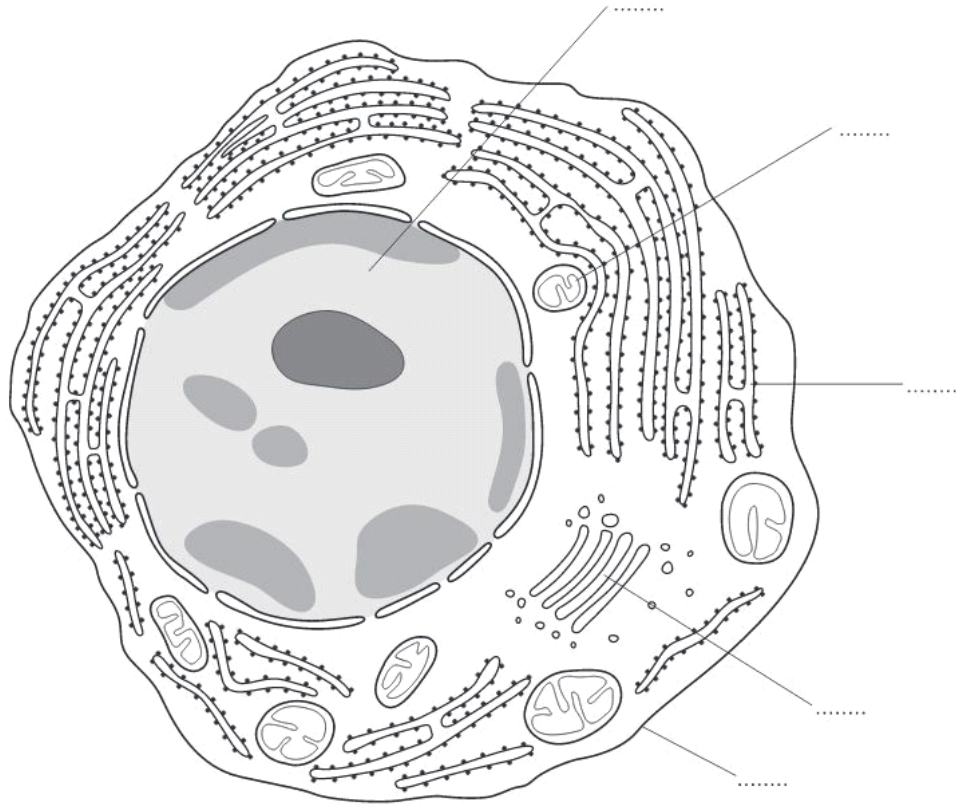


Q.1

3 During an immune response, some B lymphocytes change into plasma cells.

Fig. 3.1 is a drawing made from an electron micrograph of a plasma cell.



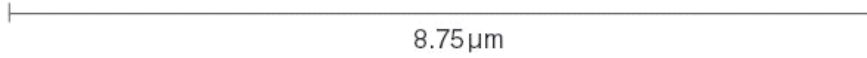


Fig. 3.1

(a) Use the label lines and the letters **A** to **E** to identify where the following processes occur.

- A** transcription
 - B** polypeptide synthesis
 - C** aerobic respiration
 - D** formation of secretory vesicles
 - E** active uptake of amino acids
- [4]

(b) State the function of plasma cells during an immune response.

.....
.....[1]

(c) State **two** ways, visible in Fig. 3.1, in which the plasma cell differs from a typical prokaryotic cell.

1.
.....
2.
.....[2]

Q.2.

4 Fig. 4.1 is an electron micrograph of a mesophyll cell from a leaf.

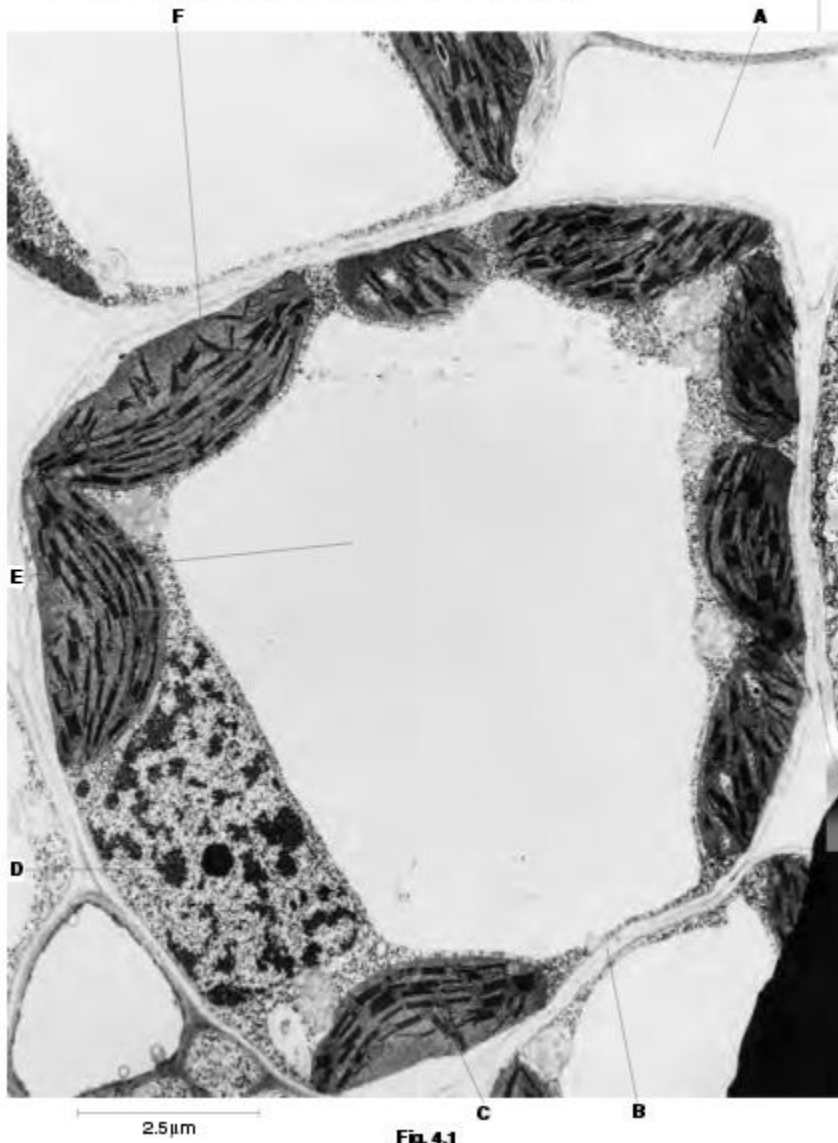


Fig. 4.1

- (a) Calculate the magnification of Fig. 4.1. Show your working and express your answer to the nearest whole number.

Answer X.....[2]

- (b) Identify, by using the letters **A** to **F**, a part of the cell shown in Fig. 4.1 where the following substances are located.

chlorophyll

cellulose

DNA

phospholipid

[4]

- (c) State three ways in which the **structure** of a red blood cell differs from the structure of the cell shown in Fig. 4.1.

1

2

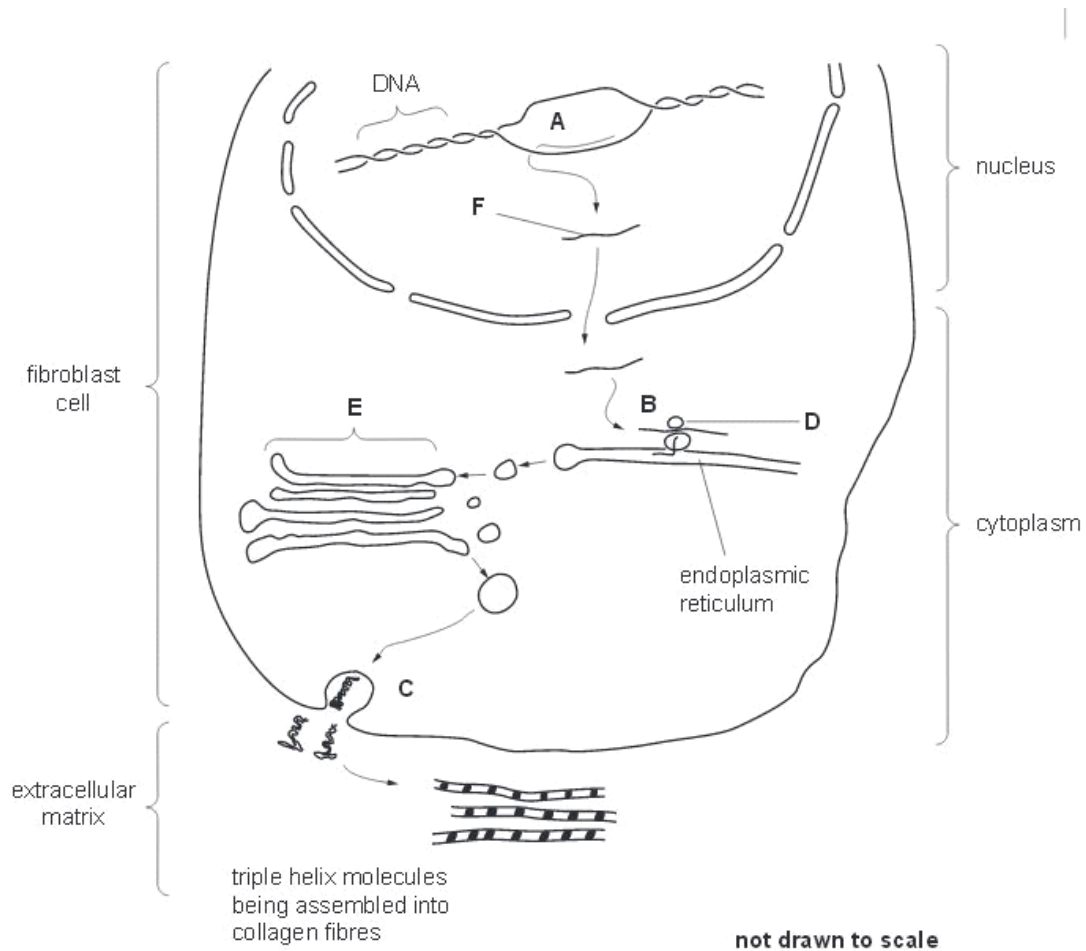
3

[3]

Q.3.

- 4 Collagen is found in the extracellular matrix of muscles, tendons, ligaments and bones. Fibroblast cells in these tissues make collagen by synthesising polypeptides that form molecules with a triple helix shape. These are secreted from fibroblasts into the extracellular matrix where enzymes assemble them into collagen fibres.

Fig. 4.1 is a diagram summarising these events.



(a) (i) Name the processes occurring at **A**, **B** and **C**.

A

B

C [3]

(ii) Name structures **D** and **E**.

D

E [2]

(iii) Name molecule **F**.

F [1]

Q.4.

1 Fig. 1.1 is a drawing made from an electron micrograph of a longitudinal section of a capillary in muscle tissue.

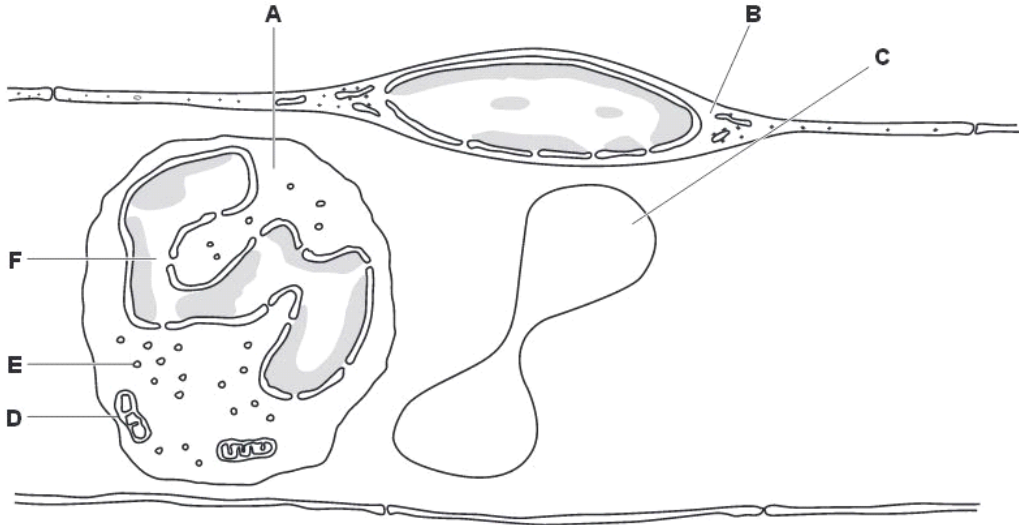


Fig. 1.1

· 8000

(a) Complete the table below using the information in Fig. 1.1 to help you.

	cell A	cell B	cell C
name of cell			red blood cell
function of cell	ingest bacteria	permit exchange of gases	
diameter / μm		20	7

[4]

(b) Name the organelles **D**, **E** and **F**.

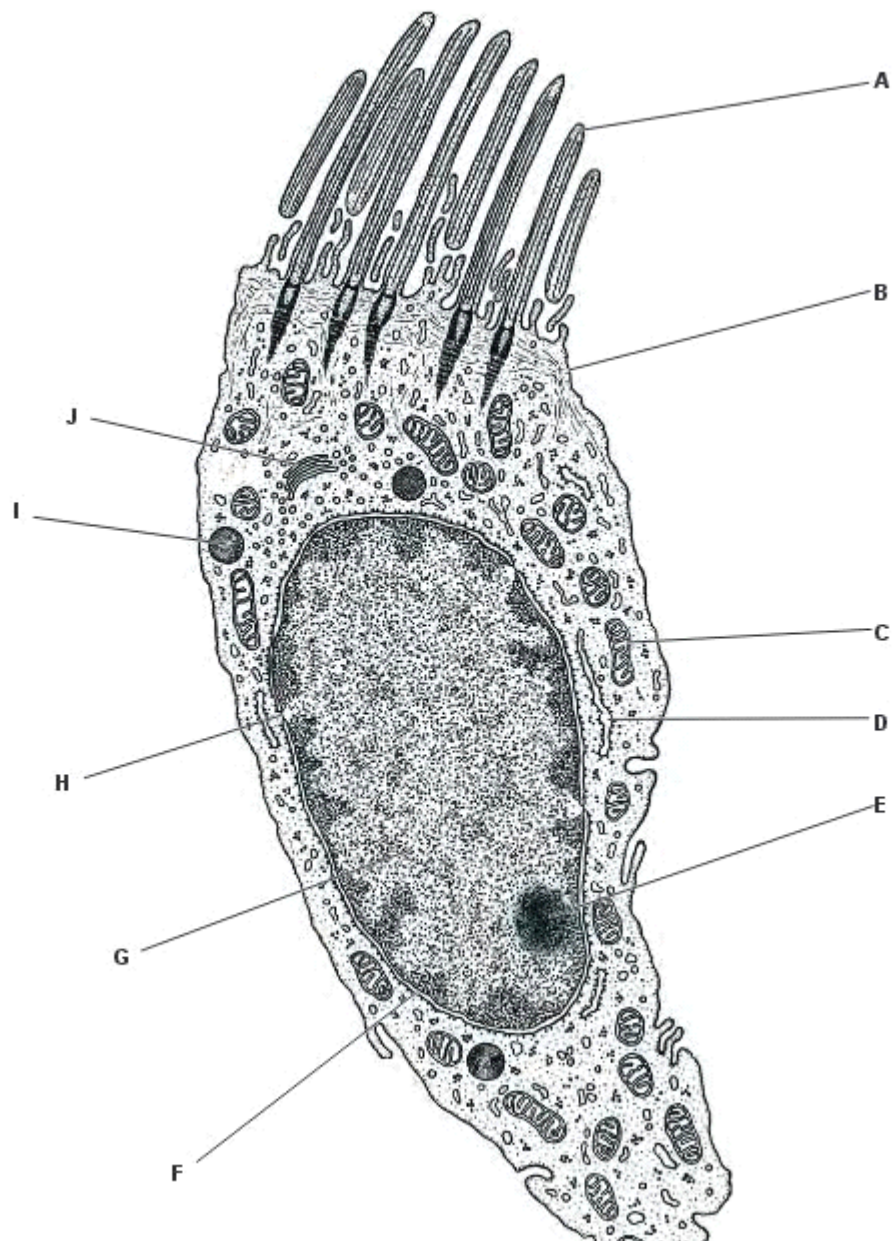
D

E

F [3]

Q.5.

- 1 Fig. 1.1 is a drawing made from an electron micrograph of a cell from the ciliated epithelium of the bronchus.



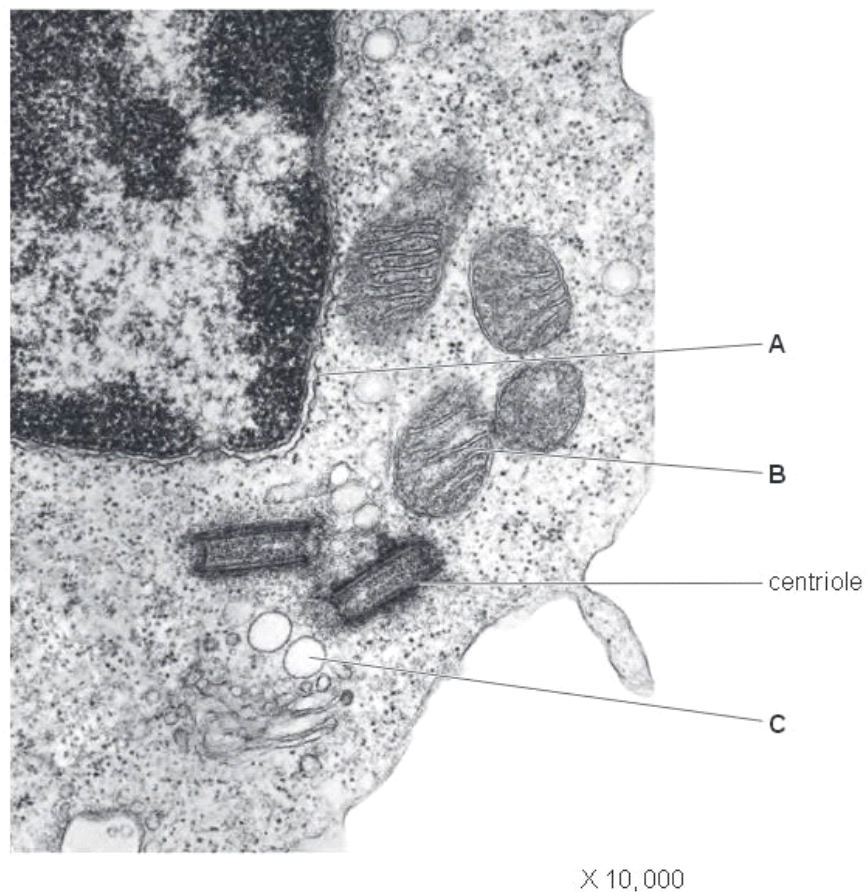
- (a) Complete the table below by writing the appropriate letter from Fig. 1.1 to indicate the structure that carries out each of the functions listed. The first one has been completed for you.

function	structure
facilitated diffusion of glucose	B
creates a current to move mucus	
aerobic respiration	
makes ribosomes	
a site of transcription	
packages proteins into lysosomes	

[5]

Q.6.

- 2 Fig. 2.1 is an electron micrograph of part of an animal cell. A centriole is labelled.



Exa
1

(a) Name the structures labelled **A** to **C**.

A

B

C [3]

(b) Describe the roles of centrioles in animal cells.

.....

.....

.....

.....

.....

..... [3]

(c) Explain why it is possible to see the internal membranes of a cell in electron micrographs, such as Fig. 2.1, but it is not possible to see them when using the light microscope.

.....

.....

.....

.....

.....

..... [3]

Q.7.

1 Fig. 1.1 shows the outline of a ciliated cell from the human gas exchange system.

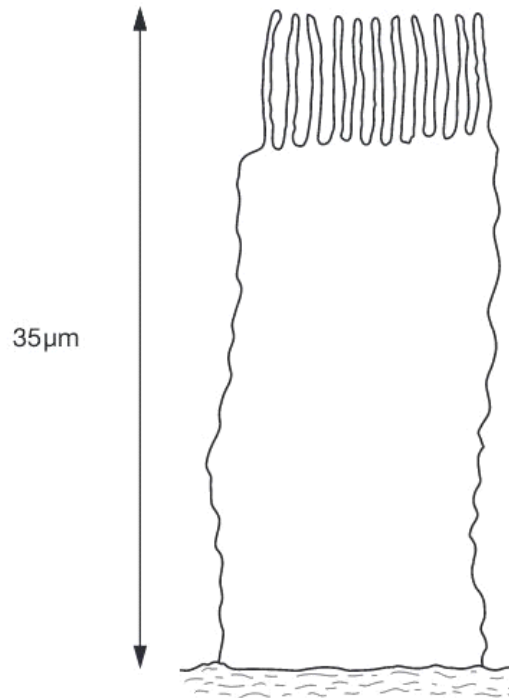


Fig. 1.1

(a) (i) Inside the ciliated cell in Fig. 1.1, draw the nuclear envelope and a mitochondrion as they would be seen with an electron microscope.

Label these structures.

[3]

(ii) Calculate the magnification of the ciliated cell in Fig. 1.1.

Show your working and express your answer to the nearest whole number.

magnification = [2]

Fig. 1.2 is a drawing of *Mycobacterium tuberculosis*.

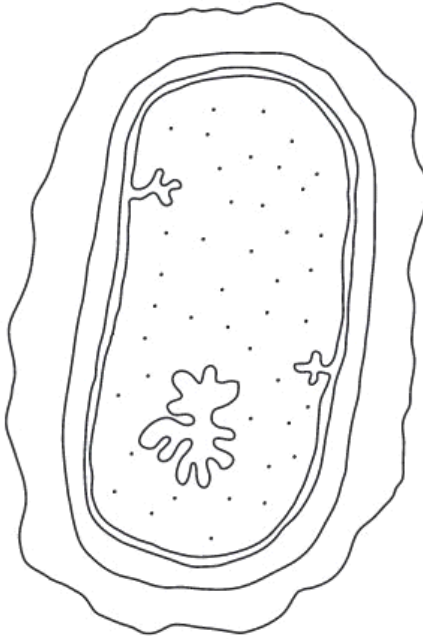


Fig. 1.2

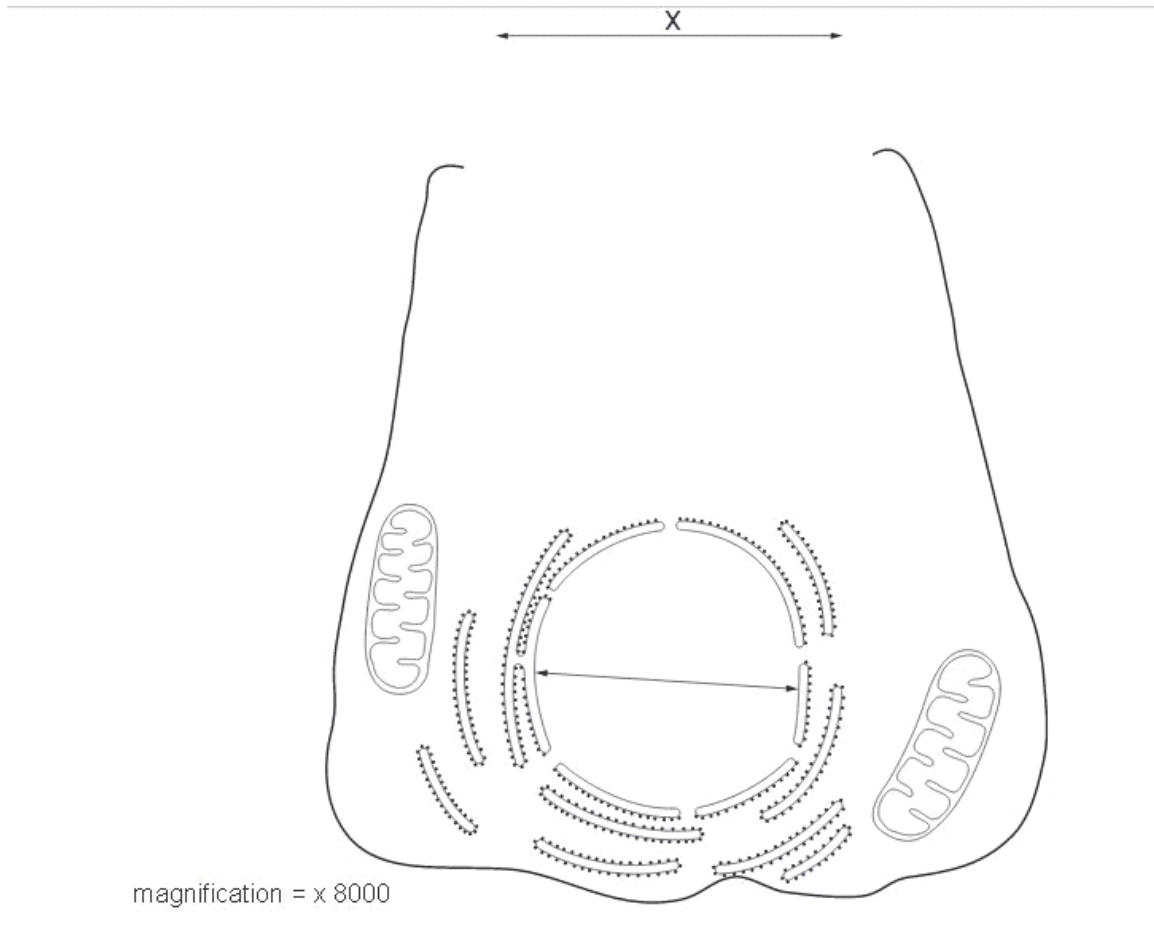
(b) State three structural features that are found in **both** *M. tuberculosis* and animal cells, such as the ciliated cell in Fig. 1.1.

1.
2.
3.[3]

Q.8.

- 1 Many of the cells in the pancreas produce enzymes. Golgi bodies in the cells produce secretory vesicles full of enzymes which are released at the cell surface by exocytosis.

Fig. 1.1 is a diagram of an enzyme-producing cell from the pancreas. The diagram is **not** complete.



- (a) (i) Complete Fig. 1.1 by drawing in the following:
- a Golgi body forming secretory vesicles
 - a secretory vesicle releasing its contents by exocytosis in the region labelled X
- [3]
- (ii) Calculate the actual diameter of the nucleus of the pancreatic cell. Show your working and express your answer to the nearest micrometre.

Answer =µm [2]

Fig. 1.2 is a drawing of the bacterium *Vibrio cholerae* the causative agent of cholera.

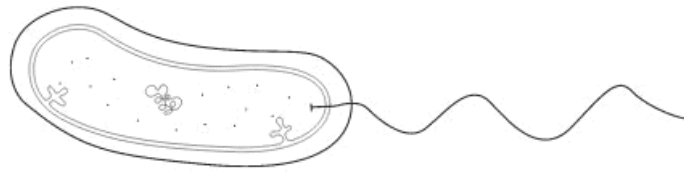


Fig. 1.2

(b) State three structural features of *V. cholerae*, that are **not** found in animal cells.

1.
2.
3. [3]

Q.9.

- 1 Fig. 1.1 is a diagram of an electron micrograph of a plant cell.
Fig. 1.2 is a diagram of an electron micrograph of an animal cell.
Both diagrams are incomplete.

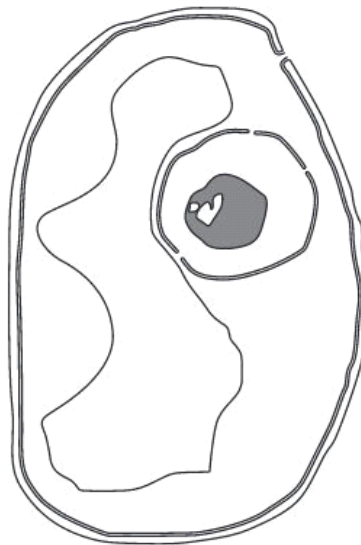


Fig. 1.1

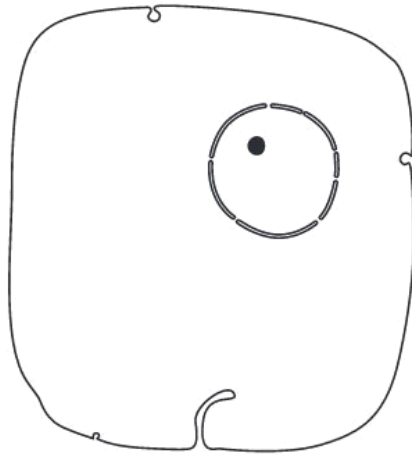


Fig. 1.2

(a) Explain how Fig. 1.1 can be identified as a plant cell.

.....

.....

.....




.....[2]

(b) Some organelles are missing from Figs 1.1 and 1.2. Information about these organelles is shown in the shaded boxes in Table 1.1.

For
Examiner's
Use

Complete the empty boxes in Table 1.1 by adding the correct information below each column heading.

Table 1.1

name of organelle	diagram of organelle(s) as seen under the electron microscope (not to scale)	one function of organelle	cell type(s) in which organelle is located
mitochondrion			animal and plant
		assemble microtubules to produce the mitotic spindle	
rough endoplasmic reticulum		protein synthesis	
Golgi apparatus			animal and plant
		photosynthesis	plant only

Q.10.

1 Fig. 1.1 shows part of an animal cell viewed with an electron microscope.



Fig. 1.1

(a) Name the structures A to C.

- A
- B
- C[3]

(b) (i) State the function of structure C.

.....[1]

(ii) Explain why structure C cannot be seen using a light microscope.

.....
.....
.....
.....[2]

(c) Suggest **one** disadvantage of the electron microscope compared to the light microscope for the study of cells.

.....
.....[1]

(d) Calculate the magnification of the image in Fig. 1.1.

Show your working and give your answer to the nearest whole number.

Answer =[2]

[Total: 9]

Q.11.

Fig. 4.1 is a transmission electron micrograph of the organism that causes tuberculosis.



Fig. 4.1

(b) (i) The actual length of the cell between X and Y in Fig. 3.1 is 2 μm .

Calculate the magnification of the electron micrograph.

Show your working and give your answer to the nearest whole number.

magnification \times [2]

(ii) The organism that causes tuberculosis is a prokaryote. State three features of prokaryotes.

1.

2.

3.[3]

Q.12.

2 Fig. 2.1 shows a drawing made from an electron micrograph of two adjacent cells in a leaf.

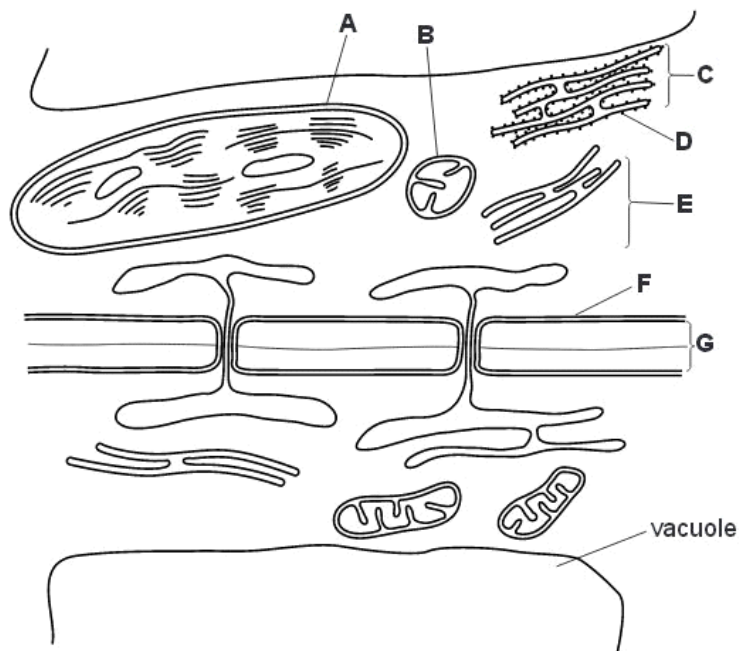


Fig. 2.1

Ex.

- (a) Structures **A** and **B** are both visible using the light microscope, but the internal detail of these organelles shown in Fig. 2.1 is only visible using the electron microscope.

Explain why the internal details of structures **A** and **B** are only visible when using the electron microscope and not when using the light microscope.

.....
.....
.....
.....
.....
.....
..... [3]

- (b) Name in full the structures labelled **C**, **D** and **E**.

C

D

E [3]

- (c) State **one** role of vacuoles in plant cells.

..... [1]

(d) Structures **F** and **G** have very different permeability properties.

Explain how the composition of structures **F** and **G** determines the permeability properties of these structures.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

(e) Fig. 2.1 shows two plasmodesmata connecting the adjacent cells.

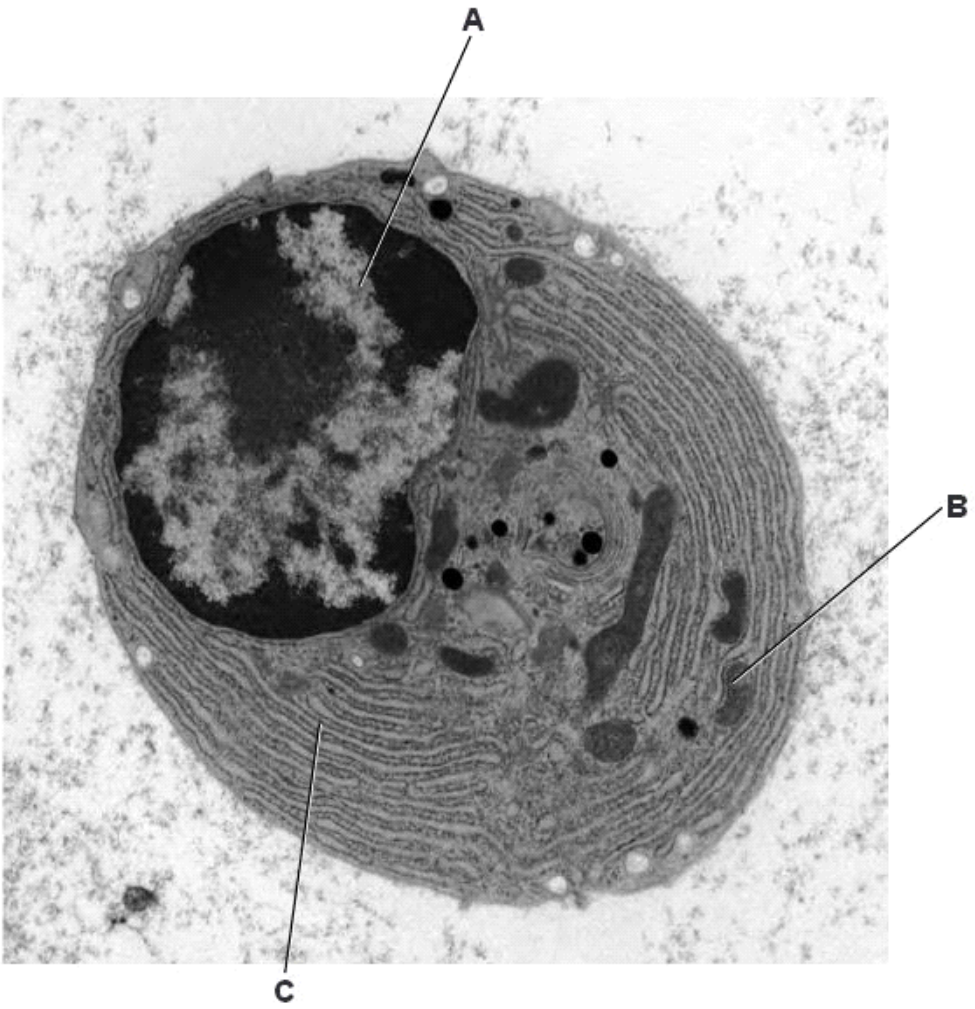
Describe the roles of plasmodesmata in transport in plants.

.....
.....
.....
.....
.....
.....
..... [3]

[Total: 14]

Q.13.

2 Fig. 2.1 is a transmission electron micrograph of a plasma cell. Plasma cells are antibody-secreting cells that are formed from B-lymphocytes.



- (a) Complete Table 2.1 to:
- name in full, structures **A**, **B** and **C**
 - outline how each structure functions to contribute to the **specific role of the plasma cell**.

Table 2.1

structure	name of structure	function of structure within plasma cell
A		
B		
C		

[6]

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9700/22/M/J/12

Q.14.

- 2 Fig. 2.1 shows xylem tissue in a longitudinal section through the stem of a dicotyledonous plant.

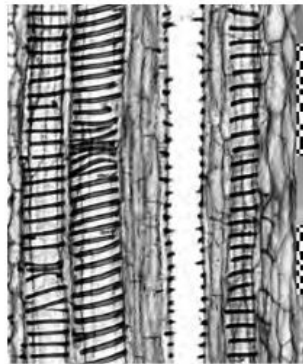


Fig. 2.1

(b) It is possible to obtain images, such as Fig. 2.1, at the same magnification with both the light microscope and the electron microscope.

State the advantages of using the light microscope, rather than using the electron microscope, in studies of tissues.

.....

.....

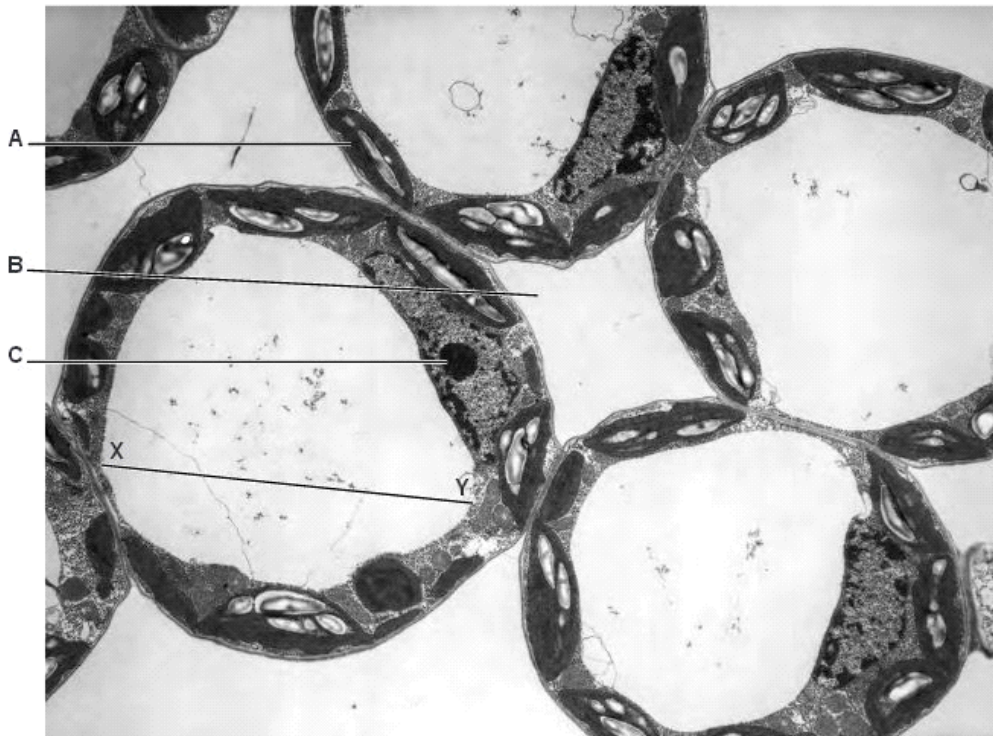
.....

.....

..... [2]

Q.15.

1 Fig. 1.1 is an electron micrograph of a transverse section of palisade mesophyll tissue in the leaf of the flowering plant, *Zinnia elegans*.



magnification $\times 7000$

Fig. 1.1

Fig. 1.1

(a) Name the features labelled **A**, **B** and **C**.

A

B

C

[3]

(b) Calculate the width of the vacuole across the line **X-Y**.

Show your working and give your answer to the nearest micrometre (μm).

answer μm [2]

Q.16.

Fig. 5.1 is drawn from an electron micrograph of a red blood cell taken from a person suffering from malaria.

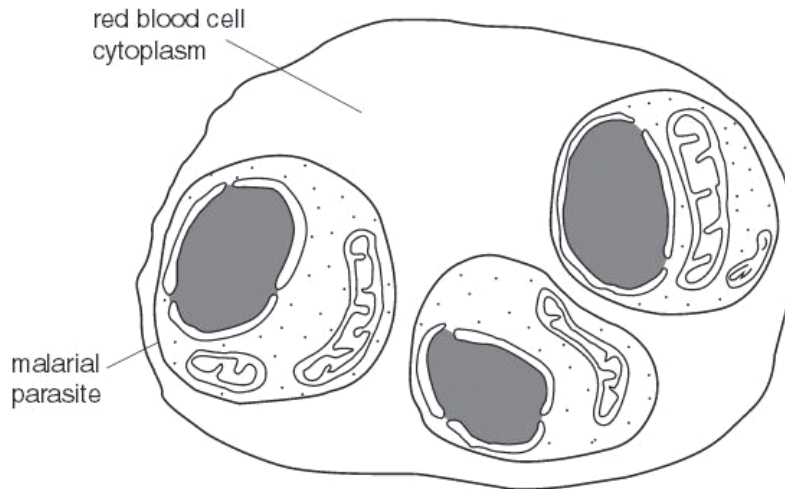


Fig. 5.1

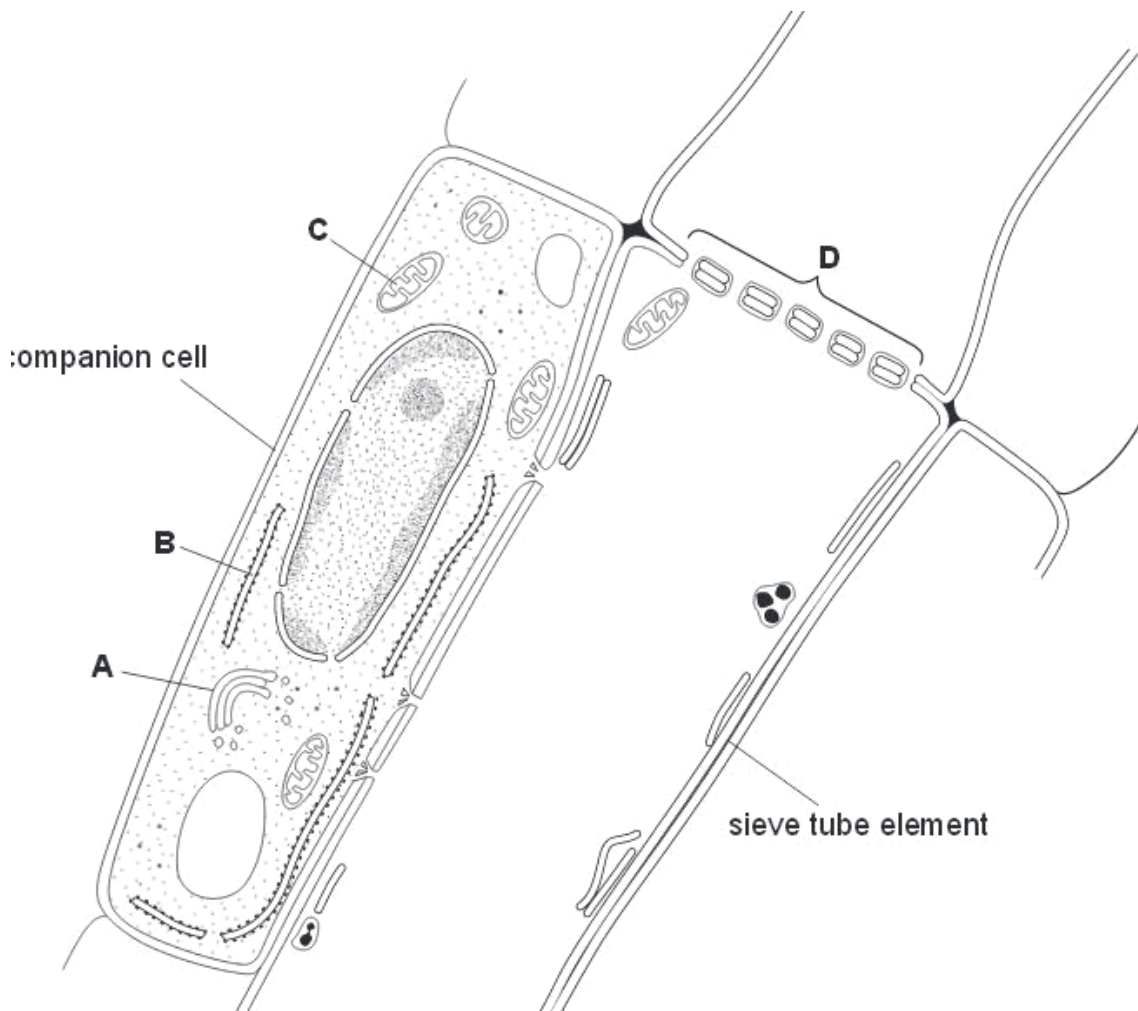
(b) State two features, **visible in Fig. 5.1**, that indicate that the malarial parasite is eukaryotic.

1.

2.[2]

Q.17.

- 1 Fig. 1.1 is a drawing made from an electron micrograph. It shows a longitudinal section through a sieve tube element and a companion cell in the phloem of a flowering plant.



(a) Refer to Fig. 1.1.

(i) Name structures A to C.

A

B

C[3]

(ii) State the name given to the region labelled **D** that separates the two sieve tube elements.

.....[1]

(iii) Name **one assimilate** that is transported in the phloem.

.....[1]

Q.18.

4 Fig. 4.1 is a diagram of a bacterium.

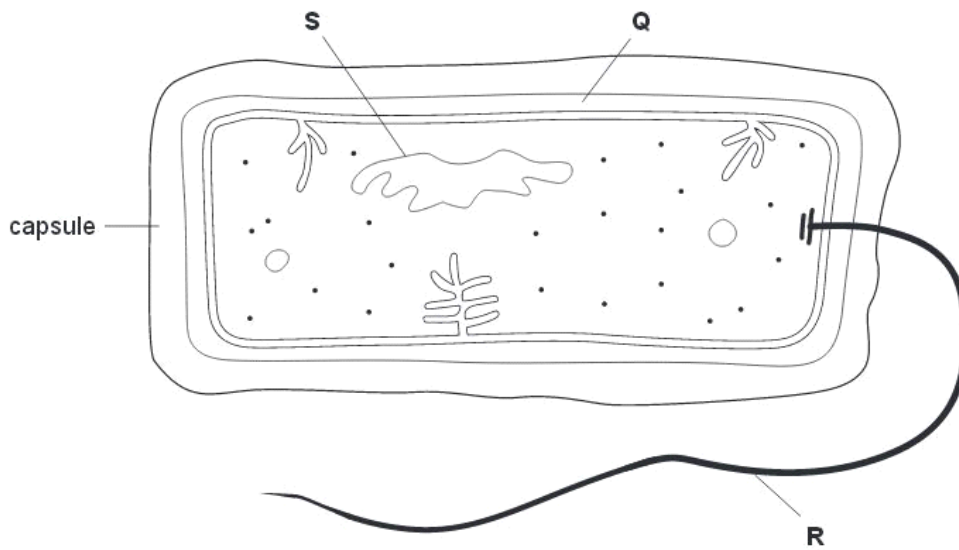


Fig. 4.1

(a) Name structures **P** to **S**.

Q

R

S[3]

(b) State the names of three structures that are present in a phagocyte from a mammal that are **not** present in bacteria.

1

2

3[3]

Q.19.

1 Fig. 1.1 is a drawing made from an electron micrograph of a goblet cell from the epithelium of the gas exchange system.

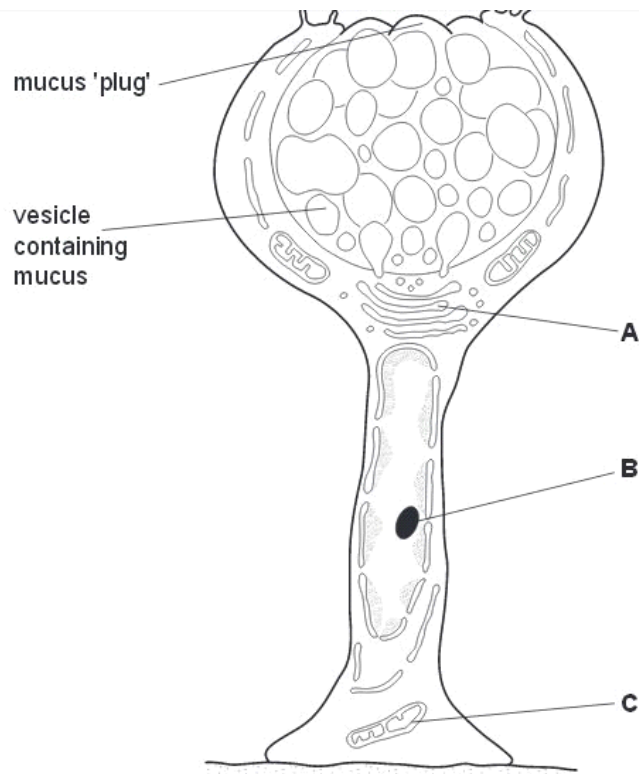


Fig. 1.1

(a) Name A to C.

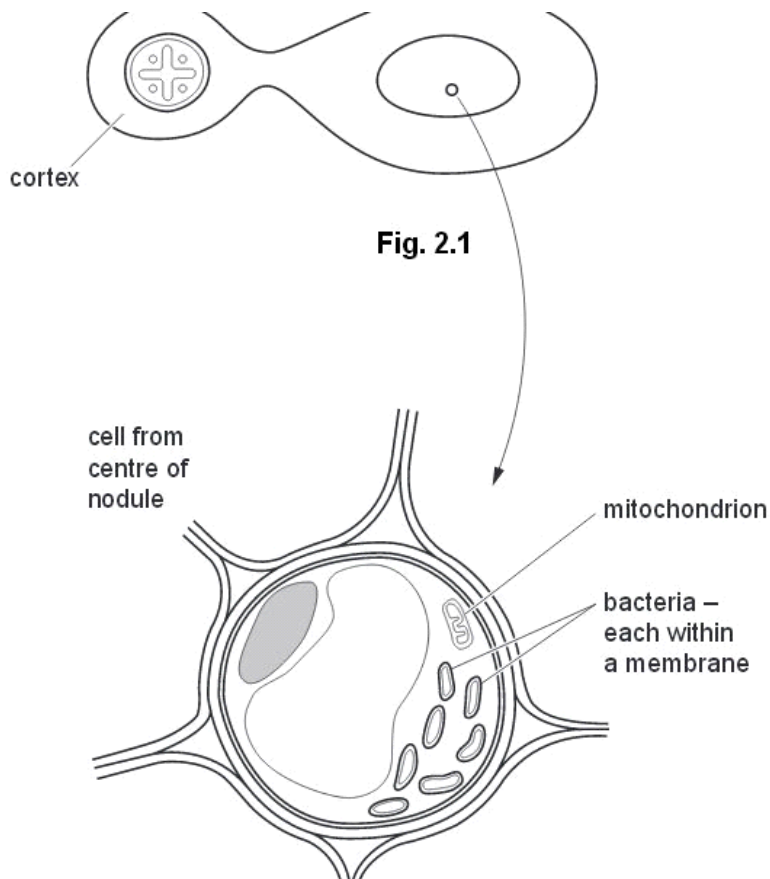
A

B

C[3]

Q.20.

2 Fig. 2.1 shows a transverse section of a root nodule of a legume. Fig. 2.2 is a drawing of a cell from the centre of the nodule made from an electron micrograph.



(a) Name three structures that are present in cells in the cortex of the root that are not present in bacterial cells.

1

2

3[3]

- (b) Explain the advantages of studying cell structure with an electron microscope rather than with a light microscope.

.....

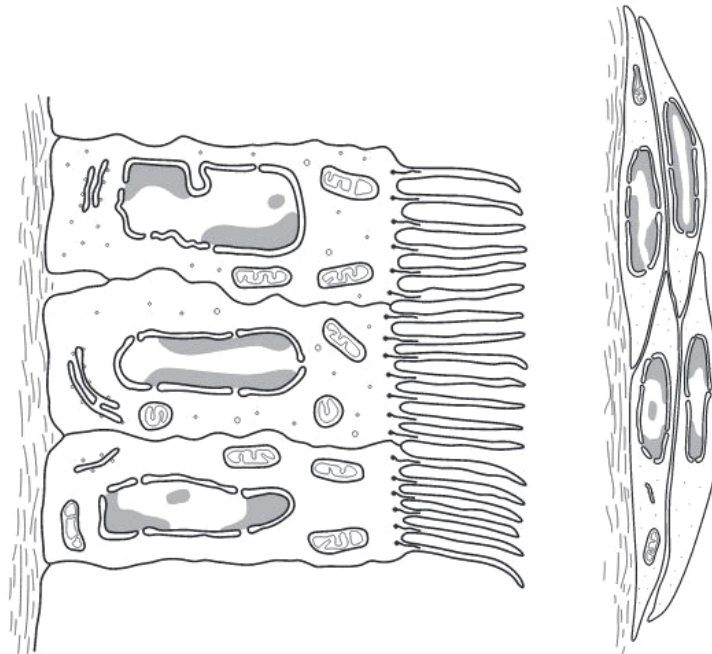
.....

.....

.....[2]

Q.21.

- 3 Fig. 3.1 shows some cells from the lining of the bronchus from a person who has never smoked.
Fig. 3.2 shows cells from the same area in a heavy smoker who suffers from chronic bronchitis.



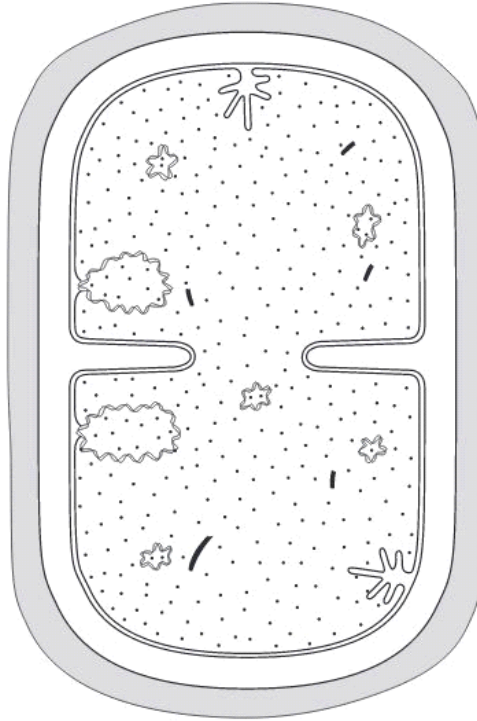
- (a) Using label lines and the following letters, label the structures **A** to **C** on Fig. 3.1.

- A** cilia
- B** nuclear membrane (nuclear envelope)
- C** endoplasmic reticulum

[3]

Q.22.

1 Fig. 1.1 shows a bacterial cell dividing by binary fission.



magnification = x 37 500

(a) With reference to Fig. 1.1, state three structural features of prokaryotic cells that are not shown by eukaryotic cells.

1

2

3[3]

Q.23.

- 1 (a) Phagocytes and lymphocytes are both involved in defence against infectious diseases. Active B lymphocytes are known as plasma cells.

Fig. 1.1 shows drawings made from electron micrographs of a phagocyte, **A**, and a plasma cell, **B**.

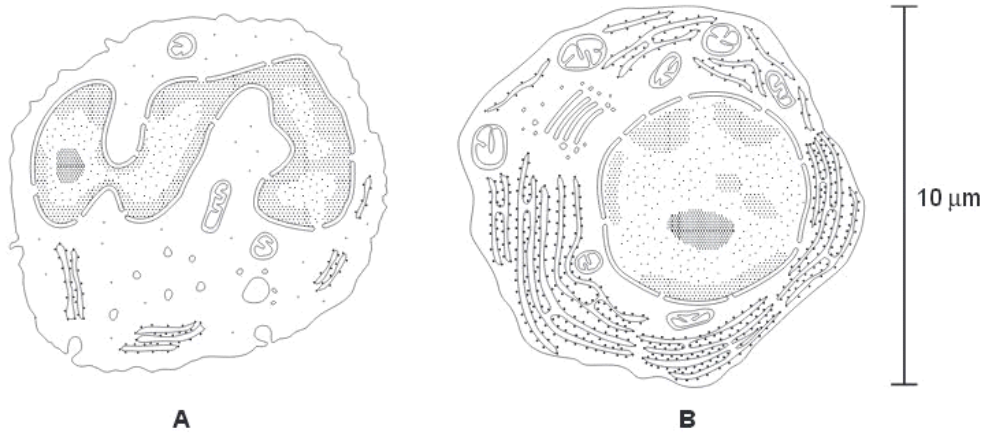


Fig. 1.1

Complete the table to show three **visible structural** differences between the cells **A** and **B**.

feature	cell A	cell B

[3]

(b) Calculate the magnification of the cells in Fig. 1.1.

Show your working and give your answer to the **nearest whole number**.

..... [2]

Q.24.

(c) Phagocytic cells contain many lysosomes.

Describe the function of lysosomes in destroying ingested bacterial cells.

.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

Q.25.

- 5 *Candida albicans* is a yeast-like fungus that lives in human lungs. It is the causative agent of one of the opportunistic infections that may develop during AIDS.

Ex

C. albicans is eukaryotic. Fig. 5.1 shows its structure.

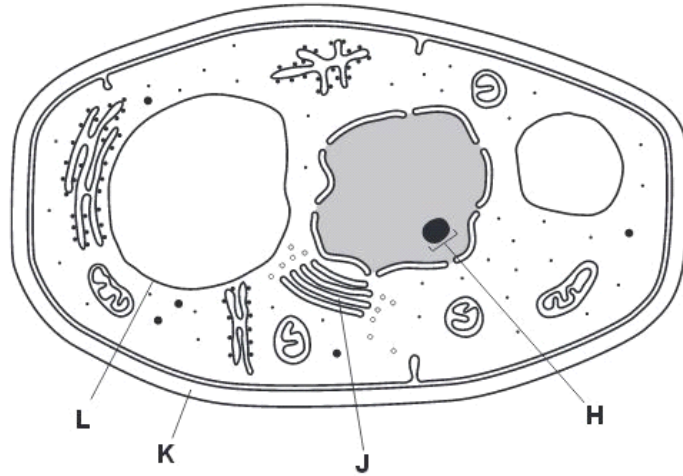


Fig. 5.1

- (a) (i) Name H to L.

H

J

K

L [4]

- (ii) State two ways in which the **structure** of a prokaryotic cell differs from that shown in Fig. 5.1.

1

.....

2

..... [2]

- (b) *C. albicans* uses a transport protein, TMP1, to absorb sugar molecules from the inside of the mouth. TMP1 is encoded by a gene within the nucleus and is produced when sugars are present in the surroundings.

Explain how the structures within the cell shown in Fig. 5.1, are involved with the production of functioning TMP1.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 10]

Q.26.

Plant cell walls consist of cellulose that is embedded in a matrix of compounds, such as pectins and proteins.

Cell wall material is synthesised inside the cell and transported to the cell surface membrane as shown in the drawing made from an electron micrograph in Fig. 5.2.

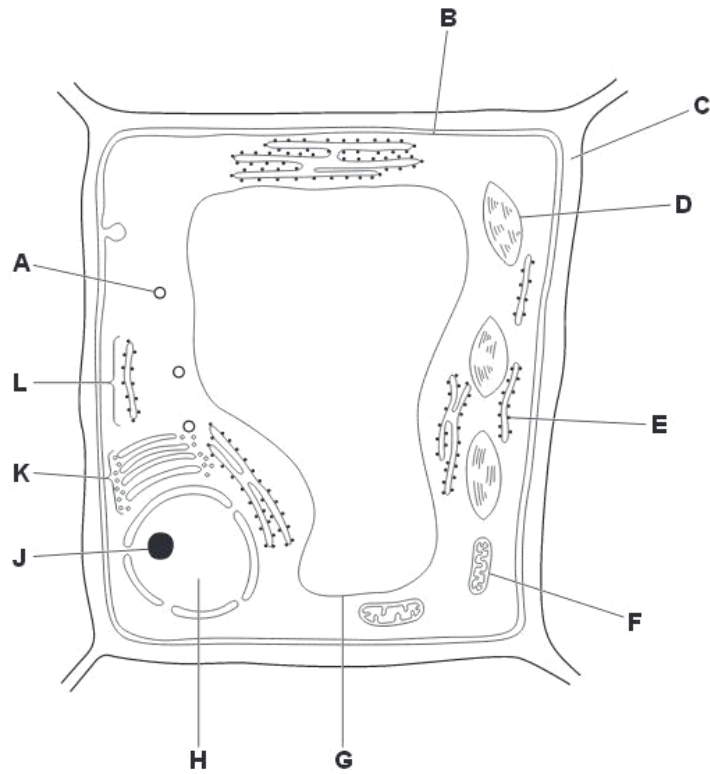


Fig. 5.2

(c) Locate the parts of the cell labelled in Fig. 5.2 which apply to each of the following statements. You must only give one letter in each case. You may use each letter once, more than once or not at all. The first answer has been completed for you.

statement	letter from Fig. 5.2
organelle that contains DNA	H
transports cell wall material to the cell surface membrane	
site of transcription	
site of ribosome synthesis	
site of photosynthesis	

[4]

- (d) Enzymes known as expansins are found in the matrix of cell walls to help the growth of cells.

Use the information in Fig. 5.2 to describe how proteins made by the ribosomes reach the matrix of the cell wall.

.....

.....

.....

.....

.....

.....

.....[3]

Q.27.

- 1 Protein production involves a complex sequence of events and a number of cell structures.

- (a) The first column in Table 1.1 shows some of the events that occur in the production of a protein in a cell and its eventual release from the cell.

Table 1.1

event	sequence of events (numbers)	cell location (letters)
exocytosis		
protein modification		
secretory vesicle formation		
transcription		
translation		

(i) In Table 1.1, write the sequence in which the events occur, using **1** as the **first** process in the sequence. [2]

(ii) From the list **A** to **F** below, choose **one** cell location for each event and write the letter in Table 1.1. Each letter may be used once, more than once, or not at all.

- A** Golgi apparatus
- B** lysosome
- C** nucleus
- D** rough endoplasmic reticulum
- E** smooth endoplasmic reticulum
- F** plasma (cell surface) membrane

[3]

(b) Describe the process of *exocytosis*.

.....

.....

.....

.....

.....

.....

..... [3]

B

Q.28.

- 6 Fig. 6.1 shows a phloem sieve tube element, its companion cell and a mesophyll cell in the leaf of a photosynthesising plant.

For
Examiner
Use

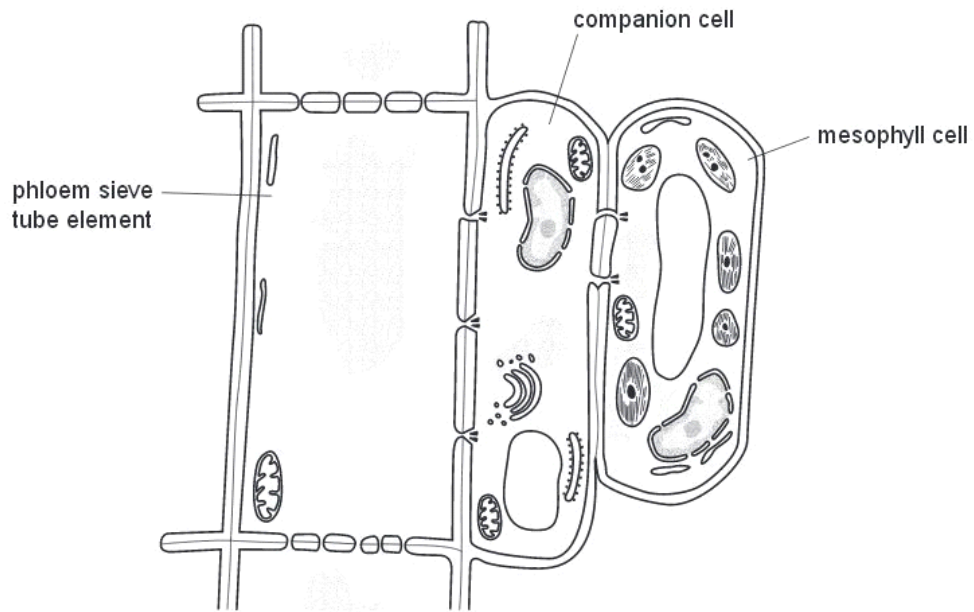


Fig. 6.1

- (a) Use label lines and the letters **C** to **E** to identify the following on Fig. 6.1.

C – a structure involved in ribosome synthesis

D – an organelle that is involved in the modification and packaging of proteins

E – an organelle that is involved in aerobic respiration

[3]

Q.29.

- 1 Fig. 1.1 is an electron micrograph of three cells of the same species of bacterium, *Erwinia carotovora*.

Ex.



Fig. 1.1

- (a) Calculate the magnification of the electron micrograph in Fig. 1.1.
Show your working and give your answer to the nearest 10 000.

magnification × [2]

- (b) Name three structures, present in animal cells, which are **not** present in the cells shown in Fig. 1.1.

1.
.....
2.
.....
3.
..... [3]

(c) *E. carotovora* is a rod-shaped bacterium.

Explain why two of the bacterial cells in Fig. 1.1 do **not** appear rod-shaped.

.....

.....

.....

..... [1]

Q.30.

1 Fig. 1.1 is a drawing made from an electron micrograph of a mammalian liver cell.

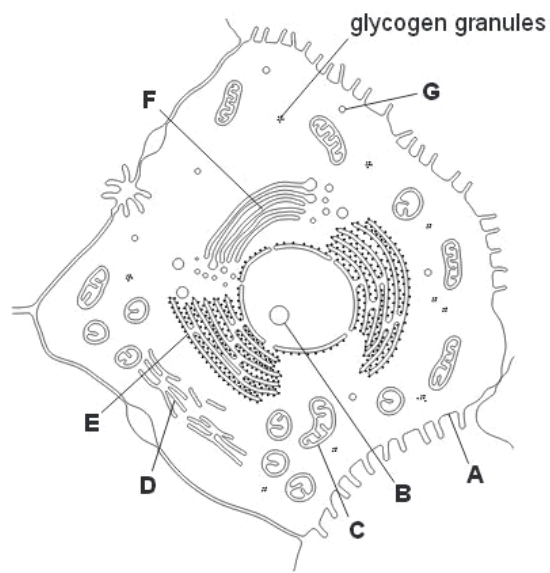


Fig. 1.1

- (a) Complete the table by naming the structures **B** to **G** and stating **one** function of each. The first one (**A**) has been completed for you.

	name of organelle	function
A	cell surface membrane	controls movement of substances into and out of the cell
B		
C		
D		
E		
F		
G		

[6]

Q.31.

- 1 Fig. 1.1 is a labelled diagram of a leaf palisade mesophyll cell, as seen with a high quality light microscope.

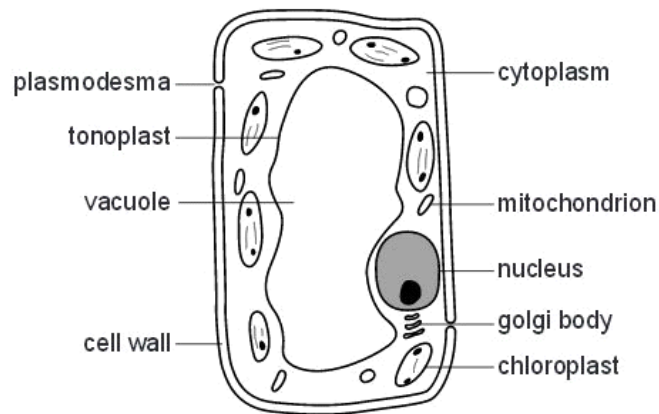


Fig. 1.1

An electron micrograph of the same leaf mesophyll cell at the **same magnification** would show more detail than is shown in Fig. 1.1.

(a) Explain why, at the **same magnification**, an electron micrograph is able to provide more detail than a light micrograph.

.....
.....
.....
..... [2]

(b) **Describe** three additional features that could be seen on an electron micrograph of the leaf mesophyll cell that are not seen in Fig. 1.1.

1.
.....
2.
.....
3.
..... [3]

(c) The length of the labelled chloroplast in Fig. 1.1 is $5.0\mu\text{m}$. Calculate the magnification of the cell shown in Fig. 1.1.

Show your working.

magnification \times [2]

Q.32.

1 Fig. 1.1 shows electron micrographs of some eukaryotic cell organelles.

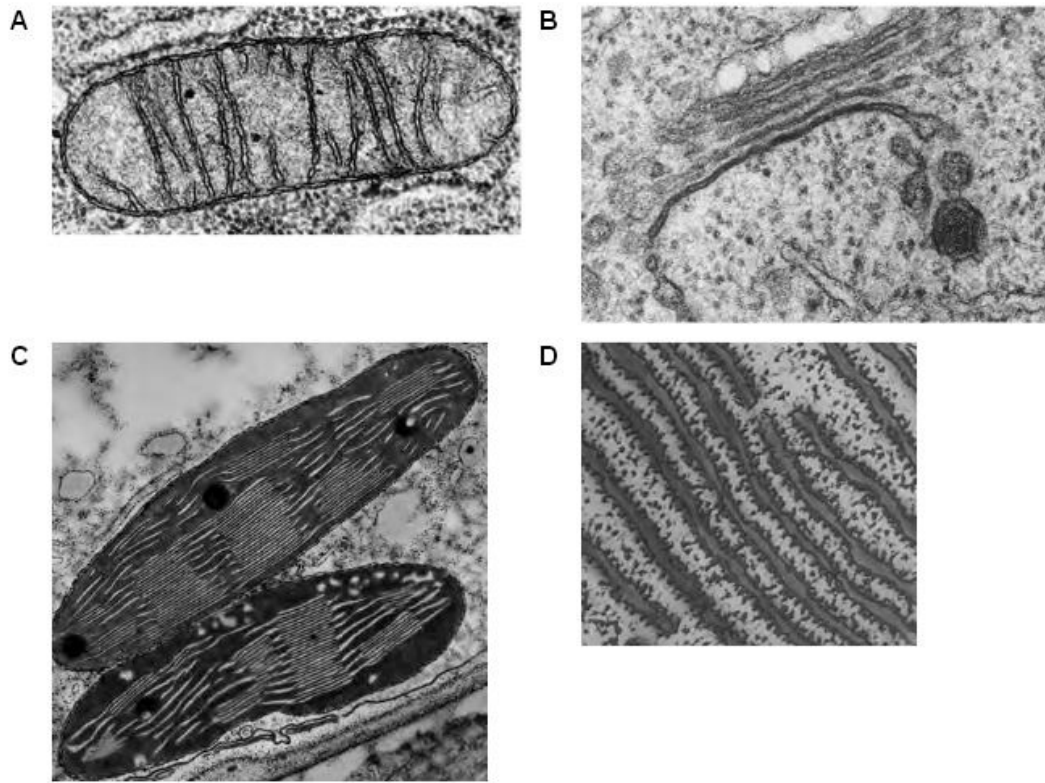


Fig. 1.1

For each of the organelles **A**, **B**, **C** and **D**, shown in Fig. 1.1, state the name and function of each.

A name

function.....

B name

function.....

C name

function.....

D name

function..... [8]

[Total: 8]

Q.33.

- 4 Cholesterol is synthesised in the smooth endoplasmic reticulum (SER) in liver cells by a series of enzyme-catalysed reactions.

Within the SER, molecules of cholesterol and triglycerides are surrounded by proteins and phospholipids to form lipoproteins. These lipoprotein particles enter the Golgi apparatus where they are packaged into vesicles and pass to the blood.

Fig. 4.1 is an electron micrograph of part of a liver cell showing lipoprotein particles within the Golgi apparatus.

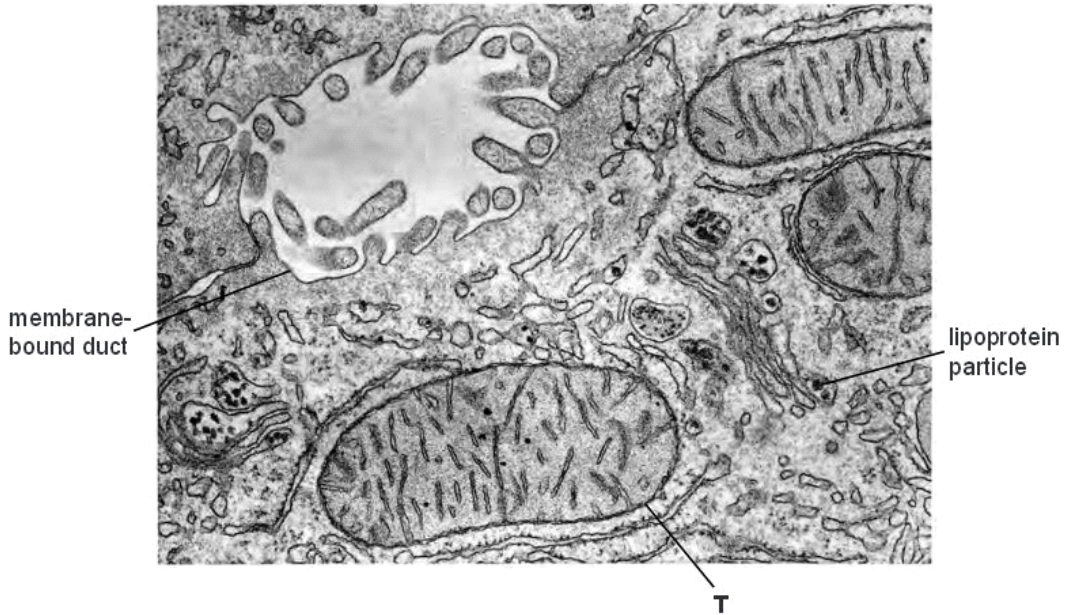


Fig. 4.1

- (a) Name structure **T** in Fig. 4.1 and state its role in liver cells.

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.....
.....
.....
.....
.....
.....

[3]

(b) (i) Suggest why cholesterol is packaged into lipoproteins before release from liver cells into the blood.

.....
.....
.....
.....[1]

(ii) Explain why cells of the body need to be supplied with cholesterol.

.....
.....
.....
.....[2]

(c) Cholesterol is also packaged into vesicles by the SER and then secreted from the cell into small fluid-filled spaces between the liver cells. These spaces form ducts that drain into the gall bladder to form bile.

Suggest how cholesterol is secreted into ducts, such as the duct in Fig. 4.1.

.....
.....
.....
.....[2]

(d) State **one** function of the Golgi apparatus **other than** the packaging of substances into vesicles for transport.

.....
.....[1]

[Total: 9]

Q.34.

4 *Staphylococcus aureus* is a bacterium that is the cause of many different infectious diseases.

Ex

(a) Fig. 4.1 is a diagram of *S. aureus*.

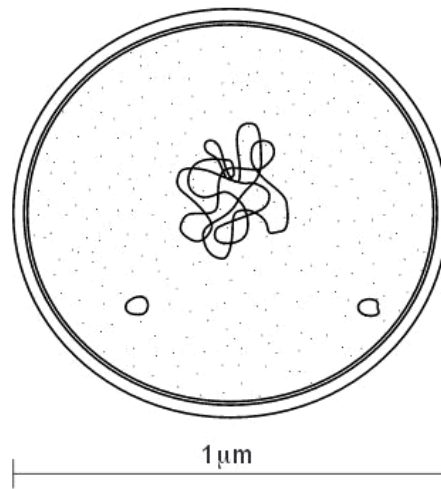


Fig. 4.1

(i) Cell structures, such as mitochondria, endoplasmic reticula (ER), Golgi apparatus, lysosomes and chloroplasts are found only in eukaryotic cells. These are not present in Fig. 4.1.

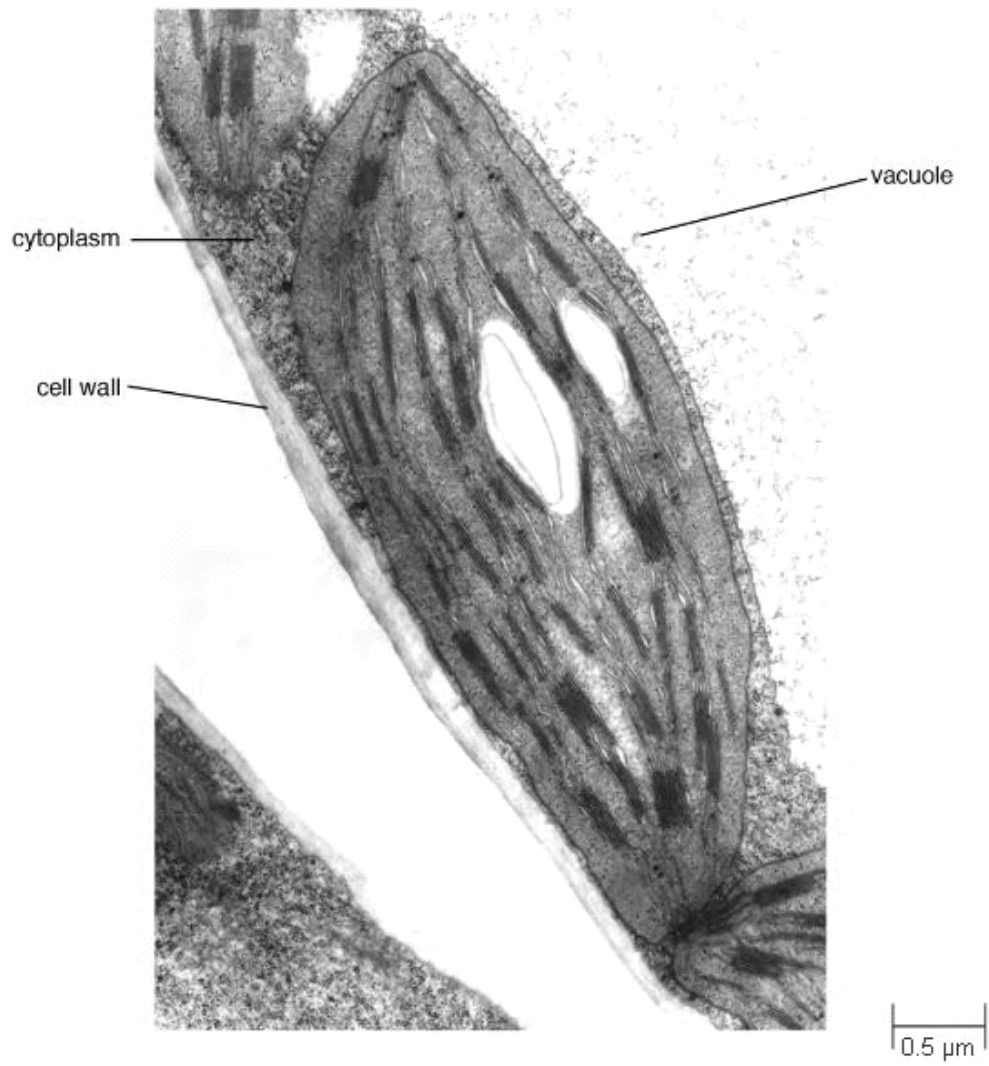
With reference to Fig. 4.1, describe **other features** that support the fact that *S. aureus* is a prokaryote.

.....
.....
.....
.....
.....
.....
.....[3]

(ii) State the main difference in the composition of the plant cell wall compared to the bacterial cell wall.

plant cell wall
bacterial cell wall [2]

Q.35.



(a) Calculate the magnification of the electron micrograph in Fig. 4.1.

Answer = [1]

(b) State two features **visible in Fig. 4.1** that identify the organelle shown as a chloroplast.

1.

2.[2]

(c) Chloroplasts absorb phosphate ions from the surrounding cytoplasm. Suggest one way in which chloroplasts use phosphate ions.

.....[1]

