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* 0000800000001 * DFD

CAMBRIDGE
International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 1 1 2 6 1 4 7 5 3 8 *

BIOLOGY

9700/22

Paper 2 AS Level Structured Questions

February/March 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 60.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages. Any blank pages are indicated.

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1 **(a)** Complete Table 1.1 to show which features are found in typical animal cells and which features are found in typical plant cells.

Put a tick (✓) in the box if the feature is found in the cell and a cross (✗) if the feature is **not** found in the cell.

Put a tick (✓) or a cross (✗) in every box.

Table 1.1

feature	animal cell	plant cell
80S ribosomes in the cytoplasm		
cell wall composed of peptidoglycan		
large permanent vacuole		

[3]

(b) Figure 1.1 is a diagram representing cells in phloem tissue in a mature leaf. Some of the features of the cells are shown.

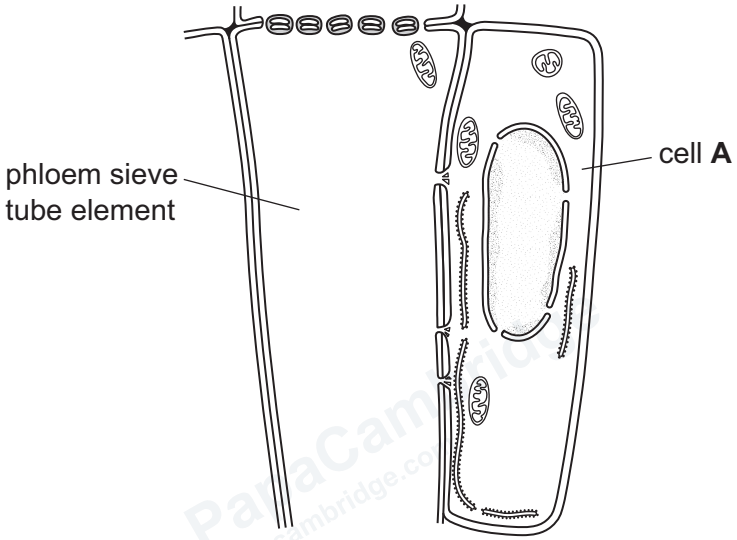


Figure 1.1

Figure 1.2 is a diagram representing part of the cell surface membrane of cell **A**.

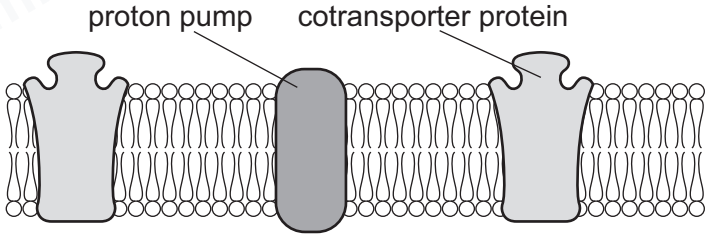


Figure 1.2

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(i) Describe **and** explain how the structure of cell **A** is related to its function in transporting sucrose into the phloem sieve tube element.

In your answer, refer only to structures that are visible in Figure 1.1 or Figure 1.2 or both.

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..... [5]

(ii) Explain how sucrose that enters the phloem sieve tube element from cell **A** is transported to a sink.

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[Total: 12]

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2 Blood transports many substances through the body, including gases such as oxygen and carbon dioxide.

(a) Water is the main component of blood.

Explain how the properties of water allow the blood circulatory system of mammals to function.

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..... [3]

(b) State **two** different ways in which carbon dioxide is transported in the blood.

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[2]

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(c) Myoglobin is a protein that binds to oxygen. Myoglobin is found in muscle tissues.

Figure 2.1 is a ribbon diagram showing the structure of myoglobin.

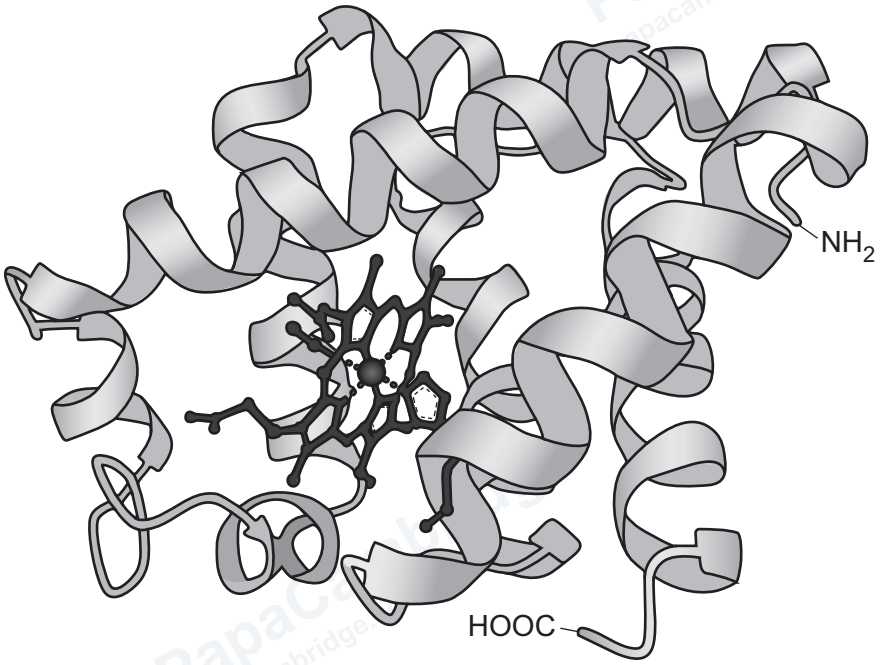


Figure 2.1

(i) Describe similarities **and** differences between the structure of the myoglobin molecule shown in Figure 2.1 and the structure of a haemoglobin molecule.

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..... [4]

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(ii) Contracting muscles have a high requirement for oxygen, which is supplied to muscle cells by the haemoglobin in red blood cells.

Myoglobin has a higher affinity for oxygen than haemoglobin.

Suggest why it is important for muscle function that myoglobin has a higher affinity for oxygen than haemoglobin.

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..... [2]

[Total: 11]

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3 Raffinose is a sugar found in many plant species.

(a) Figure 3.1 shows the structure of one molecule of raffinose.

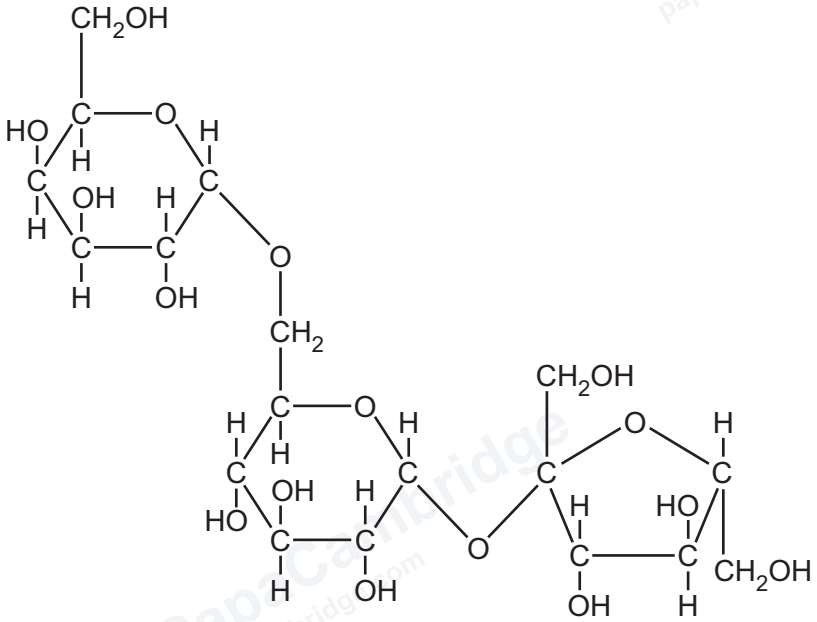


Figure 3.1

(i) Raffinose is formed by the reaction of three different monosaccharides, one of which is glucose.

On Figure 3.1, draw around the part of the molecule that forms glucose when the glycosidic bonds in raffinose are hydrolysed. [1]

(ii) State the type of glucose molecule that is formed when the glycosidic bonds of raffinose are hydrolysed.

..... [1]

(iii) Raffinose produces the same results as sucrose when it is tested with Benedict's solution.

Complete Table 3.1 to show some features of the sugars glucose, maltose and raffinose. Maltose is a disaccharide.

Table 3.1

sugar	number of glycosidic bonds in one molecule	reducing sugar or non-reducing sugar
glucose		
maltose		
raffinose		

[3]

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(b) Some bacteria in the human digestive system synthesise an enzyme known as α-GAL, which breaks down raffinose.

The rate of breakdown of raffinose by α-GAL at different concentrations of raffinose is shown in Figure 3.2.

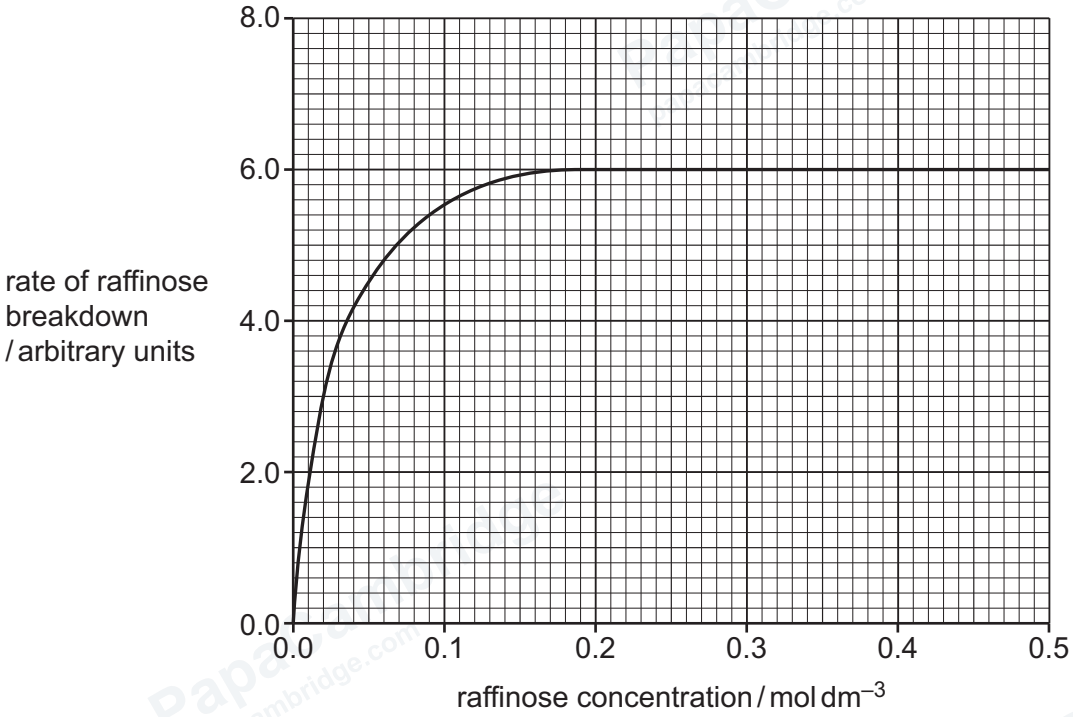


Figure 3.2

Determine the Michaelis–Menten constant, K_m, for α-GAL using the data in Figure 3.2.

K_m = ... [2]

(c) One of the molecules formed from the breakdown of raffinose by bacteria is shown in Figure 3.3.

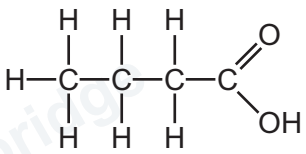


Figure 3.3

(i) State the type of molecule shown in Figure 3.3.

..... [1]

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(ii) The molecule shown in Figure 3.3 can be used to make a triglyceride.

Describe how this molecule can become part of a triglyceride molecule.

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..... [3]

[Total: 11]

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4 Respiratory syncytial virus (RSV) can infect the human gas exchange system and cause disease in human populations.

(a) Explain why the disease caused by RSV is an example of an infectious disease.

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..... [2]

(b) Figure 4.1 shows the structure of RSV.

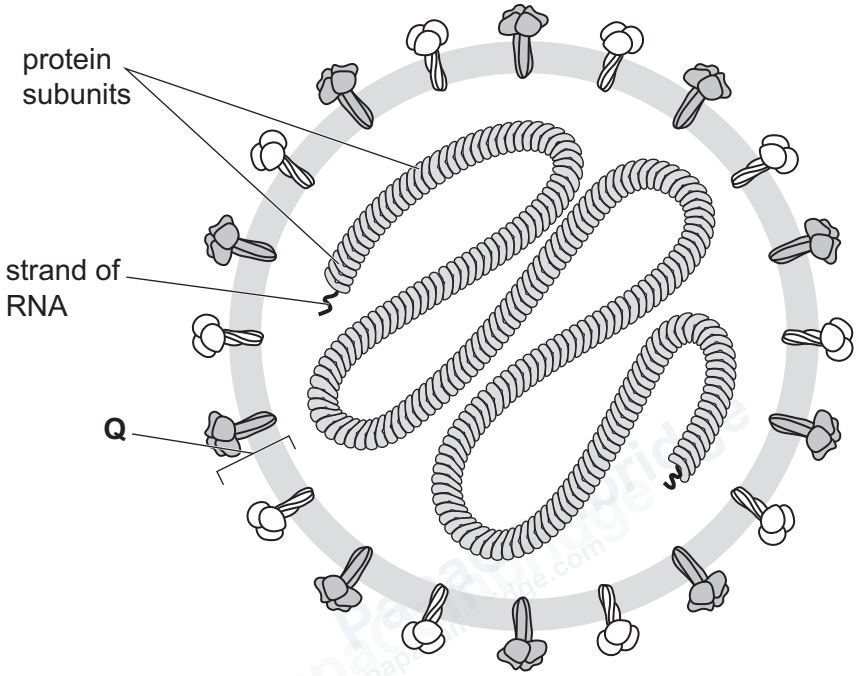


Figure 4.1

State the name of:

- the outer layer labelled **Q** in Figure 4.1

  .....

- the structure in Figure 4.1 composed of protein subunits.

  .....
  [2]

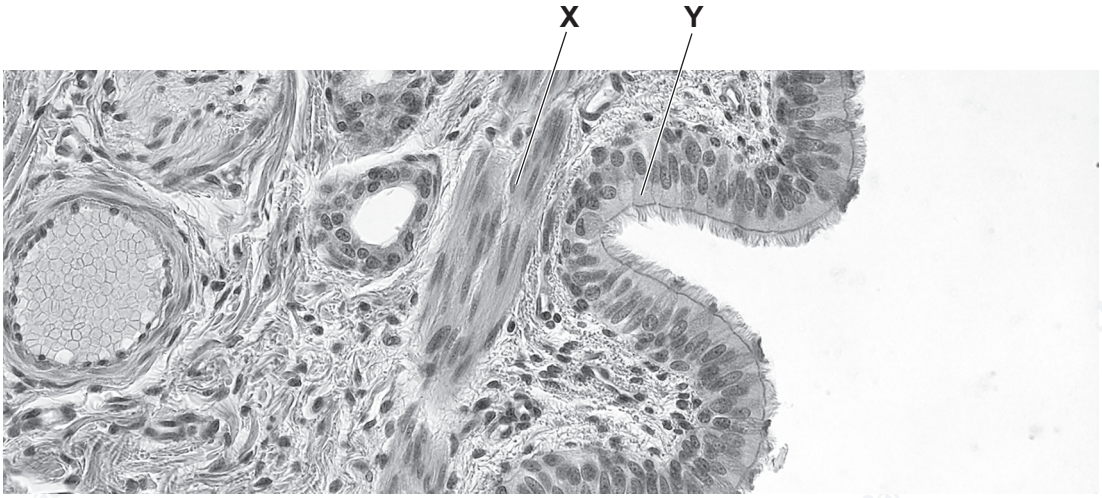
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(c) RSV can infect tissues of the bronchus.

Figure 4.2 is a photomicrograph of tissues in a bronchus.



magnification ×500

Figure 4.2

(i) State the name of the tissue labelled **X** in Figure 4.2.

..... [1]

(ii) State the function of the cell labelled **Y** in Figure 4.2.

..... [1]

(d) There are two methods that can be used to prevent people from becoming ill if they come into contact with RSV. These methods are:

- injection with a monoclonal antibody
- vaccination.

(i) State the forms of immunity that people would be expected to develop as a result of each of these two methods.

Use **two** words to describe each form of immunity.

injection with a monoclonal antibody

..... and ..... immunity

vaccination

..... and ..... immunity
[2]

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(ii) Outline how a monoclonal antibody to protect people against RSV is produced by the hybridoma method.

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(iii) State **one** advantage of using a vaccine, instead of a monoclonal antibody, to protect against RSV infection.

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..... [1]

(e) Phagocytes can remove cells in the body that have been infected with viruses such as RSV.

(i) Outline the events that lead to the formation of a phagocytic vacuole after detection of the infected body cells by a phagocyte.

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..... [2]

(ii) State the name of the organelle in a phagocyte that contains enzymes to destroy the infected cells.

..... [1]

[Total: 16]

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5 DNA replication must occur in cells before mitosis can begin.

(a) (i) Describe the role of the enzyme DNA polymerase in DNA replication.

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..... [3]

(ii) The two strands of a DNA molecule are described as antiparallel.

Explain the consequences of the antiparallel arrangement of the DNA strands for the replication of DNA.

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(b) After the separation of complementary strands of DNA during DNA replication, the separated strands of DNA can become twisted and coiled together to form tangles.

The enzyme DNA topoisomerase II alpha (TOP2A) is able to remove these tangles in a two-step process:

- step 1 – TOP2A forms a complex with the tangled DNA and catalyses the cleavage (cutting) of both strands to allow the strands to separate from one another
- step 2 – TOP2A catalyses the repairs of the cuts made in the DNA so that the strands are complete.

Etoposide is a chemical that can bind to the TOP2A–DNA complex formed in step 1. This makes the complex very stable and prevents step 2 from occurring.

Suggest **and** explain why etoposide can be used to treat some types of tumour in humans.

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[Total: 7]

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6 A cell surface membrane consists of many different molecular components.

The passage outlines the arrangement of some of the molecular components in a cell surface membrane.

Complete the passage by using the most appropriate scientific terms.

Some proteins in a cell surface membrane are located on one side of the membrane. Other proteins span the entire width of the membrane. Some of these are transport proteins and include ..... proteins that are needed for facilitated diffusion. The fluidity of the membrane is regulated by the molecule ..... , which interacts with the fatty acid tails of phospholipids. Interactions between this molecule and fatty acid tails are known as ..... interactions. [3]

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