Surname	Centre Number	Candidate Number
Other Names		0

GCSE – LEGACY

4471/01

W17-4471-01

ADDITIONAL SCIENCE/BIOLOGY

BIOLOGY 2
FOUNDATION TIER

THURSDAY, 5 JANUARY 2017 – MORNING

1 hour

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

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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 question **9**.

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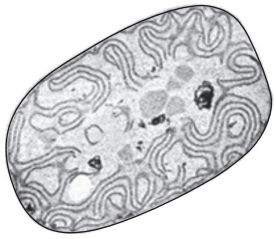
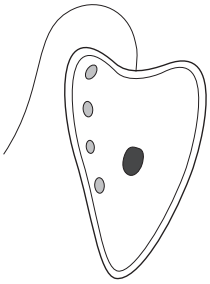
Answer **all** *questions.*

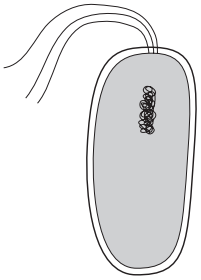
1. A photograph of the microorganism *Anabaena variabilis* and diagrams of two other microorganisms are shown below. The length of each cell is also given.



Anabaena variabilis
cell length 16μm



alga
cell length 12μm



bacterium
cell length 1μm

(a) Scientists once thought that *Anabaena* was an alga. Now they think it is a bacterium, as the cell does not have a nucleus.

(i) Complete the table below, which compares the cells of the three microorganisms. Place ✓ for presence of a feature or **x** for absence. [2]

feature of cell	*Anabaena*	alga	bacterium
nucleus	**x**	✓	
chlorophyll	✓		
cell wall	✓	✓	✓
cytoplasm	✓		
cell length over 10 μm	✓		**x**

(ii) Use the table to suggest why scientists once thought that *Anabaena* was an alga, not a bacterium. [1]

.....

.....

Examiner only

(b) Cells of *Anabaena* contain chlorophyll and carry out photosynthesis.

(i) Complete the word equation below for photosynthesis. [1]

..... + water ⟶ glucose + ...

(ii) State the function of chlorophyll in photosynthesis. [1]

.....

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Turn over.

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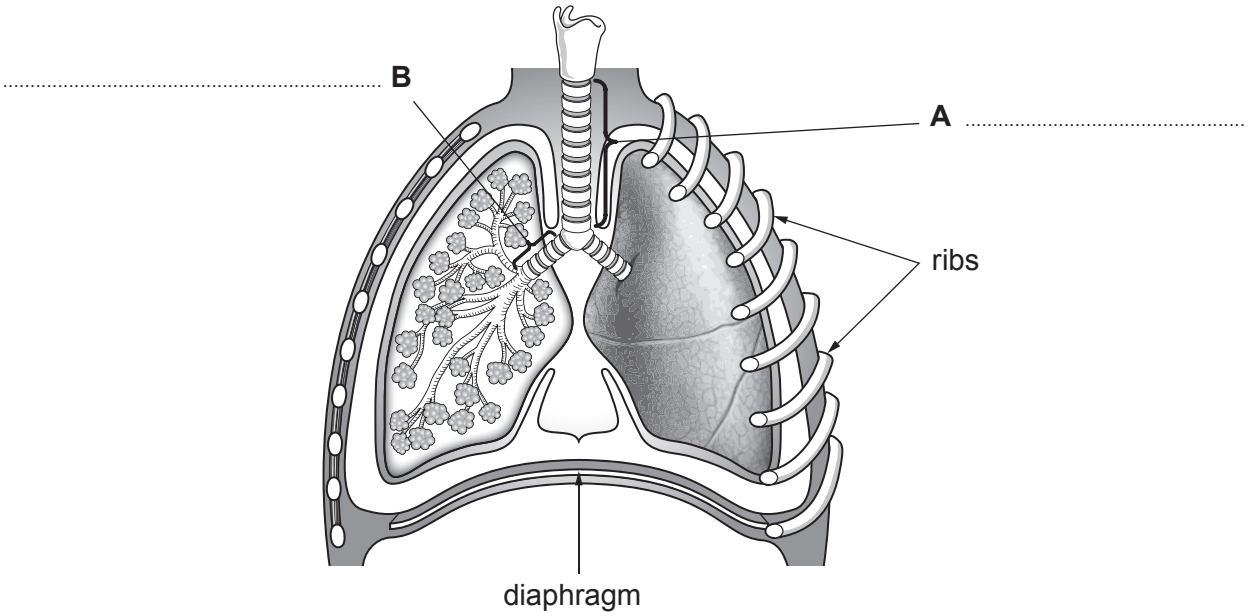
2. *(a)* The diagram shows a section through the human chest.
Label structures **A** and **B**. [2]



(b) Rhodri visits the gym to do regular weight training.

His coach investigated how his chest measurement changed when he lifted and lowered his weights.

weights lowered
(breathing in)

weights lifted
(breathing out)

Examiner only

Results of investigation

trial	chest measurement (cm)		
	weights lowered (breathing in)	weights lifted (breathing out)	decrease
1	105	90	.....
2	107	92	15
3	104	91	.....

(i) **Complete the table** to show the decrease in chest measurement for trials 1 and 3. [1]

(ii) Calculate the mean decrease in Rhodri`s chest measurement when he lifts the weights. Give your answer to one decimal place. [2]

Mean decrease = ... cm

(iii) **Complete the table** below to show what happens to Rhodri's chest when he **breathes out** and lifts the weights. Choose words from the list below. [3]

down and in **increased** **decreased** **up and out** **no change**

diaphragm movement	rib cage movement	volume	pressure
upwards			

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Turn over.

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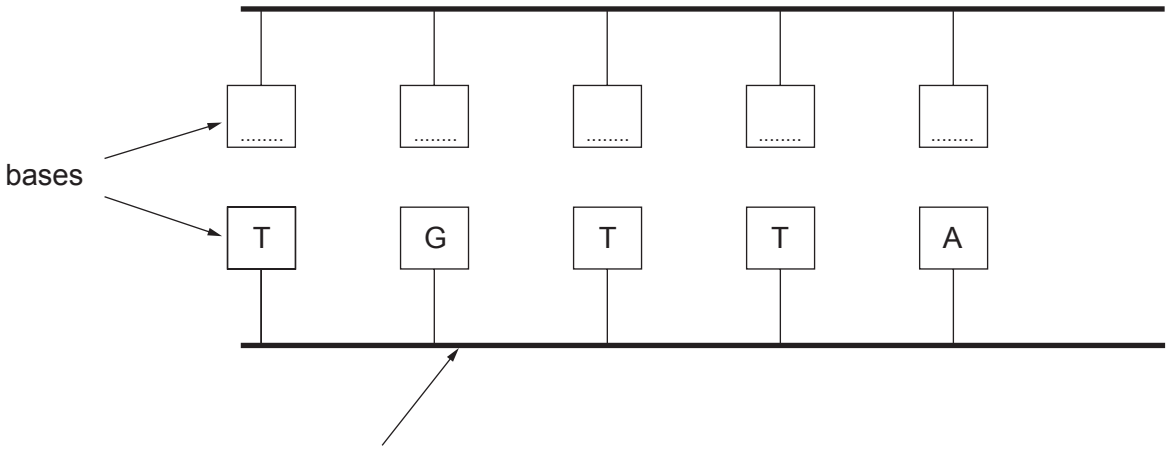
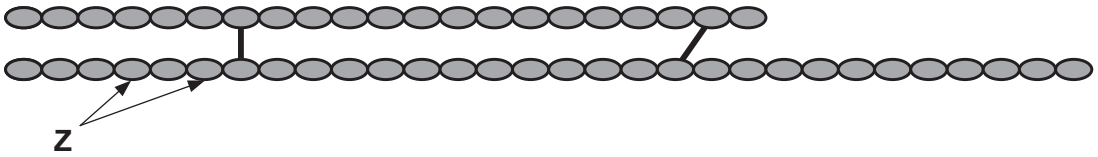
3. *(a)* The diagram below shows a small section of DNA.



(i) Five bases are shown on one strand of the DNA. Fill in the **five** missing letters for the bases on the other strand. [2]

(ii) Complete the label on the diagram by writing the missing word on the dotted line. [1]

(b) Insulin is a protein. The structure of insulin is shown below.



(i) <u>Underline</u> the name of the small molecules labelled **Z** which make up the protein. [1]

amino acids **fatty acids** **mineral salts**

(ii) Why are the bases in DNA important in building proteins from these small molecules? [2]

.....

.....

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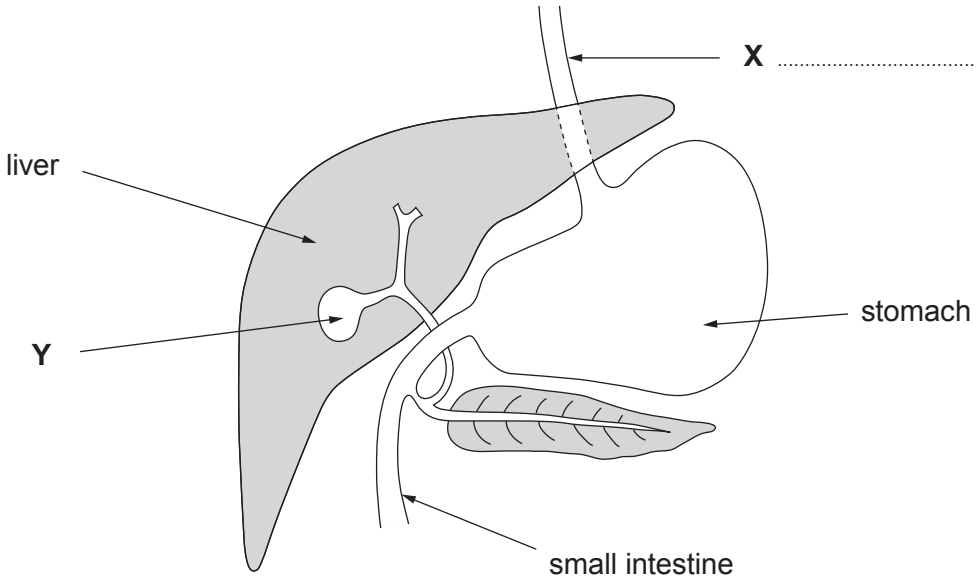
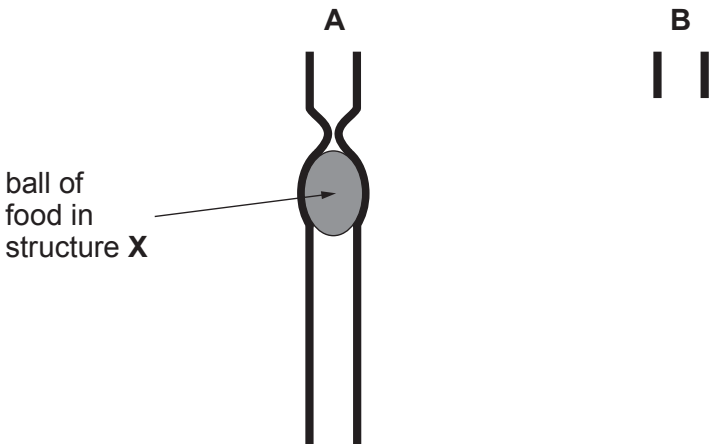
4. The diagram below shows part of the human digestive system.



(a) (i) **Label** the structure **X** on the **diagram**. [1]

(ii) The diagram below shows structure **X** in detail. In part **A** of the diagram, a ball of food has just entered structure **X**.

Complete part B of the diagram to show the ball of food after it has moved further towards the stomach. [2]



(iii) Name the process which causes the ball of food to move along structure **X** and state how muscles cause this movement to occur. [2]

I. Name of process .....

II. How muscles make the movement occur .....

.....

Examiner only

(b) (i) Name structure **Y**, shown on the diagram of the digestive system, which stores bile from the liver. [1]

.....

(ii) Describe how bile helps in the digestion of food by enzymes. [2]

.....

.....

8

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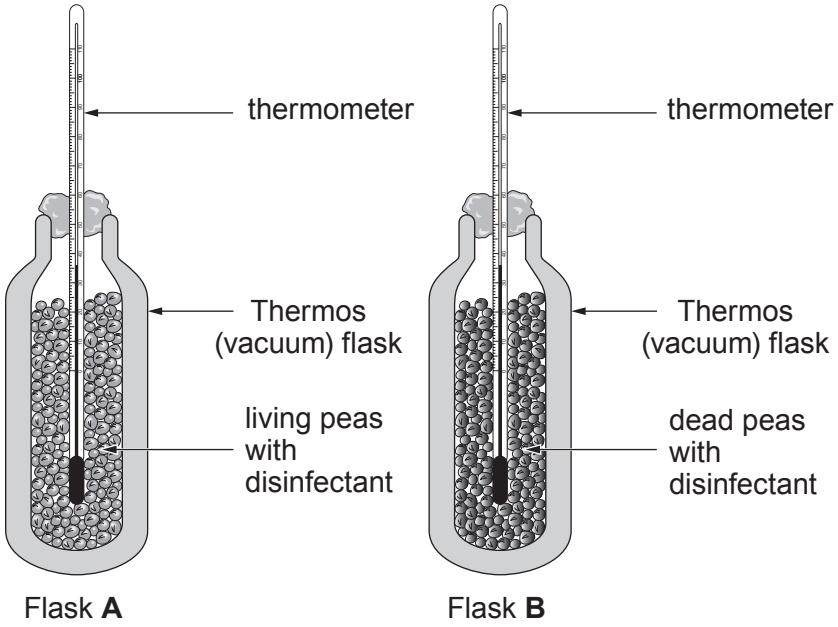
5. Seren and Robert used the apparatus shown below to investigate the release of energy in living peas.

They recorded how the temperature changed over ten days. They set up a second flask **(B)**, using dead peas, as a control.



(a) Why is it important for Seren and Robert to compare their results for flask **A** with the results for flask **B**, the control? [1]

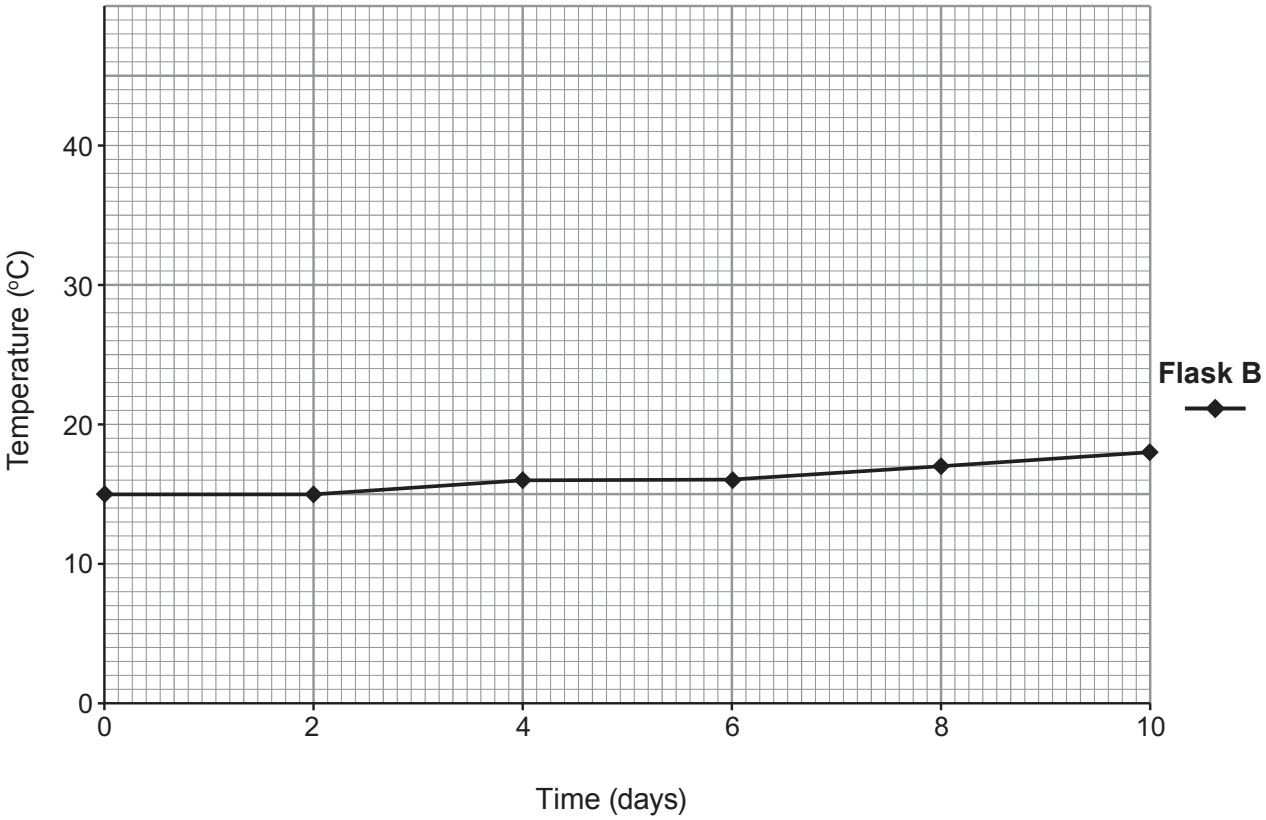
.....

Investigation results

	temperature in the flask (°C)	
time (days)	**A**	**B**
0	15	15
2	20	15
4	26	16
6	31	16
8	37	.....
10	39	.....

Examiner only

Graph of results



(b) (i) From the graph above, **add the missing values** for flask **B** to the table opposite. [1]

(ii) From the table plot the results for flask **A** onto the graph.

I. Plot the points. [2]

II. Join your plots using a ruler and label your line. [1]

(c) Use the graph to state **two** ways in which the temperature increase in flask **A** was different from that in flask **B**. [2]

1. .....

2. .....

(d) (i) What form of energy was released by the living peas? [1]

.....

(ii) Name the process taking place in the peas, which releases energy. [1]

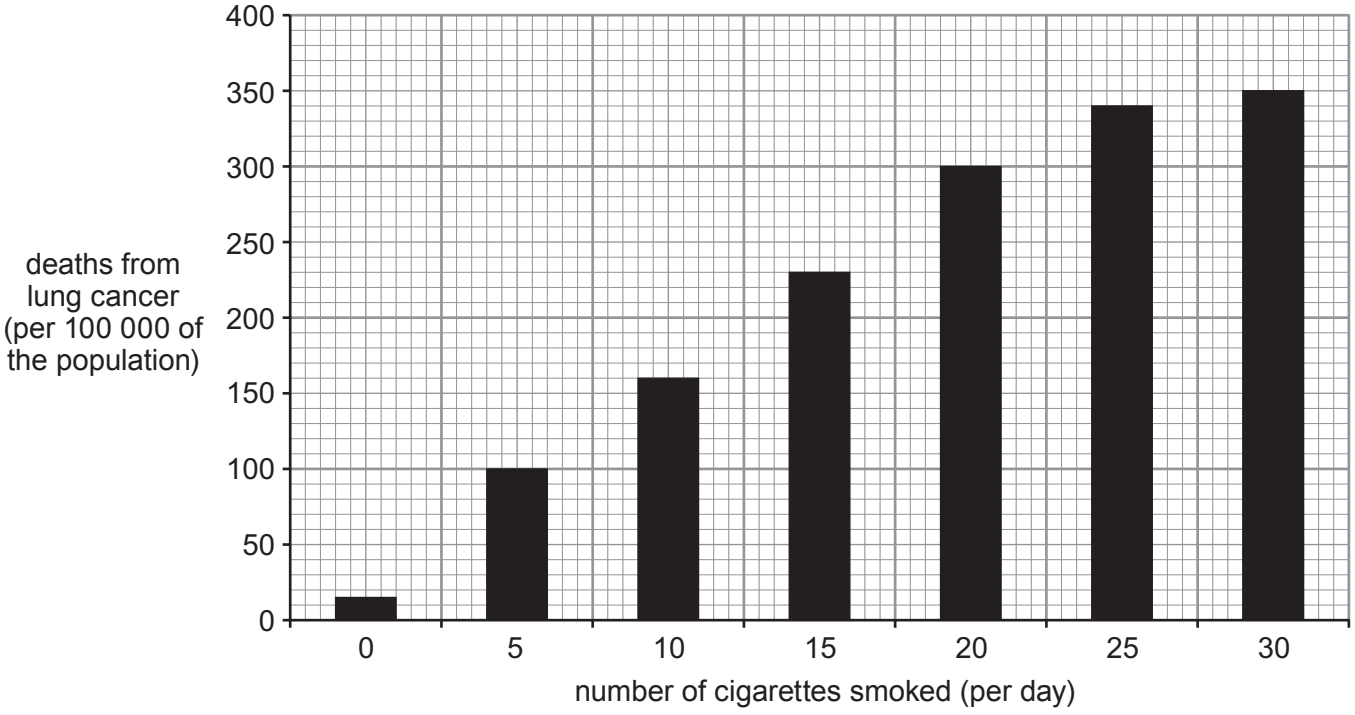
.....

9

Turn over.

Examiner only

6. The graph below shows the relationship between the number of cigarettes smoked per day and deaths of people due to lung cancer.



(a) Use **only** the information in the graph to answer the following questions.

(i) Describe the trend shown in the graph. [1]

.....

.....

(ii) I. Calculate the difference in the number of deaths, per 100 000 of the population, in those who smoke 10 cigarettes per day and those who smoke 30 cigarettes per day. [1]

Difference = ... per 100 000

Examiner only

II. In 2014 the population of Wales was 3 million. How many of the population, who smoke 15 cigarettes a day, are likely to die from lung cancer? [1]

Number of population = ...

(iii) Use the graph to state why the following statement is incorrect. [1]

'*Smoking is the only cause of lung cancer.*'

.....

.....

(b) Name the substance in cigarette smoke which causes lung cancer. [1]

.....

(c) Apart from cancer, name **one** *other* disease caused by smoking. [1]

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6

Turn over.

Examiner only

7. *(a)* State the meaning of the term diffusion. [1]

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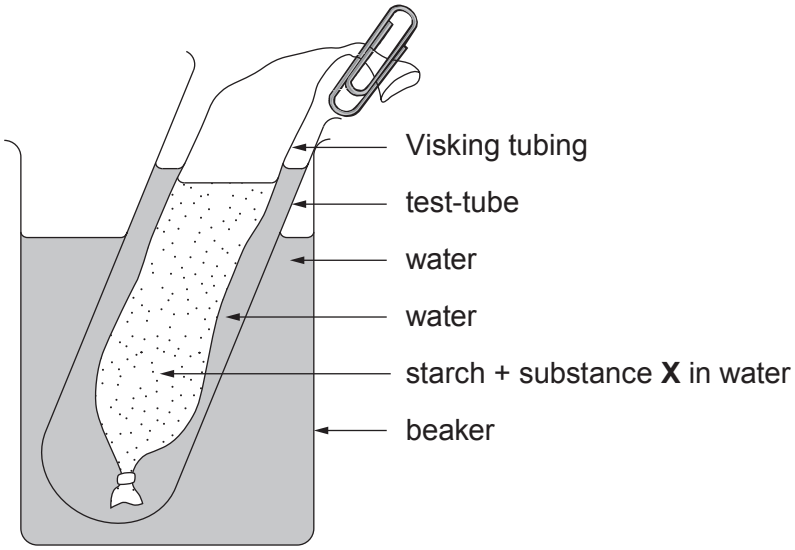
(b) The diagram below shows a piece of Visking tubing that has been set up to represent the way molecules pass through the wall of the small intestine into the bloodstream.



Every 30 minutes for the next two hours the water in the test tube was tested for the presence of both starch and glucose.

The results are shown in the table below.

	time (minutes)				
	0 (at start)	30	60	90	120
starch	-	-	-	-	-
glucose	-	+	++	+++	++++

\- substance not present
\+ substance present
+++ increasing concentration of substance

Examiner only

(i) State why starch does not appear in the water in the test tube. [1]

.....

.....

(ii) Name substance **X** and explain why glucose appears in the water in the test tube. [4]

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.....

(c) Suggest the temperature at which the reaction would work at its fastest rate by circling **one** answer below. [1]

0 °C

10 °C

35 °C

100 °C

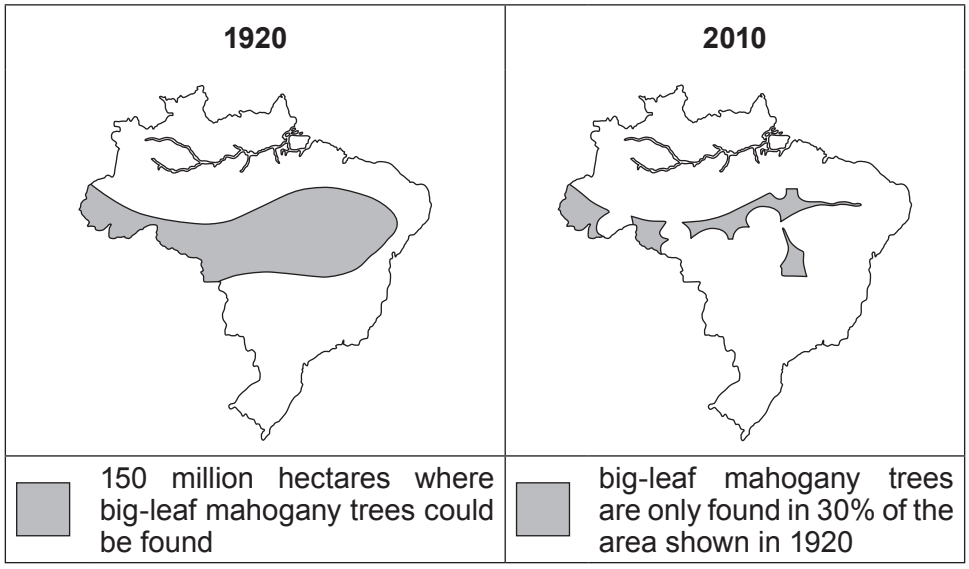
7

Turn over.

Examiner only

8. Big-leaf mahogany (*Swietenia macrophylla*) is the most financially valuable tropical tree species. Its timber has always been in great demand, particularly for furniture making.

The maps below show the distribution of big-leaf mahogany trees in Brazil in 1920 and in 2010.



(a) (i) Calculate the area that contains big-leaf mahogany trees in 2010. [1]

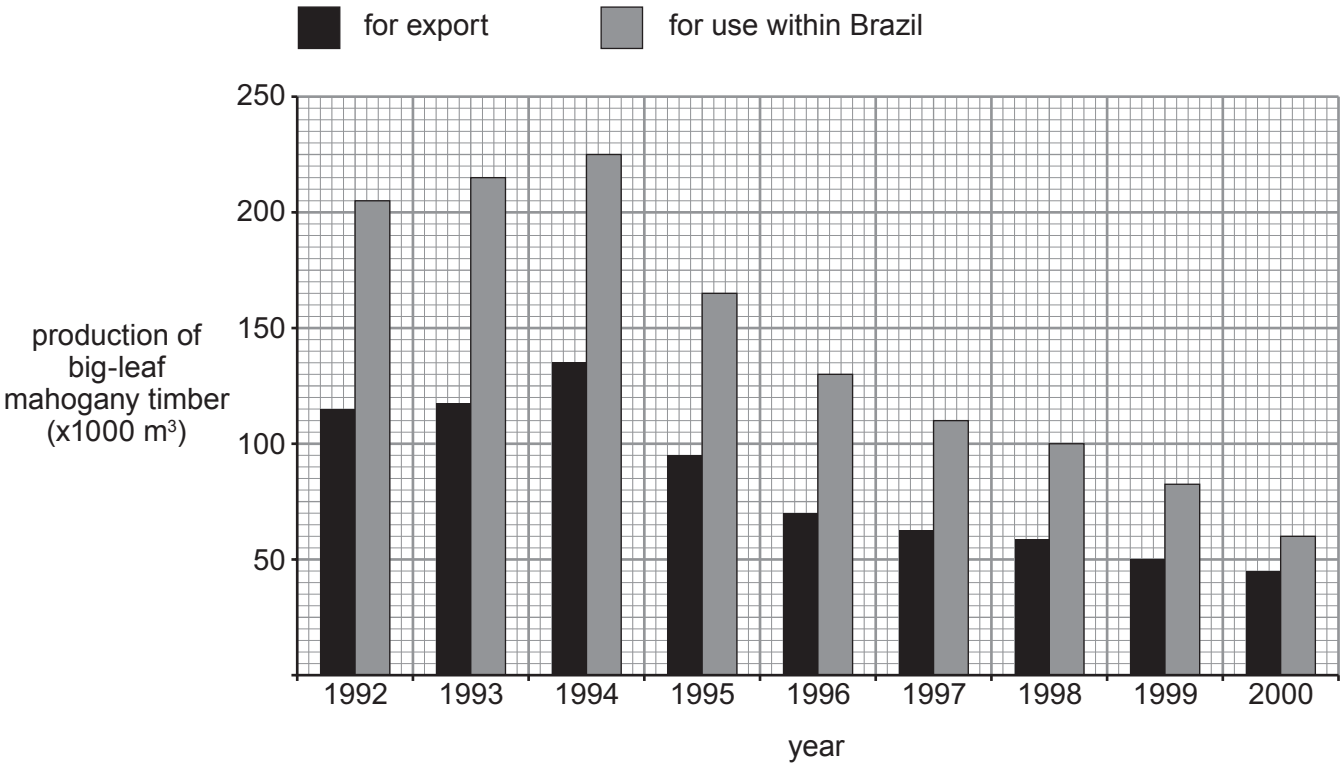
Area = ... hectares

(ii) The average density of big-leaf mahogany is 1 tree per 10 hectares. Based on this density, calculate the number of big-leaf mahogany trees remaining in Brazil in 2010. [1]

Number of trees = ...

Examiner only

(b) The graph shows the production of big-leaf mahogany timber for export from and use within Brazil between 1992 and 2000.



Calculate the difference between the total production of big-leaf mahogany timber in 1994 and 2000.
Show your working and include the unit. [2]

Difference = ...

(c) CITES is the Convention on International Trade in Endangered Species. It maintains three lists of species, known as Appendix I, II and III. The rule for placing species in each Appendix is:

Appendix **I** species threatened with extinction
Appendix **II** species not threatened with extinction but could become so, unless trade is controlled
Appendix **III** species require protection in at least one country

In 2002 big-leaf mahogany was moved from CITES Appendix **III** to Appendix **II**. Suggest a reason for this. [1]

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9. Inspired air contains the gases

- 21 % oxygen
- 0.04 % carbon dioxide
- variable % water vapour
- 79 % nitrogen

These same gases appear in expired air but some are in different concentrations. Describe how they differ and explain why. Your answer should include the percentage concentrations of each gas in expired air. [6 QWC]

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END OF PAPER

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