Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

4540758268

BIOLOGY **9700/21**

Paper 2 Structured Questions AS **May/June 2015**

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 in the spaces at the top of the page.
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 **16** printed pages.

© UCLES 2015

CAMBRIDGE International Examinations

PAPA CAMBRIDGE

Answer **all** the questions.

1 A student investigated growth in the roots of broad bean, *Vicia faba*. The student cut sections of the root tip of this plant and viewed them with a light microscope.

Fig. 1.1 is a photomicrograph of one of the sections. The cell labelled **D** is in interphase.

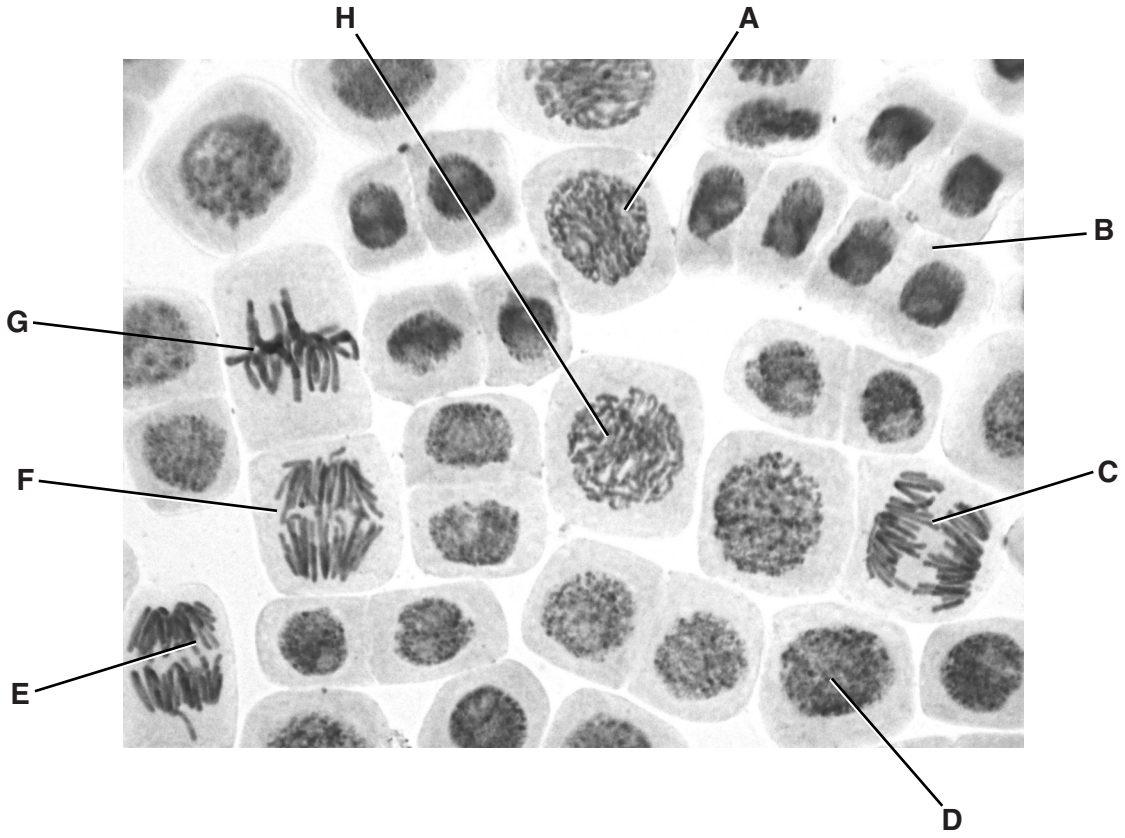


Fig. 1.1

(a) Complete the table below by:

- naming the stages of mitosis in the correct sequence following interphase
- identifying **one** example from the cells labelled **A** to **H** that is in each stage of mitosis that you have named.

stage of mitosis	label from Fig. 1.1

[5]

PAPA CAMBRIDGE

(b) In animal cells, centrioles are responsible for assembling microtubules to make the spindle at the beginning of mitosis.

Describe the role of the spindle during mitosis.

.....

.....

.....

.....

.....

.....[2]

(c) State two roles of mitosis in plants and animals **other than growth**.

1 .....

2 .....[2]

PAPA CAMBRIDGE

(d) *V. faba* is a legume. Roots of legumes often have swellings at intervals known as nodules. Cells within the nodules contain nitrogen-fixing bacteria.

(i) Explain the role of nitrogen fixation in the nitrogen cycle.

.....

.....

.....

.....

.....

.....[2]

(ii) Farmers in some parts of the world grow legume crops together with cereal crops in the same field. This is known as intercropping.

Explain how intercropping results in an increase in the yield of the cereals when the legumes die.

.....

.....

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 14]

© UCLES 2015

PAPA CAMBRIDGE

2 Pathogens enter the body in a variety of ways, including through the gas exchange system. The body has several defence mechanisms against the entry of pathogens and their spread throughout the body.

Fig. 2.1 is an electron micrograph of a cross section of the lining of a bronchiole.

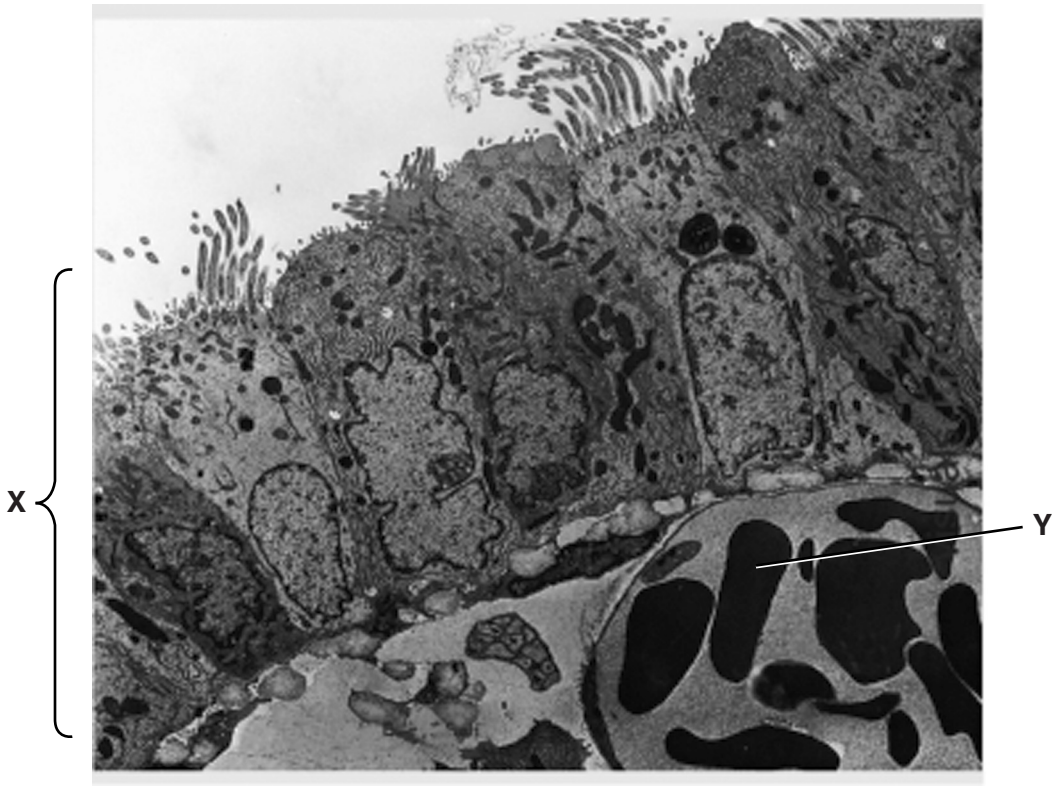


Fig. 2.1

(a) (i) Name tissue **X** and cell **Y**.

X .....

Y .....[2]

(ii) With reference to the structures visible in Fig. 2.1, state three ways in which the lining of the trachea, bronchus and bronchioles provides protection against the entry of bacterial pathogens.

1 .....

.....

2 .....

.....

3 .....

.....[3]

© UCLES 2015

[Turn over

PAPA CAMBRIDGE

Fig. 2.2 shows part of the immune response to the first infection by a bacterial pathogen that has entered the body through the lining of a bronchiole. **J** and **K** are stages in the immune response.

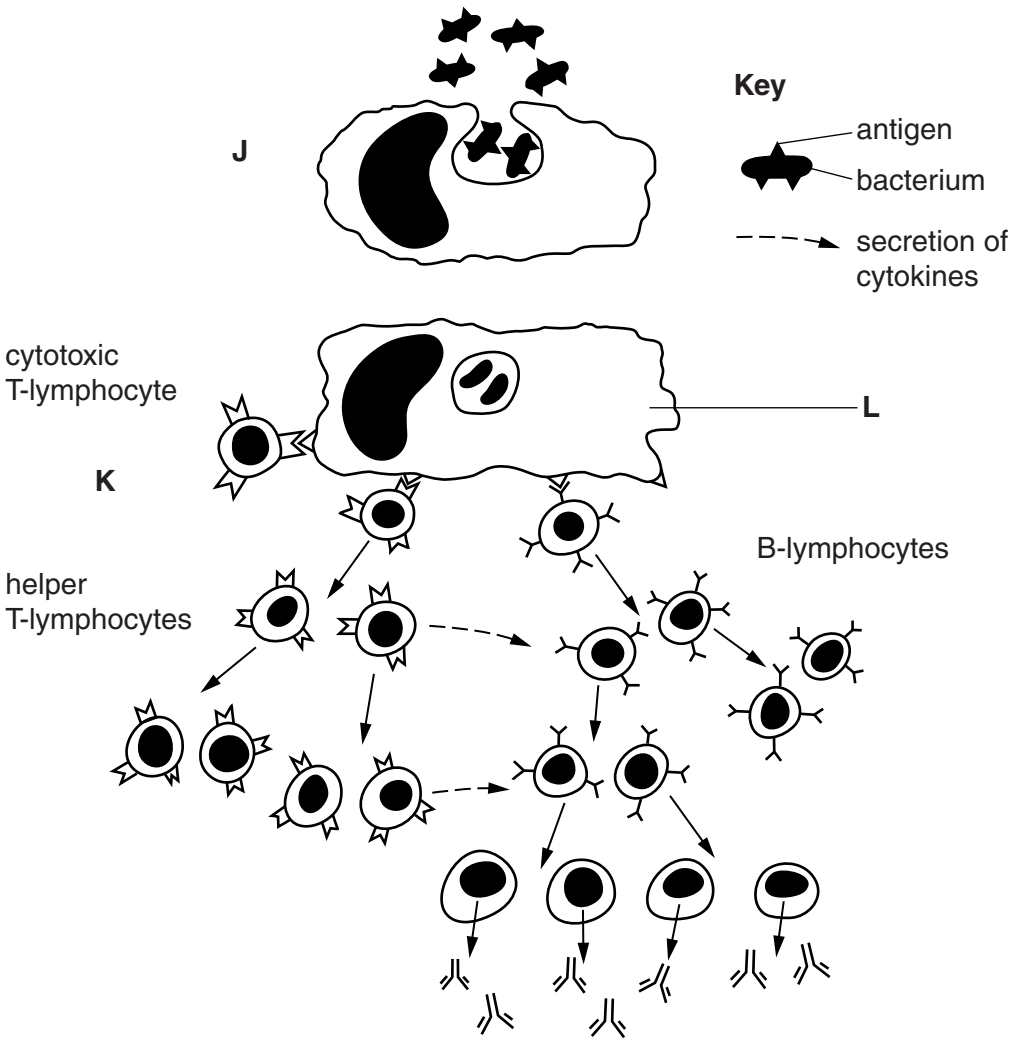


Fig. 2.2

(b) (i) State what is happening at stage **J**.

.....

.....[1]

(ii) Explain the role of cell **L** at stage **K** in the immune response.

.....

.....

.....

.....

.....[2]

PAPA CAMBRIDGE

(c) With reference to Fig. 2.2, explain how the response to a second infection by this bacterial pathogen differs from the first.

.....

.....

.....

.....

.....

.....

.....

.....

.....[3]

(d) There are various ways in which the effectiveness of immune responses can be reduced.

Suggest how each of the following reduces the effectiveness of an immune response.

(i) The number of T-lymphocytes is reduced in a person with HIV/AIDS.

.....

.....[1]

(ii) Some pathogens are covered in cell surface membranes from their host.

.....

.....[1]

(iii) B-lymphocytes do not mature properly and do not recognise any antigens.

.....

.....[1]

[Total: 14]

PAPA CAMBRIDGE

3 When a leaf is first formed it is described as a sink for carbohydrate. As the leaf continues to grow, it starts to photosynthesise and becomes a source of carbohydrates and other assimilates.

Fig. 3.1 shows the changes that occur to the structure of plasmodesmata in the leaf as it grows.

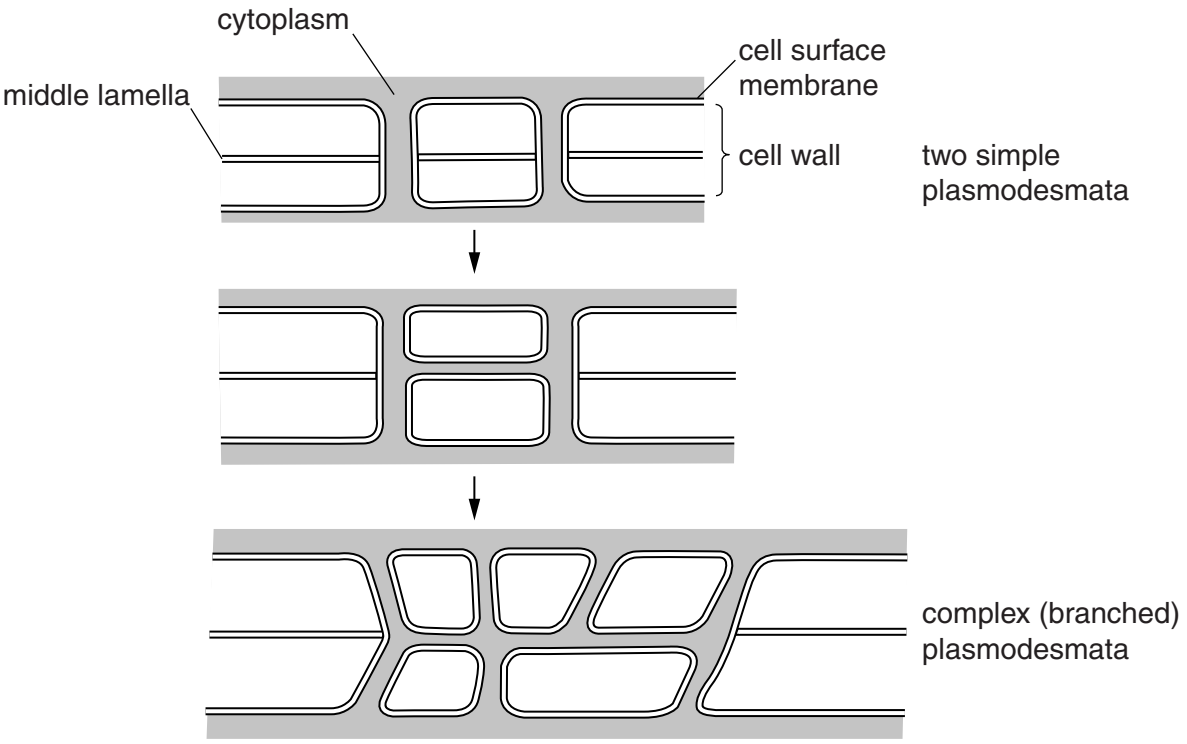


Fig. 3.1

(a) Suggest the advantage of complex plasmodesmata between cells in leaves.

.....

.....

.....

.....

.....[2]

© UCLES 2015

PAPA CAMBRIDGE

(b) Assimilates are transported into phloem sieve tubes.

Explain how assimilates in phloem sieve tubes move from the veins in a mature leaf to sinks, such as flowers and fruits, in the rest of the plant.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 6]

PAPA CAMBRIDGE

4 **(a)** Fig. 4.1 shows two ways in which enzymes interact with their substrates.

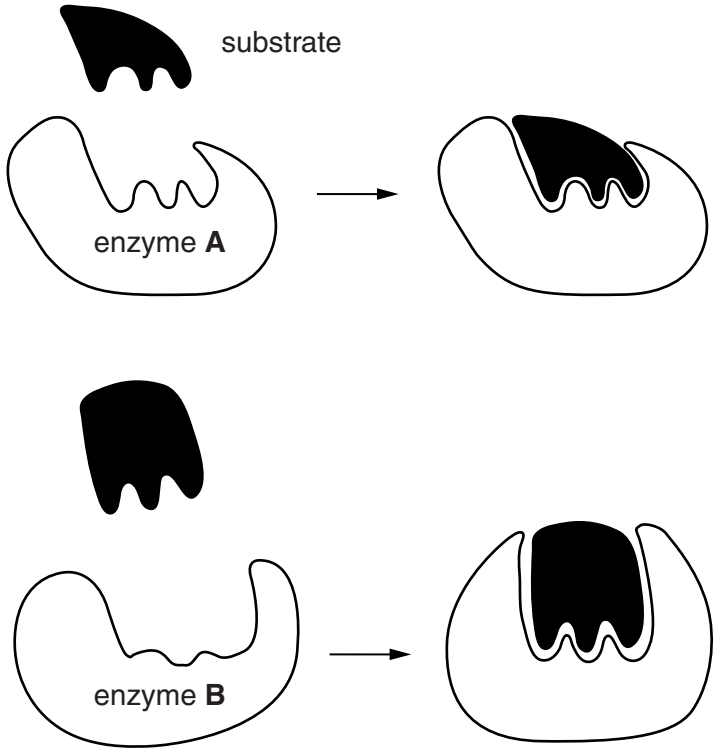


Fig. 4.1

Explain the difference between the two ways in which enzymes interact with their substrates as shown in Fig. 4.1.

.....

.....

.....

.....

.....

.....

.....[3]

PAPA CAMBRIDGE

(b) Carbonic anhydrase is an enzyme that is found in blood, liver and kidneys.
Fig. 4.2 shows a molecular model of this enzyme.

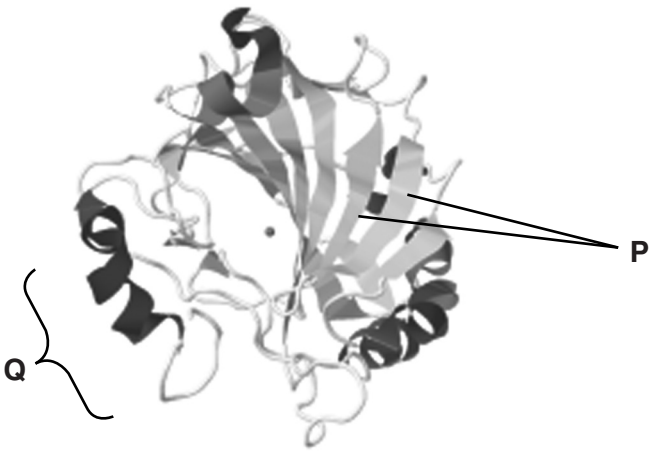


Fig. 4.2

(i) With reference to Fig. 4.2 and the parts labelled **P** and **Q**, explain the term *secondary structure*.

.....

.....

.....

.....

.....

.....

.....[3]

(ii) Describe the role of carbonic anhydrase in the blood.

.....

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 10]

PAPA CAMBRIDGE

5 Fig. 5.1 shows a diagram of the molecular structures of tristearin (a triglyceride) and phosphatidylcholine (a phospholipid).

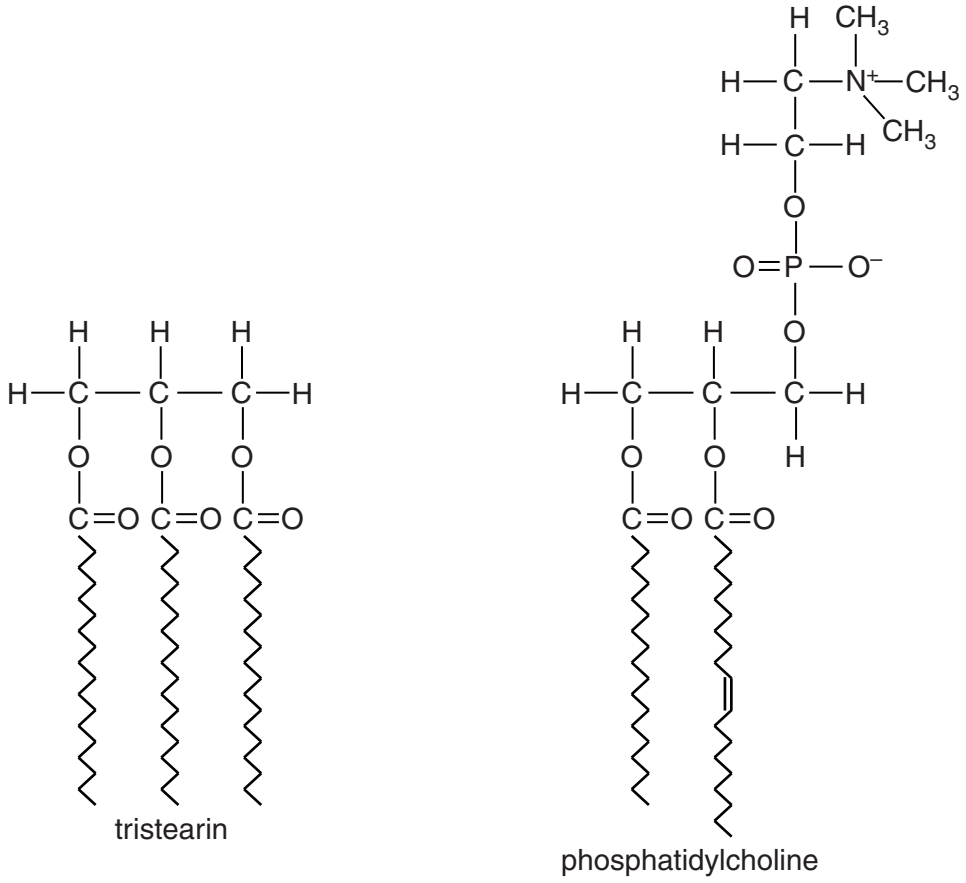


Fig. 5.1

(a) Table 5.1 shows a structural difference between the two molecules shown in Fig. 5.1.

Complete Table 5.1 with two further structural differences **other than** in numbers of different types of atoms.

Table 5.1

structural feature	tristearin	phosphatidylcholine
length of fatty acid chains	all the same length	different lengths

[2]

PAPA CAMBRIDGE

(b) Cells in the pancreas secrete enzymes, such as amylase and trypsin, into a duct.

The enzymes are packaged in vesicles so that they can be exported from these cells as shown in Fig. 5.2.

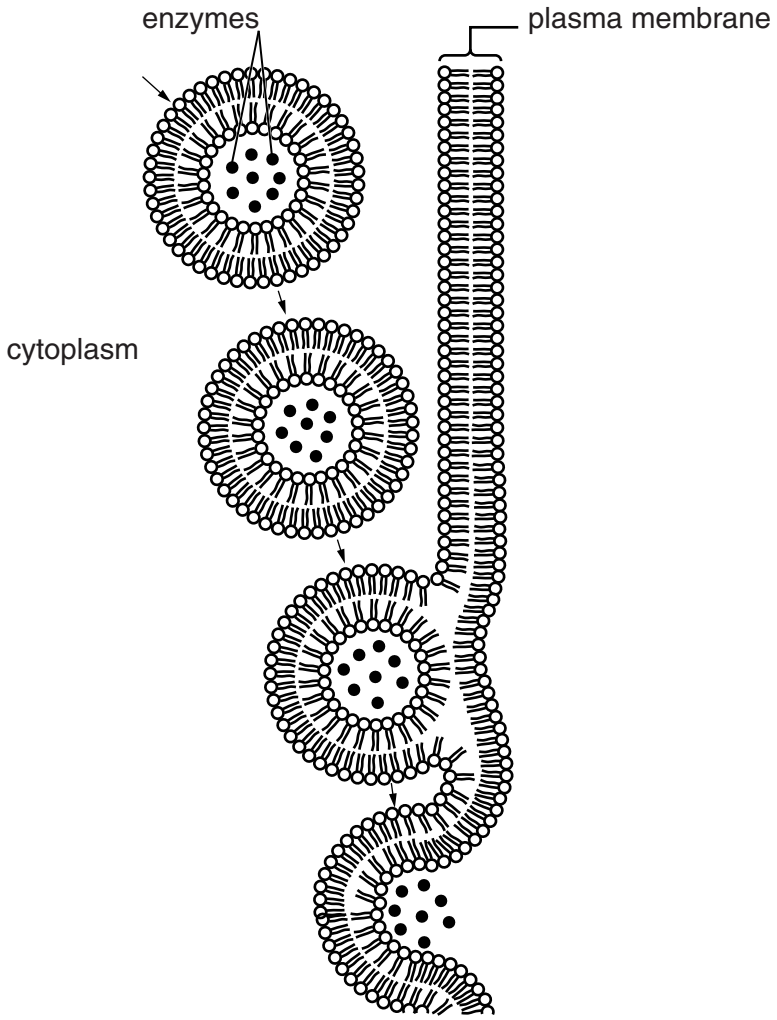


Fig. 5.2

With reference to Fig. 5.2, explain how enzymes that are secreted by cells in the pancreas are packaged into vesicles and exported.

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

PAPA CAMBRIDGE

(c) Water has many significant roles to play in cells and living organisms.

Complete Table 5.2 below by stating the property of water that allows each of the following to take place.

Table 5.2

role of water	property of water
solvent for glucose and ions	
movement in xylem	
helps to decrease body temperature in mammals	

[3]

[Total: 9]

© UCLES 2015

PAPA CAMBRIDGE

6 Red blood cells are formed from cells called reticulocytes. Stem cells in the bone marrow produce reticulocytes which differentiate into red blood cells. During differentiation haemoglobin is produced.

Fig. 6.1 shows the structure of small sections of DNA and messenger RNA (mRNA) in the nucleus of a reticulocyte during transcription.

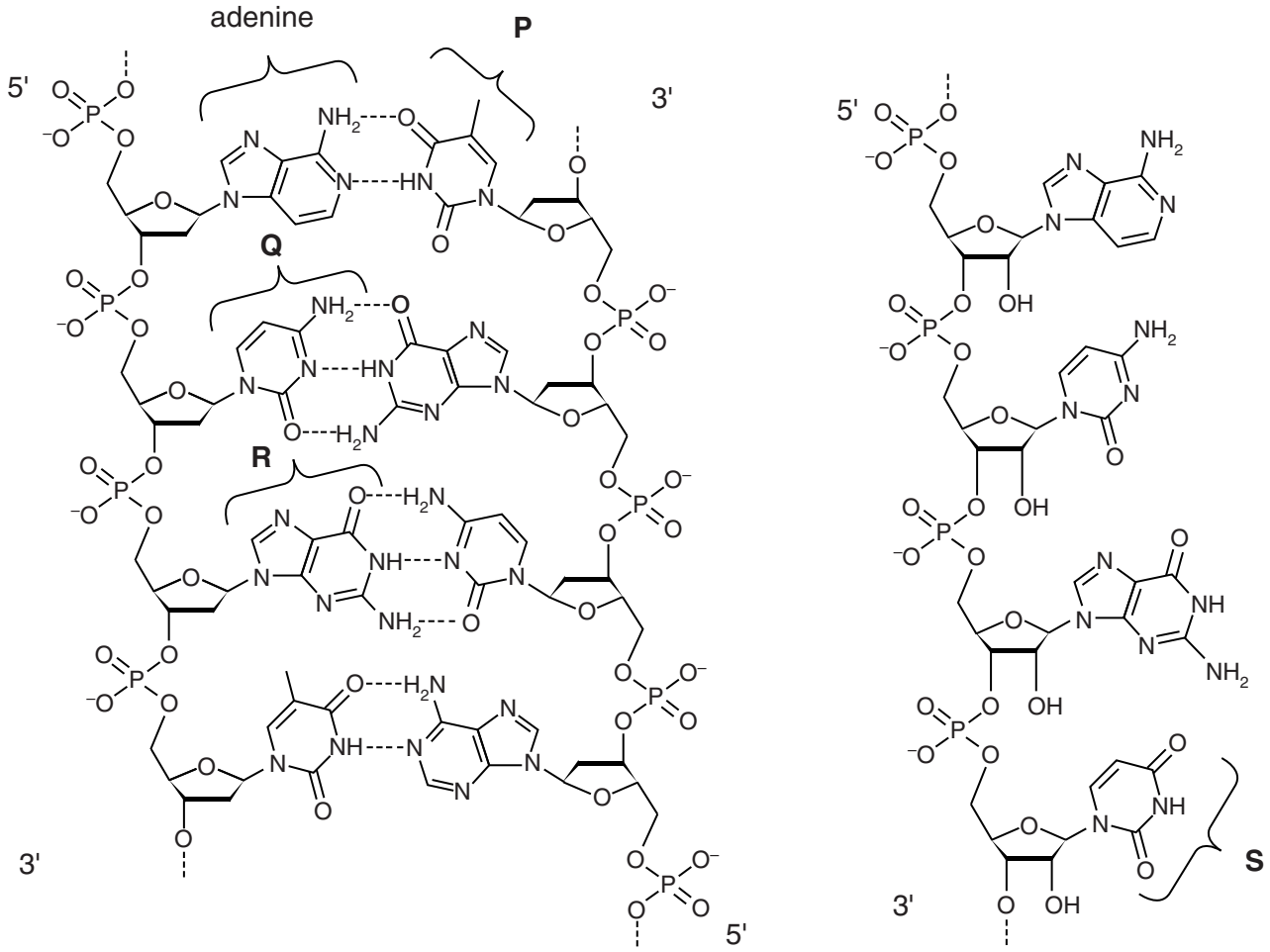


Fig. 6.1

(a) Name the bases **P** to **S**.

P .....

Q .....

R .....

S .....[4]

PAPA CAMBRIDGE

(b) Describe the role of the mRNA molecule shown in Fig. 6.1.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 7]

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.

PAPA CAMBRIDGE

Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

7833038719

BIOLOGY **9700/22**

Paper 2 Structured Questions AS **May/June 2015**

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 in the spaces at the top of the page.
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 **13** printed pages and **3** blank pages.

© UCLES 2015

CAMBRIDGE International Examinations

PAPA CAMBRIDGE

Answer **all** the questions.

1 Each of statements **A to E** describe a structure associated with the mammalian heart.

For each statement, identify the structure that is being described.

A The chamber that pumps blood into the pulmonary artery.

.....

B A blood vessel that transports deoxygenated blood into the right atrium.

.....

C The specialised tissue responsible for delaying the conduction of impulses from the atria to the ventricles.

.....

D The blood vessels that supply cardiac muscle with oxygenated blood.

.....

E The valve that prevents the backflow of blood from the ventricle that contains oxygenated blood.

.....

[5]

[Total: 5]

© UCLES 2015

PAPA CAMBRIDGE

2 Fig. 2.1 is a scanning electron micrograph of an area of the trachea showing the presence of *Bordetella pertussis* bacteria.

B. pertussis is the causative organism of a respiratory disease in humans known as whooping cough. The disease is transmitted from person to person in a similar way to tuberculosis (TB).

A symptom that is common to TB and to whooping cough is the production of an excess of mucus.

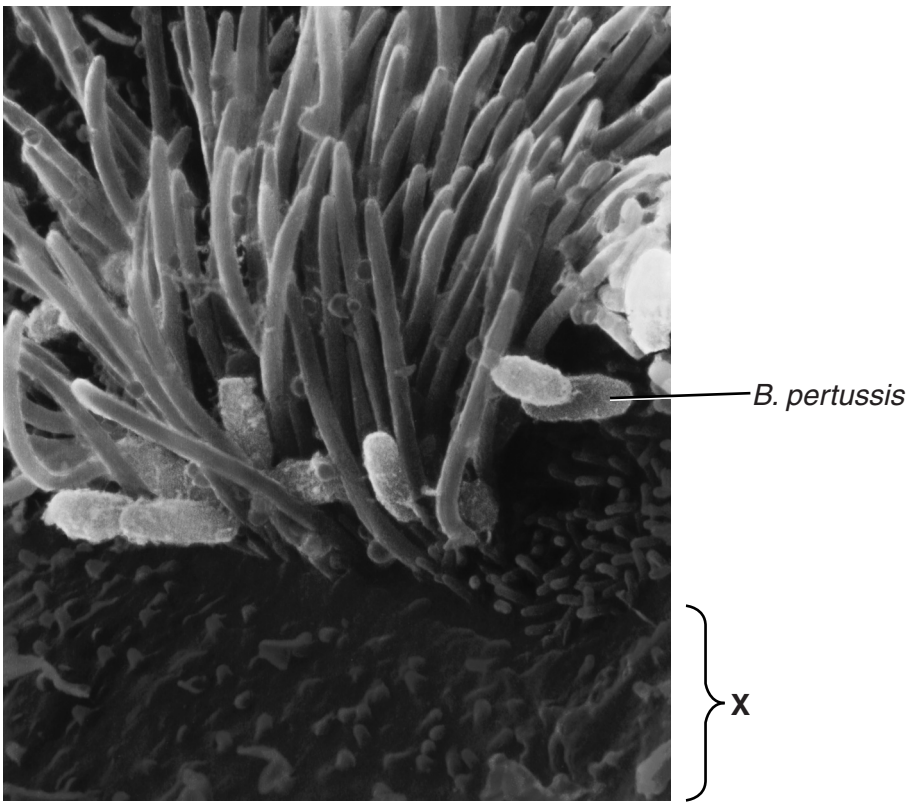


Fig. 2.1

(a) Describe the damage caused by *B. pertussis* that is shown in the area labelled **X** on Fig. 2.1 **and** explain how this will affect the functioning of the epithelial tissue of the trachea.

.....

.....

.....

.....

.....

.....

.....

.....[3]

PAPA CAMBRIDGE

(b) Goblet cells produce mucus. Name one other structure in the gas exchange system that also produces mucus.

.....[1]

(c) Suggest how whooping cough is transmitted.

.....

.....

.....

.....[2]

(d) The presence of *B. pertussis* stimulates the production of mucin, a gel-like glycoprotein that is the main component of mucus.

The mucin produced by the cell is packaged into vesicles ready for exocytosis.

(i) The first stage in the production of mucin involves transcription of the gene *MUC5AC*.

Outline the stages occurring in transcription.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

© UCLES 2015

PAPA CAMBRIDGE

(ii) Following translation, the polypeptide formed is modified by the addition of many short chains of monosaccharides in a process called glycosylation.

Suggest where glycosylation occurs in the cell **and** explain why mucin is packaged into vesicles.

.....

.....

.....

.....[2]

(e) Overproduction of mucus is one of the symptoms of chronic obstructive pulmonary disease (COPD).

Describe the signs and symptoms that enable diagnosis of COPD.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 16]

© UCLES 2015

[Turn over

PAPA CAMBRIDGE

3 Outside the body, red blood cells can be maintained in an intact state by keeping the cells in a 0.9% solution of sodium chloride. This is known as a normal saline solution.

Fig. 3.1 shows intact red blood cells.

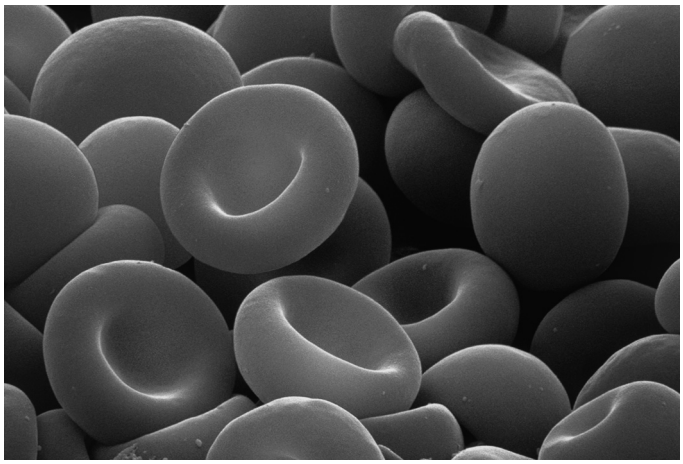


Fig. 3.1

(a) Explain why red blood cells can be maintained in an intact state by keeping them in a normal saline solution.

.....

.....

.....

.....

.....[2]

(b) In the blood, red blood cells are suspended in plasma. The main component of blood plasma is water.

Suggest **one** other component of blood plasma that could enter red blood cells **and** describe how it would cross the cell surface membrane.

component .....

description .....

.....

.....

.....

.....

.....[3]

© UCLES 2015

PAPA CAMBRIDGE

Fig. 3.2 shows red blood cells within a capillary. The capillary shown in Fig. 3.2 allows the rapid exchange of substances between the blood, tissue fluid and body cells.

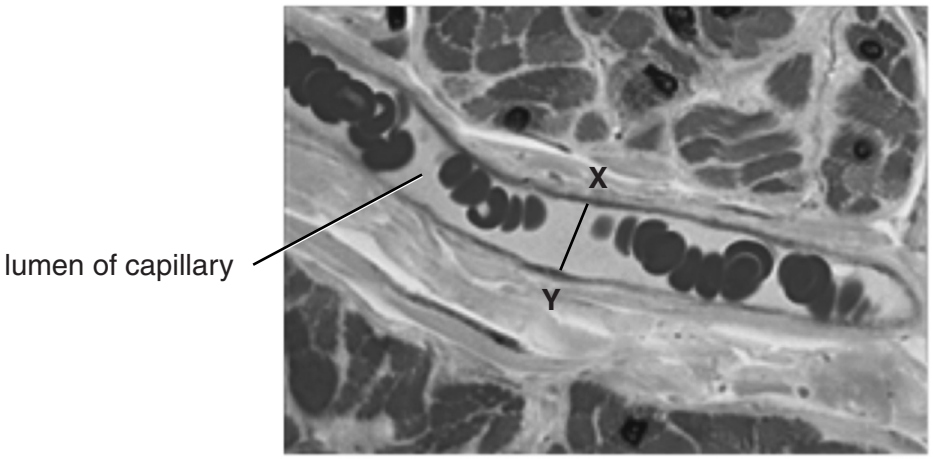


Fig. 3.2

(c) The actual diameter of the lumen of the capillary at the point **X**–**Y** in Fig. 3.2 is 9.5 μm.

Calculate the magnification of the image shown in Fig. 3.2. Show your working.

magnification × ..... [2]

(d) With reference to Fig. 3.2, explain **one** feature that enables the surrounding body cells to receive an adequate supply of oxygen from the blood supplied by the capillary.

.....

.....

.....

.....[2]

(e) Some areas of the brain, known as blood-brain barriers, have a type of capillary that is relatively impermeable to substances.

Suggest **one** way in which the structure of a capillary in the blood-brain barrier differs from the structure of the capillary shown in Fig. 3.2.

.....

.....[1]

[Total: 10]

PAPA CAMBRIDGE

4 Many microorganisms can digest cellulose by using a group of enzymes collectively known as cellulases. Cellobiose is the disaccharide produced during cellulose digestion.

The cellulase known as β-glucosidase completes the digestion of cellulose by hydrolysing the cellobiose molecule to produce two β-glucose molecules.

(a) Draw the ring structure of one β-glucose molecule in the space provided.

[2]

(b) β-glucosidase was extracted from two different bacteria, *Agrobacterium tumefaciens* and *Thermotoga maritima*.

Fig. 4.1 shows the results of an investigation into the effect of temperature between 0 °C and 100 °C, on the activity of each enzyme.

- **L** represents the lowest temperature at which activity of each enzyme was detected.
- **H** represents the highest temperature at which activity of each enzyme was detected.

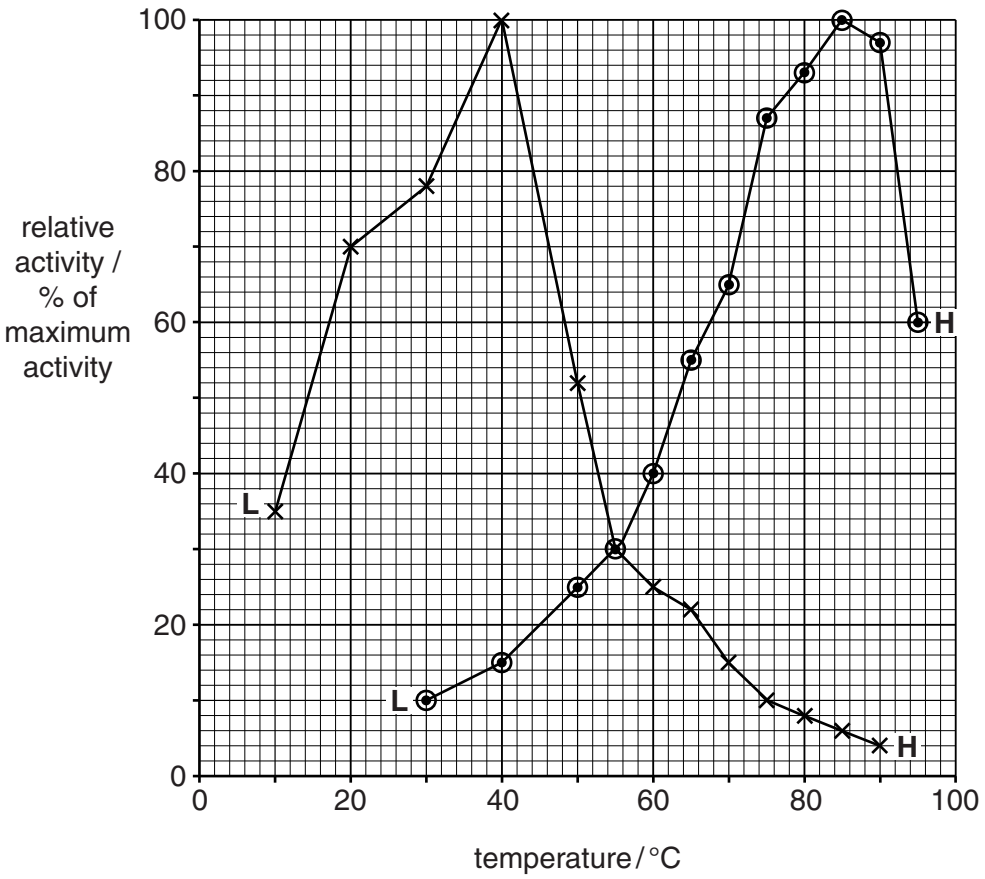


Fig. 4.1

PAPA CAMBRIDGE

(i) With reference to Fig. 4.1, describe the **differences** in the results for the two enzymes, **A** and **T**.

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

(ii) Both enzyme **A** and enzyme **T** act on cellobiose. They have a similar, but not identical, primary structure.

Suggest how similarities **and** differences in the primary structure of the two enzymes could help to explain the results obtained in the investigation.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 10]

PAPA CAMBRIDGE

5 **(a)** Natural immunity and artificial immunity can both be acquired in a passive or in an active manner.

Table 5.1 shows information about immunity acquired by two individuals, **P** and **Q**.

Complete Table 5.1.

Table 5.1

description of event	outcome for the individual	production of memory cells / yes or no	type of immunity acquired by individual
individual **P** is injected with a live, weakened disease-causing organism	individual **P** does not become ill from the disease and has long-lasting protection from the disease	.....	....
individual **Q** is injected with antibody against a specific disease-causing organism	individual **Q** does not become ill from the disease but is ill with the disease a year later	.....	....

[2]

Fig. 5.1 is a light micrograph of a sample of blood. Cell **X** is a phagocyte.

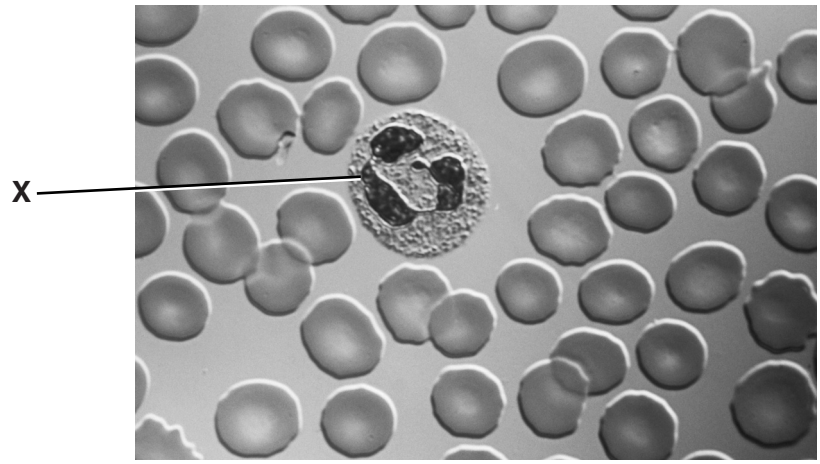


Fig. 5.1

(b) State the origin of the blood cell labelled **X**.

.....[1]

PAPA CAMBRIDGE

(c) Phagocytes play an important role when an immune response is initiated against cancerous tumour cells.

(i) Suggest how phagocytes can recognise the difference between healthy body cells and cancerous tumour cells.

.....

.....

.....

.....

.....[2]

(ii) Outline briefly how a tumour forms.

.....

.....

.....

.....

.....[2]

[Total: 7]

PAPA CAMBRIDGE

6 **(a)** Sentences **(i)** and **(ii)** are extracted from longer definitions of ecological terms. Each has one or more missing words.

Complete **(i)** and **(ii)** using the correct terms chosen from the list below.

a population	**a community**	**an ecosystem**
a niche	**a habitat**	**trophic level**
producers	**organisms**	**consumers**

(i) …… is the particular location and type of local environment occupied by …… or organism, characterised by its physical features or by its dominant …… . [3]

(ii) …… is the functional role or place of a species of organism within …… . [2]

(b) Only a small proportion of the light energy striking the leaves of producers becomes converted to chemical energy. The proportion that is converted is known as the photosynthetic efficiency (PE).

(i) Outline the possible reasons why a large proportion of light energy striking the leaves of plants is **not** converted into chemical energy.

.....

.....

.....

.....

.....

.....

.....

.....

.....[3]

© UCLES 2015

PAPA CAMBRIDGE

(ii) Most crops have a PE of 1% to 4%. Sugar cane, an important crop plant for food production and for the production of biofuel, has a PE of 7% to 8%.

Suggest the advantages of growing crops with high PE for food production or for biofuel.

.....

.....

.....[2]

(iii) Fertilisers containing nitrate are added to improve or maintain yield of crops such as sugar cane.

Name two organic compounds containing nitrogen that are made by plants and state one function of each in plant growth.

organic compound 1 .....

function .....

.....

organic compound 2 .....

function .....

.....

.....[2]

[Total: 12]

© UCLES 2015

PAPA CAMBRIDGE

BLANK PAGE

© UCLES 2015

PAPA CAMBRIDGE

BLANK PAGE

© UCLES 2015

PAPA CAMBRIDGE

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.

PAPA CAMBRIDGE

Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

1035545102

BIOLOGY **9700/23**

Paper 2 Structured Questions AS **May/June 2015**

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 in the spaces at the top of the page.
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 **13** printed pages and **3** blank pages.

© UCLES 2015

CAMBRIDGE International Examinations

PAPA CAMBRIDGE

Answer **all** the questions.

1 The cell surface membrane has a fluid mosaic structure.

(a) Describe what is meant by the term *fluid mosaic*.

.....

.....

.....

.....[2]

(b) In 1934, the biologists Davson and Danielli published their suggestion for the structure of the cell surface membrane, as shown in Fig. 1.1.

They suggested that the membrane was a phospholipid bilayer with a layer of hydrophilic protein on both surfaces.

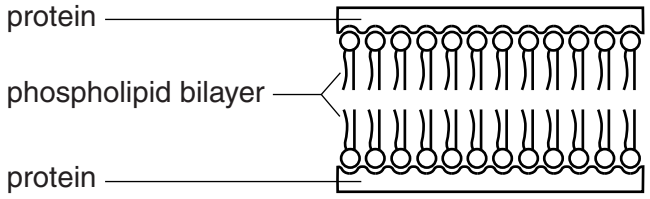


Fig 1.1

State **one** way in which the Davson-Danielli structure is similar to the fluid mosaic structure **and one** way in which it differs from the fluid mosaic model.

similarity

.....

.....[1]

difference

.....

.....[1]

PAPA CAMBRIDGE

(c) One way in which substances can cross cell membranes is by active transport.

Describe the mechanism of active transport.

.....

.....

.....

.....

.....

.....

.....[3]

(d) High temperature can damage cell membranes. One factor contributing to this damage is the denaturation of membrane proteins.

Describe how proteins become denatured at high temperature **and** explain how this could lead to damaging cell membranes.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 10]

PAPA CAMBRIDGE

2 DNA replication is an important event in the cell cycle.

(a) State when, during the cell cycle, DNA replication occurs.

.....[1]

(b) Fig. 2.1 shows pairing between two bases, **X** and **Y**, in a DNA molecule.

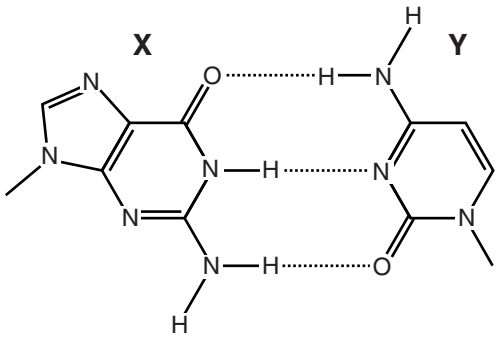


Fig. 2.1

(i) Name the type of bond shown by the dotted lines between the bases.

.....[1]

(ii) State which base, **X** or **Y**, is a pyrimidine **and** explain your answer.

.....

.....[1]

(c) The compound benzopyrene, found in tar from tobacco smoke, can become chemically changed in cells and interferes with DNA replication, causing gene mutations.

(i) State what is meant by the term *gene mutation*.

.....

.....

.....

.....

.....[2]

© UCLES 2015

PAPA CAMBRIDGE

(ii) Mutations that occur in dividing cells of the gas exchange system may result in lung cancer.

Suggest the differences in the cell cycle of a cancer cell compared with that of a normal cell of the same type.

.....

.....

.....

.....

.....[2]

[Total: 7]

PAPA CAMBRIDGE

3 Fig. 3.1 is an electron micrograph of a type of B-lymphocyte called a plasma cell.

Plasma cells secrete antibody molecules.

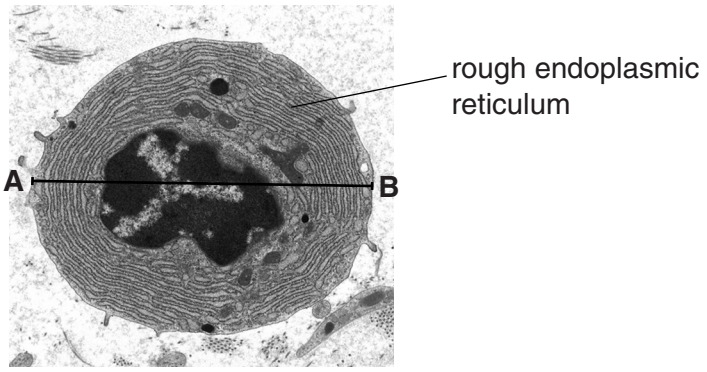


Fig. 3.1

(a) Suggest why plasma cells contain a large quantity of rough endoplasmic reticulum.

.....

.....

.....

.....

.....[2]

(b) The diameter **A** – **B** of the plasma cell in Fig. 3.1 is 15 μm.

Calculate the magnification of Fig. 3.1.

Show your working.

magnification × ..... [2]

(c) Smallpox was the first disease to be eradicated by vaccination. The vaccine was effective for up to 10 years after one dose and did not require boosters within this time.

Name the causative organism (pathogen) of smallpox.

.....[1]

© UCLES 2015

PAPA CAMBRIDGE

(d) When a person received the smallpox vaccine, the numbers of plasma cells specific for the smallpox pathogen were measured from blood samples taken over a period of 35 days.

Fig. 3.2 shows how the numbers of smallpox-specific plasma cells changed during 35 days after vaccination.

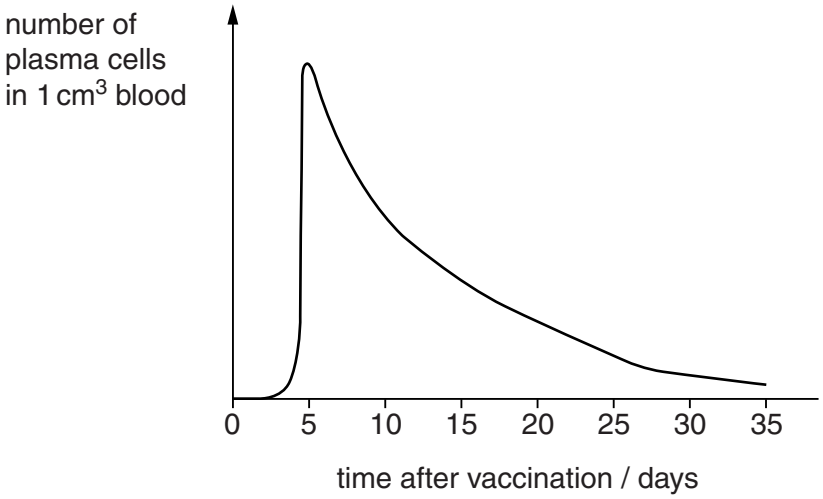


Fig. 3.2

Fig. 3.2 shows that the number of smallpox-specific plasma cells increases and then decreases within 35 days of vaccination.

Explain how a single dose of this vaccine can provide immunity for up to 10 years when the plasma cells are short-lived.

.....

.....

.....

.....

.....

.....[3]

(e) State two reasons why the vaccination programme was successful in eradicating smallpox.

1 .....

.....

2 .....

.....

[2]

(f) State the type of immunity provided by the smallpox vaccine.

.....[1]

[Total: 11]

PAPA CAMBRIDGE

4 Fig. 4.1 shows how blood pressure changes in the human systemic circulation.

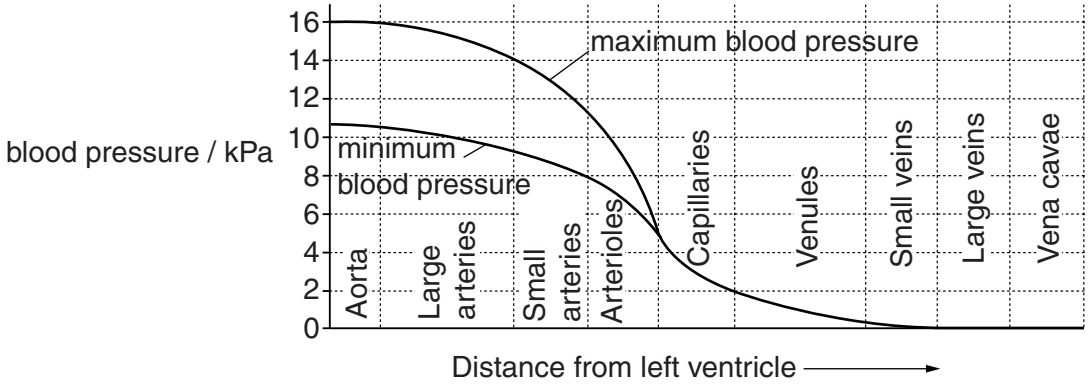


Fig. 4.1

(a) (i) Describe the changes in blood pressure shown in Fig. 4.1.

.....

.....

.....

.....

.....

.....

.....[3]

(ii) Explain how the structure of veins is related to their function in returning blood to the heart.

.....

.....

.....

.....

.....[2]

PAPA CAMBRIDGE

(b) Angiotensin is a polypeptide produced in the body to raise blood pressure.
Angiotensin converting enzyme (ACE) catalyses the final step in angiotensin production.
Fig. 4.2 shows this step.

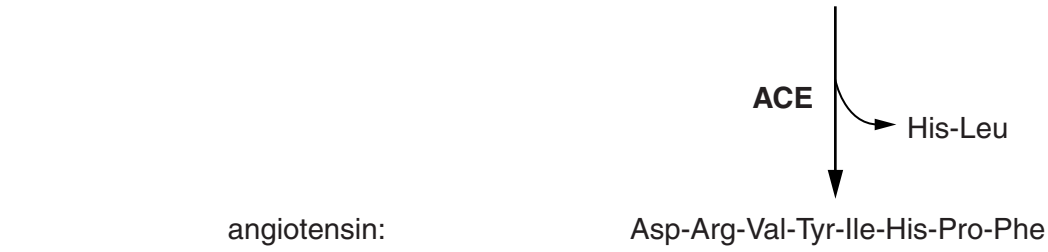


Fig. 4.2

Describe the step shown in Fig. 4.2.

.....

.....

.....

.....

.....

.....

.....[3]

(c) People with high blood pressure can be treated with a drug which lowers the concentration of angiotensin in the blood.

This drug is a competitive inhibitor of ACE.

Explain how this drug acts as a competitive inhibitor.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 11]

PAPA CAMBRIDGE

5 Fig. 5.1 is a light micrograph of some unicellular photosynthetic organisms called *Chlamydomonas*.

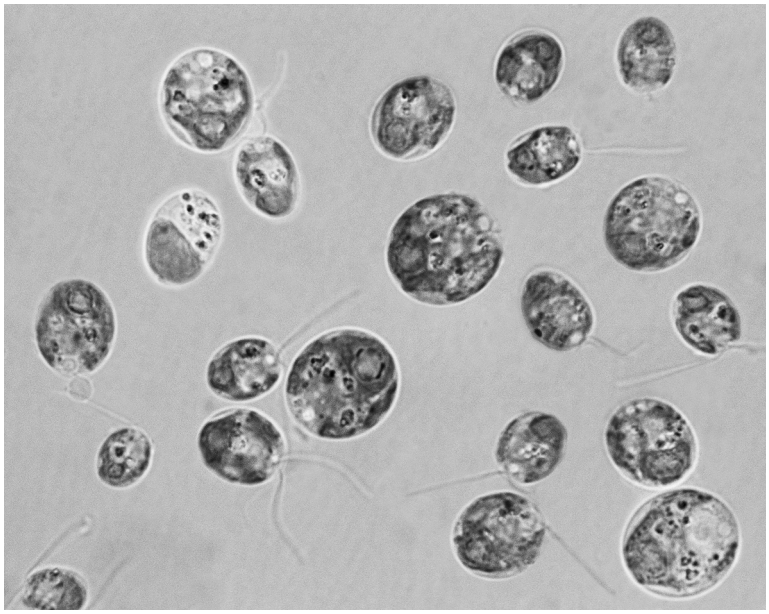


Fig. 5.1

(a) *Chlamydomonas* moves through water.

Explain why the light microscope rather than the electron microscope is used to observe the movement of *Chlamydomonas*.

.....

.....

.....

.....

.....[2]

(b) *Chlamydomonas* live in water and obtain minerals, such as magnesium ions, from the water.

(i) State **one** role of magnesium ions in photosynthetic organisms.

.....

.....[1]

(ii) State two properties of water which make it possible for organisms such as *Chlamydomonas* to live in water.

1 .....

.....

2 .....

..... [2]

© UCLES 2015

PAPA CAMBRIDGE

(c) Explain why multicellular organisms require transport systems while unicellular organisms, such as *Chlamydomonas*, do not.

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

(d) Some plants, such as the banana plant, *Musa acuminata*, produce fruit. The banana fruit has a high content of carbohydrate.

Describe how sugars are transported in phloem sieve tubes from source to sink in plants such as *M. acuminata*.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[5]

[Total: 14]

PAPA CAMBRIDGE

6 In the oceans, parts of the nitrogen cycle involve different bacteria from those that are involved on the land.

A bacterium found in oceans is *Nitrococcus mobilis*, which carries out the following step in the nitrogen cycle:

$$NO_2^- \longrightarrow NO_3^-$$

nitrite nitrate

(a) (i) Name the stage in the nitrogen cycle in which this step occurs.

.....[1]

(ii) Describe how nitrogen in nitrate can be returned to the atmosphere in the form of nitrogen gas.

.....

.....

.....

.....

.....[2]

PAPA CAMBRIDGE

(b) Phytoplankton are microscopic photosynthetic organisms that are the main producers in ocean ecosystems. Their habitat is the upper layers of the oceans where sunlight can penetrate through the water.

Define the terms:

(i) ecosystem

.....

.....

.....[2]

(ii) producer

.....

.....

.....[1]

(iii) habitat.

.....

.....

.....[1]

[Total: 7]

PAPA CAMBRIDGE

BLANK PAGE

© UCLES 2015

PAPA CAMBRIDGE

BLANK PAGE

© UCLES 2015

PAPA CAMBRIDGE

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.

PAPA CAMBRIDGE