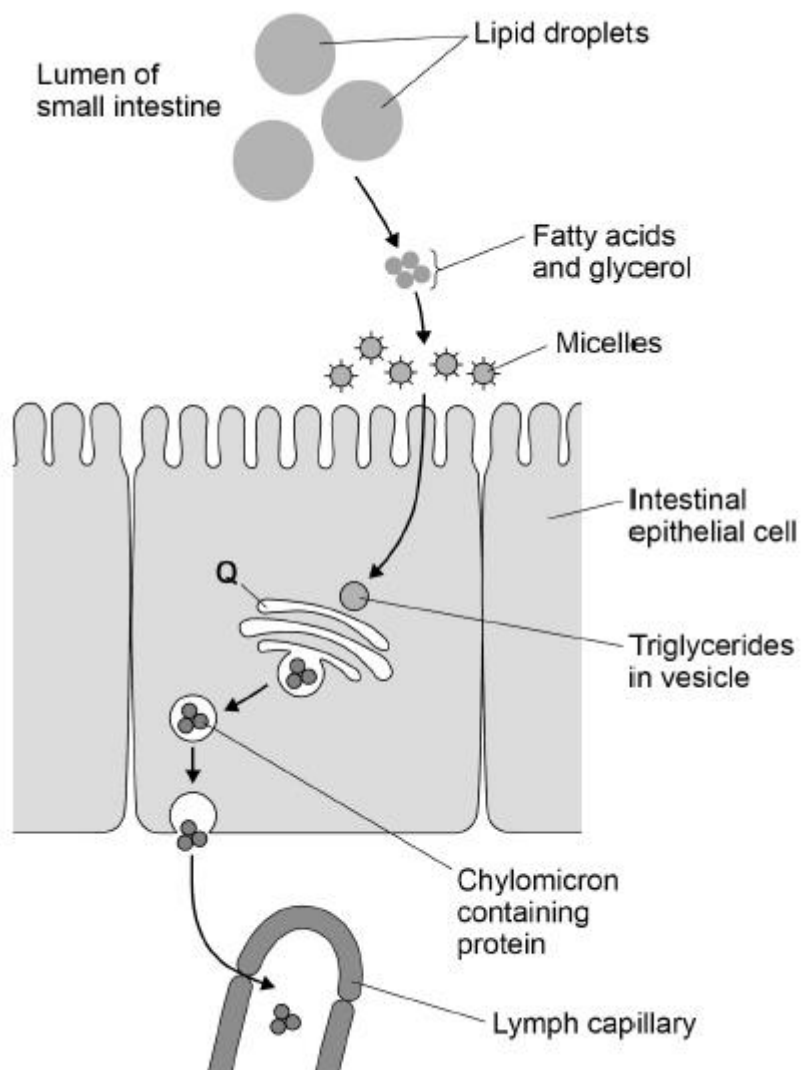


2.1 CELL STRUCTURE, EUKARYOTES, PROKARYOTES, METHODOLOGY 1 - QUESTIONS

Q1. The diagram outlines the digestion and absorption of lipids.



(a) Tick (✓) the box by the name of the process by which fatty acids and glycerol enter the intestinal epithelial cell.

Active transport

Diffusion

Endocytosis

Osmosis

(1)

(b) Explain the advantages of lipid droplet and micelle formation.

(3)

(c) Name structure **Q** in the diagram above and suggest how it is involved in the absorption of lipids.

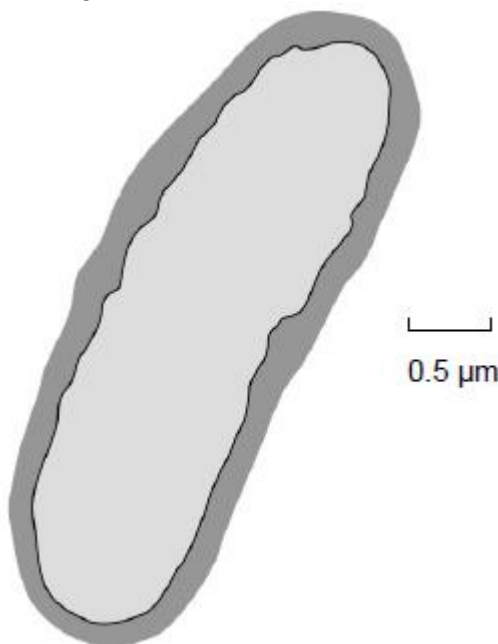
Name _____

How it is involved _____

(4)

(Total 8 marks)

Q2.A bacterium is shown in the diagram.



(a) Calculate the magnification of the image.

Magnification = _____

(1)

(b) Complete the table to show the features of a bacterium and a virus.

Put a tick (✓) in the box if the feature is shown.

Surface	Bacterium	Virus
Cell-surface membrane		
Nucleus		
Cytoplasm		
Capsid		

(2)

(c) DNA and RNA can be found in bacteria.

Give **two** ways in which the nucleotides in DNA are different from the nucleotides in RNA.

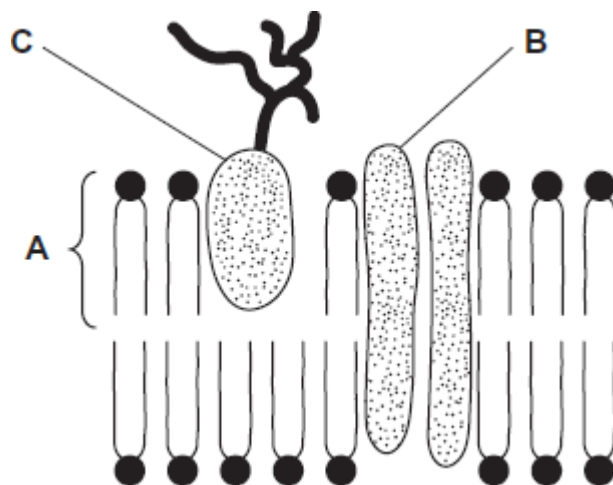
1. _____

2. _____

(2)

(Total 5 marks)

Q3. The diagram shows the structure of the cell-surface membrane of a cell.



(a) Name **A** and **B**.

A _____

B _____ (2)

- (b) (i) **C** is a protein with a carbohydrate attached to it. This carbohydrate is formed by joining monosaccharides together. Name the type of reaction that joins monosaccharides together.

Name the type of reaction that joins monosaccharides together.

_____ (1)

- (ii) Some cells lining the bronchi of the lungs secrete large amounts of mucus. Mucus contains protein.

Name **one** organelle that you would expect to find in large numbers in a mucus-secreting cell and describe its role in the production of mucus.

Organelle _____

Description of role _____

(2)
(Total 5 marks)

Q4.(a) What is a tissue?

(1)

- (b) A student cut a thin section of tissue from a potato and examined it with an optical microscope.

- (i) Starch was present in the cells of this tissue. Describe how the student could find out where in the cells the starch was present.

(2)

- (ii) The student cut a thin section of the tissue. Explain why it was important that the section was thin.

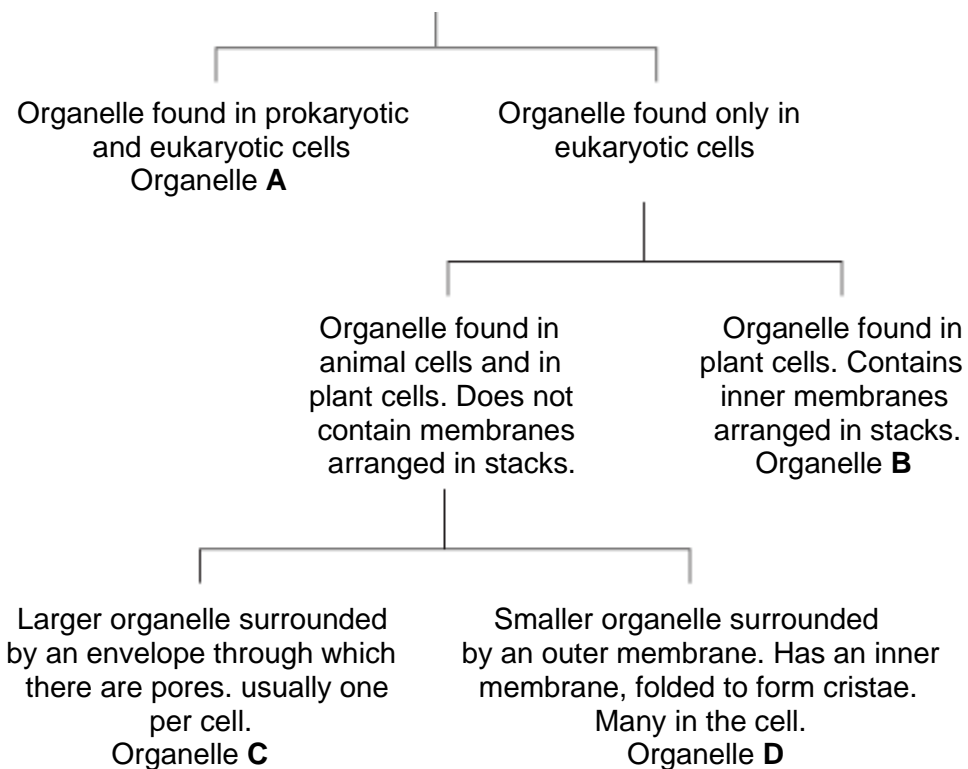
(2)

- (c) The cell walls of potato cells contain cellulose. Cellulose and starch are both carbohydrates. Describe **two** ways in which molecules of cellulose are similar to molecules of starch.

(2)

(Total 7 marks)

Q5. The diagram shows how some organelles may be distinguished from each other.



- (a) (i) Name organelle **B**.

(1)

- (ii) Describe the function of organelle **B**.

(2)

(b) Which of organelles **A**, **B**, **C** or **D**

(i) is a ribosome;

(1)

(ii) contains most of the DNA found in a plant cell?

(1)

(c) Some liver tissue was ground, filtered and centrifuged to make a suspension of organelle **D**.

(i) Explain why the solution in which the liver tissue was ground should be ice-cold.

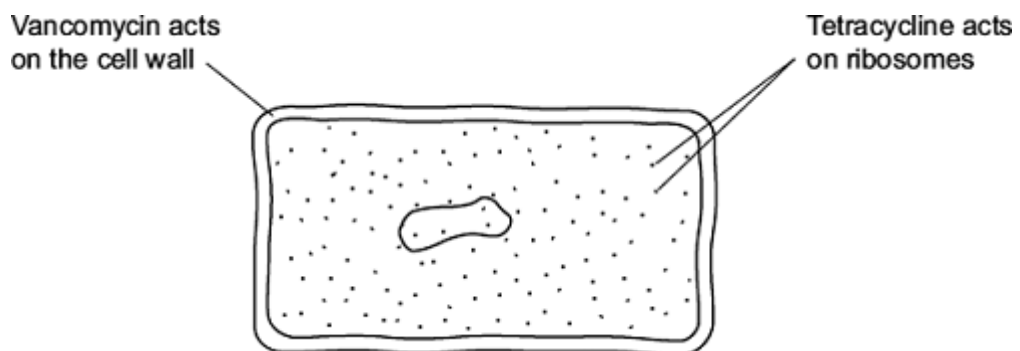
(1)

(ii) The ground liver was centrifuged at low speed. The pellet that formed at the bottom of the centrifuge tube was thrown away and the supernatant centrifuged again at higher speed. Explain why it was necessary to first centrifuge the ground liver at low speed in order to obtain a suspension of organelle **D**.

(2)

(Total 8 marks)

Q6. The diagram shows the structure of a bacterium and the sites of action of two antibiotics.



(a) (i) Use information in the diagram to explain why vancomycin does **not** affect

human cells.

(1)

(ii) Use information in the diagram to explain how tetracycline prevents bacterial growth.

(1)

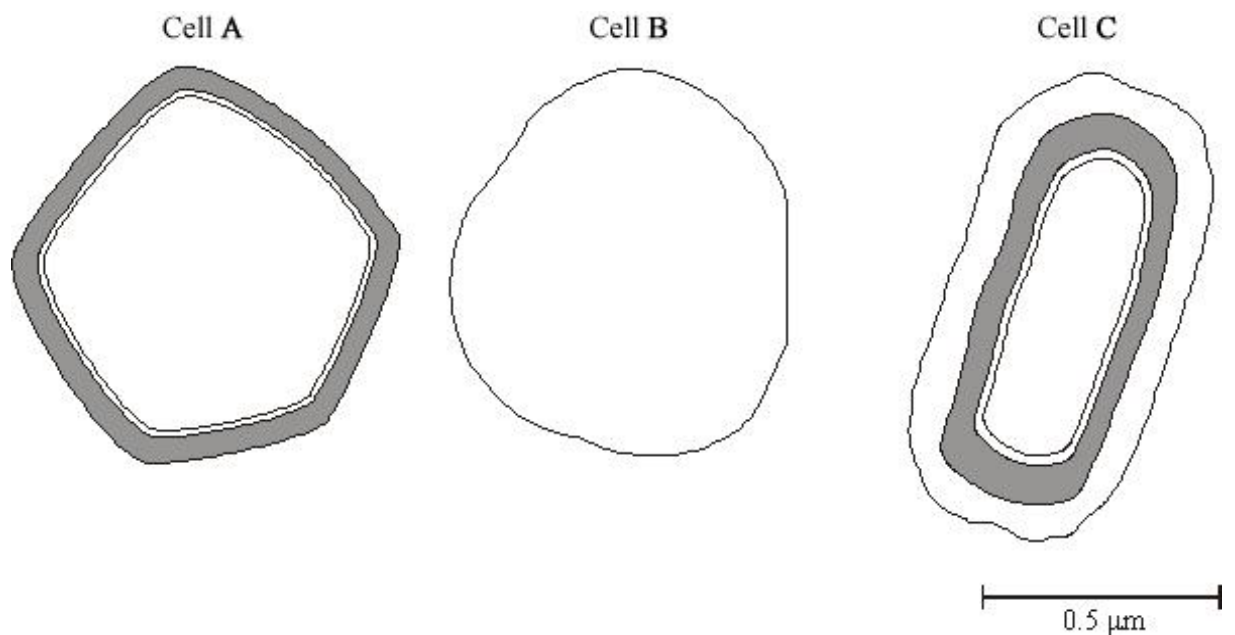
(b) Frequent treatment with vancomycin can result in resistant strains of bacteria. Explain how.

(Extra space)

(2)

(Total 4 marks)

Q7. The diagram shows the outer layers of three different cells, **A**, **B** and **C**.



(a) What is the evidence from the diagram that

(i) cell **B** is an animal cell,

(1)

(ii) cell **C** is a prokaryotic cell?

(1)

(b) Explain how you would calculate the magnification of cell **C**.

(1)

(c) Cell **A** is a plant cell. Name a polysaccharide which may be found in cell **A** but would not be found in the animal cell.

(1)

(d) Penicillin is an antibiotic. It prevents the formation of bacterial cell walls. As a result, bacterial cells that have been treated with penicillin swell and burst as water enters.

(i) Explain how water enters a bacterial cell.

(2)

(ii) Suggest why penicillin has no effect on plant cells.

(1)

(Total 7 marks)

Q8. (a) The diagram shows two organelles found in a eukaryotic cell.



A



B

(i) Name the organelles.

A _____

B _____

(1)

(ii) Explain how the inner membrane is adapted to its function in organelle **A**.

(2)

(b) Give **one** feature of a prokaryotic cell that is not found in a eukaryotic cell.

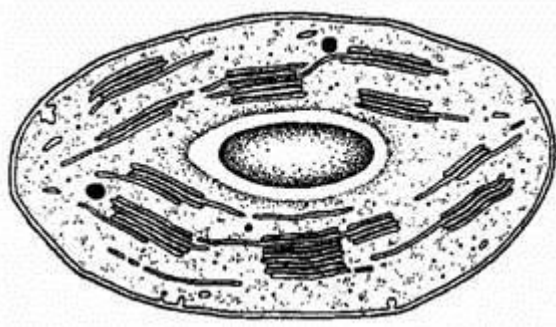
(1)

(c) Describe how a sample consisting only of chloroplasts could be obtained from homogenised plant tissue.

(3)

(Total 7 marks)

Q9. The diagram shows the structure of a chloroplast.



- (a) Label the diagram with an **X** to show where the light-dependent reactions take place and with a **Y** to show where the light-independent reactions take place.

(1)

- (b) The photolysis of water is an important part of the process of photosynthesis. Describe what happens in the photolysis of water.

(2)

- (c) ATP and reduced NADP are two products of the light-dependent reactions. Describe **one** function of **each** of these substances in the light-independent reactions.

ATP _____

Reduced NADP _____

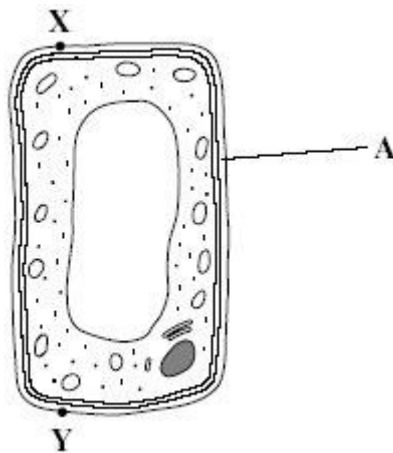
(2)

(Total 5 marks)

- Q10.** (a) Name the process in which cells become adapted for different functions.

(1)

- (b) Palisade cells are found in leaves. The diagram shows a palisade cell.



(i) Name structure **A**.

(1)

(ii) The real length of this cell between **X** and **Y** is 20 micrometres (μm). By how many times has it been magnified? Show your working.

Answer _____

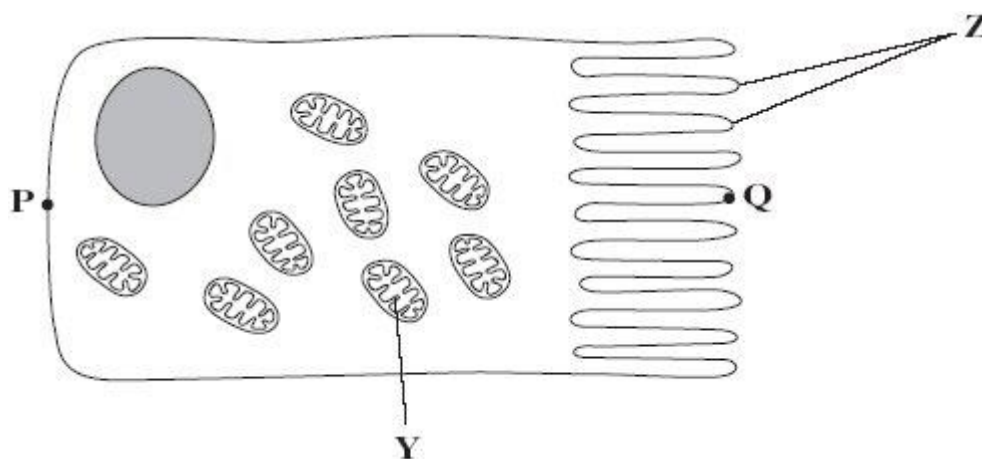
(2)

(iii) Explain **one** way in which this cell is adapted for photosynthesis.

(1)

(Total 5 marks)

Q11. The diagram shows an epithelial cell from the small intestine.



(a) (i) Name organelle **Y**.

(1)

(ii) There are large numbers of organelle **Y** in this cell. Explain how these organelles help the cell to absorb the products of digestion.

(2)

(b) This diagram shows the cell magnified 1000 times. Calculate the actual length of the cell between points **P** and **Q**. Give your answer in μm . Show your working.

Answer _____ μm (2)

(c) Coeliac disease is a disease of the human digestive system. In coeliac disease, the structures labelled **Z** are damaged.

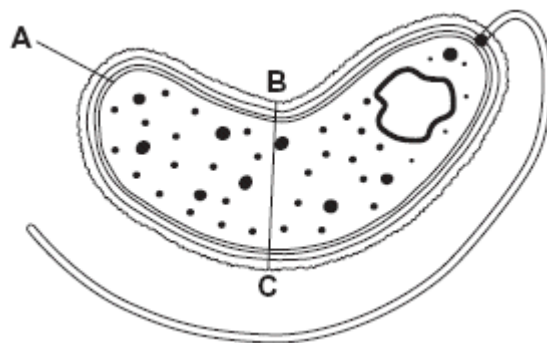
Although people with coeliac disease can digest proteins they have low concentrations of amino acids in their blood.

Explain why they have low concentrations of amino acids in their blood.

(2)

(Total 7 marks)

Q12. The diagram shows a cholera bacterium. It has been magnified 50 000 times.



(a) Name **A**.

_____ (1)

(b) Name **two** structures present in an epithelial cell from the small intestine that are **not** present in a cholera bacterium.

1. _____

2. _____

(2)

(c) Cholera bacteria can be viewed using a transmission electron microscope (TEM) or a scanning electron microscope (SEM).

(i) Give **one** advantage of using a TEM rather than a SEM.

(1)

(ii) Give **one** advantage of using a SEM rather than a TEM.

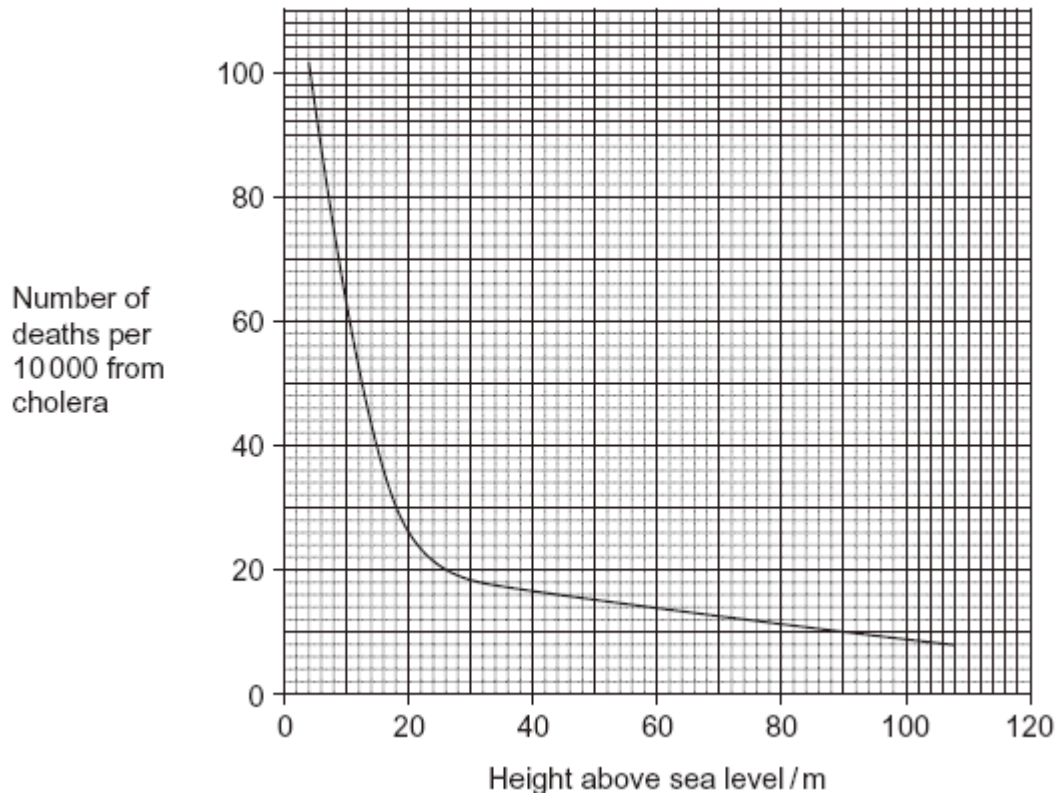
(1)

(d) Calculate the actual width of the cholera bacterium between points **B** and **C**. Give your answer in micrometres and show your working.

_____ μm

(2)

(e) An outbreak of cholera occurred in London in 1849. The graph shows the relationship between the number of deaths from cholera and the height at which people lived above sea level.



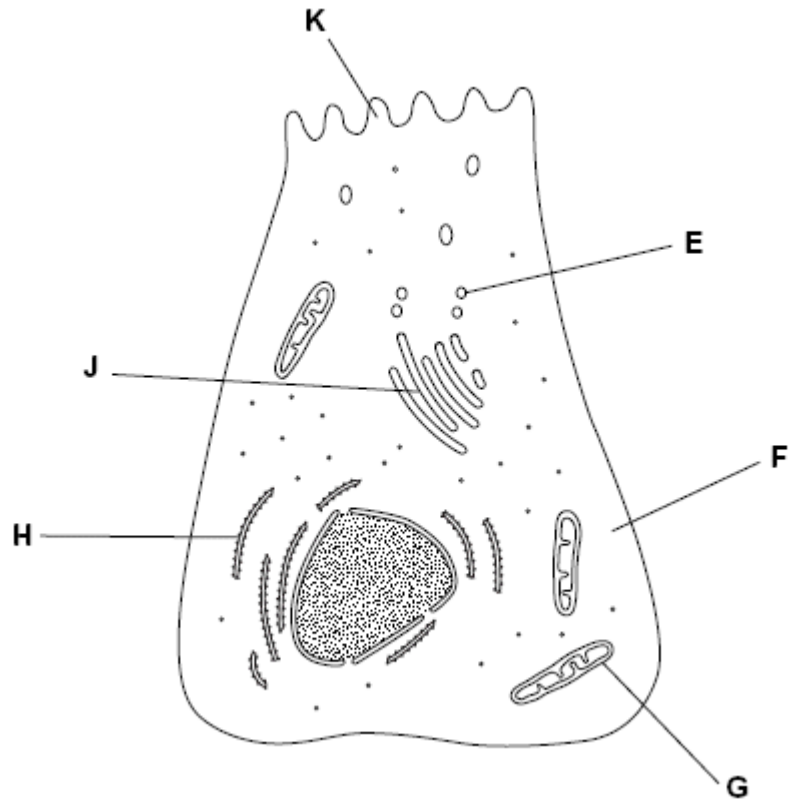
Describe the relationship between the number of deaths from cholera and the height at which people lived above sea level.

(2)
(Total 9 marks)

Q13. (a) Name the type of bond that joins amino acids together in a polypeptide.

(1)

The diagram shows a cell from the pancreas.



- (b) The cytoplasm at **F** contains amino acids. These amino acids are used to make proteins which are secreted from the cell.

Place the appropriate letters in the correct order to show the passage of an amino acid from the cytoplasm at **F** until it is secreted from the cell as a protein at **K**.



(2)

- (c) There are lots of organelle **G** in this cell. Explain why.

(2)

- (d) A group of scientists homogenised pancreatic tissue before carrying out cell fractionation to isolate organelle **G**.

Explain why the scientists

- (i) homogenised the tissue

(1)

(ii) filtered the resulting suspension

(1)

(iii) kept the suspension ice cold during the process

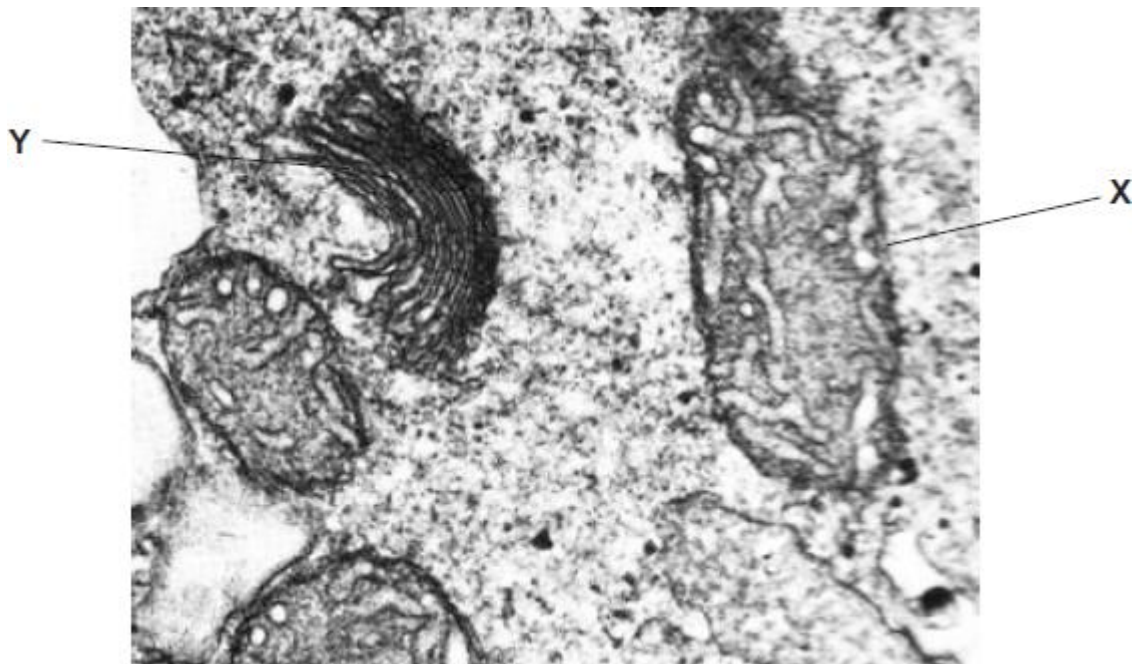
(1)

(iv) used isotonic solution during the process.

(2)

(Total 10 marks)

Q14. The photograph shows part of the cytoplasm of a cell.



(a) (i) Organelle **X** is a mitochondrion.

What is the function of this organelle?

(1)

(ii) Name organelle **Y**.

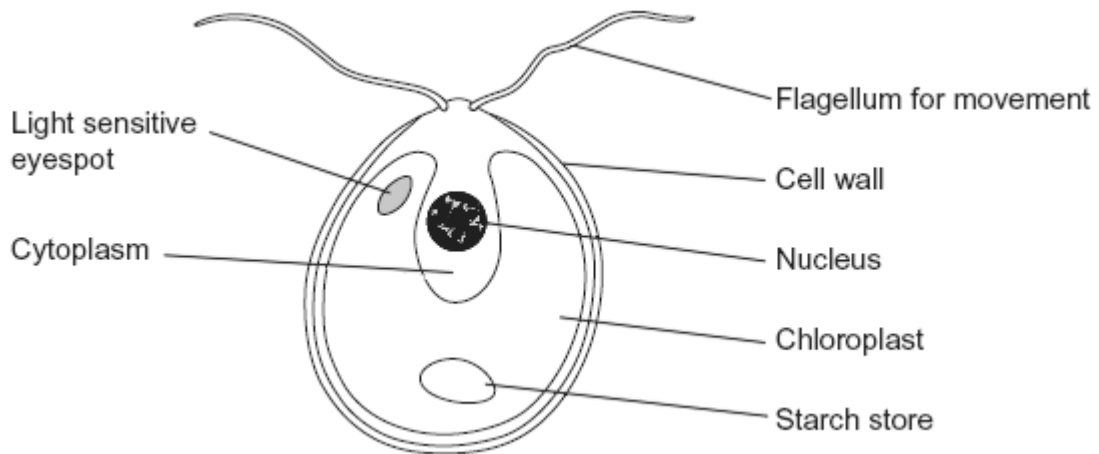
(1)

- (b) This photograph was taken using a transmission electron microscope. The structure of the organelles visible in the photograph could not have been seen using an optical(light) microscope. Explain why.

(2)

(Total 4 marks)

Q15. The diagram shows an organism called *Chlamydomonas*.



- (a) Name **two** structures shown in the diagram that are present in plant cells but are **not** present in animal cells.

1. _____

2. _____

_____ (2)

- (b) *Chlamydomonas* lives in fresh water ponds. Use your knowledge of osmosis to suggest an advantage of using starch as a carbohydrate store.

_____ (2)

- (c) *Chlamydomonas* has adaptations that help it to maintain a high rate of photosynthesis.

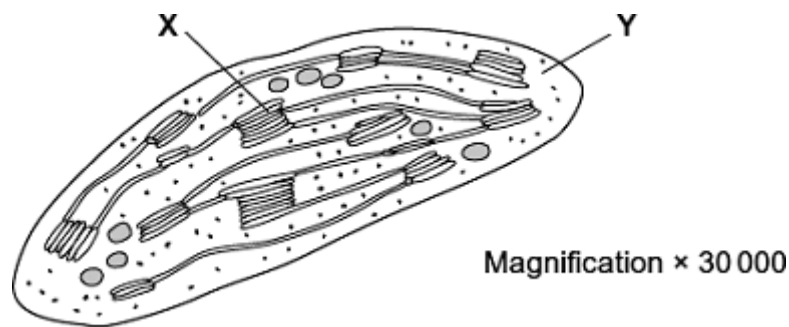
Use information in the diagram to explain what these adaptations are.

(Extra space)

(3)

(Total 7 marks)

Q16. The diagram shows a chloroplast as seen with an electron microscope.



- (a) Name X and Y.

X _____

Y _____

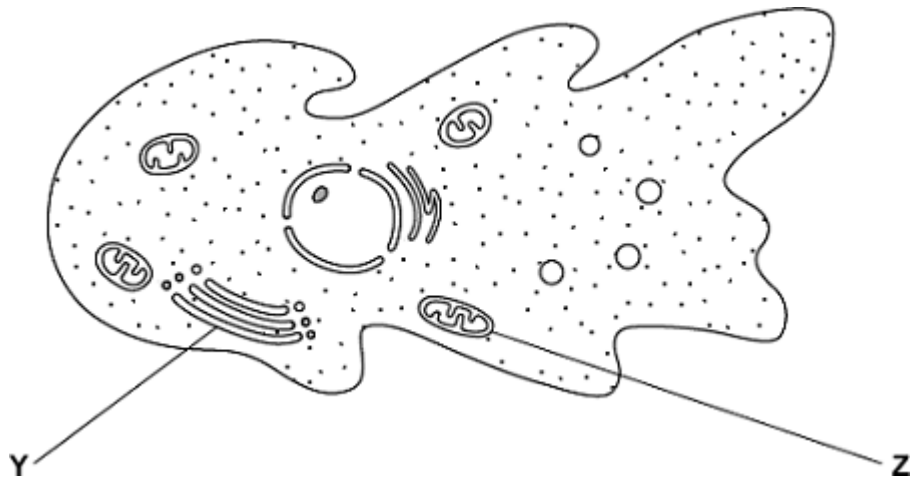
(2)

- (b) Describe the function of a chloroplast.

_____ (2)

- (c) Calculate the maximum length of this chloroplast in micrometres (μm). Show your working.

Q17. An amoeba is a single-celled, eukaryotic organism. Scientists used a transmission electron microscope to study an amoeba. The diagram shows its structure.



(a) (i) Name organelle **Y**.

(1)

(ii) Name **two** other structures in the diagram which show that the amoeba is a eukaryotic cell.

1. _____

2. _____

(2)

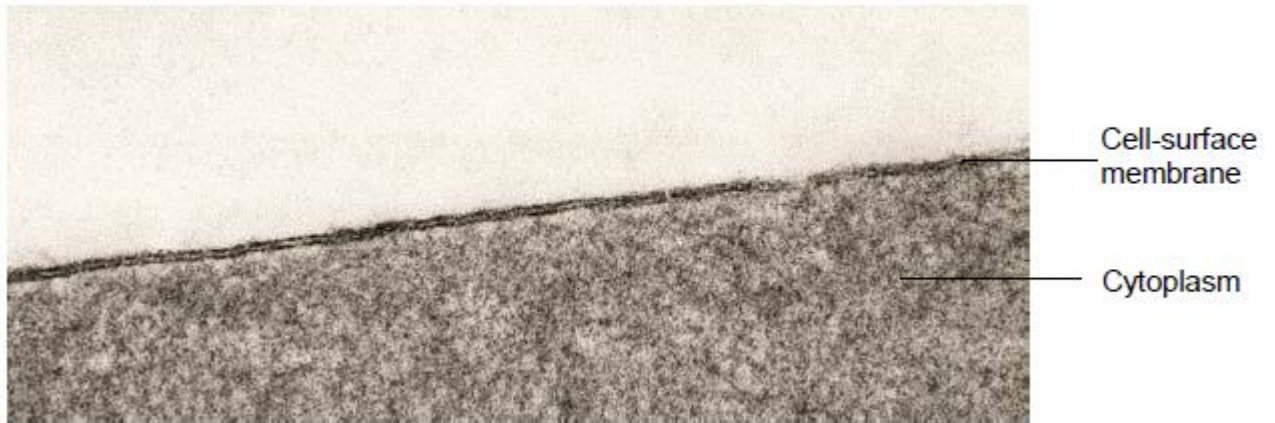
(b) What is the function of organelle **Z**?

(1)

(c) The scientists used a transmission electron microscope to study the structure of the amoeba. Explain why. (2)

(Total 6 marks)

Q18. The image below shows the cell-surface membrane of a red blood cell seen with a transmission electron microscope.



- (a) The cell-surface membrane can be seen with a transmission electron microscope but **not** with an optical microscope.

Explain why.

(1)

- (b) No organelles are visible in the cytoplasm of this red blood cell.

Suggest why.

(1)

- (c) Before the cell was examined using the electron microscope, it was stained. This stain caused parts of the structure of the cell-surface membrane to appear as two dark lines.

Suggest an explanation for the appearance of the cell-surface membrane as two dark lines.

(3)

(b) Cells that secrete enzymes contain a lot of rough endoplasmic reticulum (RER) and a large Golgi apparatus.

(i) Describe how the RER is involved in the production of enzymes.

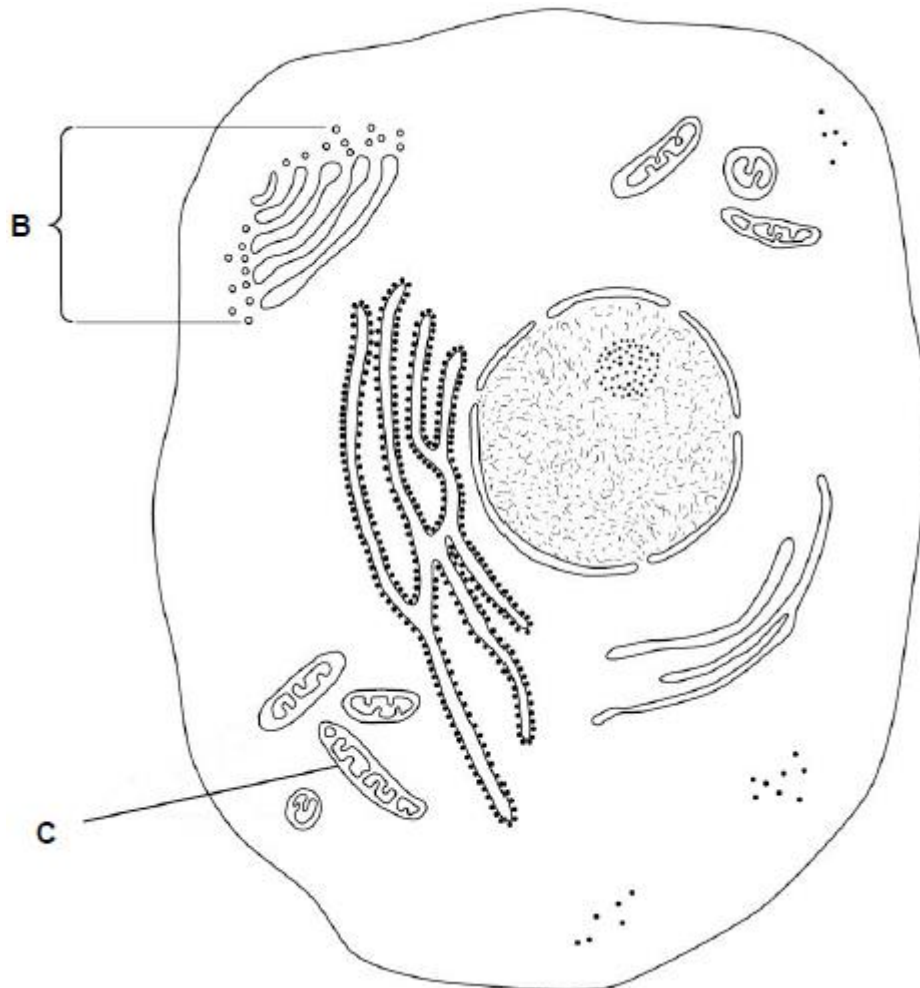
(2)

(ii) Describe how the Golgi apparatus is involved in the secretion of enzymes.

(1)

(Total 5 marks)

Q21. Below is a diagram of an animal cell.



(a) Name the organelles labelled:

B _____

C _____ (2)

(b) Name **two** structures present in plant cells that are **not** present in animal cells.

1. _____

2. _____

(1)

A biologist prepared a sample of organelles labelled **C** from liver. He used the following method.

1. Added to the liver tissues an ice-cold, buffered solution with the same water potential as the liver tissue.
2. Mixed the liver and solution in a blender.
3. Filtered the mixture from the blender.
4. Spun the filtered liquid in a centrifuge at a low speed. A pellet appeared in the bottom of the centrifuge tube.
5. Poured off the liquid above the pellet into a second centrifuge tube and spun this at a higher speed to obtain the sample of organelles labelled **C**.

(c) Explain why the solution the biologist used was ice-cold, buffered and the same water potential as the liver tissue (step 1).

Ice-cold _____

Buffered _____

Same water potential _____

(3)

(d) Explain why the biologist used a blender and then filtered the mixture (steps 2 and 3).

(2)

(e) Name the organelle that made up most of the first pellet after centrifuging at a low speed (step 4).

(1)

(f) The second centrifuge tube was spun at a higher speed to obtain the sample of

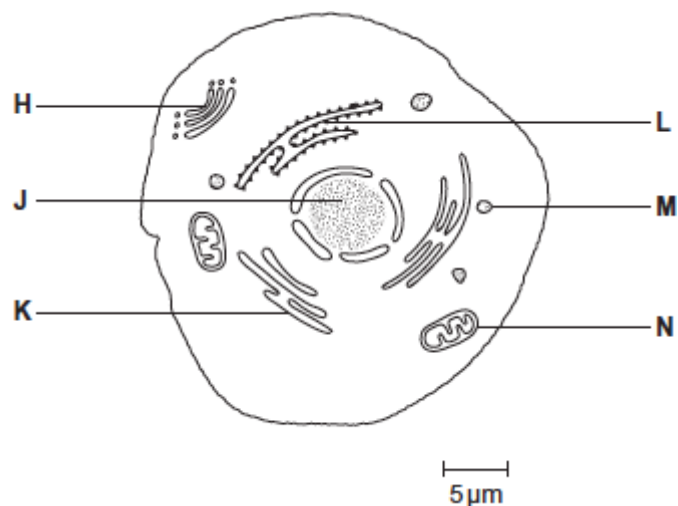
organelles labelled **C** in the diagram (step 5).

Suggest why.

(1)

(Total 10 marks)

Q22. The diagram shows a eukaryotic cell.



- (a) Complete the table by giving the letter labelling the organelle that matches the function.

Function of organelle	Letter
Protein synthesis	
Modifies protein (for example, adds carbohydrate to protein)	
Aerobic respiration	

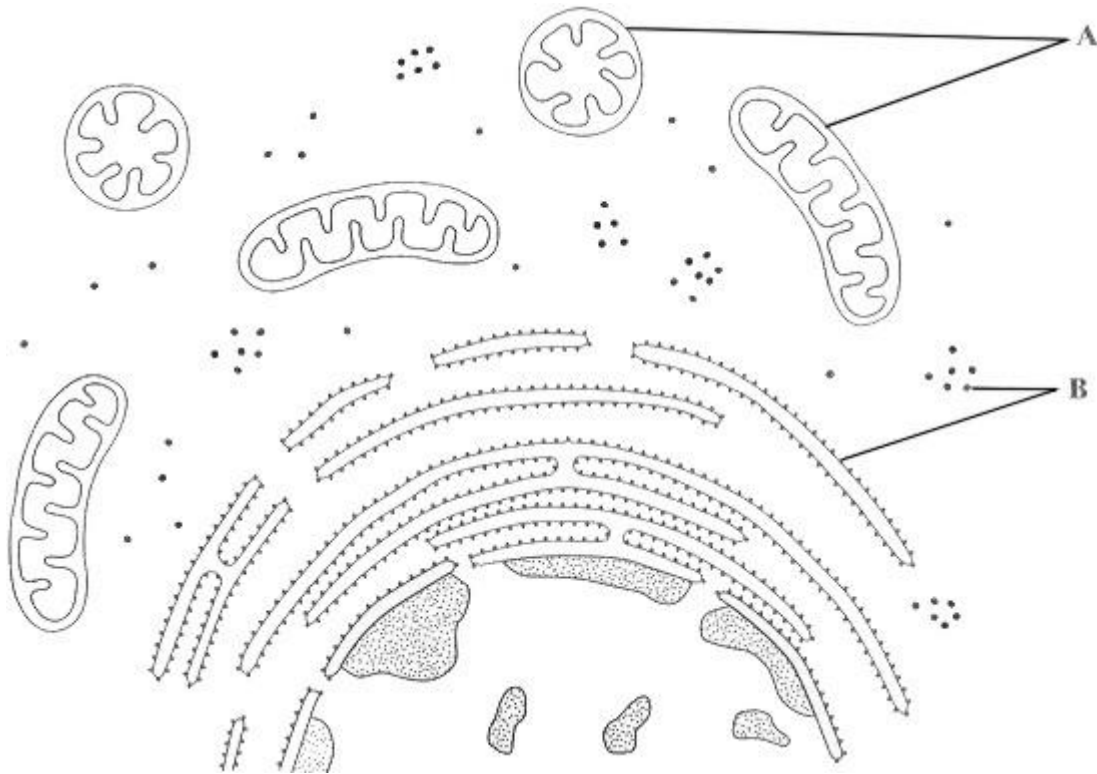
(3)

- (b) Use the scale bar in the diagram above to calculate the magnification of the drawing.
Show your working.

Answer = _____ (2)

(Total 5 marks)

Q23. The diagram shows part of an animal cell as seen through an electron microscope.



(a) Name the organelles labelled **A** and **B**.

A _____

B _____

(2)

(b) Explain why the shapes of the two organelles labelled **A** appear different.

(2)

(c) Give the function of organelle **B**.

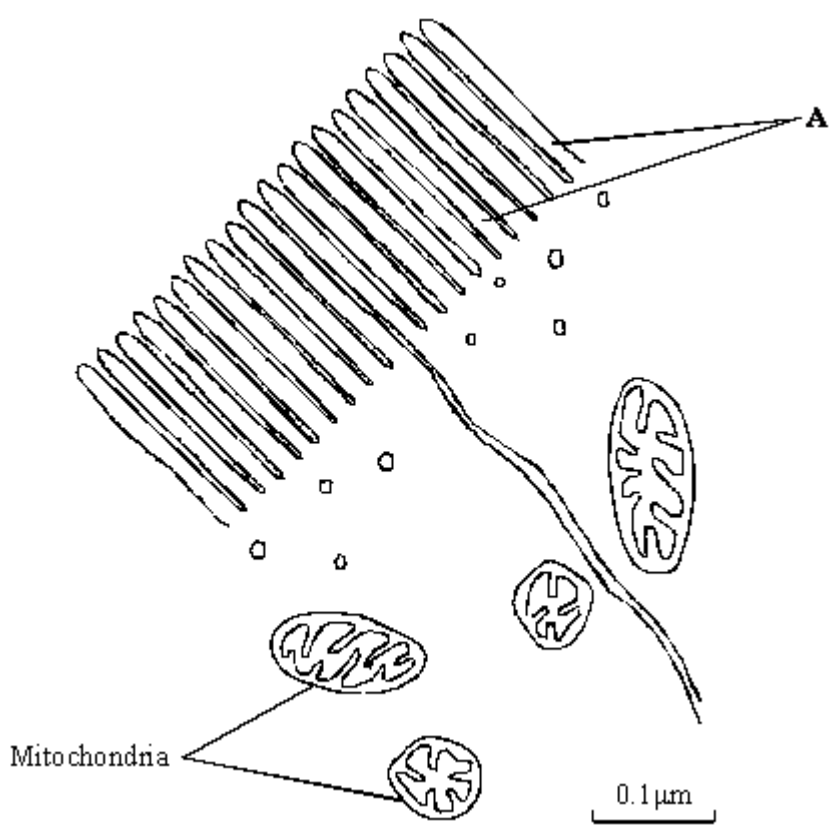
(1)

(d) The epithelial cells of the small intestine have large numbers of organelle **A**. Explain how this is an adaptation for the function of these cells.

(3)

(Total 8 marks)

Q24. The drawing shows an electron micrograph of parts of epithelial cells from the small intestine.



(a) (i) Name the structures labelled **A**.

(1)

(ii) Explain how these structures help in the absorption of substances from the small intestine.

(1)

(b) (i) The scale bar on this drawing represents a length of 0.1 μm. Calculate the magnification of the drawing. Show your working.

Magnification _____

(2)

(ii) Explain why an electron microscope shows more detail of cell structure than a light microscope.

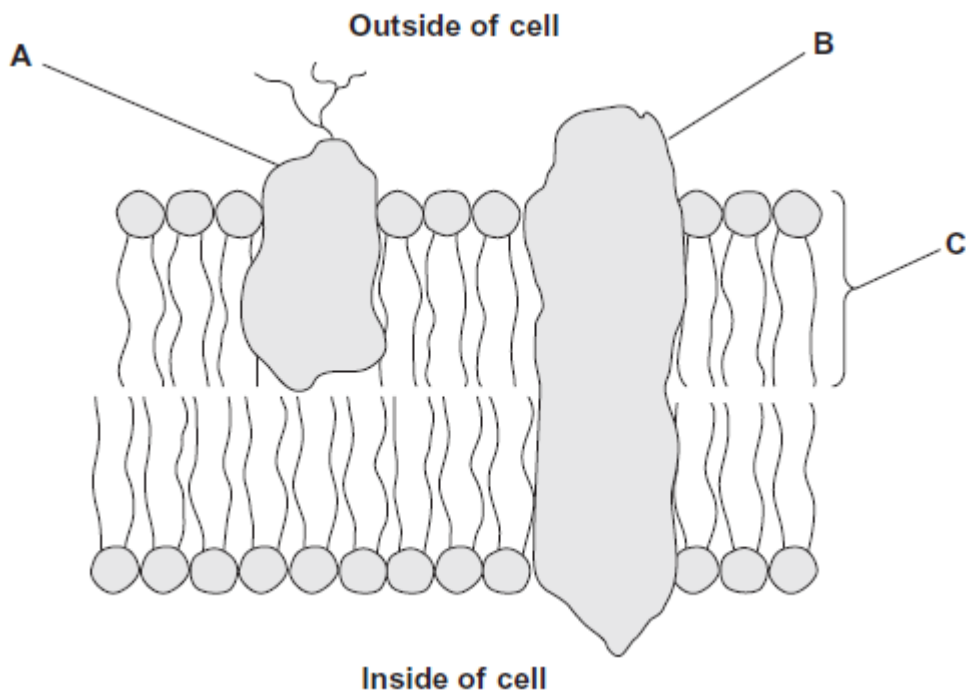
(2)

(c) The length of mitochondria can vary from 1.5 μm to 10 μm but their width never exceeds 1 μm . Explain the advantage of the width of mitochondria being no more than 1 μm .

(1)

(Total 7 marks)

Q25. The diagram shows the structure of a plasma membrane.



(a) Name

protein **A** _____

protein **B** _____

molecule **C** _____

(3)

(b) Name **two** structures found in a prokaryotic cell that are **not** found in a human cell.

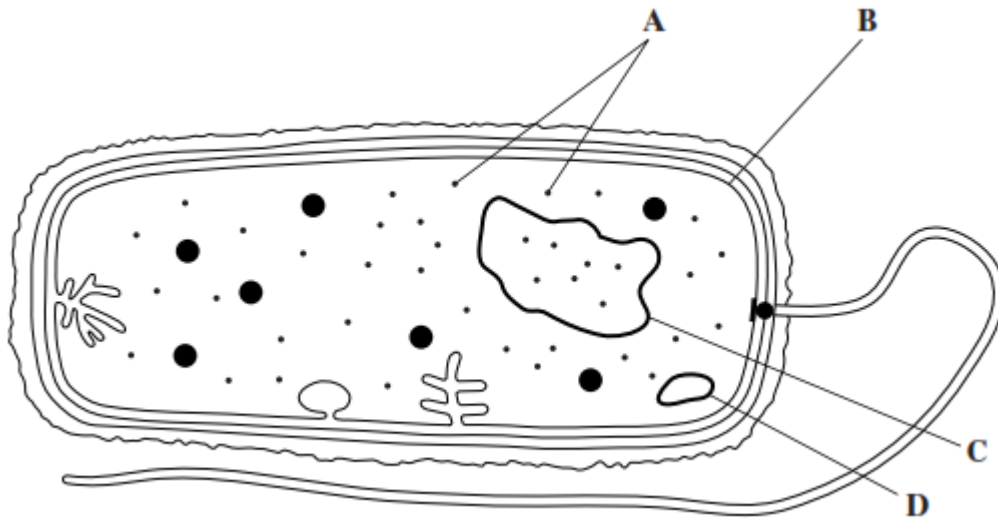
1. _____

2. _____

(2)

(Total 5 marks)

Q26. The diagram shows a bacterium.



(a) Name

(i) organelle **A** _____

(1)

(ii) structure **B** _____

(1)

(b) Give **two** ways in which the structure of this bacterium is different from the structure of cells lining the alveoli of a human lung.

1. _____

2. _____

(2)

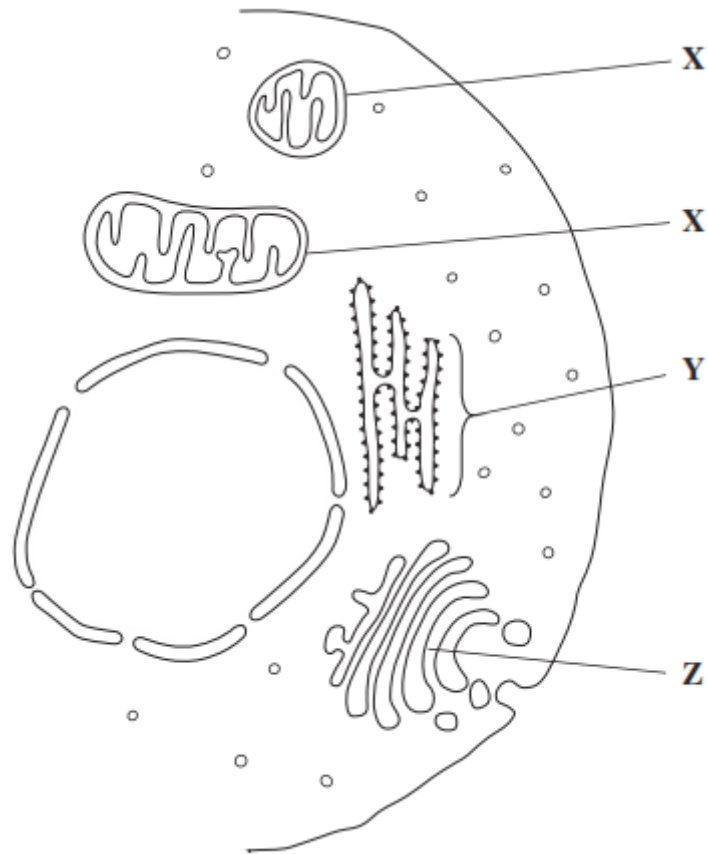
(c) Structures **C** and **D** are made of the same type of biological molecule. They have a similar function.

What is the function of **C** and **D**?

(1)

(Total 5 marks)

Q27. The drawing shows part of a human cell.



(a) Name organelles

X _____

Y _____

(2)

(b) (i) The organelles labelled X all have very similar shapes in this cell. Explain why they appear to have different shapes in this drawing.

(Extra space) _____

(1)

(ii) Large numbers of organelles X and Z are found in mucus-secreting cells. Explain why.

(Extra space)

(2)

(Total 5 marks)

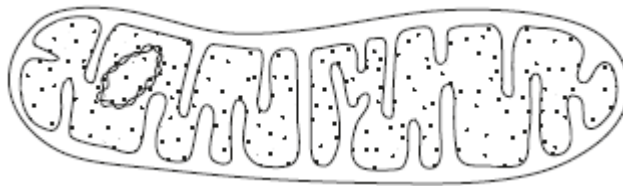
Q28. (a) The table shows some parts of cells and two different types of cell.

Complete the table by putting a tick in a box if the structure is present in the type of cell.

	Cell wall	Cell-surface membrane	Nucleus
White blood cell	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bacterial cell	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(2)

(b) The diagram is of a mitochondrion at a magnification of $\times 30\,000$.



Calculate the actual length of this mitochondrion in micrometres (μm). Show your working.

Answer = _____ μm

(2)

(c) Some scientists support the theory that mitochondria are organelles that evolved from prokaryotic cells.

(i) Give **one** piece of evidence that supports the theory that mitochondria evolved from prokaryotic cells.

(1)

(ii) What is the advantage to cells of having mitochondria?

(2)

(Total 7 marks)

Q29. (a) The table below shows features of a bacterium and the human immunodeficiency virus (HIV) particle.

Complete the table by putting a tick (✓) where a feature is present.

Feature	Bacterium	Human immunodeficiency virus (HIV) particle
RNA		
Cell wall		
Enzyme molecules		
Capsid		

(2)

(b) When HIV infects a human cell, the following events occur.

- A single-stranded length of HIV DNA is made.
- The human cell then makes a complementary strand to the HIV DNA.

The complementary strand is made in the same way as a new complementary strand is made during semi-conservative replication of human DNA.

Describe how the complementary strand of HIV DNA is made.

(3)

(c) Contrast the structures of DNA and mRNA molecules to give **three** differences.

1. _____

2. _____

3. _____

(3)

(Total 8 marks)

Q30. Cells constantly hydrolyse ATP to provide energy.

(a) Describe how ATP is resynthesised in cells.

- _____
- _____
- _____
- _____ (2)

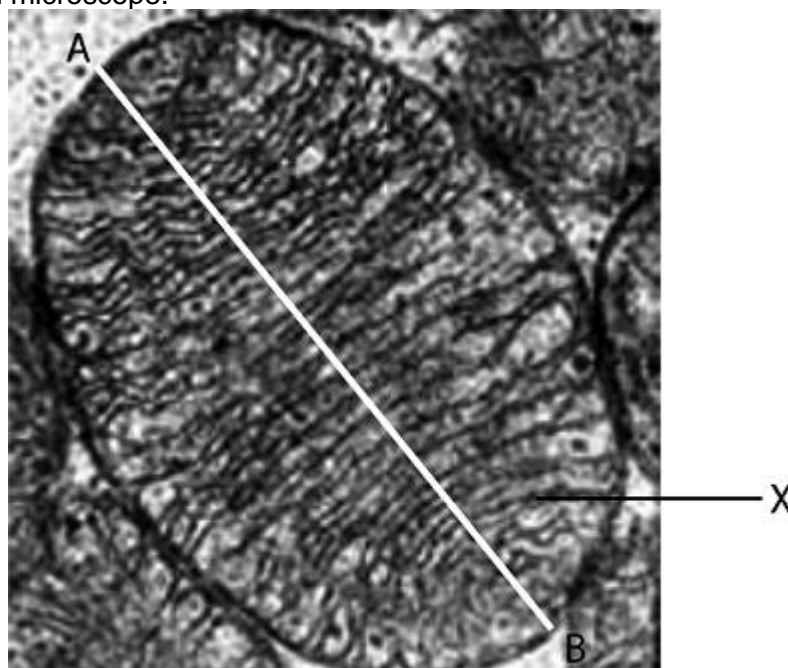
(b) Give **two** ways in which the hydrolysis of ATP is used in cells.

1. _____

 2. _____

- (2)

(c) This is a photograph (micrograph) of a mitochondrion taken using a scanning electron microscope.



What is the evidence that a scanning electron microscope was used to take this photograph?

(1)

(d) Name the part of the mitochondrion labelled **X** in the photograph.

(1)

(e) The actual length of the mitochondrion between points **A** and **B** in the photograph is 4 μm .

What is the magnification of the mitochondrion in the photograph?

Show your working.

Magnification _____

(2)

(Total 8 marks)

Q31. (a) Glycogen and cellulose are both carbohydrates.

Describe **two** differences between the structure of a cellulose molecule and a glycogen molecule.

1. _____

2. _____

(2)

(b) Starch is a carbohydrate often stored in plant cells.

Describe and explain **two** features of starch that make it a good storage molecule.

1. _____

2. _____

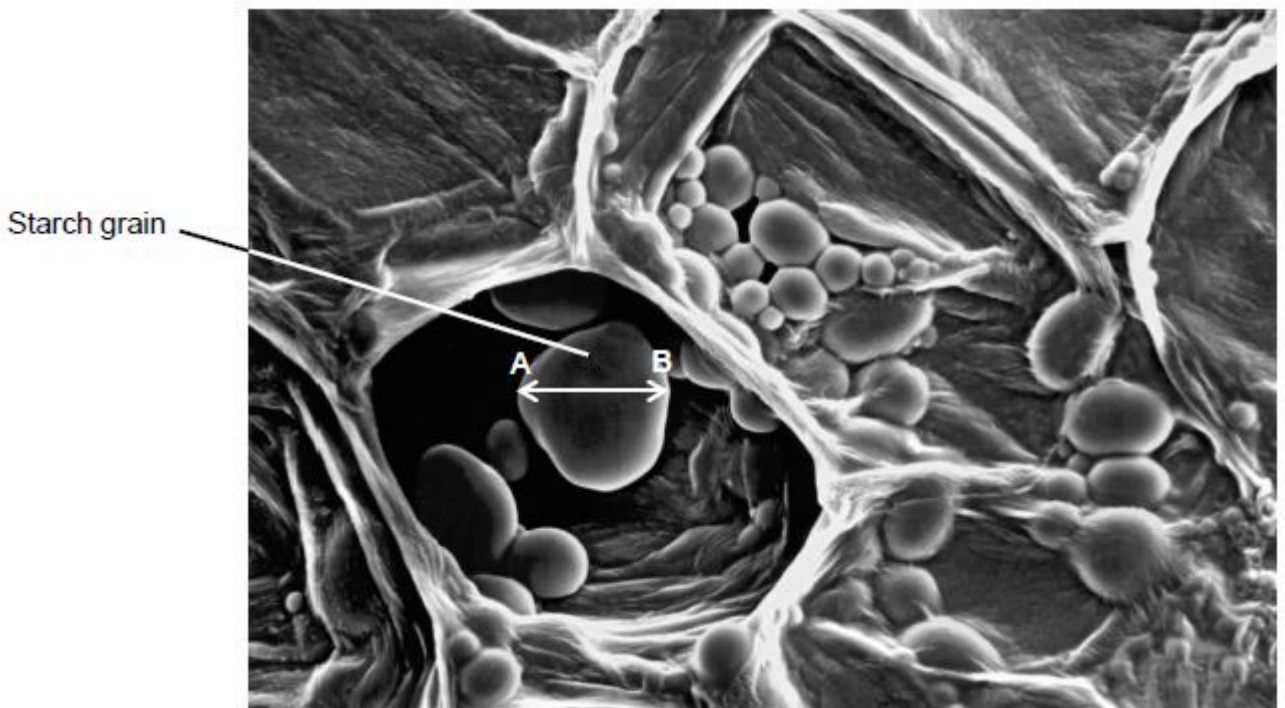
(2)

(c) Tick (✓) the box that identifies the test which would be used to show the presence of starch.

- Acid hydrolysis test
- Benedict's test
- Emulsion test
- Iodine/potassium iodide test

(1)

(d) The diagram shows a section through a plant tissue at a magnification of $\times 500$.



Calculate the actual diameter of the starch grain between points **A** and **B**.

Use your knowledge of how myosin and actin interact to suggest how the myosin molecule moves the mitochondrion towards the presynaptic membrane.

Do **not** include the roles of calcium ions and tropomyosin in your answer.

(2)

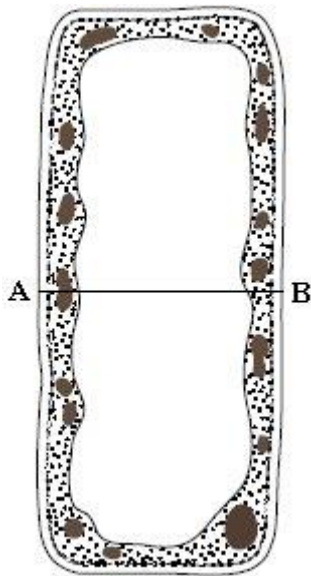
- (c) This movement of mitochondria happens when nerve impulses arrive at the synapse.

Suggest and explain **one** advantage of the movement of mitochondria towards the presynaptic membrane when nerve impulses arrive at the synapse.

(2)

(Total 7 marks)

Q33. The figure shows a section through a palisade cell in a leaf as seen with a light microscope. The palisade has been magnified $\times 2000$.



x 2000

- (a) Calculate the actual width of the cell, measured from **A** to **B**, in μm . Show your working.

Answer _____ μm

(2)

- (b) Palisade cells are the main site of photosynthesis. Explain **one** way in which a palisade cell is adapted for photosynthesis.

(2)

(Total 4 marks)

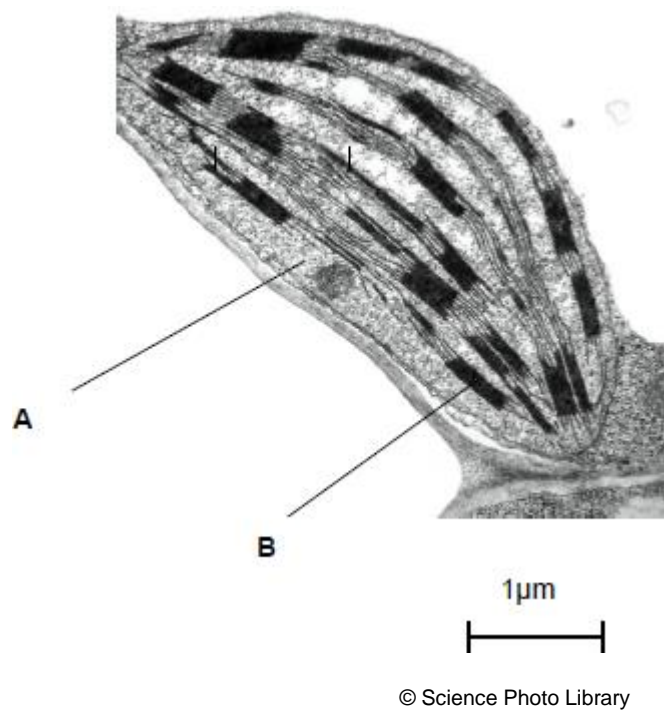
Q34.

- (a) Describe how you could use cell fractionation to isolate chloroplasts from leaf tissue.

(Extra space) _____

(3)

The figure below shows a photograph of a chloroplast taken with an electron microscope.



(b) Name the parts of the chloroplast labelled **A** and **B**.

Name of **A** _____

Name of **B** _____

(2)

(c) Calculate the length of the chloroplast shown in the figure above.

Answer _____

(1)

(d) Name **two** structures in a eukaryotic cell that **cannot** be identified using an optical microscope.

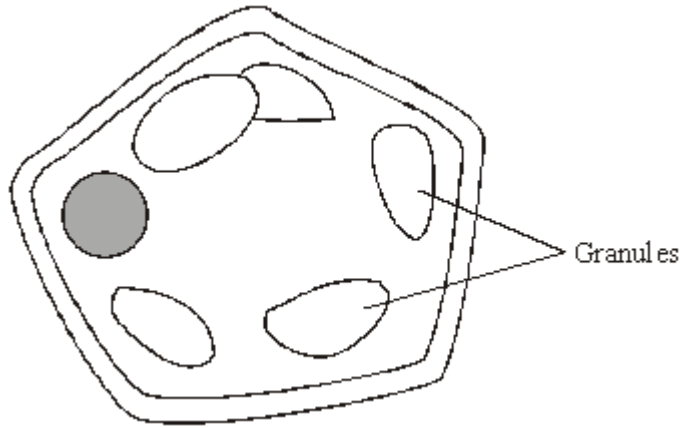
1. _____

2. _____

(1)

(Total 7 marks)

Q35. The diagram shows a cell from a potato.



(a) Give **two** features which may be found in a prokaryotic cell which would not be found in this cell.

1. _____

2. _____

(2)

(b) (i) Describe how you could confirm that the granules contained starch.

(1)

(ii) Name **one** polysaccharide other than starch that would be found in this cell.

(1)

(c) Explain **one** advantage of storing starch rather than glucose in potato cells.

(2)

(Total 6 marks)