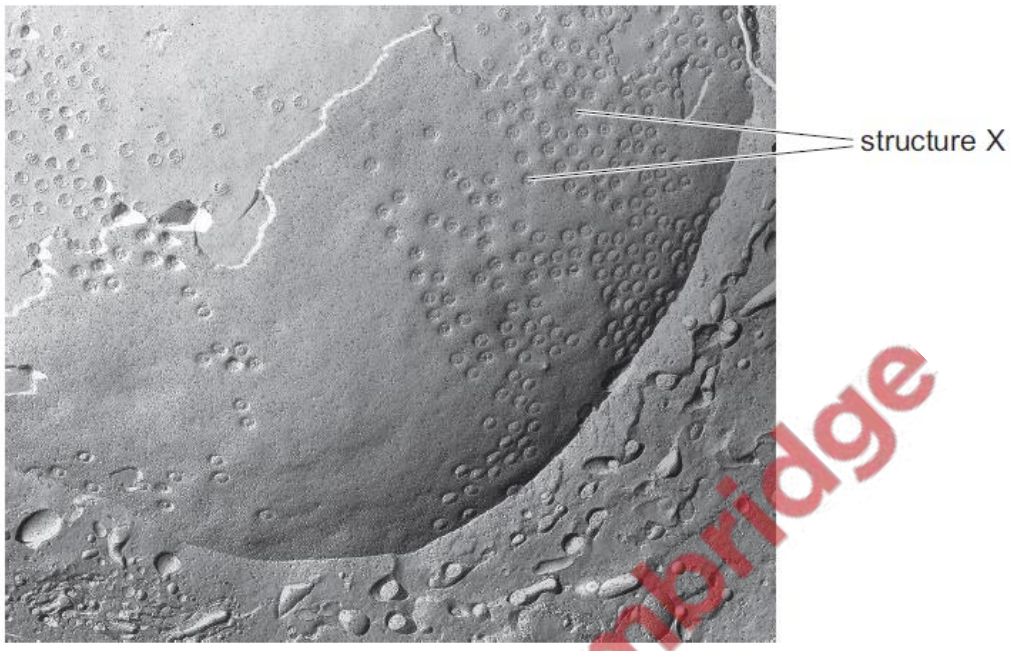
Cell Structure – AS 9700 June 2022

1. June/2023/Paper_9700/11/No.1

The electron micrograph shows onion root cells prepared using a freeze-fracture technique. The cells were quickly frozen and then physically broken apart. Freeze fracture breaks apart cells along weak areas, such as membranes and the surfaces of organelles.



×20 000

Which statement best explains the appearance of the electron micrograph?

A The cells were broken apart at the endoplasmic reticulum; structure X is a ribosome.

B The cells were broken apart at the nuclear envelope; structure X is a nuclear pore.

C The cells were broken apart at the nuclear envelope; structure X is a ribosome.

D The cells were broken apart at the tonoplast; structure X is a plasmodesma.

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2. June/2023/Paper_9700/11/No.2

Which cell structures can form vesicles?

	cell surface membrane	endoplasmic reticulum	Golgi body
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key

✓ = can form vesicles

✗ = cannot form vesicles

3. June/2023/Paper_9700/11/No.3

Four students were asked to match the function with the appearance of some cell structures in an animal cell.

The functions were listed by number.

1 synthesis of polypeptides

2 synthesis of lipids

3 packaging of hydrolytic enzymes that will remain in the cell

The appearances were listed by letter.

V membranes which surround an enclosed inner cavity

W non-membrane-bound, spherical structures

X a double membrane interspersed with pores

Y non-membrane-bound, cylindrical structures

Z membrane-bound sacs, arranged as a flattened stack

Which student correctly matched the numbered function with the appearance of the cell structure?

	1	2	3
A	W	V	Z
B	W	Z	Y
C	Z	W	Z
D	Z	V	W

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4. June/2023/Paper_9700/11/No.4

Which cells contain a tonoplast?

	root hair	companion	sieve tube element	endodermis
A	✓	✓	✓	✓
B	✓	x	✓	✓
C	x	✓	✓	x
D	✓	✓	x	✓

key

✓ = contain tonoplast

x = do not contain tonoplast

5. June/2023/Paper_9700/11/No.5

Which organelles found in animal or plant cells are surrounded by double membranes?

A chloroplasts, mitochondria, vacuoles

B chloroplasts, mitochondria, nuclei

C chloroplasts, nuclei, vacuoles

D mitochondria, nuclei, vacuoles

6. June/2023/Paper_9700/11/No.6

Some scientists think that mitochondria evolved from bacteria that entered the cytoplasm of a different cell and were able to survive there.

Which structural features of mitochondria support this hypothesis?

	folded internal membrane	circular DNA	70S ribosomes
A	✓	✓	✓
B	✓	✓	x
C	✓	x	✓
D	x	✓	✓

key

✓ = supports

x = does not support

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7. June/2023/Paper_9700/11/No.7

What is present in all viruses, all prokaryotes **and** all eukaryotes?

A ribose

B deoxyribose

C cytosine

D thymine

8. June/2023/Paper_9700/11/No.14

Which statement about cell signalling is correct?

A One type of receptor molecule will recognise all ligands in the body.

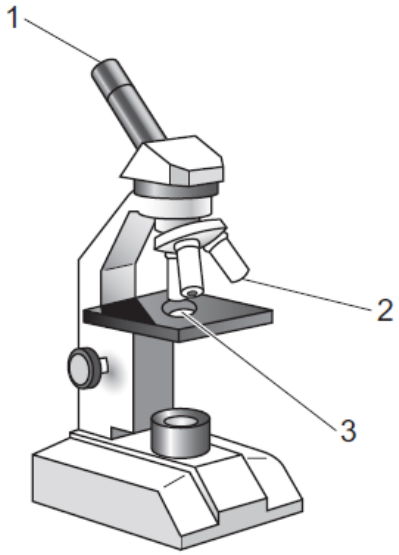
B The binding of a ligand may cause a change to the shape of the receptor.

C The receptors for ligands are always found on the inside of cells.

D The same ligand is made by all of the cells in the body.

9. June/2023/Paper_9700/12/No.1

A graticule and a micrometer scale can be used to measure the size of biological structures that are viewed with a microscope.



Which row shows the correct locations for the placement of a graticule and a micrometer scale on the microscope shown?

	graticule	micrometer scale
A	1	2
B	1	3
C	2	3
D	3	1

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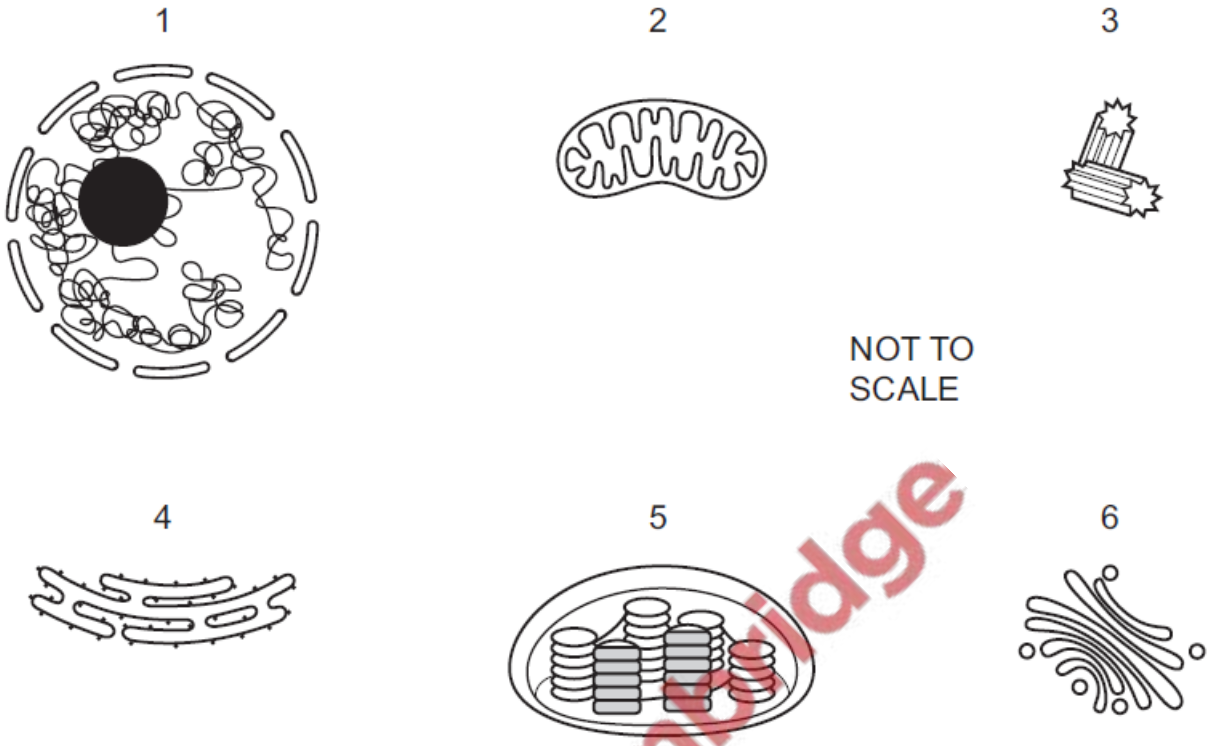
10. June/2023/Paper_9700/12/No.2

Six organelles found in eukaryotic cells are shown.



Which organelles are involved in the synthesis and secretion of a glycoprotein?

A 1, 2, 3 and 4 **B** 1, 2, 4 and 6 **C** 2, 3 and 5 **D** 3, 4, 5 and 6

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11. June/2023/Paper_9700/12/No.3

Which cell structures can have mRNA inside them?

1 chloroplast

2 mitochondrion

3 nucleus

4 rough endoplasmic reticulum

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 2, 3 and 4 only

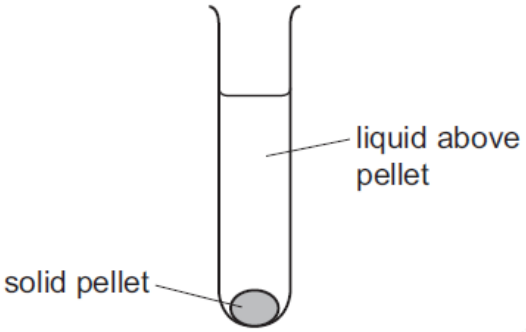
D 3 and 4 only

12. June/2023/Paper_9700/12/No.4

A scientist carried out an experiment to separate the organelles in an animal cell by mass.

The scientist mixed the cells with a buffer solution which had the same water potential as the cells. The cells were broken open with a blender to release the organelles.

The extracted mixture was filtered and then spun in a centrifuge at a high speed to separate the heaviest type of organelle. These sank to the bottom, forming solid pellet 1.



The liquid above pellet 1 was poured into a clean centrifuge tube and spun in the centrifuge at a higher speed to separate the next heaviest type of organelle. These organelles sank to the bottom, forming solid pellet 2.

This procedure was repeated twice more to obtain pellet 3 and pellet 4, each containing a single type of organelle.

What is the main function of the type of organelle extracted in pellet 2?

A digestion of old organelles

B production of ATP

C production of mRNA

D synthesis of protein

13. June/2023/Paper_9700/12/No.5

Which structures are found in palisade mesophyll cells **and** photosynthetic prokaryotes?

1 cell surface membrane

2 cellulose wall

3 ribosomes

4 chloroplasts

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1 and 3 only

D 2 and 4 only

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14. June/2023/Paper_9700/13/No.1

Which feature is visible with a light microscope using a natural light source?

A DNA molecule of diameter 2 nm

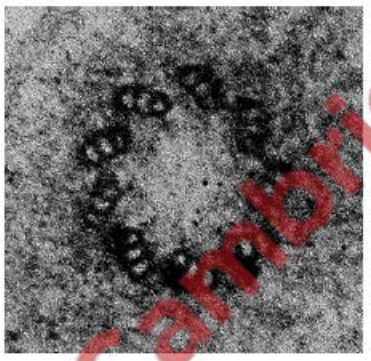
B *Paramecium* cell of diameter 200 μm

C phospholipid bilayer of width 8 nm

D ribosome of diameter 20 nm

15. June/2023/Paper_9700/13/No.2

The electron micrograph shows a structure found in the cytoplasm of an animal cell.



Which biological molecules are found in this structure?

1 nucleic acids

2 proteins

3 phospholipids

A 1 and 3 **B** 1 only **C** 2 and 3 **D** 2 only

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16. June/2023/Paper_9700/13/No.3

Which cell structures contain nucleic acid?

1 cytoplasm

2 lysosomes

3 mitochondria

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 3 only

17. June/2023/Paper_9700/13/No.4

Mitochondria are thought to have evolved from prokaryotic cells that were ingested by an ancestral cell.

Which feature have prokaryotes lost during their evolution into mitochondria?

A cell wall

B circular chromosome

C endoplasmic reticulum

D ribosomes

18. June/2023/Paper_9700/13/No.5

Which polymers are present in all viruses, all prokaryotes **and** all eukaryotes?

1 polynucleotides

2 polypeptides

3 polysaccharides

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

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19. June/2023/Paper_9700/13/No.6

How many of the listed structures typically contain genetic material that has telomeres?

- bacterial cell
- chloroplast
- mitochondrion
- nucleus

A 1 **B** 2 **C** 3 **D** 4

20. June/2023/Paper_9700/21/No.1

Fig. 1.1 is a transmission electron micrograph of a cell from the stem of sago pondweed, *Stuckenia pectinata*.

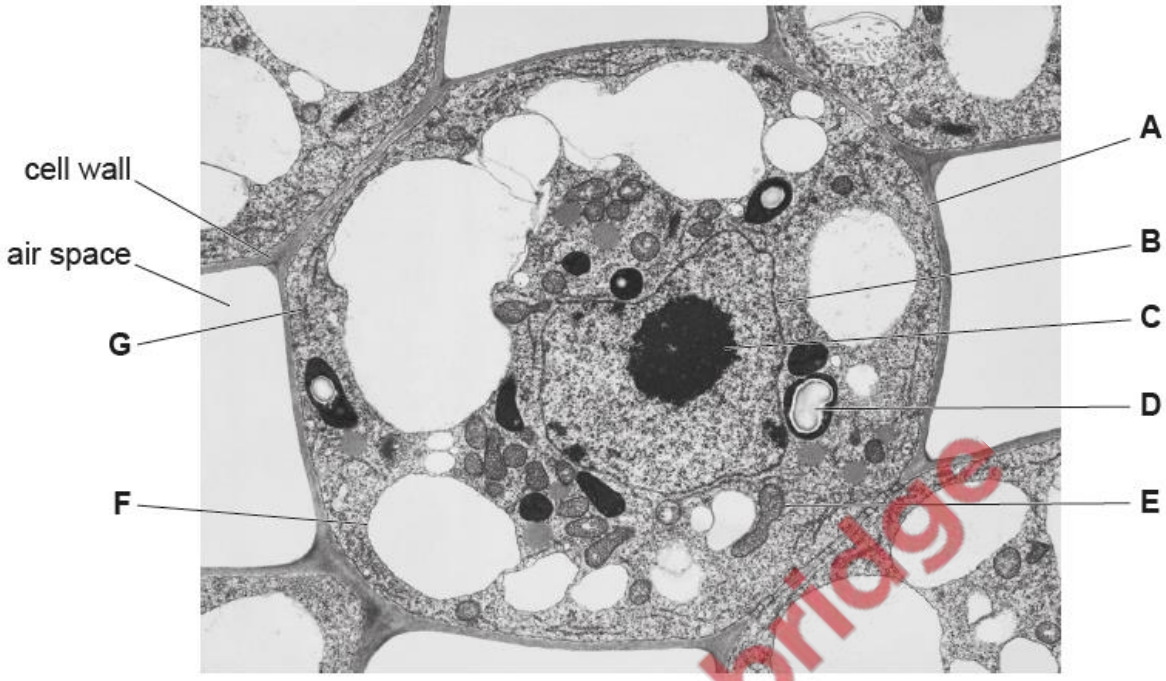

Fig. 1.1

(a) (i) State the evidence from Fig. 1.1 that shows that the cell is from the stem of *S. pectinata* and **not** from the mesophyll of a leaf.

.....

..... [1]

(ii) Complete each row in Table 1.1 to identify a cell structure shown in Fig. 1.1 that carries out the function listed.

Table 1.1

function	name of cell structure	letter on Fig. 1.1
gas exchange		
production of subunits of ribosomes		
active transport of ions		
aerobic respiration		

[4]

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(b) Plant vacuoles develop when vesicles fuse together. The vacuoles increase in size as more vesicles fuse.

Fig. 1.2 shows the movement of vesicles within a plant cell during the development of a vacuole.

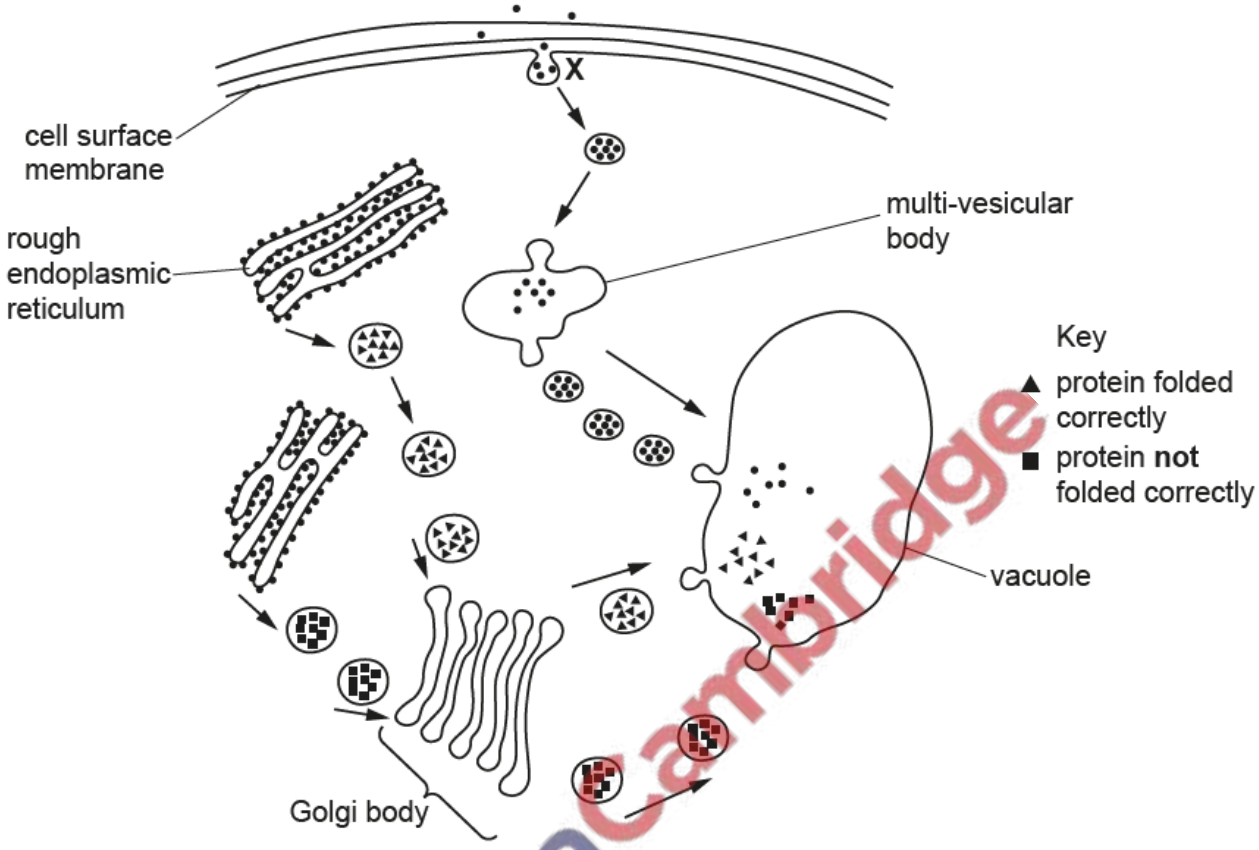

Fig. 1.2

(i) Name the process that is occurring at **X**.

..... [1]

(ii) Some of the vesicles formed by the Golgi body pass to the vacuole. These vesicles contain proteins that have been folded correctly and some that have **not** folded into their correct shapes. The proteins that have **not** folded correctly pass to the vacuole where they are broken down.

Explain how proteins that have **not** folded correctly are broken down in the vacuole.

.....

.....

.....

.....

.....

.....

..... [3]

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(c) Small vacuoles in *S. pectinata* may have roles similar to lysosomes in animal cells.

Describe the role of lysosomes in animal cells in defence against pathogens.

.....

.....

.....

.....

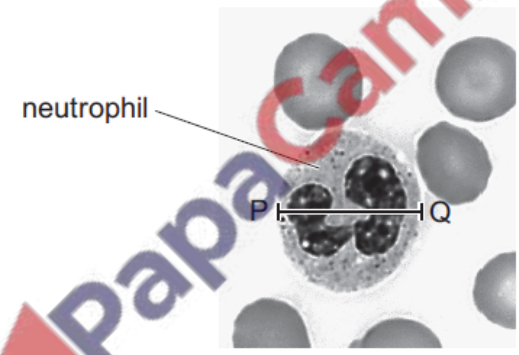
.....

..... [2]

[Total: 11]

21. March/2023/Paper_9700/12/No.1

The photomicrograph shows cells from a human blood smear.



Which calculation shows a correct method to calculate the actual diameter of the neutrophil shown in the photomicrograph in micrometres (μm)?

A $\frac{\text{length of line PQ in mm} \times 1000}{\text{magnification of photomicrograph}}$

B $\frac{\text{length of line PQ in mm} \times 10\,000}{\text{magnification of photomicrograph}}$

C $\frac{\text{magnification of photomicrograph}}{\text{length of line PQ in mm} \times 1000}$

D $\frac{\text{magnification of photomicrograph}}{\text{length of line PQ in mm} \times 10\,000}$

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22. March/2023/Paper_9700/12/No.2

A student calibrated an eyepiece graticule using a stage micrometer.

- Each division of the stage micrometer was 0.01 mm.
- With a ×10 magnification objective lens, 10 eyepiece graticule units matched 10 divisions on the stage micrometer.

The same microscope was used with a ×40, instead of a ×10, magnification objective lens to measure the diameter of an alveolus. The diameter of the alveolus was found to be 96 eyepiece graticule units.

The eyepiece lens was not changed.

What is the best estimate for the diameter of the alveolus?

A 0.960 mm **B** 3.84 mm **C** 240 μm **D** 384 μm

23. March/2023/Paper_9700/12/No.3

Which statements are correct for chloroplasts and also for mitochondria?

1 They contain 80S ribosomes.

2 They can transcribe their circular DNA.

3 They can translate mRNA.

4 They are enclosed by double membranes.

A 1, 2, 3 and 4

B 1 and 2 only

C 2, 3 and 4 only

D 3 and 4 only

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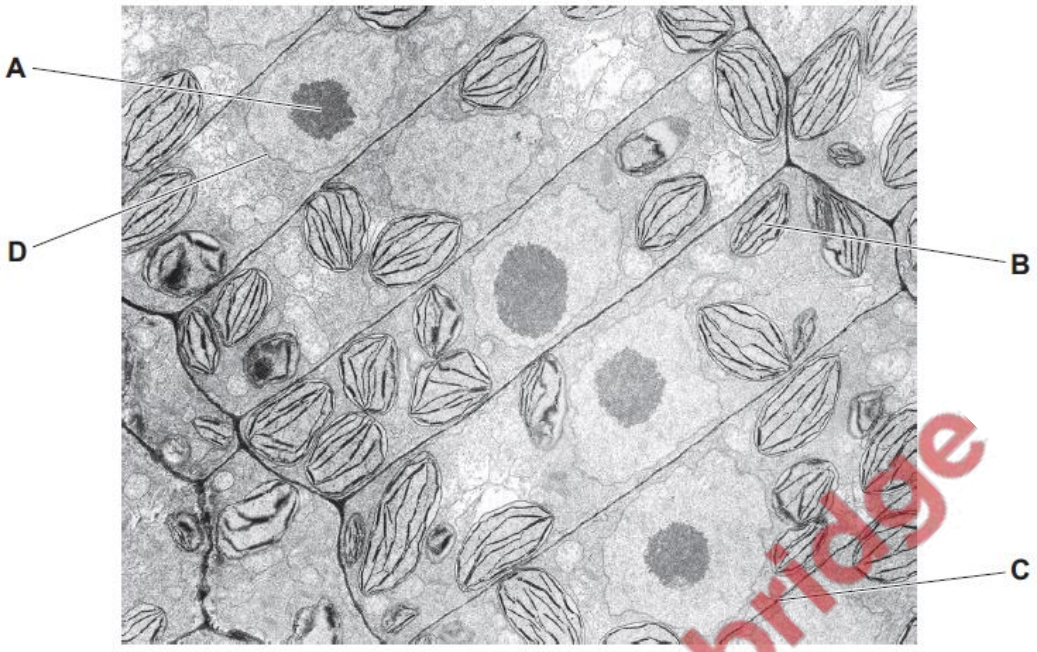
24. March/2023/Paper_9700/12/No.4

The electron micrograph shows some cells from a root.

Which cell structure is **not** usually found in cells from a root?



25. March/2023/Paper_9700/12/No.6

What is present in all viruses?

A ribose

B deoxyribose

C adenine

D thymine

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26. March/2023/Paper_9700/22/No.1(a _ b)

(a) Table 1.1 lists cell structures that can be found in eukaryotic cells or prokaryotic cells. Some of these cell structures can be found in both types of cell.

Complete the table using a tick (✓) to show that the cell structure can be present in a particular type of cell and a cross (✗) to show that the cell structure **cannot** be present.

Put a tick or a cross in every box.

The top row has been completed for you.

Table 1.1

cell structure	eukaryotic cells	prokaryotic cells
nucleus	✓	✗
Golgi body		
circular DNA		
70S ribosome		

[2]

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(b) All cells have a cell surface membrane. Fig. 1.1 shows a transmission electron micrograph of part of **two** adjacent animal cells, cell 1 and cell 2.

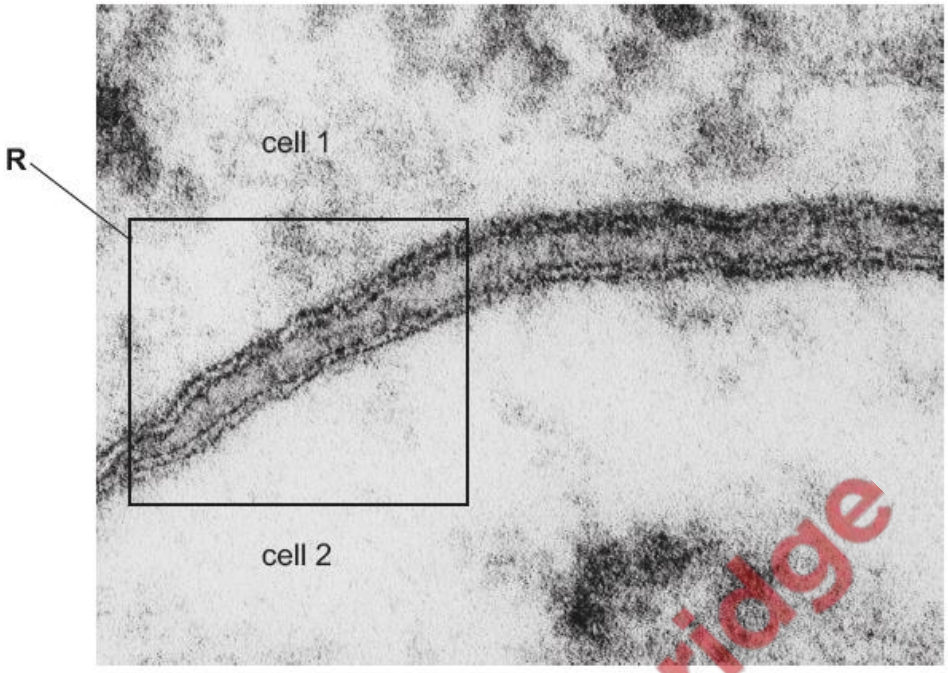

Fig. 1.1

In the space provided, draw a diagram of the region in the box labelled **R** on Fig. 1.1. Your diagram should show the four dark lines.

Label the diagram to identify what is shown by the dark lines and each of the three spaces between them.

space for diagram:

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