1.2 Cells: Origin & Ultrastructure

Question Paper

Course	DP IB Biology
Section	1. Cell Biology
Topic	1.2 Cells: Origin & Ultrastructure
Difficulty	Medium

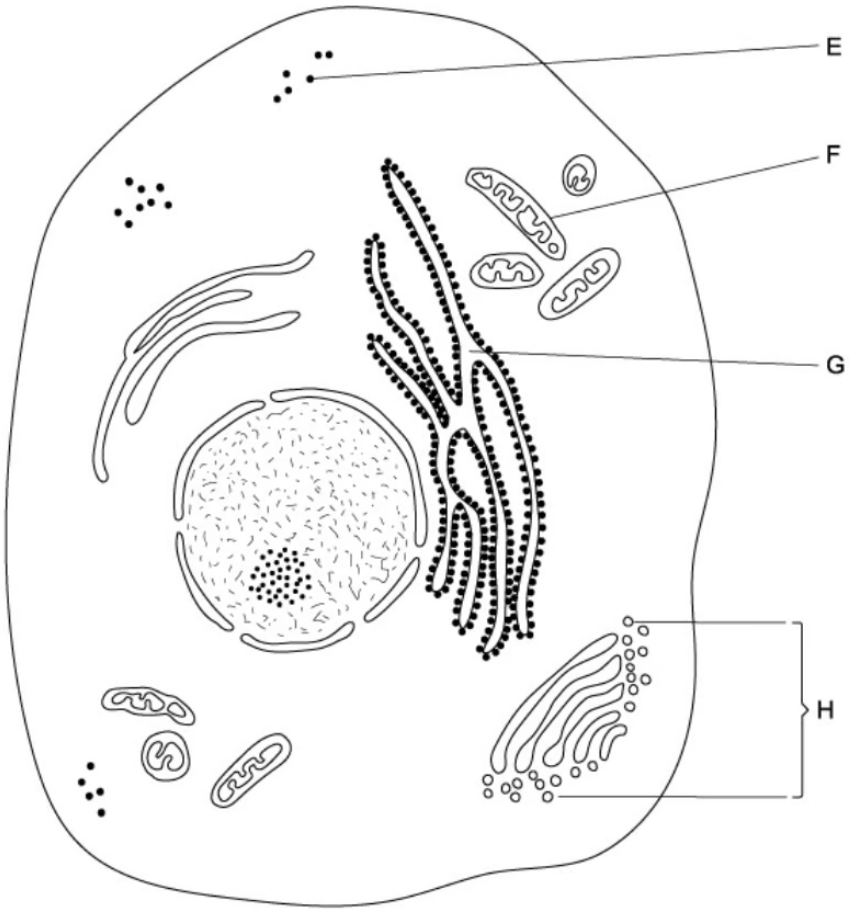
Time allowed: 60

Score: /43

Percentage: /100

Question 1a

a) A student drew a eukaryotic cell based on what they saw in an electron micrograph.



Identify **F** and **H** in the student's drawing.

.

[2 marks]

Question 1b

b) The student concluded that the eukaryotic cell in part (a) was not a plant cell.

State why they came to this conclusion.

[2 marks]

Question 1c

c) One scientific theory suggests that mitochondria are organelles that evolved from prokaryotic cells.

Outline **two** pieces of evidence from mitochondria that support this theory.

[2 marks]

Question 1d

d) State the function that mitochondria provide to the cells that contain them.

[2 marks]

Question 2a

a) The following statement describes some of Louis Pasteur's findings:

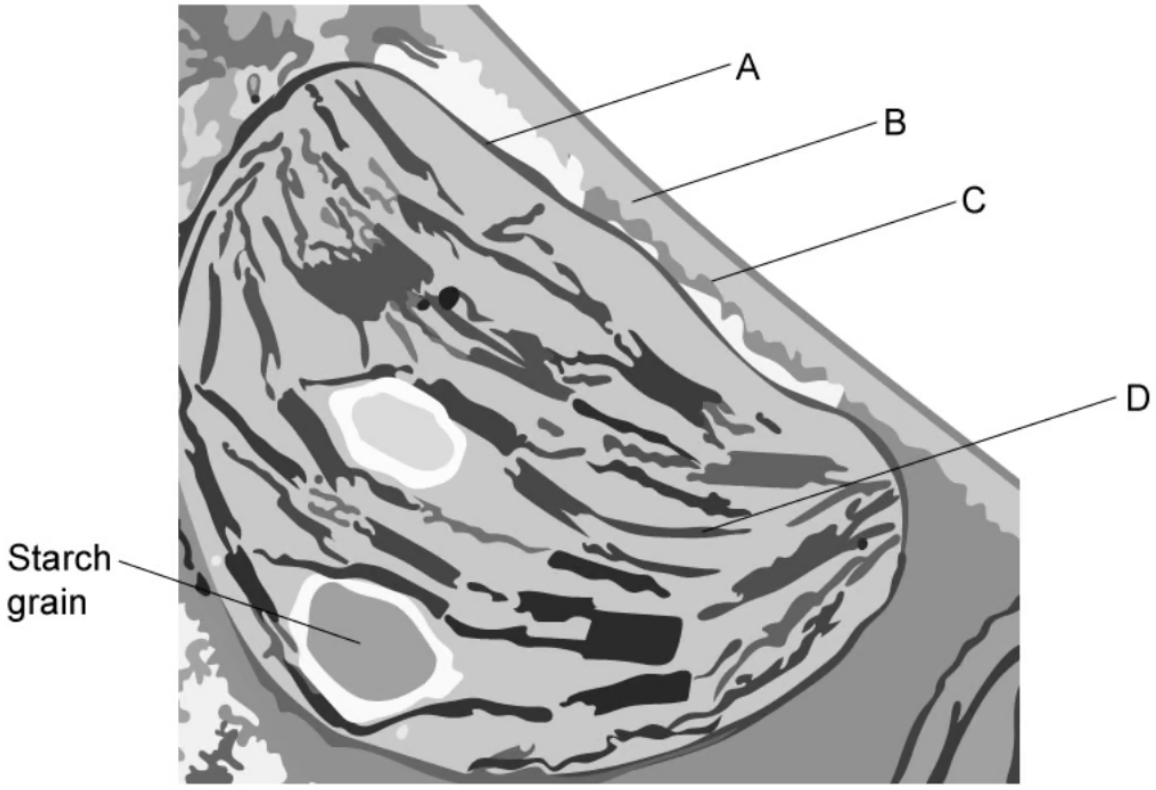
> Broth was first boiled, killing all organisms in it. The broth was then transferred to a swan-necked flask, which prevented organisms from entering. The result was that no organism subsequently grew in the broth. The swan-necked flask was then broken. The result was that the broth subsequently went cloudy, indicating the growth of microorganisms.

Explain what these findings demonstrated.

[1 mark]

Question 2b

b) The electron micrograph below shows part of a palisade mesophyll cell.

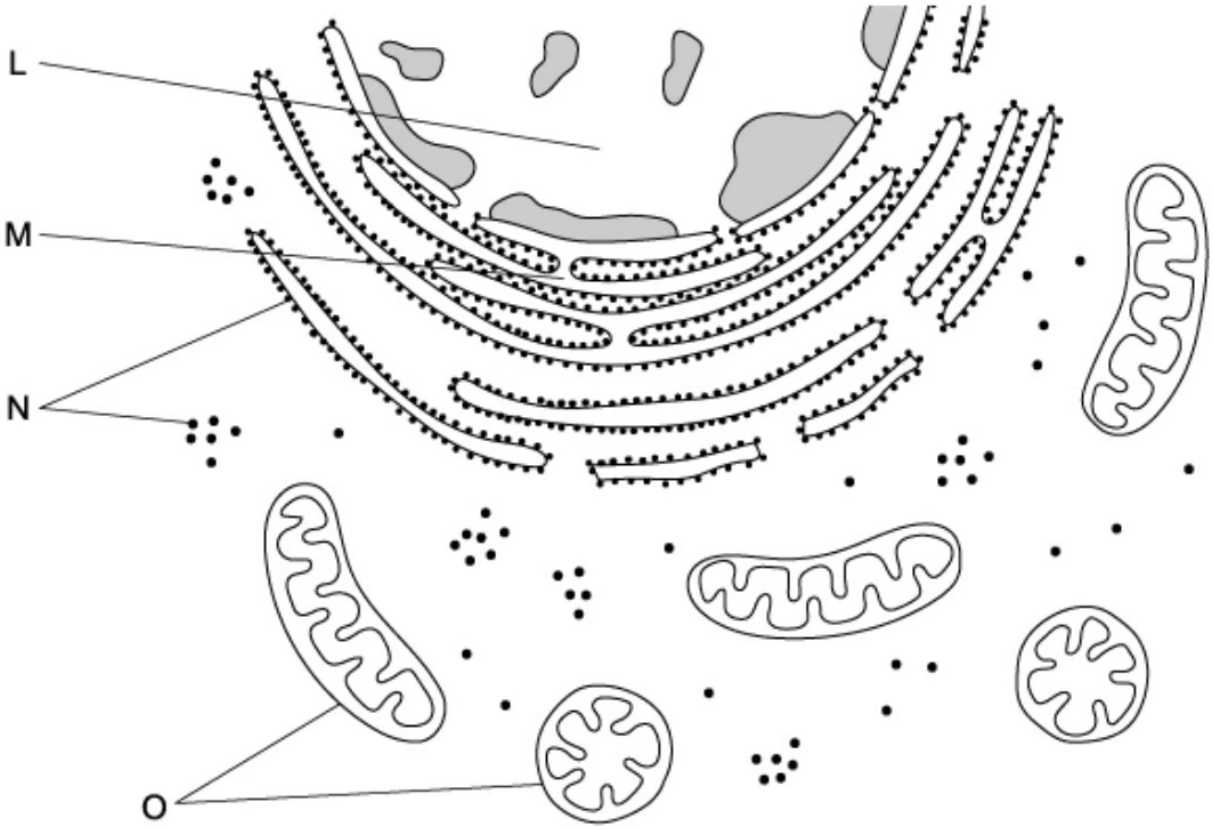


Identify structures **A** and **D**

[2 marks]

Question 2c

c) The diagram below shows a drawing of part of an animal cell as seen through an electron microscope.



Suggest why the shapes of the two organelles labelled **O** in the diagram appear different.

[2 marks]

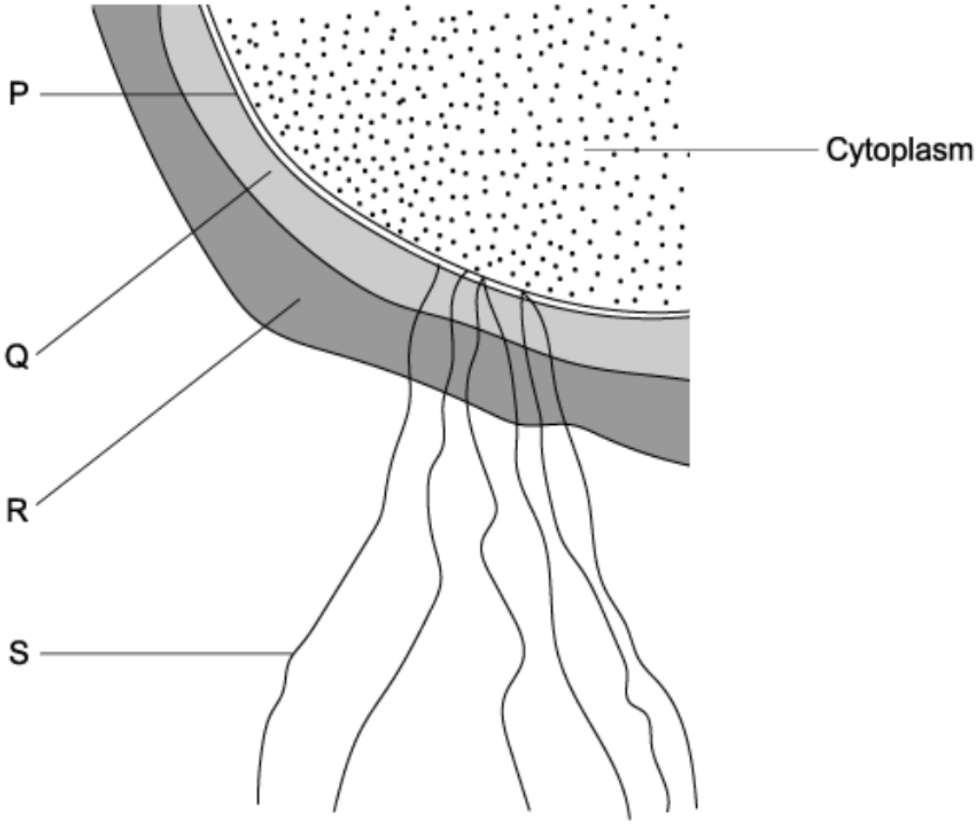
Question 2d

d) State the function of organelle **N** in the diagram in part (c).

[1 mark]

Question 3a

a) Phospholipids and peptidoglycan are two biological molecules, each of which are the main constituent of structures found in prokaryotic cells. The drawing below shows part of a prokaryotic cell.



i) Identify (**P**, **Q**, **R,** or **S**) and name the structure in which phospholipids are the main biological molecule.

ii) Identify (**P**, **Q**, **R,** or **S**) and name the structure in which peptidoglycan is the main biological molecule.

[4 marks]

Question 3b

b) In certain conditions some prokaryotic cells can divide every 25 minutes.

With a starting population of 2.45×10^3 cells, and assuming each cell divides every 25 minutes, calculate how many cells there will be after 3.75 hours. Assume no cells die during this time.

[2 marks]

Question 3c

c) Identify structure **R** in the diagram in part (a).

[1 mark]

Question 4a

a) Scientists used an electron microscope rather than an optical microscope to study the structure of a unicellular, eukaryotic organism known as an amoeba.

Explain why scientists used an electron microscope to study the structure of an amoeba.

[2 marks]

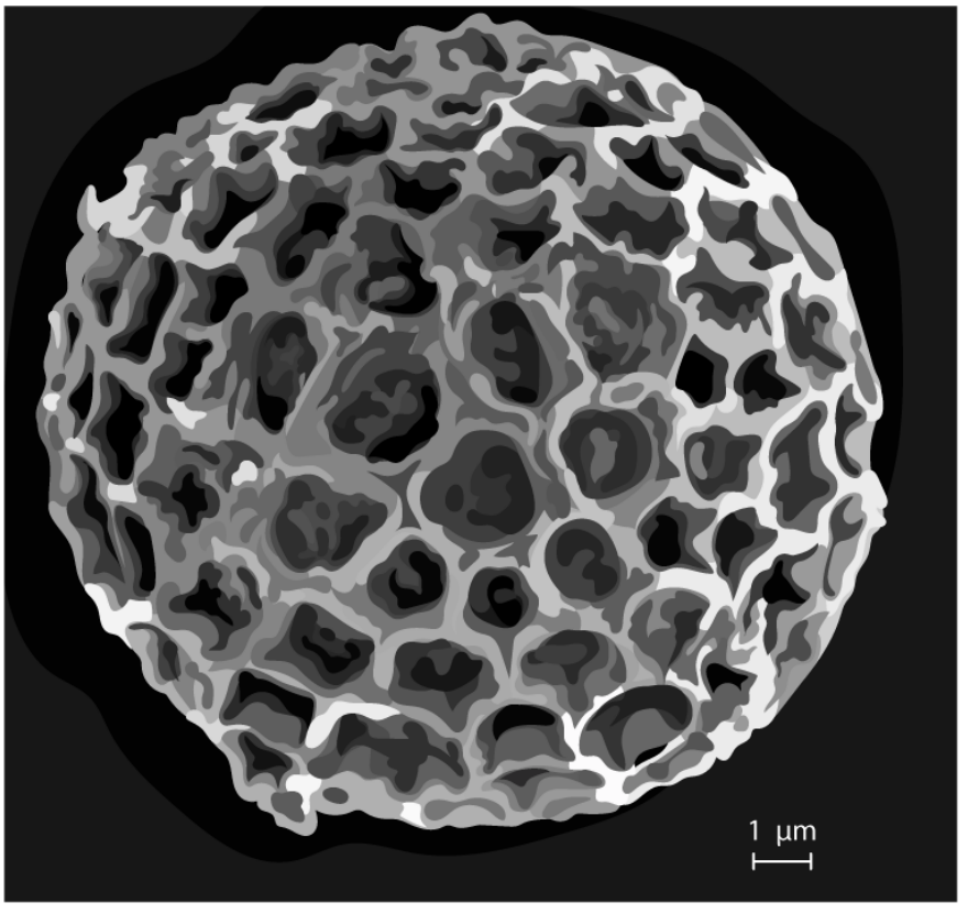
Question 4b

b) State **three** structures in the amoeba cell that the scientists would not have been able to identify using a light microscope.

[3 marks]

Question 4c

c) The electron micrograph below is of a spore from a fungus (*Tilletia controversa*), that affects wheat crops.



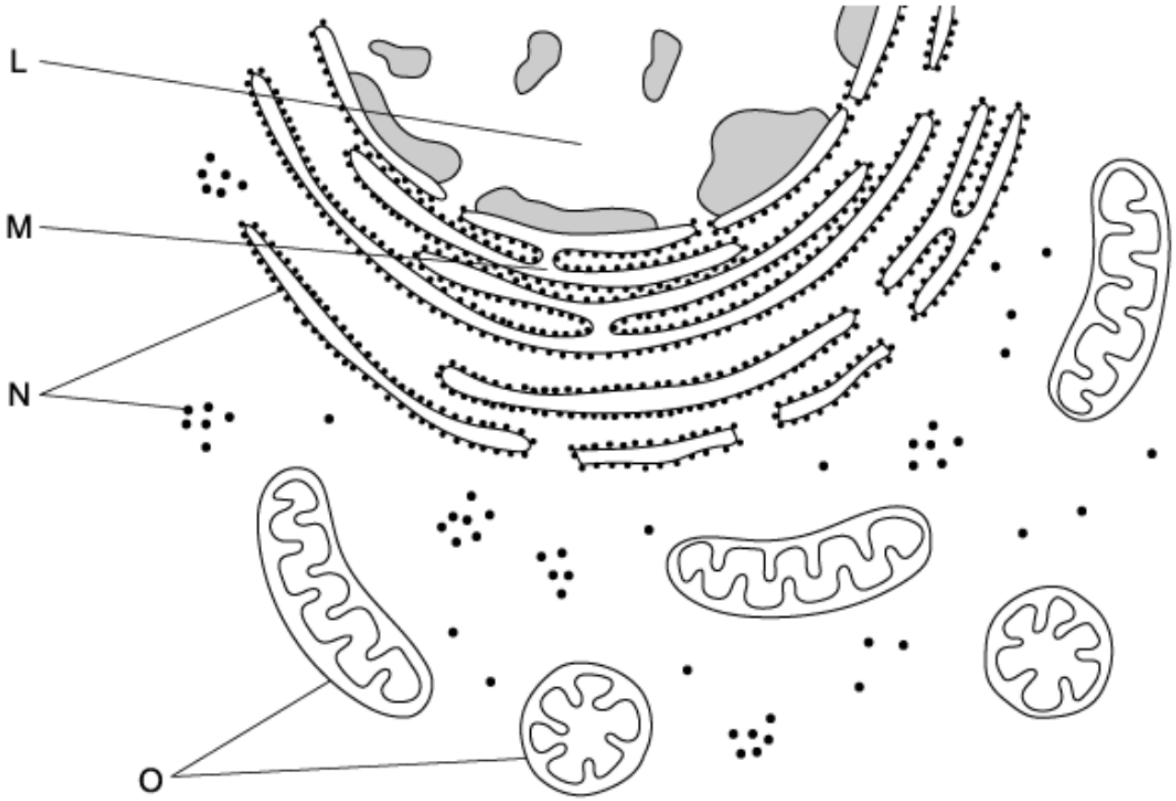
Identify, with a reason, whether the electron micrograph above was produced using a transmission electron microscope (TEM) or a scanning electron microscope (SEM).

[2 marks]

Question 5a

One mark is available for clarity of communication throughout this question.

a) The diagram below shows a drawing of part of an animal cell as seen through an electron microscope.

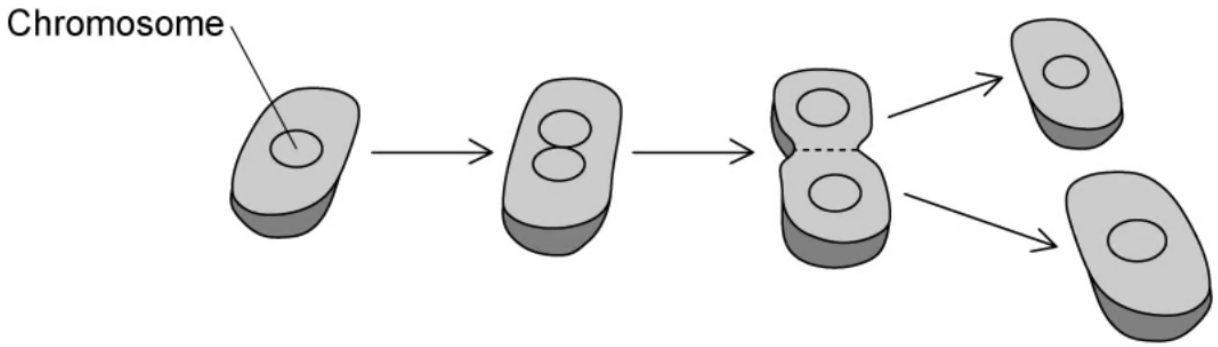


Large numbers of organelle **O** are found in small intestine epithelial cells. Explain why these cells are adapted in this way.

[3 marks]

Question 5b

b) Describe the process shown in the diagram below.



[5 marks]

Question 5c

c) Compare and contrast the structures of prokaryotic and eukaryotic cells.

[7 marks]