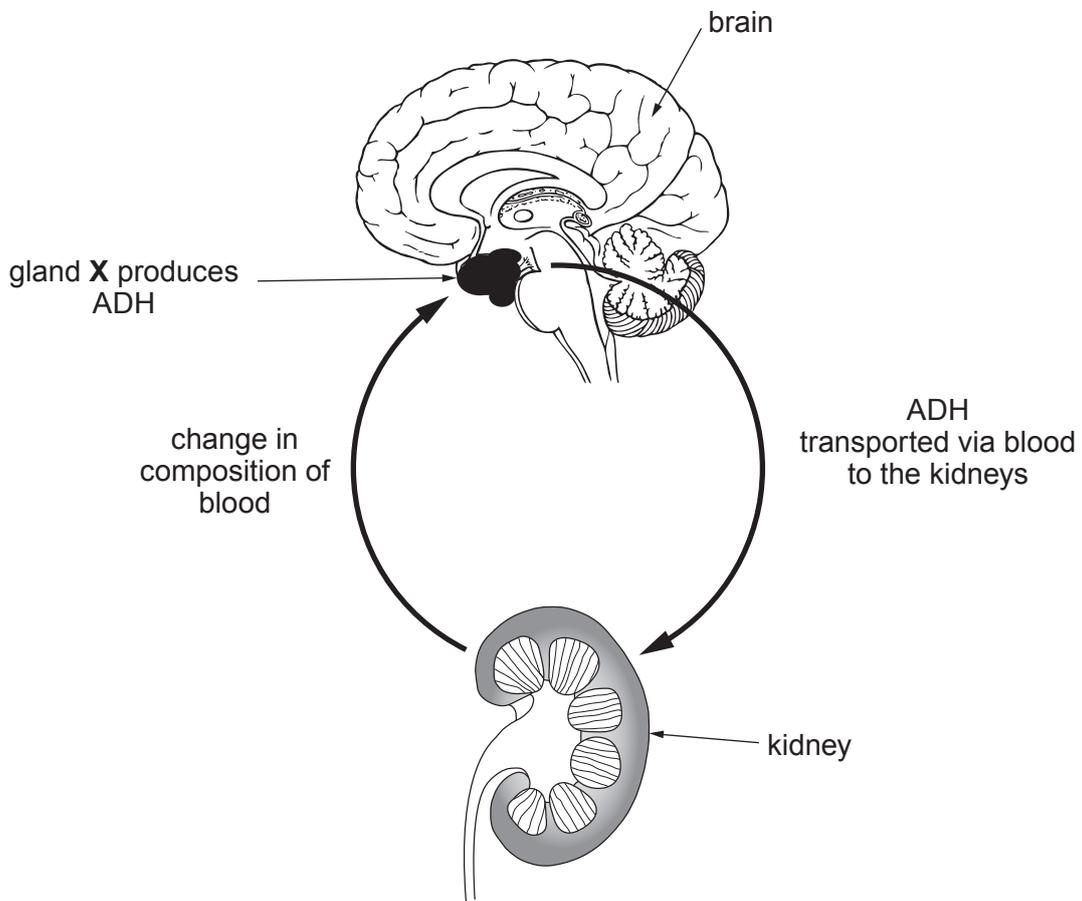
[1]

(ii) an increase in water vapour around the plant.

[1]

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7. The diagram below shows some of the processes which control the composition of blood and urine.



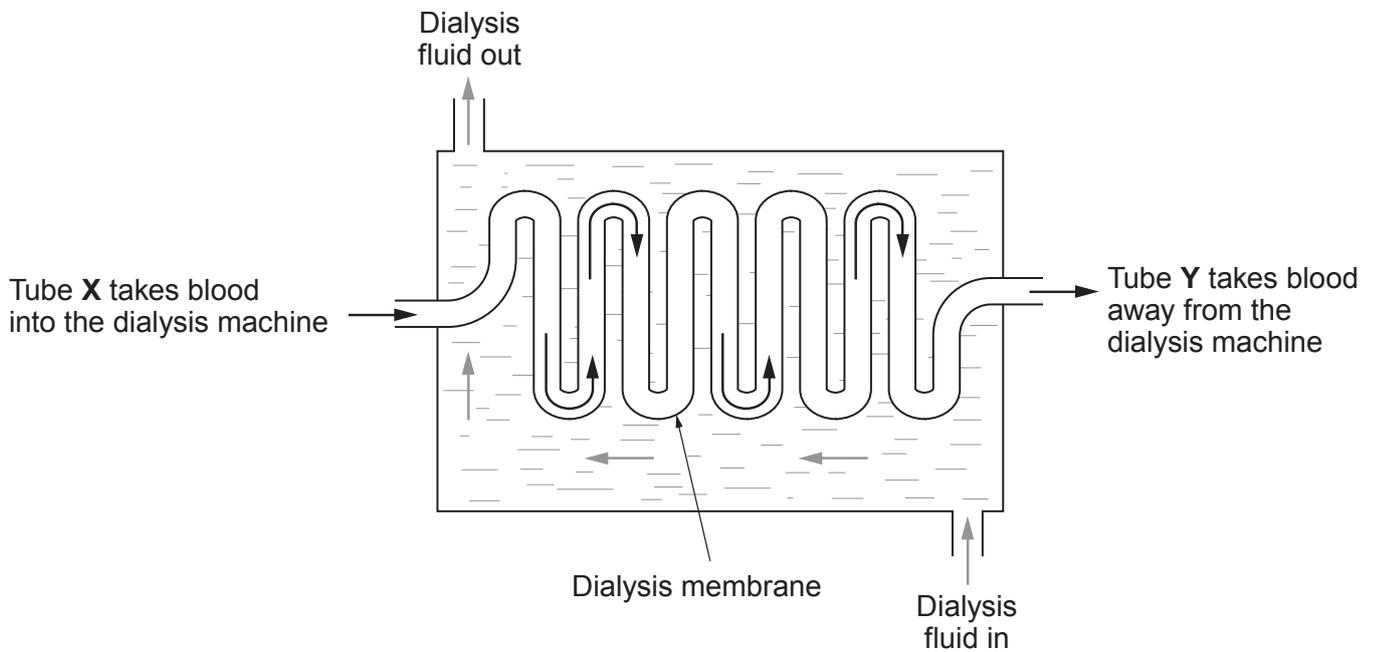
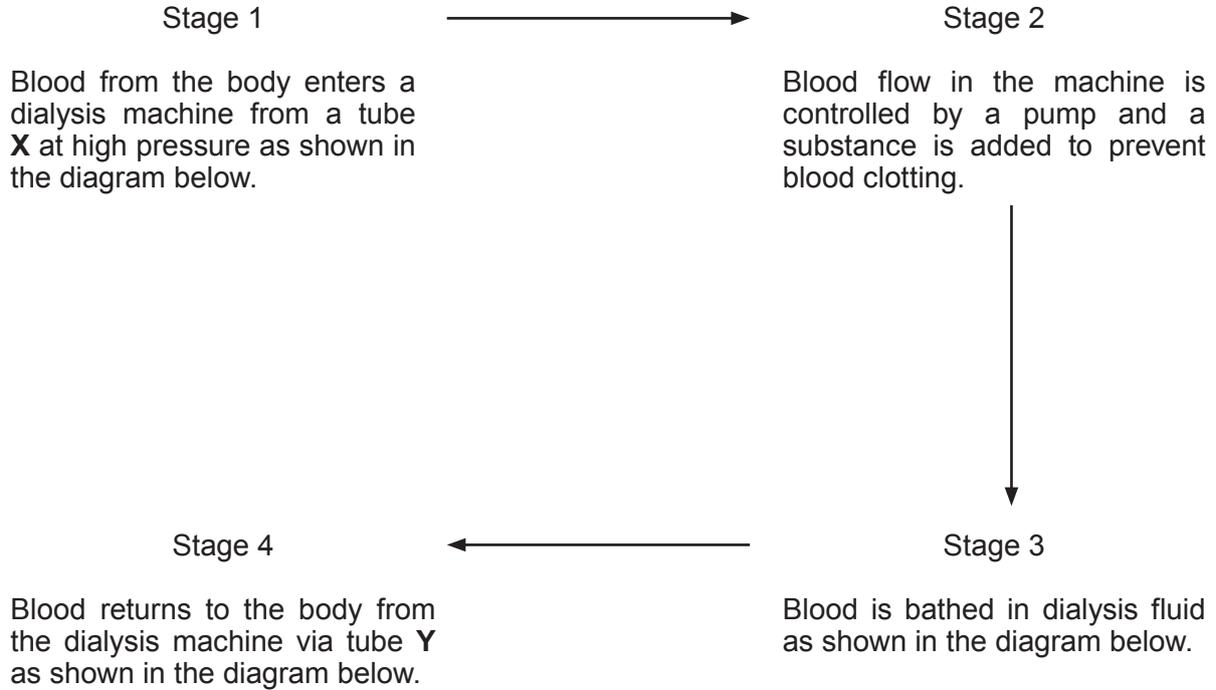
- (a) Identify the stimulus which causes gland X to release ADH. [1]

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- (b) Describe the effect of an increase in ADH production on the kidney and on the composition of urine. [3]

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8. When the kidneys fail to function, treatment may be necessary using a kidney dialysis machine. The flow diagram below outlines a procedure of kidney dialysis.



(a) (i) What blood vessels in the body are equivalent to tubes **X** and **Y** shown in the diagram on page 14? [2]

X

Y

(ii) Suggest why it is necessary to prevent blood clotting in stage **2**. [1]

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(iii) State the process by which molecules, other than water, will filter from the blood into the dialysis fluid. [1]

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(iv) Suggest why the blood and the dialysis fluid are flowing in opposite directions in stage **3**. [1]

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(b) What other treatment might a person have if their kidneys fail to function? [1]

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9. The World Health Organisation (WHO) collects data on the disease, tuberculosis (TB) which is caused by a bacterium. The WHO used the data shown in the table below to estimate:

- the total number of people with the disease in each region;
- the number of deaths from TB in each region.

Region	Number of people with TB per 100 000	Number of deaths from TB per 100 000
Africa	345	78
USA	43	6
Eastern Mediterranean	122	28
Europe	50	8
South East Asia	190	38
Western Pacific	112	19

(a) (i) Give **one** reason why it is necessary to express the number of people as per 100 000. [1]

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(ii) Calculate the percentage of those with TB in Europe who survive the disease. Show your working. [2]

percentage who survive %

(iii) How does the data show that Africa is less successful at treating TB than Europe? [1]

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(b) A vaccine against TB has existed since 1921. Explain how a vaccine can protect the body from a disease caused by a bacterium. [4]

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(c) The number of cases of TB decreased considerably in many countries during the 20th century. Over the past 15 years, the number of cases worldwide has greatly increased. Suggest why this has happened. [1]

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TURN OVER FOR THE LAST QUESTION

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