OXFORD

INTERNATIONAL
AQA EXAMINATIONS

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

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Forename(s) _____

Candidate signature _____
I declare this is my own work.

INTERNATIONAL AS
BIOLOGY (9610)

Unit 2 Biological Systems and Disease

Time allowed: 1 hour 30 minutes

Materials
For this paper you must have:
- a ruler with millimetre measurements
- a scientific calculator, which you are expected to use where appropriate.

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 75.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

Do not write outside the box

Answer **all** questions in the spaces provided.

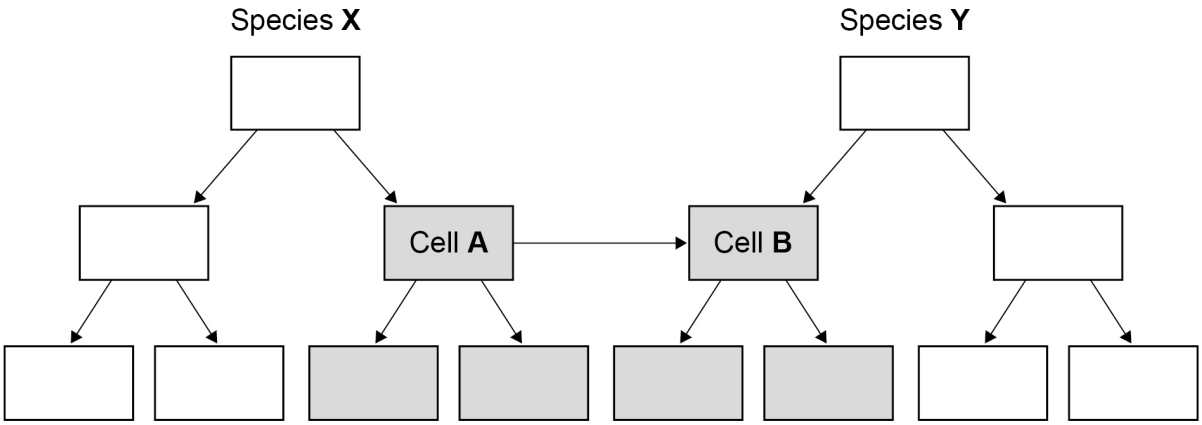
0 1 Some species of bacteria are resistant to antibiotics. These bacteria can continue to divide even when antibiotics have been used.

0 1 . 1 Describe how bacteria divide by binary fission.

[2 marks]

Figure 1 shows two species of bacteria (**X** and **Y**) and the number of cells after two divisions. The shaded bacteria are resistant to a type of antibiotic.

Figure 1



Cell **A** was the first cell to become resistant to this type of antibiotic.

0 1 . 2 Suggest what caused cell **A** to become resistant.

[1 mark]

Do not write outside the box

0 1 . 3 Explain how cell **B** gained resistance to this antibiotic from cell **A**.

[3 marks]

0 1 . 4 Species **X** and **Y** divide every 20 minutes.

Calculate the total number of resistant bacteria after cells **A** and **B** had been dividing for 3 hours.

[2 marks]

Total number of antibiotic-resistant bacteria = _____

8

Turn over for the next question

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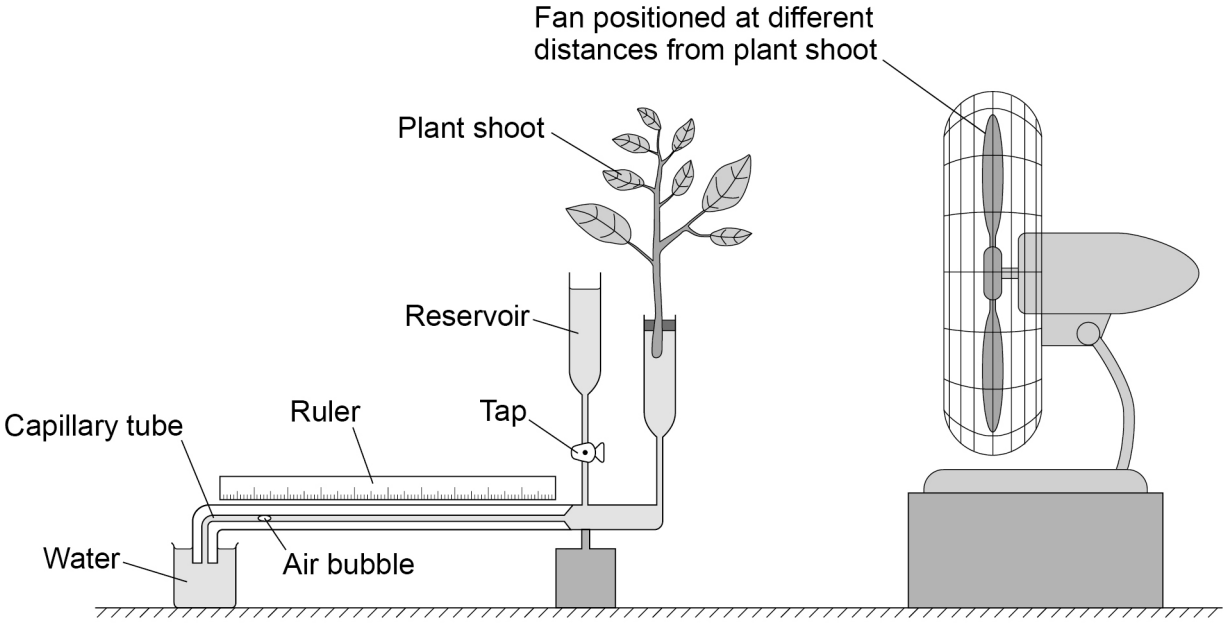
0 2 A student investigates the effect of wind speed on the rate of water uptake by a plant shoot.

The student places a fan at different distances from a potometer to create different wind speeds.

Figure 2 shows the equipment the student uses.

Figure 2



0 2 . 1 Give **two** environmental factors the student should keep constant during this investigation.

[2 marks]

1 _____

2 _____

0 2 . 2 The student cuts the shoot under water and also positions it in the potometer under water.

Give **two** other precautions the student should take when setting up a potometer to get an accurate measurement of water uptake.

[2 marks]

1 _____

2 _____

Do not write outside the box

Table 1 shows the student's results from this experiment.

Table 1

Distance between the plant shoot and the fan / cm	Rate of water uptake / $mm^3\ hour^{-1}$
20	776.4
40	718.3
60	702.6
80	686.9
100	682.2

0 2 . 3 The rate of water uptake was calculated using the distance the air bubble moved through the capillary tube in 5 minutes.

The diameter of the capillary tube was 1.0 mm

When the fan was positioned 20 cm away from the plant shoot, calculate the distance the air bubble moved in 5 minutes.

Give your answer in mm and correct to 2 significant figures.

The area of a circle is found using the formula:

Area = πr^2 Use 3.14 for the value of π

[3 marks]

Distance = _____ mm

Do not write outside the box

0 2 . 4 Explain the results shown in **Table 1** (on page 5).

[3 marks]

0 2 . 5 The student wants to compare these results with those of other students to find out if they are similar.

To compare the results, give **one** additional measurement all the students in the group should take.

[1 mark]

11

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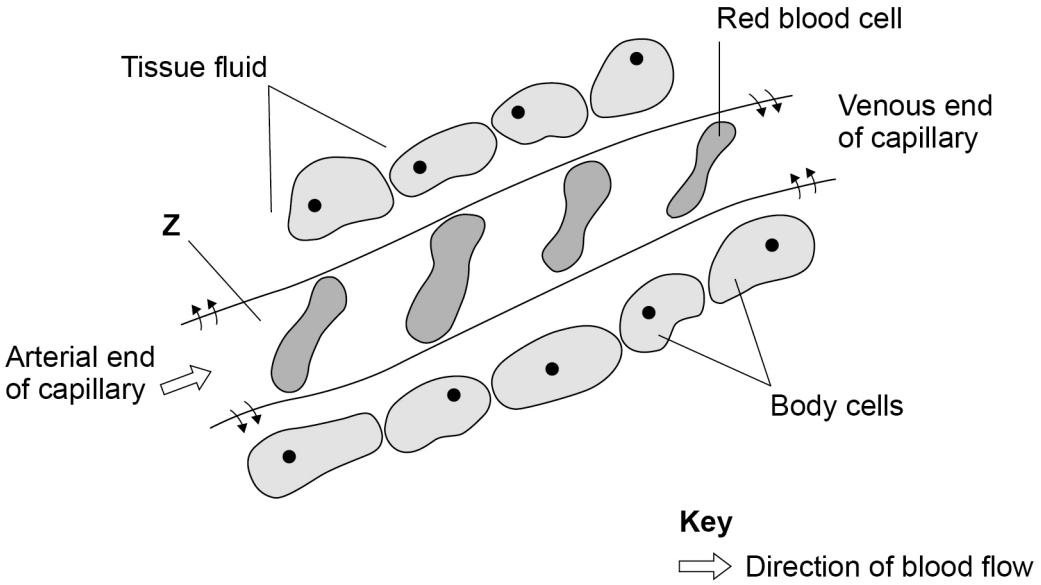
0 3 In humans, substances move out of the capillaries to form tissue fluid.

Figure 3 shows a capillary and some of the surrounding cells.

Figure 3



0 3 . 1 Name the fluid found at point **Z**.

[1 mark]

_____

0 3 . 2 Give **two** ways the composition of fluid at point **Z** is different from tissue fluid.

[2 marks]

1 _____

2 _____

Question 3 continues on the next page

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0 3 . 3 Tissue fluid is formed at the arterial end of the blood capillary.

Describe how some tissue fluid is returned to the circulatory system at the venous end of the capillary.

[4 marks]

7

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0 4 A student investigates the different stages of the cell cycle in the roots of onion plants.

As part of the method, the student:

- places a root tip onto a microscope slide
- adds two drops of a stain
- positions a cover slip on top of the root tip
- presses downwards on the cover slip.

0 4 . 1 Explain why the student:

[3 marks]

uses tissue only from the tip of the onion root _____

_____

_____

adds a stain _____

_____

_____

presses downwards on the cover slip. _____

_____

_____

0 4 . 2 The student uses an optical microscope to identify and count cells in different stages of the cell cycle.

When counting cells with the optical microscope, explain **two** precautions the student should take to make sure the results are valid.

[4 marks]

1 _____

_____

_____

_____

2 _____

_____

_____

_____

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Table 2 shows the results the student recorded.

Table 2

Stage	**Number of cells**
Interphase	110
Prophase	12
Metaphase	11
Anaphase	5
Telophase	12

0 4 . 3 The student recorded five cells in anaphase.

Describe the appearance of a cell in anaphase.

[1 mark]

_____

_____

0 4 . 4 One cell cycle of the root tissue studied takes 16 hours.

The number of cells at each stage is proportional to the time spent at that stage.

Calculate the number of minutes these root cells are in anaphase.

Use information from **Table 2**.

[2 marks]

_____ minutes

Do not write outside the box

0 4 . 5 Another student completes the same experiment using root tissue from the same variety of onion plant.

The two students get different results.

Give **two** possible reasons for the different results.

[2 marks]

1 _____

_____

2 _____

_____

12

Turn over for the next question

Do not write outside the box

0 5 . 1 The aorta takes oxygenated blood away from the heart.

Describe **two** ways that the structure of the aorta is related to its function.

[2 marks]

1 _____

_____

_____

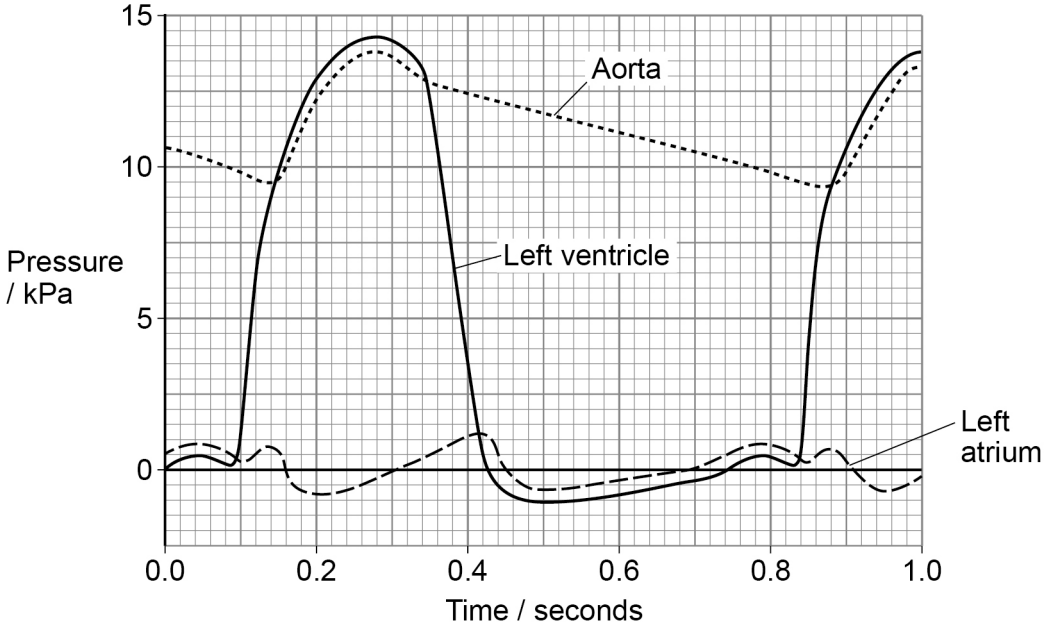
2 _____

_____

_____

Figure 4 shows the pressure changes in the left side of the heart.

Figure 4



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Use information from **Figure 4** to answer the following questions.

0 5 . 2 Calculate the heart rate in beats per minute.

Give your answer to the nearest whole number.

[1 mark]

_____ beats per minute

0 5 . 3 Calculate the length of time that the muscle of the left ventricle would be contracting within a 24-hour period.

Assume the heart rate stayed constant during this time.

Give your answer in hours, to the nearest hour.

[2 marks]

_____ hours

Question 5 continues on the next page

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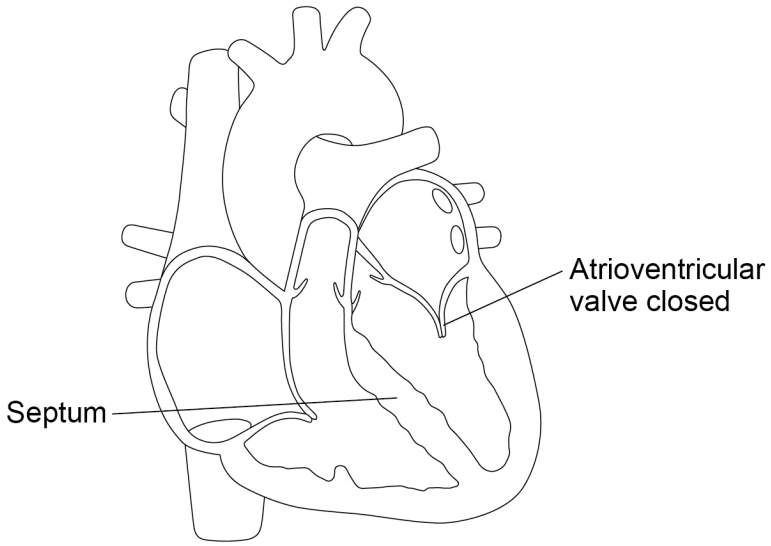
Figure 5 shows a section through the human heart during one stage of the cardiac cycle.

Figure 5



0 5 . 4 At 0.2 seconds in the cardiac cycle shown in **Figure 4** (on page 12), blood is leaving the left ventricle.

Use information from **Figure 4** and **Figure 5** to explain what causes blood to leave the left ventricle at this time.

[3 marks]

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0 5 . 5 Some babies are born with a hole in the septum between the left ventricle and the right ventricle.

Babies with a hole in the septum of the heart transport less oxygen around the body.

Suggest why.

[2 marks]

_____

_____

_____

_____

_____

_____

10

Turn over for the next question

Do not write outside the box

0 6 . 1 Describe how HIV replicates after the virus enters a human cell.

[6 marks]

0 6 . 2 Some people are resistant to infection by HIV. These people have a mutation in the gene that codes for the proteins on the surface of CD4 helper T cells.

Suggest how people with this mutation may be resistant to HIV infection.

[3 marks]

9

Do not write outside the box

0 7 . 1 Explain how a mutation of a tumour suppressor gene can cause a tumour.

[2 marks]

0 7 . 2 Some tumours are benign and some tumours are malignant.

Which statement is **not** true of malignant tumours?

[1 mark]

Tick (✓) **one** box.

- More likely to be life-threatening ☐
- More likely to grow projections into surrounding tissue ☐
- More likely to grow slowly ☐
- More likely to occur again after treatment ☐

Question 7 continues on the next page

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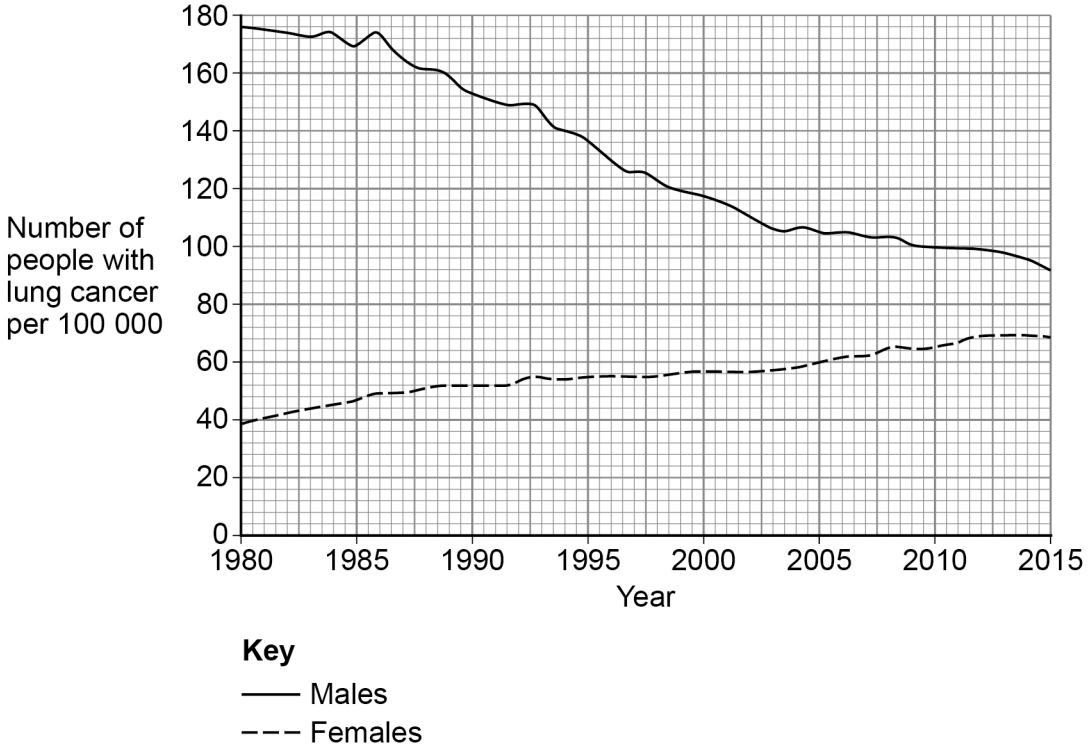
Figure 6 shows the numbers of males and females with lung cancer in the UK between 1980 and 2015.

Figure 6



0 7 . 3 Describe how the numbers of males and females with lung cancer have changed between 1980 and 2015.

Use information from **Figure 6**.

[2 marks]

Do not write outside the box

Table 3 shows the mean survival rates for males and females diagnosed with lung cancer in 2015 in the UK.

Table 3

	Mean survival rate after 2015 diagnosis / % ± SE		
	1 year	Estimated	
		5 years	10 years
Males	30.4 ± 0.3	8.4 ± 0.9	4.0 ± 1.2
Females	35.1 ± 0.3	11.6 ± 1.0	6.5 ± 1.9

0 7 . 4 **Table 3** shows that females with lung cancer are expected to survive longer than males with lung cancer.

Are the survival rates for females **significantly** greater than the survival rates for males?

Give evidence from **Table 3** in your answer.

[3 marks]

8

Turn over for the next question

Do not write outside the box

0 8 . 1 Describe how:

- carbohydrates are digested in the human body
- the products of carbohydrate digestion are absorbed.

[5 marks]

Do not write outside the box

0 8 . 2 Describe the mass flow hypothesis for the movement of carbohydrates in plants.

[5 marks]

10

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED

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Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

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