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CANDIDATE NAME

CENTRE NUMBER

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BIOLOGY **0610/42**

Paper 4 Theory (Extended) **May/June 2026**

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

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1 (a) A student investigated the effect of wind speed on the rate of transpiration in a plant shoot.

Figure 1.1 shows the apparatus used.

As water is taken up by the plant shoot, the air bubble in the capillary tube moves towards the shoot.

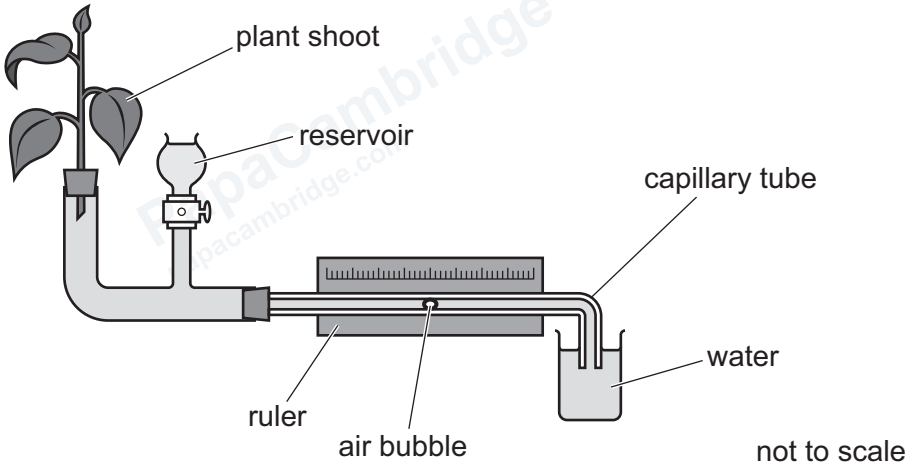

Figure 1.1

The student used a fan set at different speeds to change the wind speed.

He measured the distance travelled by the air bubble in 300 seconds.

The results of the student's investigation are shown in Table 1.1.

Table 1.1

wind speed / m s^{-1}	distance travelled by the air bubble in 300 s / mm	rate of transpiration / mm s^{-1}
0	2	0.01
2	12	0.04
4	20	0.07
6	35	0.12
8	115	0.38
10	135	.....

(i) Calculate the rate of transpiration for a wind speed of 10 m s^{-1} where the distance moved by the bubble was 135 mm in 300 seconds.

Write your answer in Table 1.1. [1]

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(ii) Describe the effect on the rate of transpiration of increasing the wind speed in this investigation.

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..... [2]

(iii) Suggest why the rate of transpiration is only an estimate of water uptake in a plant.

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.....

..... [1]

(iv) State **two** other environmental factors that can change the rate of transpiration in a plant shoot.

1 .....

2 .....

[2]

(b) Explain how transpiration causes the movement of water in the xylem.

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..... [4]

[Total: 10]

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2 **(a)** Describe what is meant by a sustainable resource.

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..... [2]

(b) Tilapia is a type of fish that is eaten by many people around the world.

In the wild, tilapia feed on producers.

Fish farmers grow these fish in water in outdoor ponds.

The ponds are positioned to maximise access to sunlight.

Suggest how maximising sunlight leads to an increase in the growth of tilapia.

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..... [3]

(c) Tilapia are a good source of protein. Some farmers add waste organic material to the ponds as a source of mineral ions for the fish.

(i) State the name of the mineral ion that provides an element found in all proteins.

..... [1]

(ii) State **one** reason why proteins are important in the human diet.

..... [1]

(iii) State the name of a process that could occur if the farmer adds excessive waste organic material to the pond.

..... [1]

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(d) One way of conserving wild fish stocks is to regulate the size of the holes in the nets that are used to catch the fish.

Explain how this helps to conserve fish stocks.

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..... [4]

(e) Some species are threatened with extinction.

Explain the reasons why species become endangered.

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..... [6]

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(f) Organisms can be conserved in captive breeding programmes by using the techniques of artificial insemination (AI) and *in vitro* fertilisation (IVF).

Describe the processes of artificial insemination (AI) and *in vitro* fertilisation (IVF).

artificial insemination (AI) .....

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in vitro fertilisation (IVF) .....

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[5]

[Total: 23]

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3 Figure 3.1 shows the human male reproductive system.

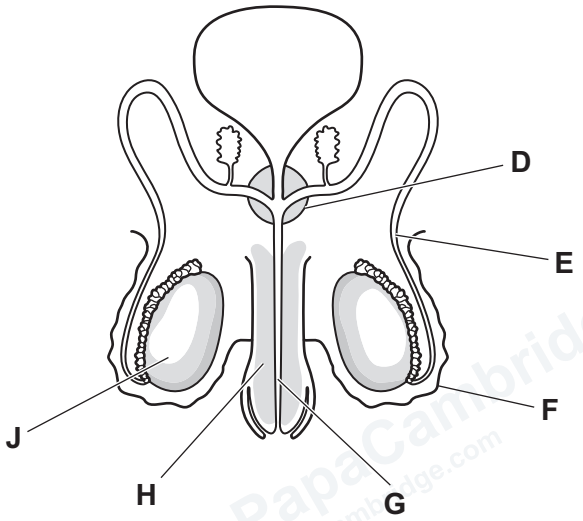

Figure 3.1

(a) Use the information in Figure 3.1 to complete Table 3.1.

Table 3.1

name	letter from Figure 3.1	function
	E	
prostate gland		
	F	
		tube for urine and sperm to pass through
penis		

[5]

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(b) Meiosis occurs in structure **J** in Figure 3.1.

Explain the importance of meiosis occurring in structure **J**.

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..... [4]

[Total: 9]

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4 Glucose is a carbohydrate.

(a) List the chemical elements that are found in all carbohydrates.

..... [1]

(b) Figure 4.1 is a diagram that shows part of the human body.

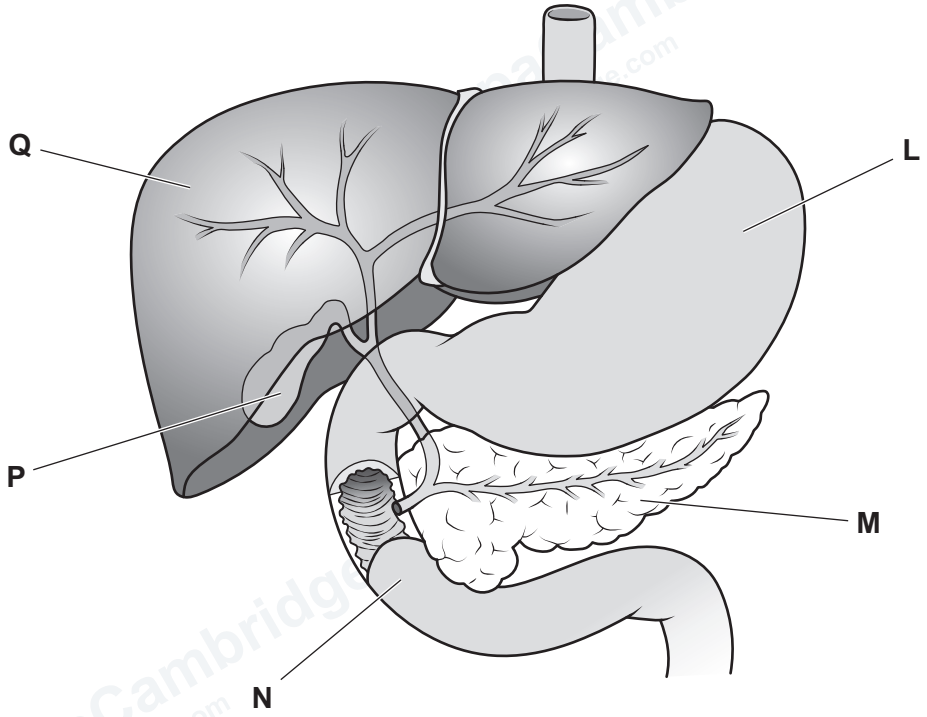

Figure 4.1

(i) State the letter of the structure shown in Figure 4.1 that:

produces urea .....

produces pepsin .....

[2]

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(ii) Structure **M** in Figure 4.1 releases a hormone that increases blood glucose concentration.

State the name of this hormone **and** explain how it increases blood glucose concentration.

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..... [3]

(iii) State the name of **one other** hormone that increases blood glucose concentration.

..... [1]

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(c) People with diabetes cannot control their blood glucose concentration.

Figure 4.2 is a graph that shows the changes in blood glucose concentration after eating a meal in a person without diabetes and in a person with diabetes.

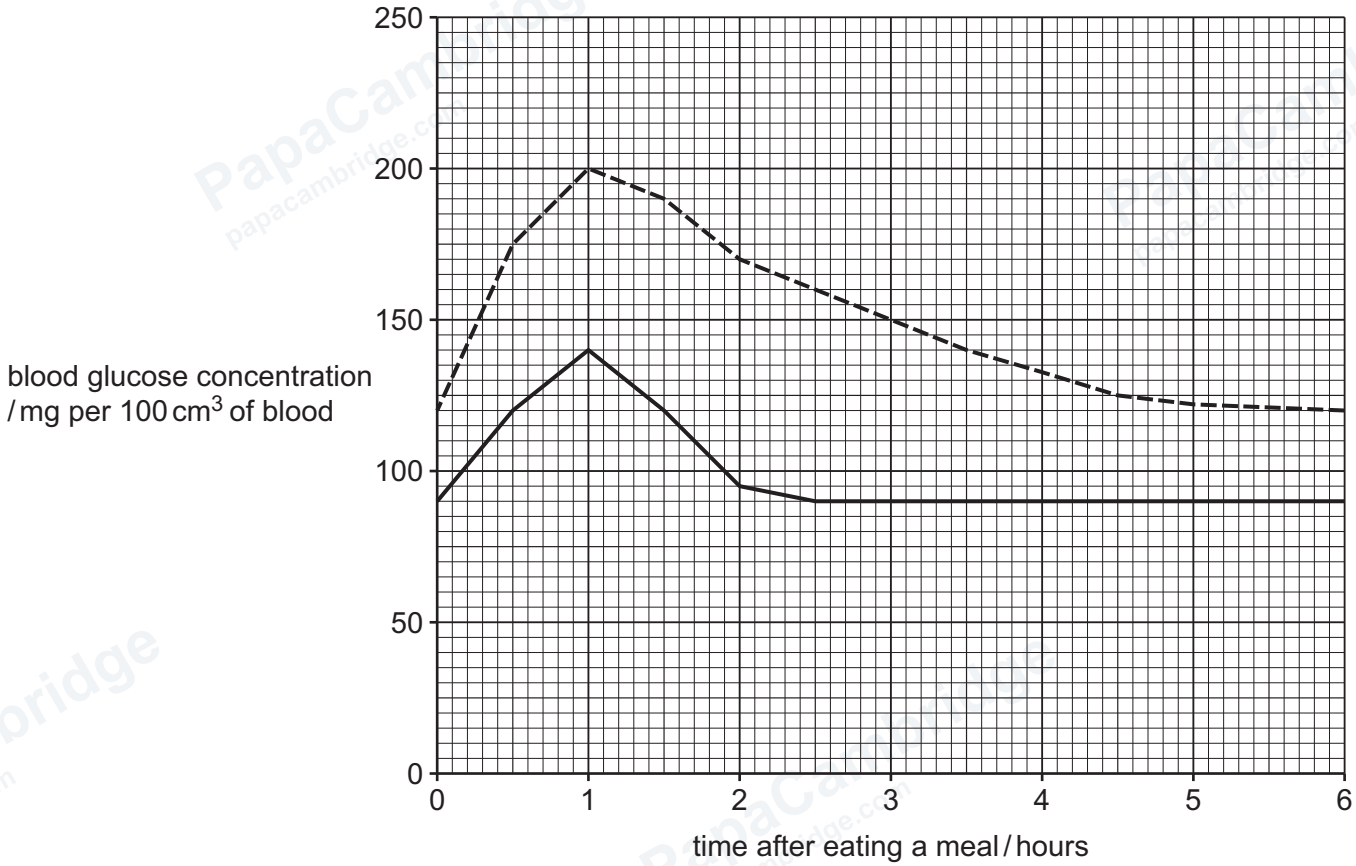

Figure 4.2

Describe the differences between the blood glucose concentrations of the person without diabetes and the person with diabetes.

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..... [3]

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(d) Outline the treatment for type 1 diabetes.

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..... [3]

[Total: 13]

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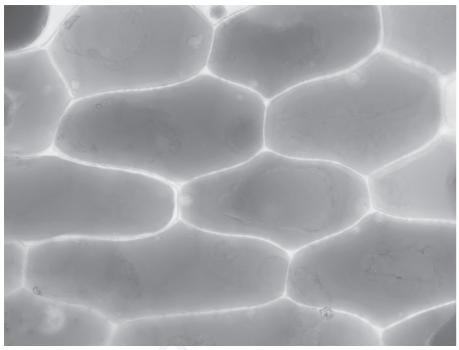
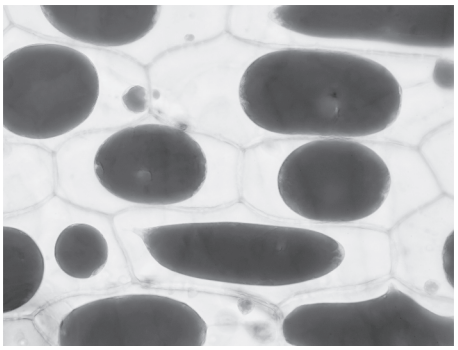
5 **(a)** A student investigated the effect of salt solution concentration on some plant cells.

The student immersed cells from one onion plant in two different concentrations of salt solution, labelled **A** and **B**.

Figure 5.1 shows photomicrographs of the plant cells one hour after being placed in the different salt solutions.



solution **A**



solution **B**

Figure 5.1

Explain the appearance of the plant cells shown in Figure 5.1.

cells in solution **A** .....

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cells in solution **B** .....

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[6]

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(b) **(i)** Describe the roles of mitosis in a root.

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..... [3]

(ii) Roots contain stem cells.

Suggest the role of stem cells in a root.

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..... [1]

(iii) Roots absorb magnesium ions from the soil.

State the name of the substance that contains magnesium ions in a palisade mesophyll cell.

..... [1]

(iv) Explain how mineral ions are absorbed by roots.

.....

.....

.....

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.....

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..... [3]

[Total: 14]

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6 When surgeons operate on a heart, the patient can be connected to a heart-lung machine to keep blood flowing around the body during the operation.

Figure 6.1 is a diagram of a heart-lung machine connected to a human heart.

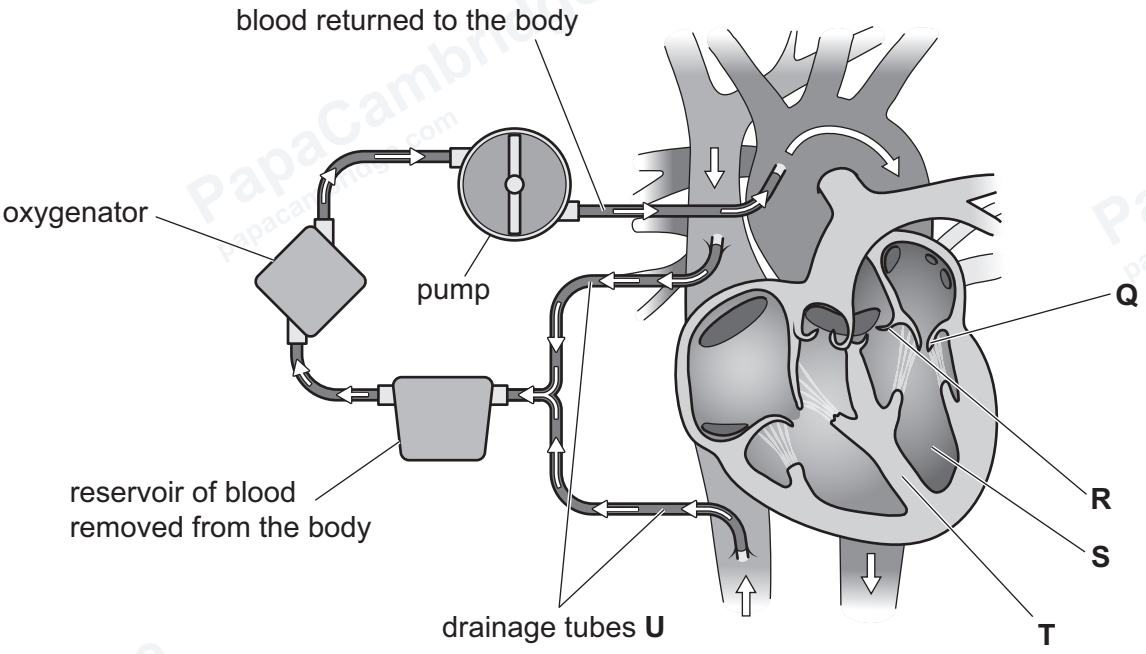

Figure 6.1

(a) (i) State the name of the heart structures labelled **Q**, **R** and **S** in Figure 6.1.

Q .....

R .....

S .....

[3]

(ii) State the letter of the heart structure in Figure 6.1 that separates oxygenated and deoxygenated blood.

..... [1]

(iii) State the name of the blood vessel in Figure 6.1 that the drainage tubes labelled **U** are connected to.

..... [1]

(iv) State the name of the organ that the oxygenator replaces in Figure 6.1.

..... [1]

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(b) State the name of the arteries that supply the heart muscle with oxygen.

..... [1]

(c) Complete the sentences about the human circulatory system.

In a human, blood passes through the heart ..... during one complete circuit of the body.

This type of circulatory system is called a ..... circulation.

An advantage of this type of circulatory system is that blood can be transported at ..... pressure around the body. This increases the efficiency of supplying oxygen molecules to cells for ..... to release energy. [4]

[Total: 11]

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