



A-Level Biology

Cell Structure

Question Paper

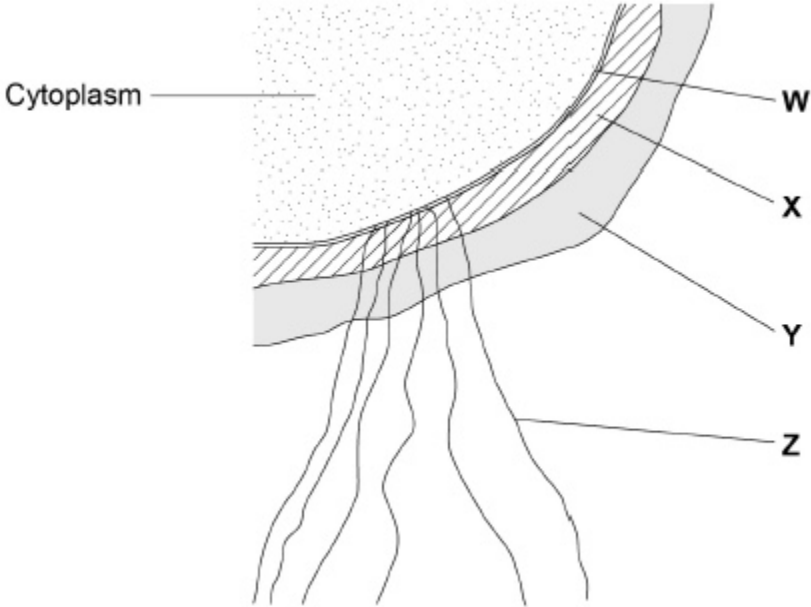
Time available: 73 minutes

Marks available: 60 marks

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1.

The diagram shows part of a prokaryotic cell.



(a) Name the structures labelled **W** to **Z** in the diagram.

W _____

X _____

Y _____

Z _____

(2)

(b) Name the main biological molecule in:

W _____

X _____

(2)

(c) Name the process by which prokaryotic cells divide.

(1)

- (d) Some prokaryotic cells can divide every 30 minutes. A liquid culture contained a starting population of 1.35×10^4 cells.

Assuming each cell divides every 30 minutes, calculate how many cells there will be after 3 hours. Assume no cells die during this time.

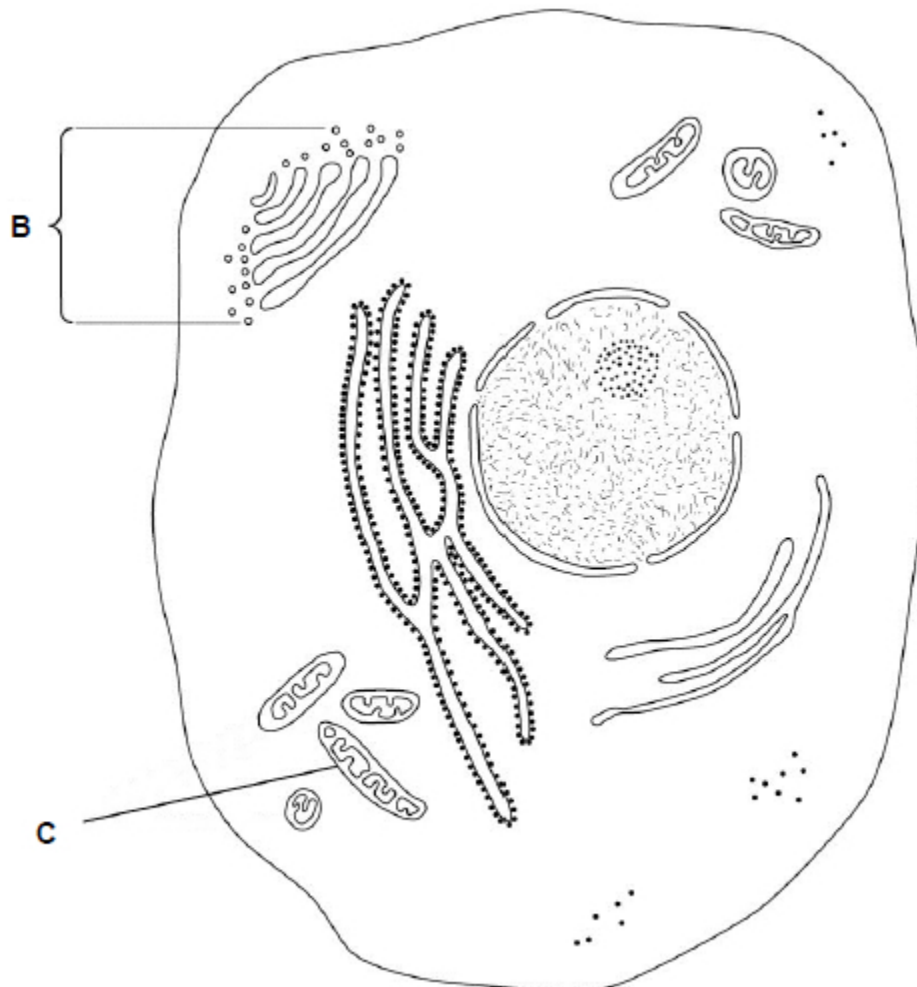
Answer = _____

(2)

(Total 7 marks)

2.

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)

- 3.** (a) Eukaryotic cells produce and release proteins.

Outline the role of **organelles** in the production, transport and release of proteins from eukaryotic cells.

Do **not** include details of transcription and translation in your answer.

(4)

The image below is a transmission electron micrograph of a plant cell.



(b) Suggest why a nucleus is **not** visible in above image.

(1)

(c) Name the organelles labelled **S** and **T** in the image above.

Organelle **S** _____

Organelle **T** _____

(1)

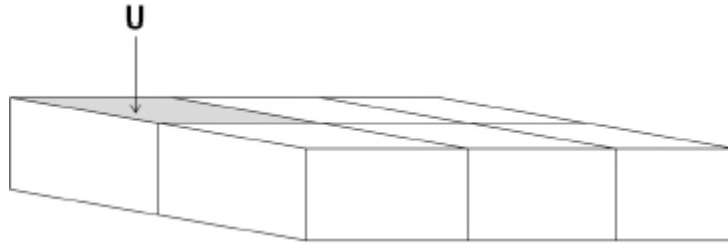
(d) Give **one** advantage of viewing a biological specimen using a transmission electron microscope compared with using a scanning electron microscope.

(1)

- (e) The cells in the diagram below are part of a continuous layer of cells forming the upper surface of a leaf.

The shaded area of cell **U** is $150 \mu\text{m}^2$

The total area of the upper surface of the leaf is 70.65 cm^2



Calculate the number of cells in the upper surface of the leaf.

Give the answer in standard form.

Assume that all these cells are identical in size.

Show your working.

Number of cells _____

(2)

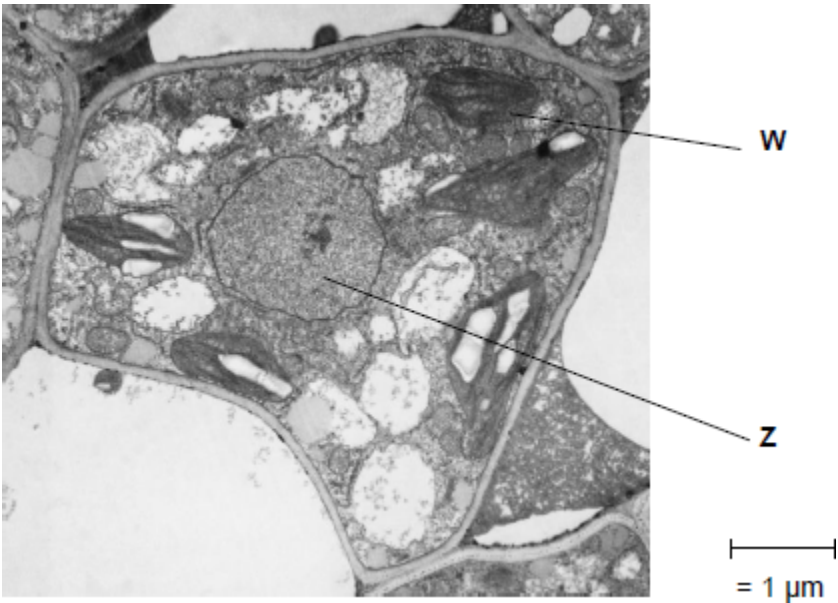
(Total 9 marks)

4.

(a) Describe how you could make a temporary mount of a piece of plant tissue to observe the position of starch grains in the cells when using an optical (light) microscope.

(4)

The figure below shows a microscopic image of a plant cell.



© Science Photo Library

(b) Give the name and function of the structures labelled **W** and **Z**.

Name of **W** _____

Function of **W** _____

Name of **Z** _____

Function of **Z** _____

(2)

- (c) A transmission electron microscope was used to produce the image in the figure above. Explain why.

(2)

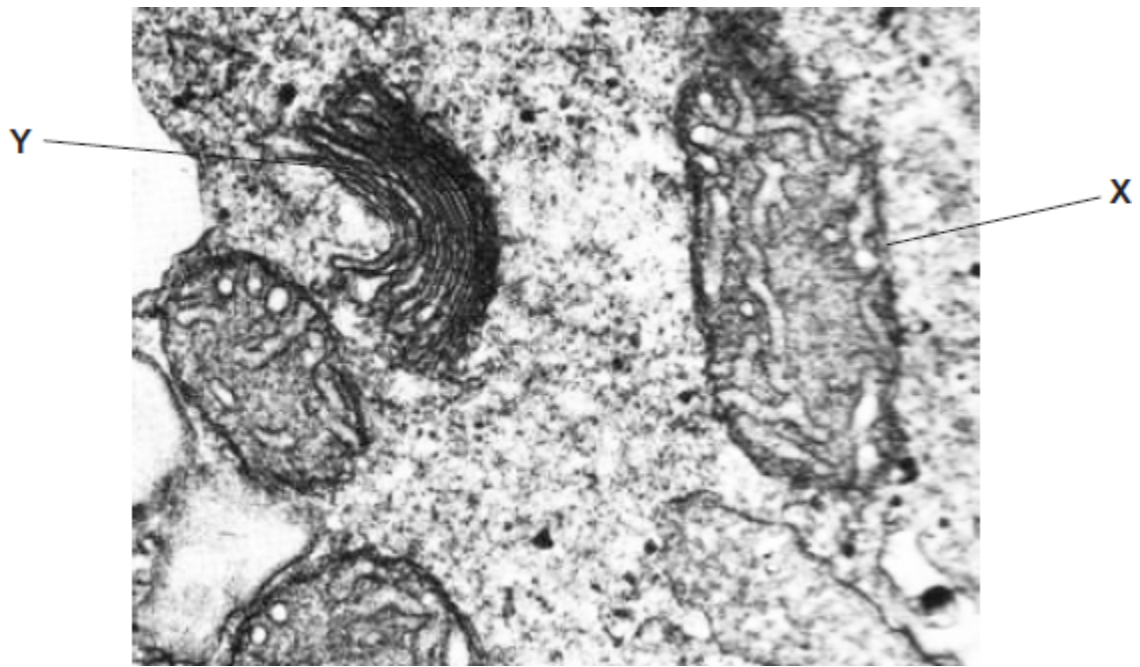
- (d) Calculate the magnification of the image shown in the figure in part (a).

Answer = _____

(1)

(Total 9 marks)

5. 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)

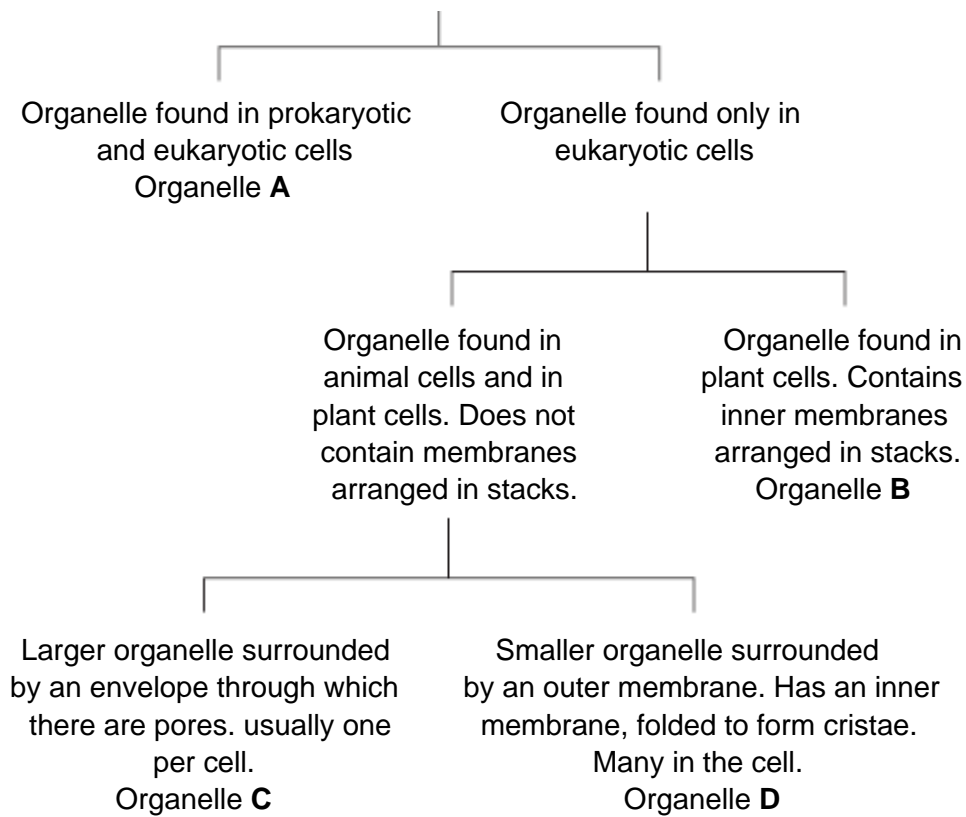
(b) This photograph was taken using a transmission electron microscope. The structure of the organelles visible in the photograph could not have been seen using an optical(light) microscope. Explain why.

(2)

(Total 4 marks)

6.

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)

7.

Read the following passage.

In a human, there are over 200 different types of cell clearly distinguishable from each other. What is more, many of these types include a number of different varieties. White blood cells, Wfor example, include lymphocytes and granulocytes.

Although different animal cells have many features in common, each type has adaptations. 5 associated with its function in the organism. As an example, most cells contain the same organelles, but the number may differ from one type of cell to another. Muscle cells contain many mitochondria, while enzyme-secreting cells from salivary glands have particularly large amounts of rough endoplasmic reticulum.

The number of a particular kind of organelle may change during the life of the cell. An 10 example of this change is provided by cells in the tail of a tadpole. As a tadpole matures into a frog, its tail is gradually absorbed until it disappears completely. Absorption is associated with an increase in the number of lysosomes in the cells of the tail.

Use information from the passage and your own knowledge to answer the following questions.

(a) Explain the link between.

(i) mitochondria and muscle cells (lines 6 - 7);

(3)

(ii) rough endoplasmic reticulum and enzyme-secreting cells from salivary glands (lines 7 - 8).

(2)

(b) Use information in the passage to explain how a tadpole's tail is absorbed as a tadpole changes into a frog.

(2)

(c) Starting with some lettuce leaves, describe how you would obtain a sample of undamaged chloroplasts. Use your knowledge of cell fractionation and ultracentrifugation to answer this question.

(6)

(Total 13 marks)