Cambridge International AS & A Level

**Cambridge International Examinations**
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

*2666922669*

**BIOLOGY** **9700/21**

Paper 2 AS Level Structured Questions **October/November 2017**

**1 hour 15 minutes**

Candidates answer on the Question Paper.

No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **15** printed pages and **1** blank page.


© UCLES 2017

CAMBRIDGE International Examinations

Answer **all** questions.

**1** Fig. 1.1 is a photomicrograph of plant cells showing stages in cell division.

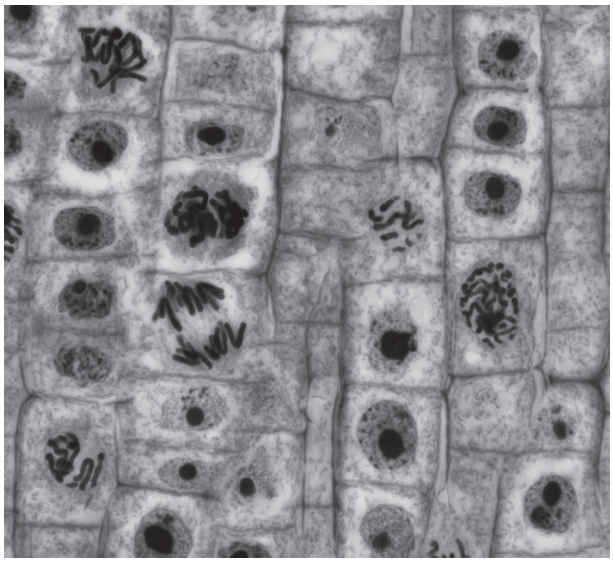


**Fig. 1.1**

**(a)** On Fig. 1.1, draw a circle around a cell in anaphase. [1]

**(b)** Suggest the advantages of using a light microscope, rather than an electron microscope, to study cell division.

.....

.....

.....

.....

..... [2]

**(c)** Mitosis is important in producing more cells for plant growth.

Describe **three other** ways in which mitosis is important in plants.

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 6]

© UCLES 2017

**2** Fig. 2.1 is a transmission electron micrograph of a section through a blood vessel.

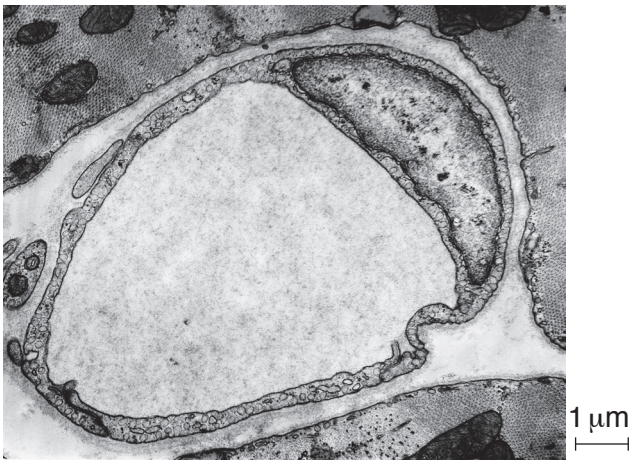



**Fig. 2.1**

**(a)** State the type of blood vessel shown in Fig. 2.1 **and** give **two** reasons for your choice.

*type of blood vessel* .....

*reason 1* .....

.....

*reason 2* .....

.....[3]

Fig. 2.2 is a graph showing how the blood pressure in the pulmonary artery and in the right ventricle changes during one cardiac cycle.

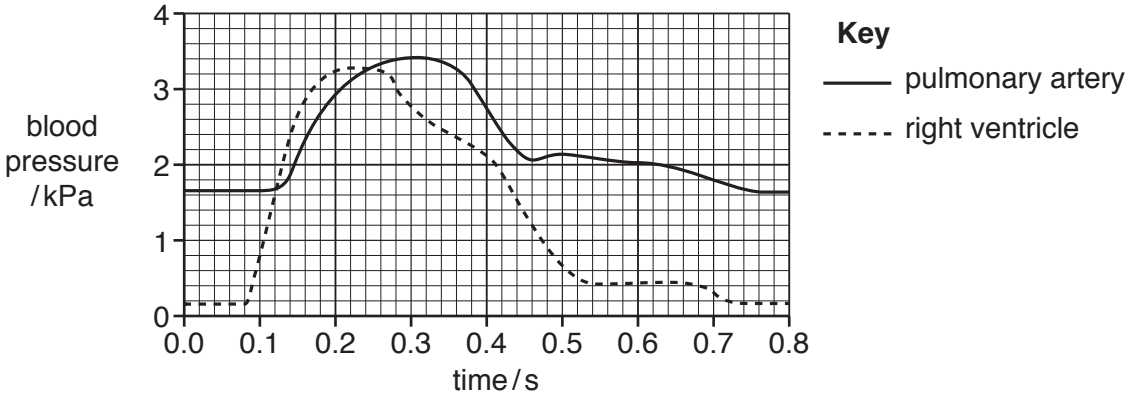



**Fig. 2.2**

**(b)** Use Fig. 2.2 to state the time at which:

**(i)** the valve between the right ventricle and the pulmonary artery closes

.....[1]

**(ii)** the ventricle begins to contract.

.....[1]

**(iii)** State **and** explain the similarities and differences between Fig. 2.2 and a graph showing how the blood pressure for the **left** ventricle changes during the same cardiac cycle.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 9]

© UCLES 2017

**3** Cells of the immune system function to protect the body against infectious diseases.

**(a) (i)** Name the type of cell that produces antibodies.

.....[1]

**(ii)** The virus that causes the infectious disease influenza has two antigens, **H** and **N**. Antibodies are produced in response to an infection by this virus. The antibodies are specific for either antigen **H** or for antigen **N**.

Describe how the structure of an antibody molecule allows it to be specific for **one** antigen, such as **H** or **N**.

.....

.....

.....

.....

.....

.....

.....

.....[3]

**(b)** Cholera is a disease caused by a bacterial pathogen.

**(i)** Name the pathogen that causes cholera.

.....[1]

**(ii)** Describe how the pathogen that causes cholera is transmitted.

.....

.....

.....

.....[2]

© UCLES 2017

**[Turn over**

**(c)** Viruses that infect bacteria are called bacteriophages. Some bacteriophages that infect the cholera pathogen cause lysis of the bacterium.

**(i)** Suggest what happens to the structure of a bacterial cell to cause lysis.

.....

.....

.....

.....

.....[2]

**(ii)** Some scientists believe that bacteriophages could be used to treat people who are infected with cholera.

Suggest the properties of the bacteriophages that would make this possible.

.....

.....

.....

.....[2]

**(iii)** Antibiotics can be used to treat people with cholera.

State why antibiotics are **not** effective against measles.

.....

.....

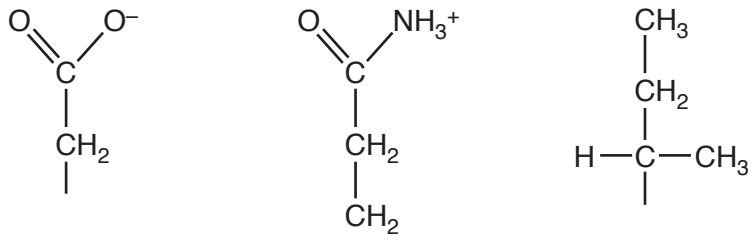
.....

.....[1]

[Total: 12]

© UCLES 2017

**4** Fig. 4.1 shows the structure of the R groups of three amino acids, aspartate (Asp), glutamine (Gln) and isoleucine (Ile).




**Asp R group** **Gln R group** **Ile R group**

**Fig. 4.1**

**(a)** One of the mRNA codons for the amino acid Gln is CAA.
A mutation could change this codon from CAA to UAA.

UAA is a STOP codon.

State what is meant by a STOP codon.

.....

.....

.....[1]

**(b)** Many proteins that contain the amino acids shown in Fig. 4.1 are globular.

Describe how the three R groups in Fig. 4.1 can contribute to the globular structure of a protein.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

**(c)** An example of a globular protein is the enzyme starch phosphorylase. This enzyme catalyses the conversion of starch to glucose-1-phosphate.

Name the type of bond that is broken when starch is converted to glucose-1-phosphate.

.....[1]

© UCLES 2017

An investigation was carried out to find out how the activity of starch phosphorylase varied with temperature, when free in solution and when immobilised in alginate.

The results are shown in Fig. 4.2.

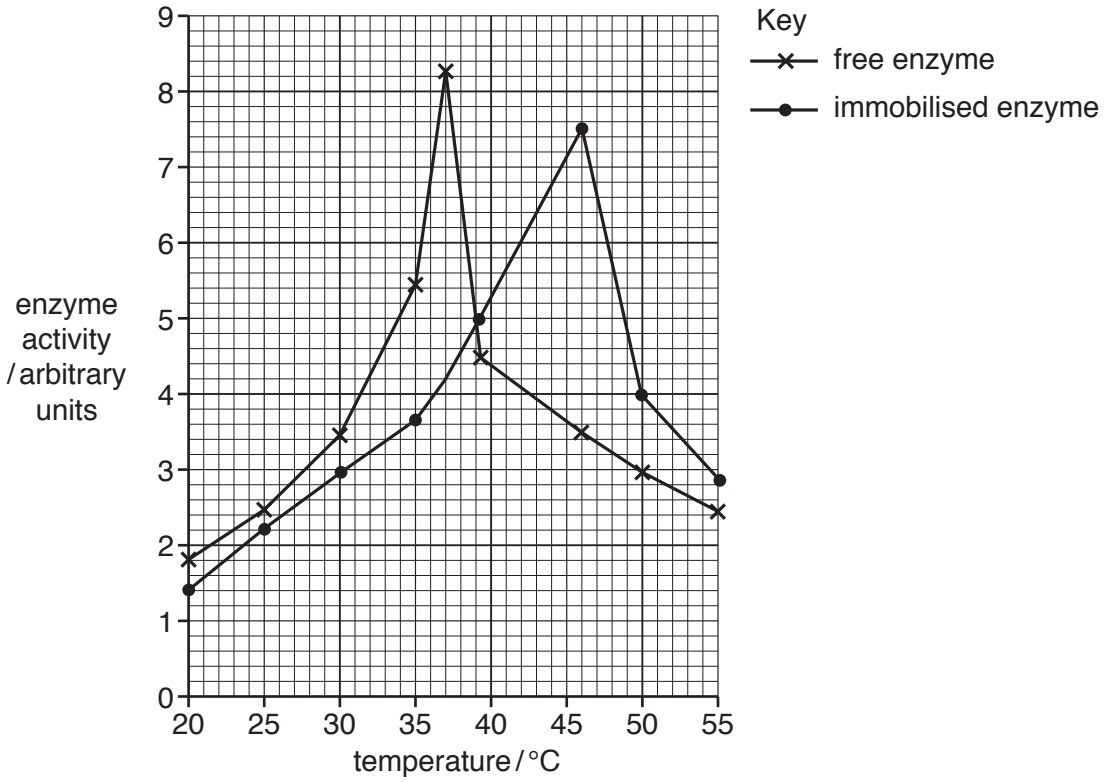



**Fig. 4.2**

**(d)** With reference to Fig. 4.2, compare the results for the enzyme activity when free in solution and when immobilised.

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

**(e)** State how the Michaelis–Menten constant ($K_m$) is derived from $V_{max}$ for an enzyme.

.....

.....

.....[1]

**(f)** The $K_m$ values for starch phosphorylase were determined when free in solution and when immobilised.

The $K_m$ values were:

- free in solution, $K_m = 0.34\,mmol\,dm^{-3}$
- immobilised, $K_m = 0.84\,mmol\,dm^{-3}$.

Suggest an explanation for the difference between the two values.

.....

.....

.....

.....

.....

.....[2]

[Total: 13]

© UCLES 2017

**5** Fig. 5.1 is a transmission electron micrograph of part of a cell.

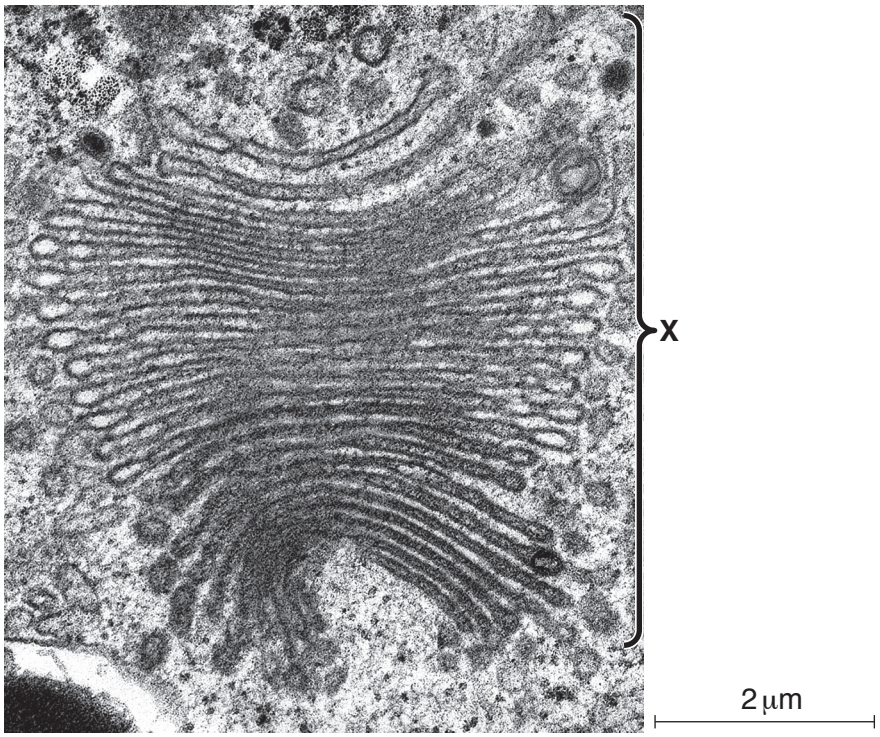



**Fig. 5.1**

**(a) (i)** Name the organelle labelled **X**.

.....[1]

**(ii)** Put a tick (✓) in the box beside the type, or types, of cell that contain this organelle.

| | |
|---|---|
| animal cell | |
| plant cell | |
| bacterial cell | |

[1]

**(b)** Use the scale bar to calculate the magnification of Fig. 5.1.

Write down the formula and use it to make your calculation. Show your working.

*formula*

magnification × .....[3]

© UCLES 2017

**(c)** The organelle in Fig. 5.1 is made from structures surrounded by a single membrane.

Name **two** organelles that are surrounded by double membranes.

.....[2]

**(d)** **(i)** The structure of the cell surface membrane is described as a fluid mosaic.

Explain what is meant by the term *fluid mosaic*.

.....

.....

.....

.....

.....

.....

.....[2]

**(ii)** Outline the roles of the cell surface membrane.

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 13]

**6** Plants have two transport tissues, xylem and phloem.

**(a)** Describe **and** explain **two** ways in which the structure of xylem vessels is adapted to their function.

*description 1* .....

.....

*explanation 1* .....

.....

.....

*description 2* .....

.....

*explanation 2* .....

.....

.....[2]

**(b)** Describe **two** differences between the vessels that transport phloem sap in flowering plants and the vessels that transport blood in mammals.

.....

.....

.....

.....

.....

.....[2]

© UCLES 2017

Fig. 6.1 shows root hair cells.

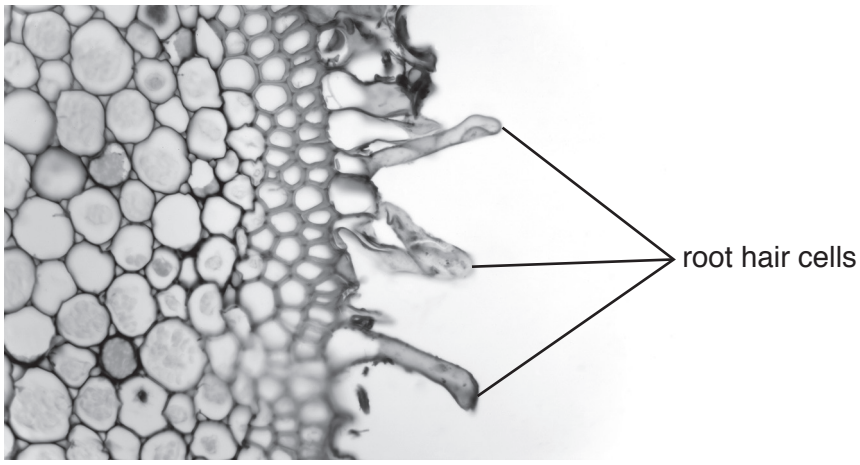



**Fig. 6.1**

**(c)** Explain why the root hair cells in Fig. 6.1 have more mitochondria than the other root cells shown.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 7]

© UCLES 2017

**BLANK PAGE**

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© UCLES 2017

Cambridge International AS & A Level

**Cambridge International Examinations**
Cambridge International Advanced Subsidiary and Advanced Level

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CANDIDATE NAME | | | | | | | | | |
| CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | |

*7347358412*

**BIOLOGY** **9700/22**

Paper 2 AS Level Structured Questions **October/November 2017**

**1 hour 15 minutes**

Candidates answer on the Question Paper.

No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.



DC (LK/SW) 127829/3
© UCLES 2017

CAMBRIDGE International Examinations

Answer **all** questions.

**1** The root apical meristem is a region of undifferentiated cells in the root tips of plants. Mitosis occurs in this region.

**(a)** Fig. 1.1 is an image of the root tip of *Allium* as observed using a microscope with a low-power objective lens.

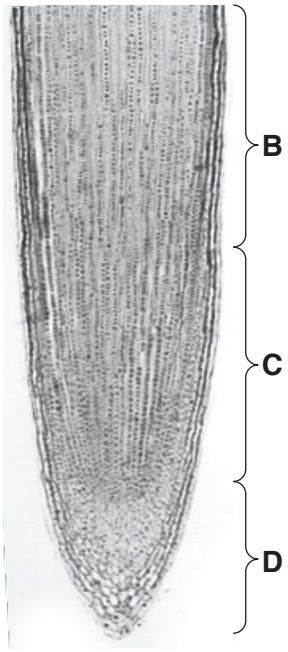



**Fig. 1.1**

State which region, **B**, **C**, or **D**, should be chosen in order to observe the highest proportion of cells in stages of mitosis.

.....[1]

© UCLES 2017

**(b) (i)** Draw a labelled diagram to show the structure of a chromosome at late prophase of mitosis.

[3]

**(ii)** Describe the behaviour of the nuclear envelope during mitosis.

.....

.....

.....

.....

.....[2]

[Total: 6]

**2** Triglycerides and phospholipids are types of lipid.

Fig. 2.1 shows the structure of one type of phospholipid known as phosphatidylcholine.
F1 and F2 are fatty acid residues.

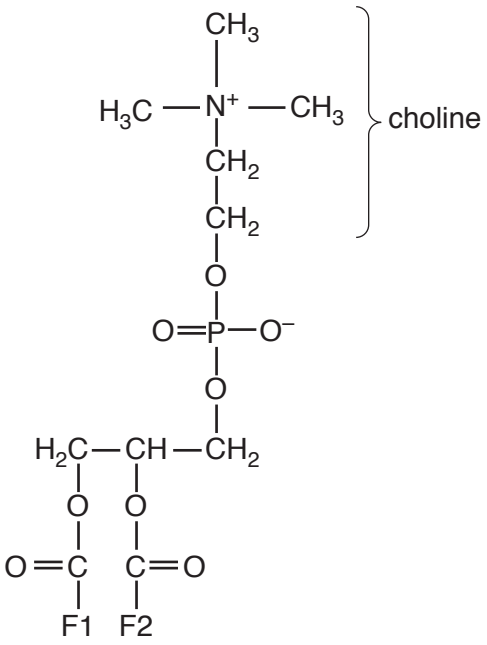



**Fig. 2.1**

**(a)** Phospholipase is an enzyme that can break down phospholipids. This enzyme is found in the venom of some insects, such as bees.

Bee venom can destroy red blood cells, a condition known as haemolysis.

Suggest how bee venom destroys red blood cells.

.....

.....

.....

.....

.....

.....

.....[2]

**(b)** Compare, stating similarities and differences, the structure of the phosphatidylcholine shown in Fig. 2.1 with the structure of a triglyceride molecule.

*similarities* .....

.....

.....

.....

.....

.....

.....

*differences* .....

.....

.....

.....

.....

.....

.....

.....[4]

**(c)** Name **and** describe the cell structure in which the synthesis of triglycerides and other lipids takes place.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 9]

**3** Hydrolytic enzymes can function within the cell or can be secreted by the cell, where they are able to catalyse reactions.

**(a)** State the term used to describe an enzyme that functions within the cell.

.....[1]

**(b)** The rates of reaction of two different hydrolytic enzymes, enzyme **G** and enzyme **H**, were measured at different substrate concentrations. The results are shown in Fig. 3.1.

The two enzymes have different values of the Michaelis–Menten constant ($K_m$).

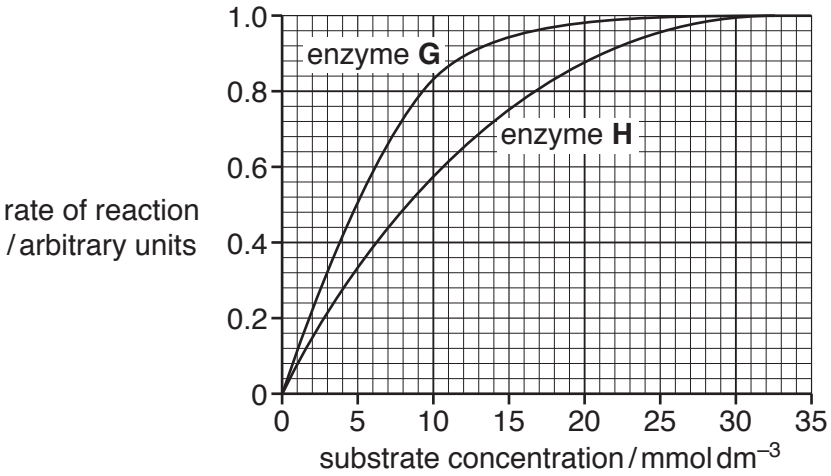



**Fig. 3.1**

**(i)** The $K_m$ value of enzyme **G** is 5 mmol dm$^{-3}$.

Use Fig. 3.1 to derive the $K_m$ value for enzyme **H**.

Show your working.

.....

.....

.....

.....[2]

**(ii)** With reference to Fig. 3.1, explain how the values of $K_m$ for these enzymes provide information about the relationship between the enzyme and their substrates.

.....

.....

.....

.....

.....[2]

© UCLES 2017

Cells can break down an old or damaged organelle, such as a mitochondrion, by enclosing the organelle in a membrane formed from the endoplasmic reticulum. This forms a vacuole. Vesicles containing hydrolytic enzymes fuse with the vacuole and the organelle is then digested.

**(c)** Name the vesicles in the cell that contain hydrolytic enzymes.

.....[1]

**(d)** The cell has internal chemical messengers that signal when an old or damaged mitochondrion should be broken down.

Suggest **one** feature involving mitochondrial structure or function that could lead to the release of these internal signals.

.....

.....[1]

**Question 3 continues on page 8**

**(e)** Glucocerebrosidase is an enzyme synthesised by macrophages to hydrolyse glucocerebroside, a glycolipid found in cell membranes.

The *GBA* gene codes for glucocerebrosidase. There are a number of different mutations of the *GBA* gene. Some mutations result in a single amino acid change in the enzyme molecule produced, and this causes a disorder known as Gaucher's disease. Two of these mutations, at different positions in the *GBA* gene, are shown in Table 3.1.

**Table 3.1**

| **amino acid change caused by mutation** | | | **severity of Gaucher's disease** |
|---|---|---|---|
| | **from** | **to** | |
| mutation 1 | asparagine (Asn) | serine (Ser) | mild |
| mutation 2 | leucine (Leu) | proline (Pro) | severe |

With reference to Table 3.1,

- outline how a mutation leads to a single amino acid change in the enzyme glucocerebrosidase **and**
- suggest why the two different amino acid changes, Asn to Ser and Leu to Pro, will result in differences in the tertiary structure of the enzyme.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[5]

[Total: 12]

© UCLES 2017

**4** Fig. 4.1 is a transmission electron micrograph of the bacterium that causes cholera, *Vibrio cholerae*.

The flagellum shown in Fig. 4.1 allows movement of the bacterium within the gut and may also function to help it to bind to an intestinal epithelial cell. The organism does not enter the cell but the toxin it releases can enter and cause damage. Large quantities of water, chloride ions and sodium ions are lost from the cell.




**Fig. 4.1**

People with symptoms of cholera have severe watery diarrhoea and as a result can become very dehydrated.

**(a)** Explain how a loss of chloride ions and sodium ions from the intestinal epithelial cell will cause a loss of water from the cell.

.....

.....

.....

.....

.....[2]

**(b)** The main treatment for cholera is oral rehydration therapy (ORT) using oral rehydration salts (ORS). This involves drinking a solution of electrolytes (mineral ions) and glucose.

Fig. 4.2 summarises the movement of glucose and sodium ions across an intestinal epithelial cell.

Fig. 4.2 includes three different types of cell surface membrane proteins:

- SGLT1 is a cotransporter protein
- GLUT2 and $Na^+/K^+$ pump are two types of carrier protein.

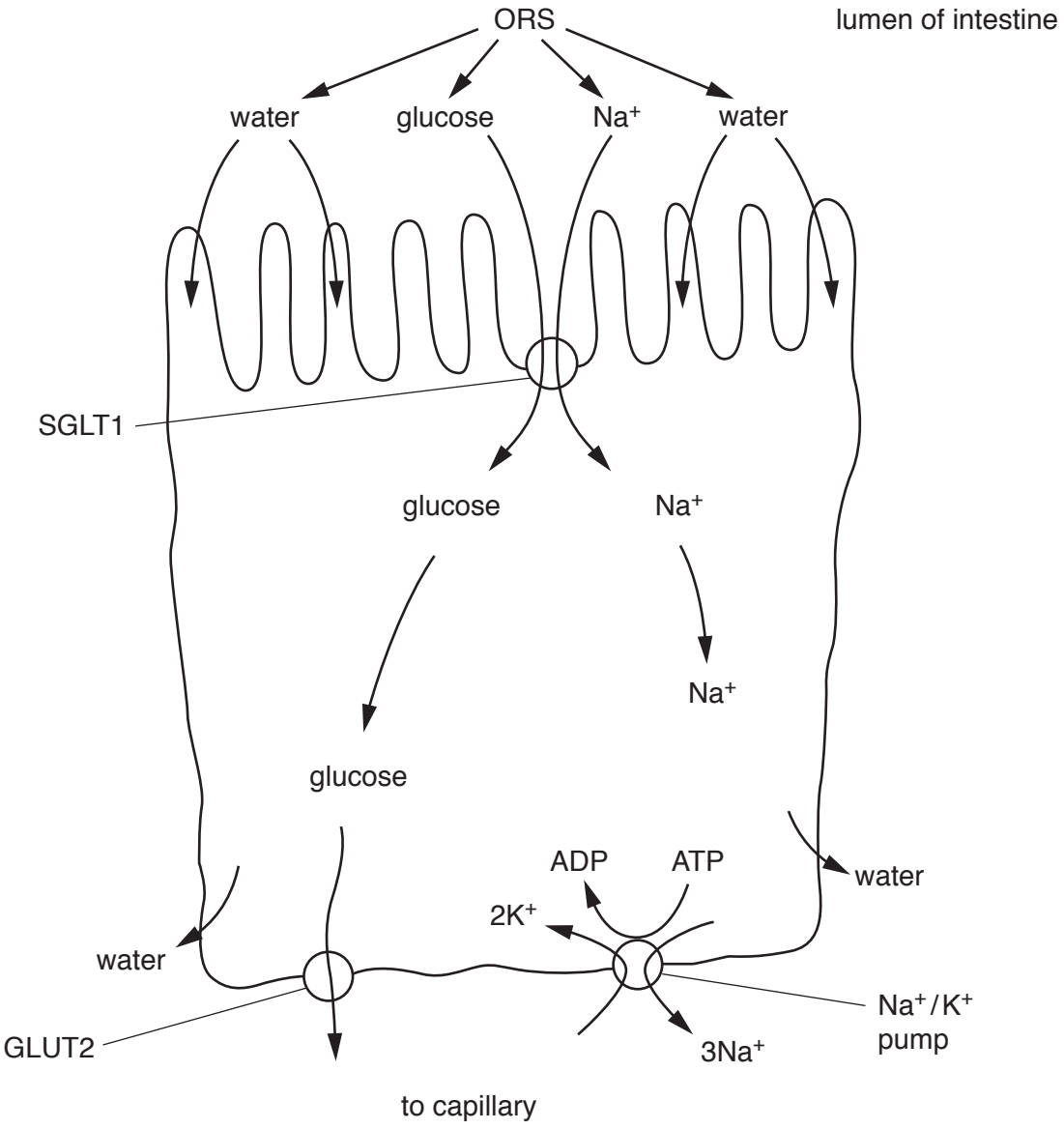



**Fig. 4.2**

The first rehydrating solution developed for the treatment of cholera did not contain glucose. Using ORS, patients absorb a higher concentration of sodium ions and there is an increase in water uptake.

With reference to Fig. 4.2:

- outline the transport mechanisms that result in the movement of glucose and sodium ions across the intestinal epithelial cell
- suggest how the movement of glucose and sodium ions increases water uptake by the cell.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

**(c)** In severe cases of cholera, the rehydrating solution is given intravenously, as a drip directly into a vein.

Suggest **one** reason why the rehydrating solution is given as a drip directly into a vein rather than into an artery.

.....

.....

.....[1]

In very severe cases of cholera, antibiotics are also prescribed. The preferred antibiotic for treatment of cholera is a single dose of doxycycline, a form of tetracycline antibiotic.

**(d)** Tetracycline binds to a ribosomal subunit.

Suggest what effect this will have on the metabolism of *V. cholerae*.

.....

.....[1]

© UCLES 2017

**[Turn over**

**(e)** A study was carried out to compare the effectiveness of the antibiotic tetracycline in the treatment of 118 patients with cholera. The patients were divided into four different treatment groups:

- Group **A**, given one dose of 1 g tetracycline
- Group **B**, given one dose of 2 g tetracycline
- Group **C**, given a multiple dose (one dose of 500 mg tetracycline every 6 hours for 24 hours)
- Group **D**, no antibiotic given.

Following treatment, the volume of diarrhoea collected from each patient was measured every 16 hours for 128 hours. Fig. 4.3 shows the mean volume collected for each group.

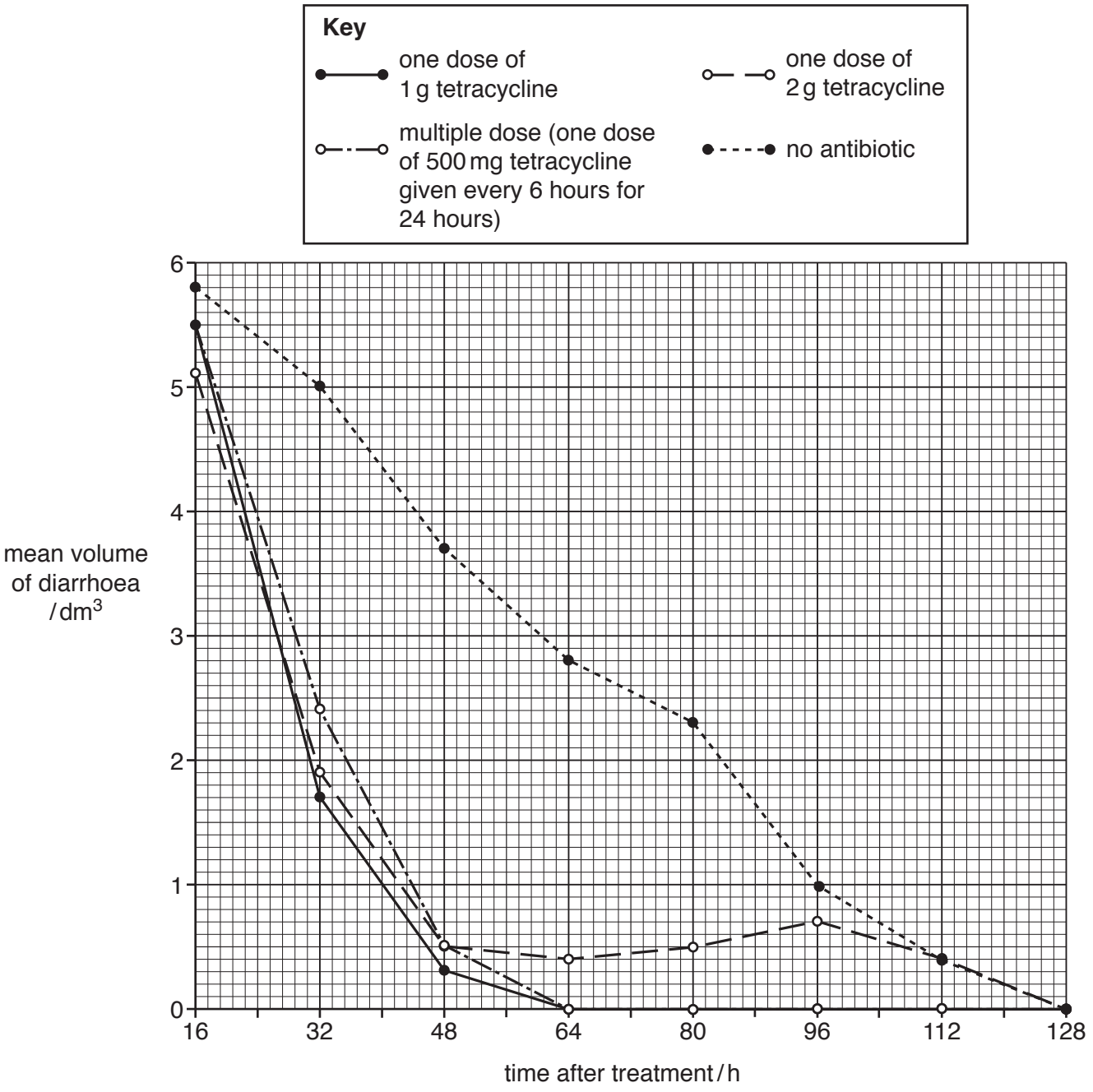



**Fig. 4.3**

© UCLES 2017

**(i)** Describe the trends shown in Fig. 4.3.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[3]

**(ii)** Explain whether the results support, or do not support, treating very severe cases of cholera with tetracycline.

.....

.....

.....

.....

.....[2]

**(f)** Some strains of *V. cholerae* are antibiotic resistant.

Explain why this means that medical practitioners prefer to treat cholera with a single dose of antibiotic, rather than a multiple dose of the same antibiotic.

.....

.....

.....

.....

.....

.....[2]

**(g)** Most people who have recovered from cholera rarely become ill again from the disease. In these people, antibodies have been identified that will bind either to the cholera toxin, or to the bacterial flagellum, or to the main bacterial cell.

Explain why the antibodies are different, each one specific to its target.

.....

.....

.....

.....

.....

.....

.....[3]

**(h)** Evidence suggests that newborn babies of mothers who have had cholera have immunity to the disease.

State **precisely** the type of immunity these babies are likely to have.

.....[1]

[Total: 19]

© UCLES 2017

5 **(a)** Descriptions **A**, **B** and **C** relate to the movement of water from the soil to the xylem in roots.

State the correct term to match each of the descriptions **A**, **B** and **C**.

**A** The specialised root epidermal cell that provides a large surface area for the uptake of water from the soil.

.....

**B** The band of suberin in the cell walls of the endodermis that prevents the movement of water by the apoplastic pathway.

.....

**C** The cell structures that allow water to pass from one cell to the next as part of the symplastic pathway.

.....

[3]

**(b)** Explain, with reference to the structure of xylem vessel elements, why water does **not** take a symplastic pathway in the xylem to the leaves.

.....

.....

.....

.....

.....[2]

**(c)** Explain why the rate of movement of water in the xylem may slow down at night.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 8]

© UCLES 2017

**[Turn over**

**6** Fig. 6.1 is a diagram of a vertical section through the mammalian heart. The labels **Q** to **X** represent valves and blood vessels of the heart.

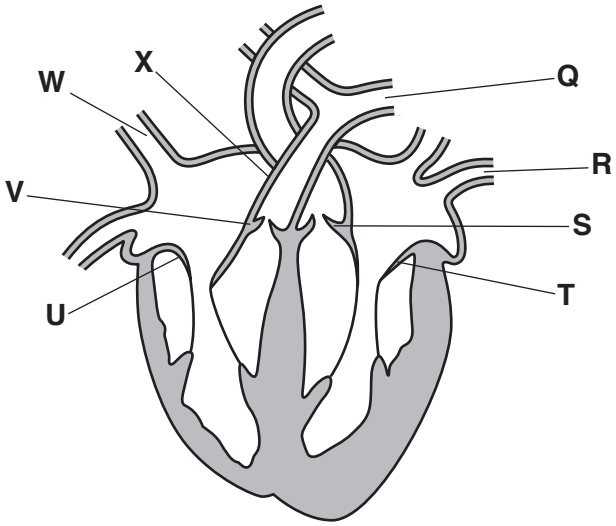



**Fig. 6.1**

**(a) (i)** State which label represents the valve that prevents the backflow of blood from the aorta into the ventricle.

.....[1]

**(ii)** Name the blood vessel that carries oxygenated blood from the lungs to the heart **and** state which label represents this blood vessel.

*name* .....

*label* .....[2]

**(b)** State **precisely** where the sinoatrial node is located.

.....[1]

**(c)** Explain the role of the atrioventricular node in the coordination of heart action.

.....

.....

.....

.....[2]

[Total: 6]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

Cambridge International AS & A Level

**Cambridge International Examinations**
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

*7949124229*

**BIOLOGY** **9700/23**

Paper 2 AS Level Structured Questions **October/November 2017**

**1 hour 15 minutes**

Candidates answer on the Question Paper.

No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **15** printed pages and **1** blank page.


© UCLES 2017

CAMBRIDGE International Examinations

Answer **all** questions.

**1** Fig. 1.1 is a transmission electron micrograph of a part of an animal cell.




**Fig. 1.1**

**(a)** Calculate the actual width of the organelle labelled **A**, as shown by line **X**–**Y**.

State the formula that you will use and show your working.

Give your answer in μm and to one decimal place.

*formula*

..... μm [3]

**(b)** **(i)** Name the organelle **A** and state its role in cells.

*name* .....

*role* .....

.....

.....[2]

© UCLES 2017

**(ii)** Name the cell structure labelled **B** and state **one** reason for your answer.

*name* .....

*reason* .....

.....

.....[2]

[Total: 7]

**2** **(a)** Explain why the wall of the left ventricle in the heart is thicker than the wall of the right ventricle.

.....

.....

.....

.....

.....

.....[2]

Fig. 2.1 shows the heart and blood vessels at three stages of the cardiac cycle.

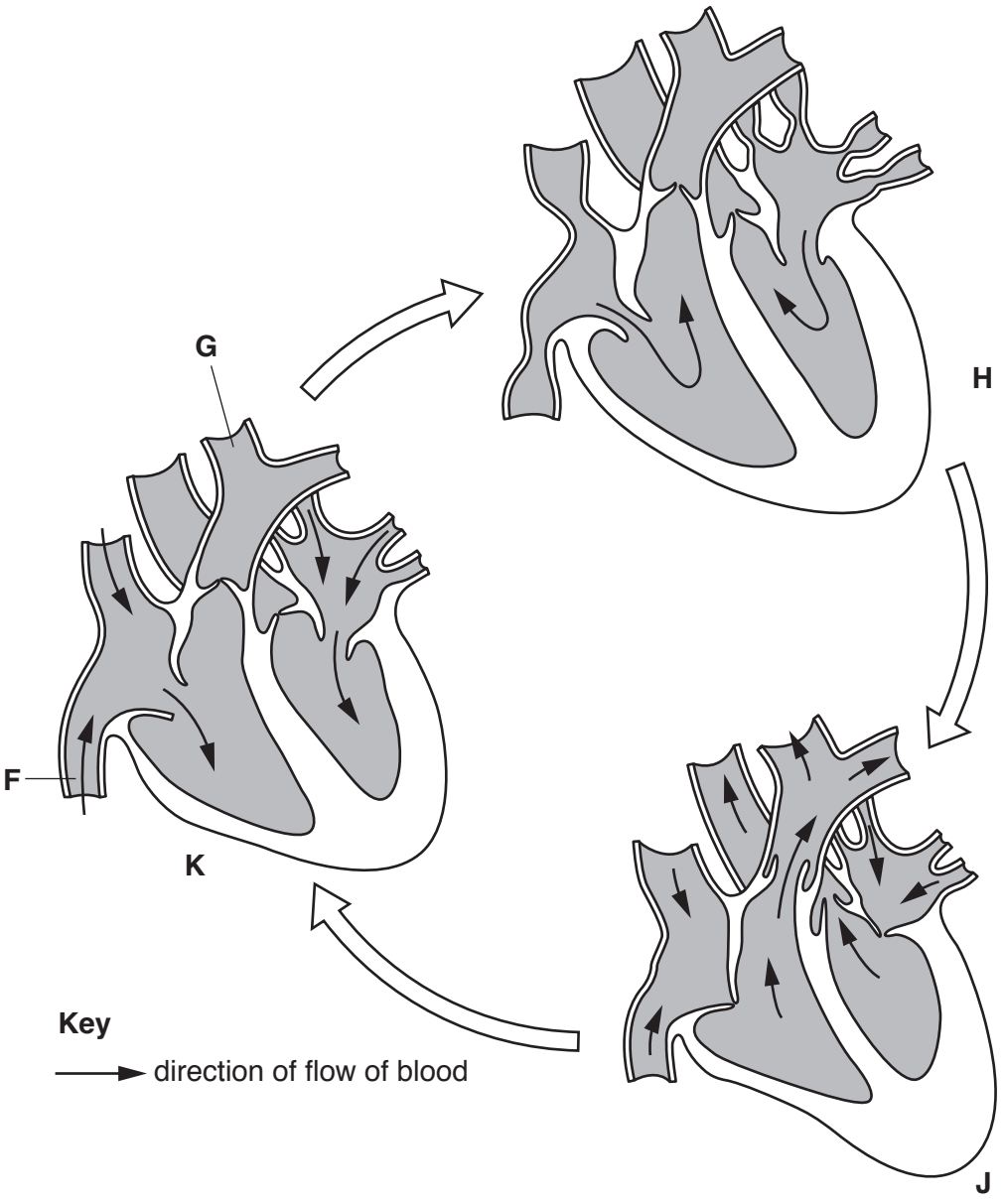



**Fig. 2.1**

**(b) (i)** Name the blood vessels labelled **F** and **G**.

**F** .....

**G** .....[2]

**(ii)** Name the stage of the cardiac cycle at **K**.

.....[1]

**(c)** Describe what happens in the heart between stages **H** and **J** as shown in Fig. 2.1.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[5]

[Total: 10]

**3** Fig. 3.1 shows the structure of an alveolus and surrounding structures in a mammalian lung. The lining of each alveolus is formed by two types of epithelial cell, alveolar type 1 and alveolar type 2.

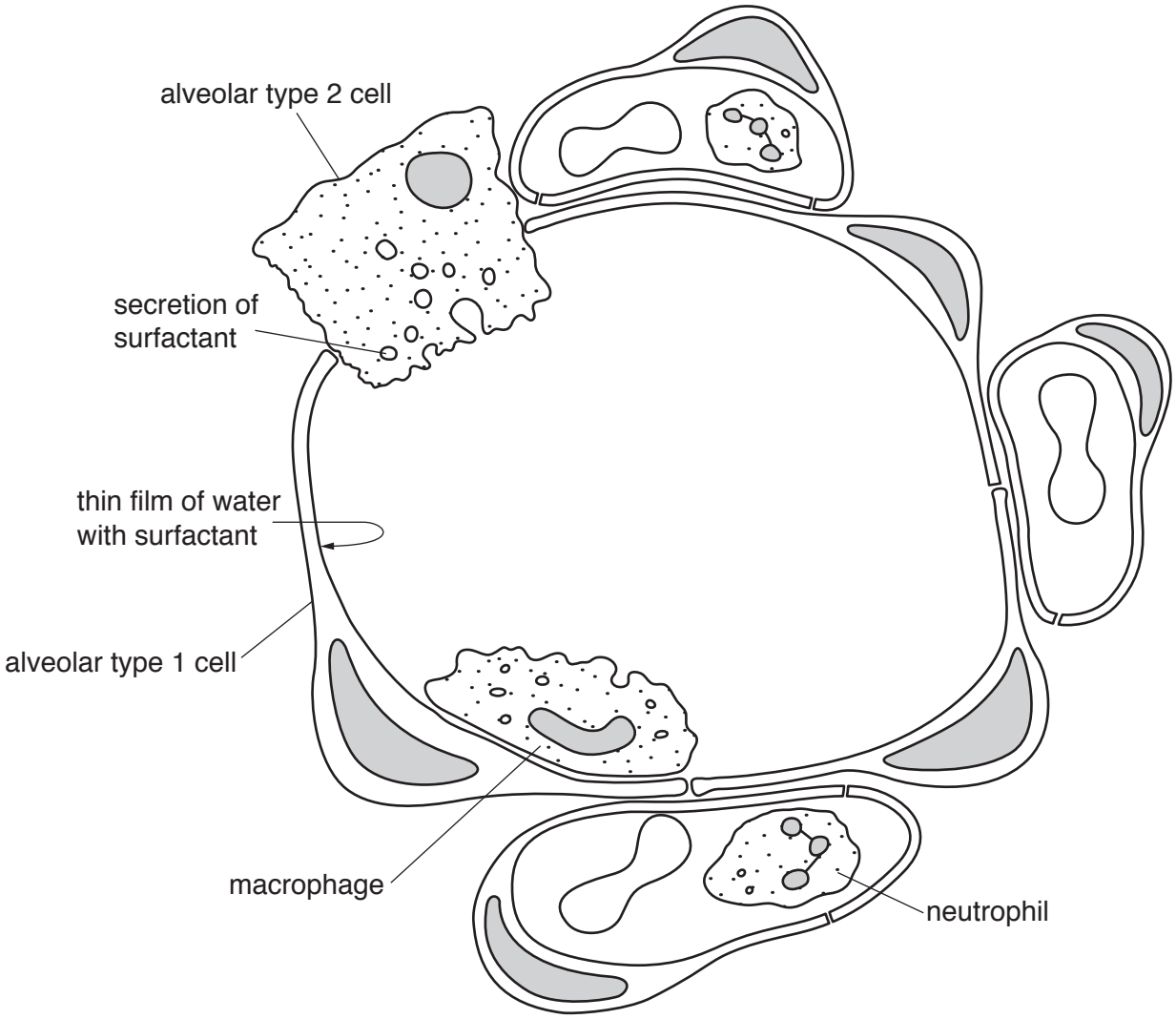



**Fig. 3.1** not to scale

**(a)** Explain how the structure of an alveolar type 1 cell is adapted to its function.

.....

.....

.....

.....

.....

.....[2]

**(b)** Alveolar type 2 cells secrete pulmonary surfactant into the watery fluid that lines the alveolus. The surfactant reduces the surface tension of the fluid so that the alveolus does not collapse.

Pulmonary surfactant is a mixture of phospholipids and proteins. The phospholipids form a monolayer on the surface of the fluid.

Explain how phospholipids interact with water to form a monolayer on the surface of the fluid.

.....

.....

.....

.....

.....[2]

Macrophages and neutrophils are found in the lungs, as shown in Fig. 3.1.

**(c)** Describe the role of macrophages in the lungs.

.....

.....

.....

.....

.....

.....

.....[3]

**(d)** Neutrophils leave the blood and secrete the extracellular enzyme, elastase.

**(i)** Suggest why neutrophils secrete elastase.

.....

.....

.....

.....

.....[2]

**(ii)** The protein alpha-1 antitrypsin is produced in cells in the liver and is transported to the lungs, where it inhibits the action of elastase.

Some people produce a different form of this protein that remains within liver cells. These people are at an increased risk of developing emphysema, in which alveolar walls break down. Emphysema is one of the conditions associated with chronic obstructive pulmonary disease (COPD).

Explain why these people are at increased risk of developing emphysema.

.....

.....

.....

.....

.....

.....[3]

[Total: 12]

**BLANK PAGE**

**4** Malaria is a disease transmitted by a vector.

**(a) (i)** State the name of the pathogen that causes malaria.

.....[1]

**(ii)** State the name of the vector that transmits the pathogen.

.....[1]

In 2014, the World Health Organization (WHO) estimated that 3200 million people were at risk of malaria. This was almost half of the world population in 2014.

Table 4.1 shows the number of cases of malaria and the number of deaths from malaria between 1998 and 2013. The table shows numbers for all the countries of the world and for the countries in the WHO African region.

The table also shows the numbers in the African region as percentages of the numbers for all countries.

**Table 4.1**

| year | number of cases of malaria in millions | | cases in the African region as a percentage of all countries | number of deaths from malaria in thousands | | deaths in the African region as a percentage of all countries |
|---|---|---|---|---|---|---|
| | all countries | African region | | all countries | African region | |
| 1998 | 272.9 | 237.6 | 87.1 | 1110.0 | 961.0 | 90.1 |
| 2003 | 236.0 | 186.6 | 79.1 | 872.0 | 800.0 | 91.7 |
| 2008 | 225.1 | 181.0 | 80.4 | 747.0 | 677.0 | 90.6 |
| 2013 | 198.0 | 158.4 | 80.0 | 584.0 | 525.6 | 90.0 |

**(b)** Describe the trends shown in Table 4.1.

.....

.....

.....

.....

.....

.....

.....[3]

© UCLES 2017

**(c)** Suggest reasons why the number of cases of malaria and the number of deaths from malaria changed between 1998 and 2013.

.....

.....

.....

.....

.....

.....

.....[3]

**(d)** Malaria is very difficult to control even though there is improved understanding of the disease.

Explain why malaria is very difficult to control.

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 12]

**5** The tree species *Caryocar brasiliense* grows in areas where there is very little rainfall for five months of the year. During this long dry season the trees have mechanisms to reduce the rate of transpiration.

An investigation was carried out on *C. brasiliense* to find out how the rate of transpiration and the mean water potential of leaf cells changed over 12 hours in one day during the dry season.

The results are shown in Fig. 5.1 **A** and **B**.

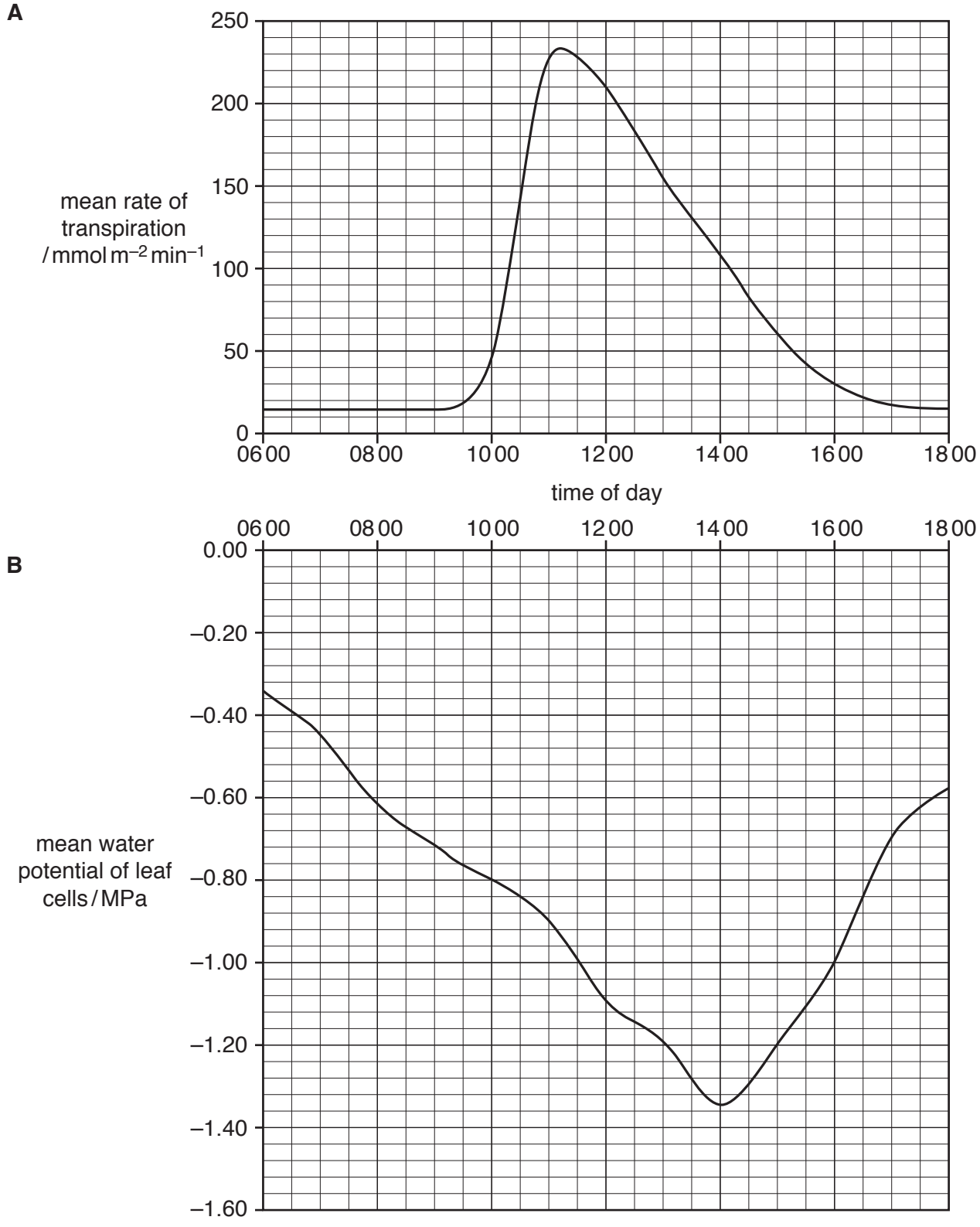



**Fig. 5.1**

© UCLES 2017

**(a)** Define the term *transpiration*.

.....

.....

.....

.....[2]

**(b)** With reference to Fig. 5.1**A** and **B**, describe the changes recorded in the mean water potential of leaf cells over the 12 hour period. Suggest explanations for these changes.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

**(c)** The tree *C. brasiliense* is able to survive through long dry periods.

Many plant species that live in areas with little rainfall have features that reduce transpiration rates. Some adaptations reduce the water potential gradient for water vapour between the air spaces inside the leaves and the surrounding air.

Outline how leaves are adapted to reduce transpiration rates in this way.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 9]

© UCLES 2017

**[Turn over**

**6** Extracellular growth factors are involved in the control of cell cycles in some mammalian cells. One of these growth factors is epidermal growth factor (EGF).

Fig. 6.1 shows the events that occur when EGF is present at the surfaces of two cells, **A** and **B**.

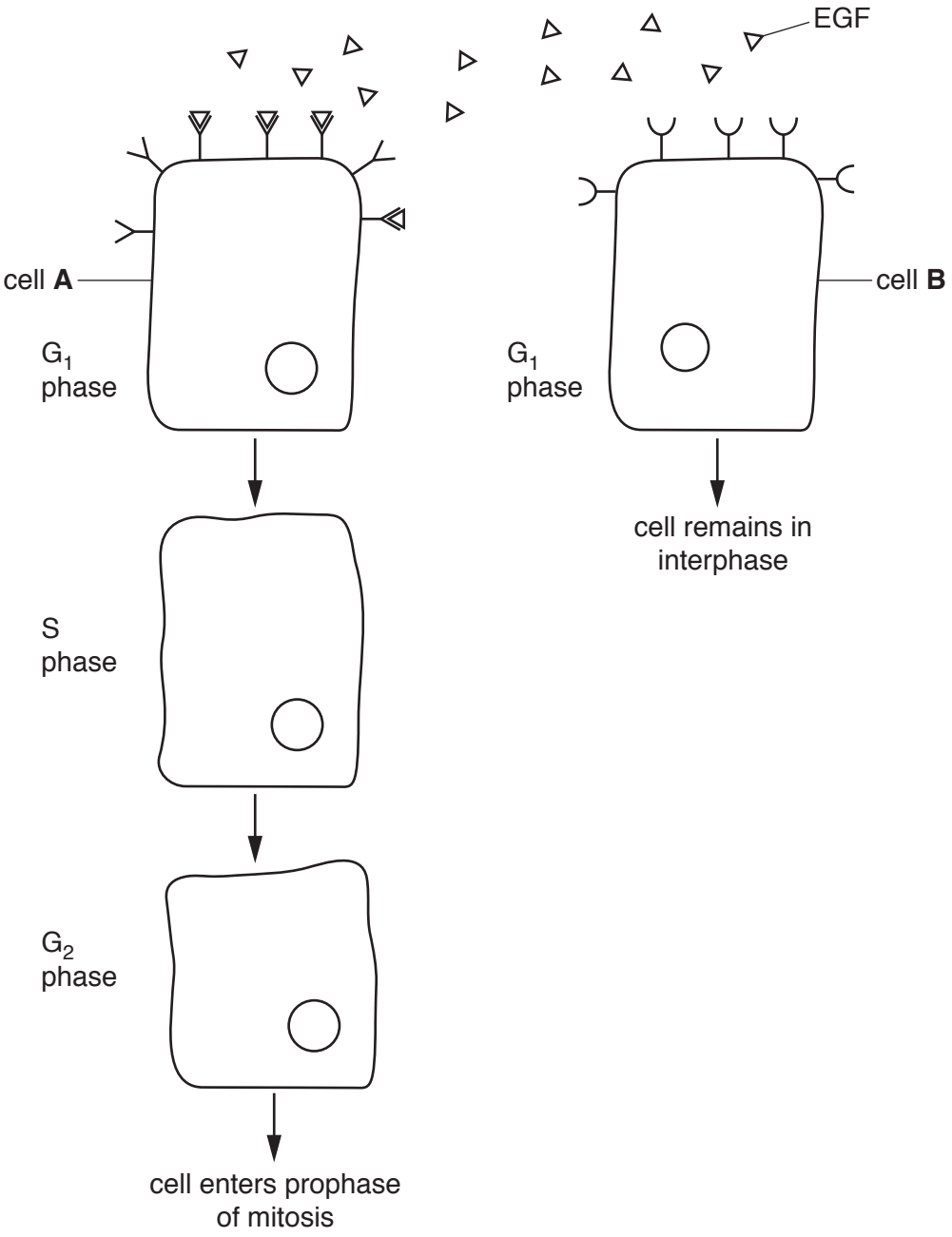



**Fig. 6.1**

**(a)** Explain why cell **A** in Fig. 6.1 responds to EGF, but cell **B** does not.

.....

.....

.....

.....

.....[2]

**(b)** In the cell cycle, more mRNA is produced in the $G_1$ phase than during mitosis.

Suggest why this is so.

.....

.....

.....

.....[1]

**(c)** DNA is replicated during the S phase of the cell cycle. EGF is one of many factors that stimulate the change from the $G_1$ phase to the S phase.

State the substances used to synthesise DNA during the S phase.

.....

.....

.....

.....

.....[3]

**Question 6 continues on page 16**

**(d)** Fig. 6.2 is a drawing of chromosome 1 from rice, *Oryza sativa*, during metaphase of mitosis.

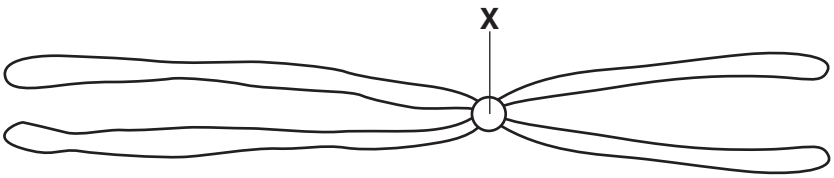



**Fig. 6.2**

**(i)** State the name and function of the region of the chromosome labelled **X**.

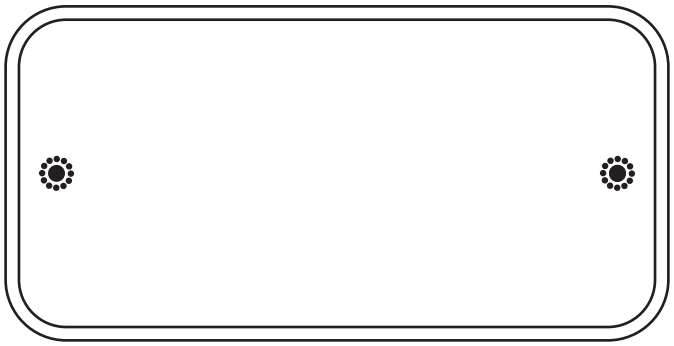
*name* .....

*function* .....

.....

.....[2]

**(ii)** In the outline of the cell below, draw the chromosome from Fig. 6.2 as it would appear in anaphase of mitosis.



[2]

[Total: 10]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.