CAMBRIDGE INTERNATIONAL AS & A LEVEL BIOLOGY · 9700

BIOLOGY



EXAM QUESTION PACK

1 CELL STRUCTURE

SCORE	PERCENTAGE
/	%

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Chapter 1

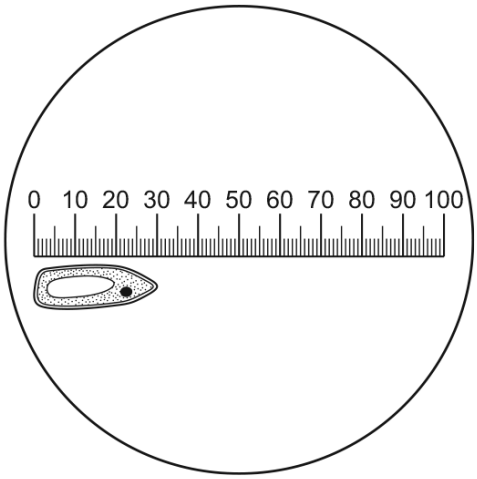
Cell structure

1.1 The microscope in cell studies

1. 9700_m20_qp_12 Q: 1

The diagram shows an eyepiece graticule and cell viewed through a microscope. When the eyepiece graticule was calibrated at this magnification, the whole length of the graticule shown covered 12 divisions of a stage micrometer scale.

There were 100 divisions in 10 mm of the stage micrometer.



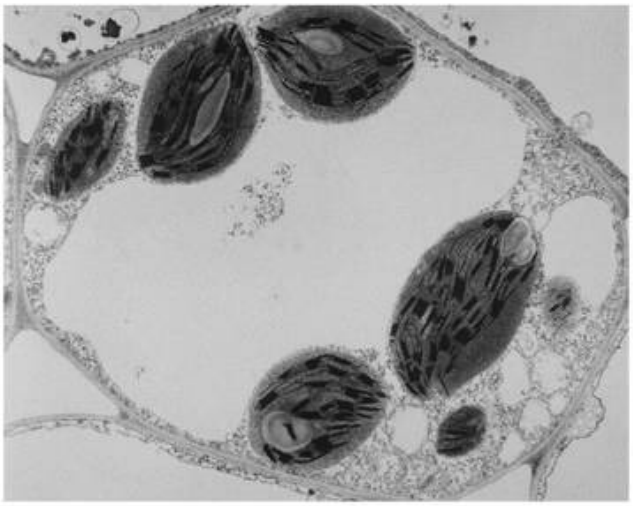
What is the actual length of the cell?

A 2.5 μm **B** 3.6 μm **C** 360 μm **D** 3 mm

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2. 9700_s20_qp_11 Q: 1

The photomicrograph shows the ultrastructure of part of a cell.



Which statement about the type of cell shown in the photomicrograph is correct?

A It is a plant cell because it has both chloroplasts and a nucleus.

B It is a plant cell because it has chloroplasts.

C It is an animal cell because it has a cell membrane.

D It is an animal cell because it has mitochondria.

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3. 9700_s20_qp_11 Q: 3

A student examined a slide of human blood with a light microscope and made a careful drawing of the different cell types. The student used an eyepiece graticule so that the relative sizes of the different cell types were drawn accurately.

In the drawing:

- red blood cells were 7 mm in diameter
- lymphocytes were 6 mm in diameter
- neutrophils were 14 mm in diameter.

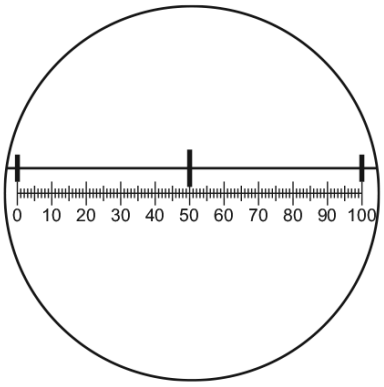
What is the linear magnification of the drawing?

A ×10 **B** ×40 **C** ×100 **D** ×1000

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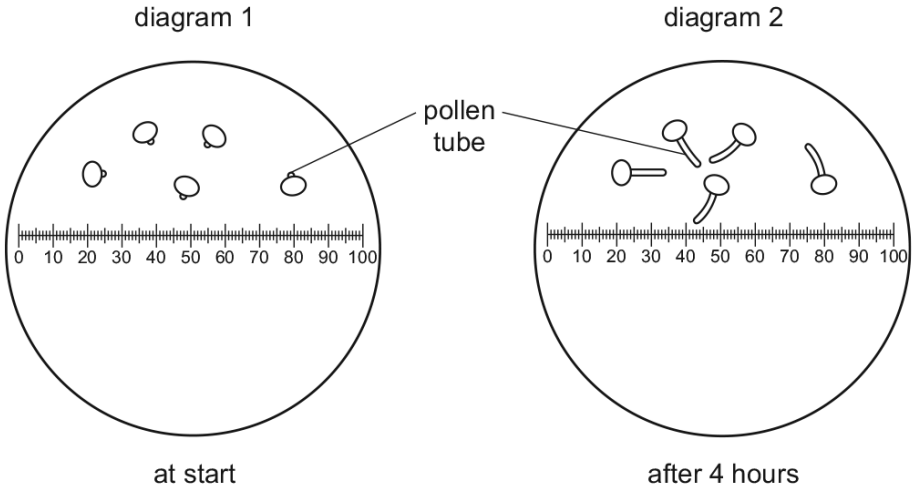
4. 9700_s20_qp_11 Q: 4

The diagram shows a graduated slide, with divisions of 0.1 mm viewed using an eyepiece graticule.



Pollen grains were grown in a sugar solution and viewed using the eyepiece graticule.

Diagram 1 shows the pollen grains at the start. Diagram 2 shows the pollen grains after four hours.



What is the growth rate of the pollen tubes?

A $5\,\mu mh^{-1}$ **B** $10\,\mu mh^{-1}$ **C** $5\,mmh^{-1}$ **D** $10\,mmh^{-1}$

---

5. 9700_s20_qp_12 Q: 1

What is the definition of the resolution of a light microscope?

A the degree of sharpness produced by the microscope

B the greatest distance between two objects visible in the same field of view

C the minimum distance that allows two objects to be viewed as separate

D the size of the smallest object visible using the microscope

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6. 9700_s20_qp_12 Q: 2

The electron micrograph shows a type of virus at a magnification of ×30 000.



What is the length of the virus?

A 2.2×10^3 nm

B 2.2×10^2 nm

C 2.2×10^1 nm

D 2.2×10^0 nm

---

7. 9700_s20_qp_13 Q: 1

A student was given a photomicrograph of a cell and told the magnification of the image.

The student was asked to calculate the actual size of the cell.

Which row in the table explains how to do this?

	measure the image in	convert to μm by multiplying by	rearrange the formula to
A	cm	1.0×10^4	$\frac{M}{I}$
B	cm	1.0×10^6	$I \times M$
C	mm	1.0×10^3	$\frac{I}{M}$
D	mm	1.0×10^4	$I \times M$

---

8. 9700_w20_qp_11 Q: 1

Which row shows the correct order of size of these cell structures?

1 width of a mitochondrion

2 width of a ribosome

3 width of a cell surface membrane

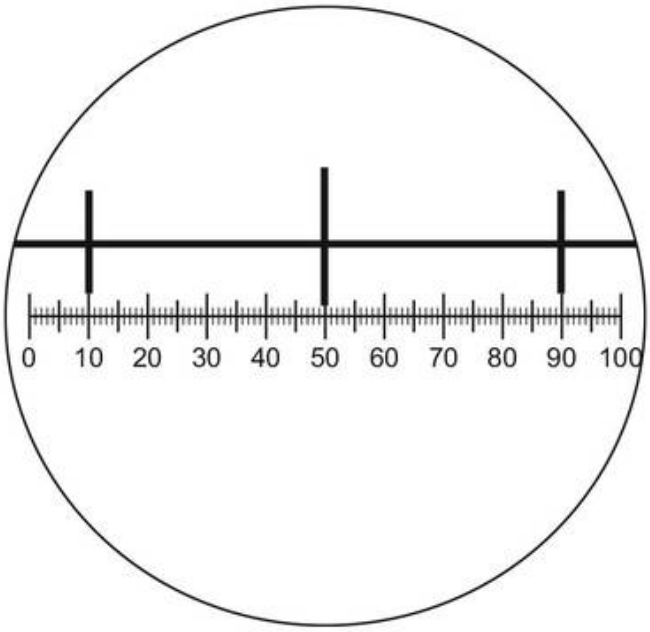
4 width of a chloroplast

	largest		→	smallest
A	1	4	2	3
B	1	4	3	2
C	4	1	2	3
D	4	2	1	3

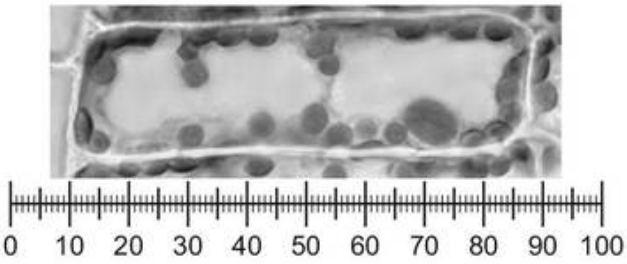
9. 9700_w20_qp_11 Q: 2

The diagram shows a stage micrometer scale viewed through an eyepiece containing a graticule.

The small divisions of the stage micrometer scale are 0.1 mm.



The stage micrometer scale is replaced by a slide of a plant cell.



What is the actual length of the nucleus in the plant cell?

A 8 μm **B** 25 μm **C** 200 μm **D** 0.8 mm

10. 9700_w20_qp_12 Q: 1

The size of the measles virus, *Morbillivirus*, is approximately 150 nm.

The *Mimivirus* is approximately 4.5 times larger than *Morbillivirus*, whilst the *Pandoravirus* is approximately 1.5 times larger than the *Mimivirus*.

Which viruses can be seen using a light microscope with a maximum resolution of 0.25 μm **and** using an electron microscope?

	Morbillivirus	*Mimivirus*	*Pandoravirus*
A	✓	✓	✓
B	✗	✓	✓
C	✗	✗	✓
D	✗	✗	✗

key

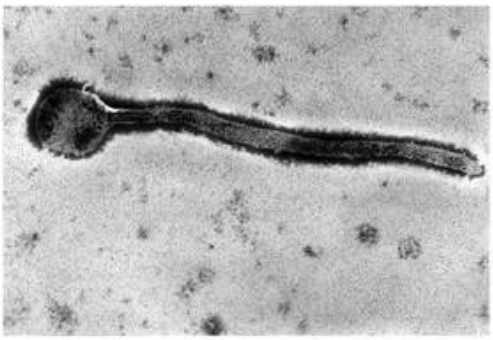
✓ = can be seen

✗ = cannot be seen

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11. 9700_w20_qp_12 Q: 2

The electron micrograph shows a type of virus at a magnification of ×60 000.



What is the actual length of the virus?

A 1.1 nm **B** 11 nm **C** 110 nm **D** 1100 nm

---

12. 9700_w20_qp_13 Q: 1

What are the appropriate units for measuring diameters of alveoli, diameters of white blood cells and the width of cell walls?

	diameters of alveoli	diameters of white blood cells	width of cell walls
A	mm	mm	nm
B	mm	μm	μm
C	μm	mm	μm
D	μm	μm	nm

---

13. 9700_w20_qp_13 Q: 2

The actual diameter of a prokaryotic cell is 0.5 μm. An electron micrograph of the cell has a magnification of ×50 000.

What is the diameter of the cell in the image?

A 2.5×10^{-1} mm

B 2.5×10^{0} mm

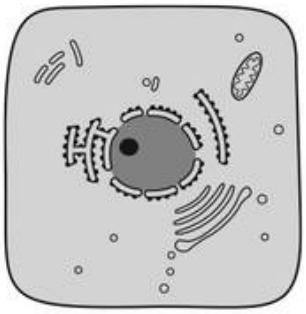
C 2.5×10^{1} mm

D 2.5×10^{2} mm

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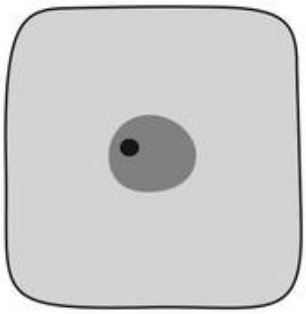
14. 9700_m19_qp_12 Q: 1

The diagram below was drawn from an electron micrograph of an animal cell.



Which diagram would represent the same cell seen under a simple light microscope, using daylight as the only light source?

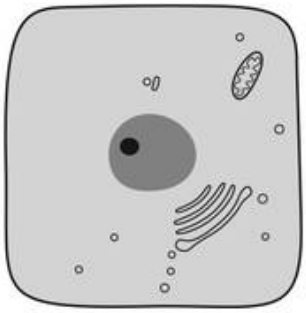
A



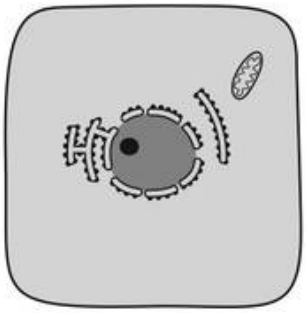
B



C



D



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15. 9700_m19_qp_12 Q: 2

The diameter of a red blood cell in a diagram was measured as 2.5 cm.

The actual diameter of the red blood cell was 7 μm.

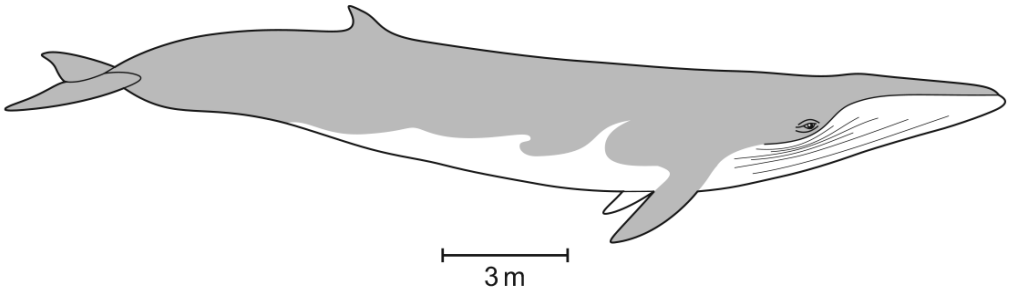
Which calculation would give the correct magnification for the red blood cell in the diagram?

A $\frac{7}{25000}$ **B** $\frac{2500}{7}$ **C** $\frac{25000}{7}$ **D** $\frac{25000}{7000}$

---

16. 9700_m19_qp_12 Q: 3

The diagram shows a fin whale drawn to scale.



A student made three statements about the diagram.

1 The magnification is ×0.006.

2 The ratio of actual size to diagram size is 1667 : 1.

3 The fin whale has an actual length of 24 m.

Which statements are correct?

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

---

17. 9700_s19_qp_11 Q: 1

A student was told that the actual length of a cell structure is 5 μm.

The student was asked to state an equation that can be used to calculate the magnification of an electron micrograph of this cell structure. The student used some of the letters q to u in the equation.

q = the length of the cell structure image on the micrograph in centimetres

r = the length of the cell structure image on the micrograph in millimetres

s = 1000

$t = \frac{1}{5}$

u = 5

Which is the correct equation to calculate the magnification?

A $\frac{q}{s} \times u$ **B** $q \times s \times t$ **C** $\frac{r}{s} \times u$ **D** $r \times s \times t$

---

18. 9700_s19_qp_12 Q: 1

The actual length of a cell structure is 8 μm.

Which steps are used to calculate the magnification of an electron micrograph of this cell structure?

step 1 measure the length of the cell structure image on the micrograph in centimetres

step 2 measure the length of the cell structure image on the micrograph in millimetres

step 3 divide the image length by 1000

step 4 multiply the image length by 1000

step 5 divide by 8

step 6 multiply by 8

A steps 1, 3 and 6

B steps 1, 4 and 6

C steps 2, 3 and 5

D steps 2, 4 and 5

---

19. 9700_s19_qp_12 Q: 2

What is the typical resolution of a microscope using daylight as a light source with a ×10 eyepiece lens and a ×40 objective lens?

A 0.20 nm **B** 200 nm **C** 100 μm **D** 400 μm

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20. 9700_s19_qp_13 Q: 1

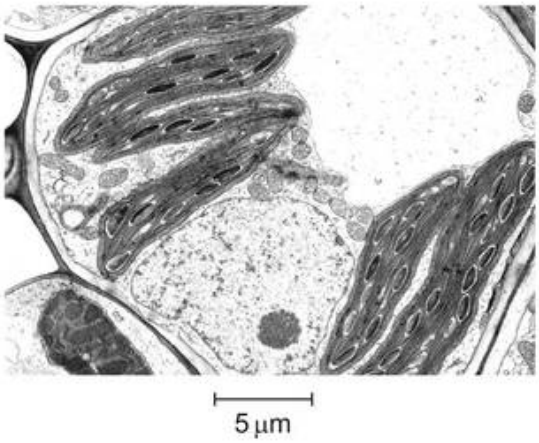
Which combination of lenses for a light microscope will give the greatest magnification?

	eyepiece lens	objective lens
A	×5	×100
B	×10	×40
C	×15	×40
D	×15	×100

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21. 9700_s19_qp_13 Q: 2

The photomicrograph shows some mesophyll tissue from a dicotyledonous leaf.



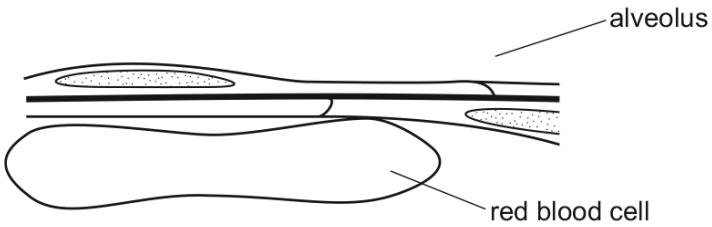
What is the magnification of the photomicrograph?

A ×280 **B** ×2800 **C** ×3570 **D** ×7000

---

22. 9700_w19_qp_11 Q: 3

The drawing has been made from a section showing part of an alveolus and a red blood cell in a capillary. The magnification of the drawing is ×5000.



What is the minimum distance that oxygen must diffuse from air in an alveolus into the red blood cell?

A 0.1 nm **B** 1.0 nm **C** 0.1 μm **D** 1.0 μm

---

23. 9700_w19_qp_12 Q: 1

A student calibrated the scale on an eyepiece graticule in the eyepiece lens of a light microscope. The student was given a stage micrometer scale to use.

The divisions on the stage micrometer scale were 0.1 mm apart.

Which data must the student collect in order to calibrate the eyepiece graticule?

1 magnification of the eyepiece lens of the microscope

2 number of divisions of the stage micrometer scale seen in one field of view of the microscope

3 number of divisions of the eyepiece graticule scale equivalent to each division of the stage micrometer scale

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

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24. 9700_w19_qp_12 Q: 2

The diameter of living cells varies considerably.

The diameter of a typical eukaryotic cell is 1.5×10^1 μm.
The diameter of a typical prokaryotic cell is 7.5×10^2 nm.

Using these measurements, what is the maximum number of each cell type which could fit along a line 1 cm long?

	number of white blood cells	number of *Streptococcus* cells
A	6.7×10^4	1.3×10^2
B	6.7×10^3	1.3×10^5
C	6.7×10^2	1.3×10^4
D	6.7×10^1	1.3×10^3

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25. 9700_w19_qp_13 Q: 2

How many nanometres are there in one millimetre?

A 1000 **B** 10 000 **C** 100 000 **D** 1 000 000

---

26. 9700_m18_qp_12 Q: 1

The eyepiece lens of a microscope can be fitted with an eyepiece graticule.

Which of these statements about eyepiece graticules are correct?

1 They measure the actual length of cells in micrometres.

2 They help biologists to draw cells with correct proportions.

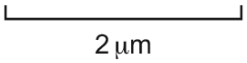
3 They change in size when the objective lens is changed from ×10 to ×40.

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

---

27. 9700_m18_qp_12 Q: 2

A student was asked to use the scale bar shown to calculate the magnification of a cell on a photomicrograph.



Which method could the student use to calculate the magnification of the cell?

A divide the diameter of the cell by the length of the scale bar, both measured in the same units of length

B measure the diameter of the cell in millimetres, multiply by 2000 and divide by the length of the scale bar measured in millimetres

C measure the length of the scale bar in millimetres, convert to micrometres and divide by 2

D measure the length of the scale bar in millimetres, convert to micrometres and multiply by 2

---

28. 9700_m18_qp_12 Q: 3

Which eyepiece and objective lens combination of a light microscope allows the greatest number of cells in a field of view to be seen?

	eyepiece lens	objective lens
A	×5	×10
B	×5	×40
C	×10	×10
D	×10	×40

---

29. 9700_s18_qp_11 Q: 1

Which statements about resolution and magnification are correct?

	resolution	magnification
A	the ability to distinguish between two separate objects that are very close together	the number of times larger an image is compared with the real size of the object
B	the clarity of the image formed by the microscope	the power of the microscope to focus on very small objects
C	the number of times larger an image is compared with the real size of the object	the ability to distinguish between two separate objects that are very close together
D	the power of the microscope to focus on very small objects	the clarity of the image formed by the microscope

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30. 9700_s18_qp_11 Q: 2

An eyepiece graticule has a scale with 100 divisions. A stage micrometer has a scale with 50 divisions, each of which is 0.040 mm apart.

Using a ×40 objective lens, the whole length of this stage micrometer scale lines up with 15 divisions of the eyepiece graticule.

What is the actual length of the 100 division scale of the eyepiece graticule?

A 1.3 mm **B** 13 mm **C** 75 μm **D** 750 μm

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31. 9700_s18_qp_11 Q: 3

A prokaryotic cell which is 1 μm in diameter, is magnified 50 000 times in an electron micrograph.

What is the diameter of the cell in the electron micrograph?

A 5×10^{-1} mm

B 5×10^{0} mm

C 5×10^{1} mm

D 5×10^{2} mm

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32. 9700_s18_qp_12 Q: 2

Which of these statements about light microscopy are correct?

1 The greater the resolution of a light microscope, the greater the detail that can be seen.

2 The greater the magnification of a light microscope, the greater the detail that can be seen.

3 Increasing the magnification of a light microscope up to its limit of resolution allows more detail to be seen.

4 The shorter the wavelength of light used in a light microscope, the greater the detail that can be seen.

A 1, 2, 3 and 4

B 1, 3 and 4 only

C 1 and 2 only

D 4 only

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33. 9700_s18_qp_13 Q: 1

Which steps are needed to find the actual width of a xylem vessel viewed in transverse section using a ×10 objective lens?

1 Convert from mm to μm by multiplying by 10^{-3}.

2 Calibrate the eyepiece graticule using a stage micrometer on ×4 objective lens.

3 Measure the width of the xylem vessel using an eyepiece graticule.

4 Multiply the number of eyepiece graticule units by the calibration of the eyepiece graticule.

A 1, 2, 3 and 4

B 1 and 2 only

C 2, 3 and 4 only

D 3 and 4 only

---

34. 9700_w18_qp_11 Q: 1

A student made notes describing photomicrographs of four cells.

cell 1 Grey cytoplasm at edge of cell contains many black lines and spots. Large white area in centre of cell.

cell 2 Grey cytoplasm contains many black lines and spots which fill the entire cell.

cell 3 Pale blue cytoplasm surrounds a single dark blue spot.

cell 4 Many green structures are enclosed within a rectangular shape with visible boundaries.

Which table identifies the type of cell and the type of microscope used to take each photograph?

A

	animal cell	plant cell
electron microscope	1	2
light microscope	3	4

B

	animal cell	plant cell
electron microscope	1	2
light microscope	4	3

C

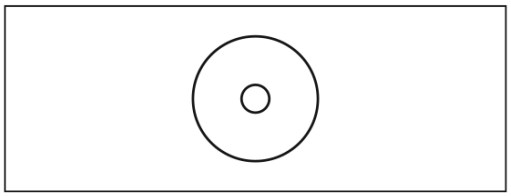
	animal cell	plant cell
electron microscope	2	1
light microscope	3	4

D

	animal cell	plant cell
electron microscope	2	1
light microscope	4	3

35. 9700_w18_qp_11 Q: 2

The diagram shows a slide of a transverse section of a stem. This diagram is the same size as the actual slide.



A student observed this slide using a light microscope at a magnification of ×40. The student made a plan drawing of the stem, which was 20 cm in diameter.

The student labelled the plan 'Transverse section of a stem ×40'.

Which statement explains why this label is **not** correct?

A The actual size of the stem should have been checked using an eyepiece graticule.

B The actual size of the stem was smaller under low power.

C The image size in the drawing was larger than ×40.

D The image size in the drawing was smaller than ×40.

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36. 9700_w18_qp_12 Q: 2

A specimen of plant tissue is first observed under a microscope using red light with a wavelength of 650 nm.

The same specimen is then observed under the same conditions, but using green light with a wavelength of 510 nm.

What happens to the magnification and resolution when using green light compared to red light?

	magnification	resolution
A	decreases	decreases
B	increases	increases
C	remains the same	decreases
D	remains the same	increases

---

37. 9700_w18_qp_13 Q: 1

Which statement explains why it is necessary to use an electron microscope to see the cristae of a mitochondrion?

A The magnification of the electron microscope is greater than that of the light microscope.

B The membranes of the cristae are separated by a distance greater than 200 nm.

C The resolution of a student microscope using daylight is too low.

D The wavelength of an electron beam is longer than the wavelength of light.

---

38. 9700_w18_qp_13 Q: 2

A prokaryotic cell which is 0.25 μm in diameter, is magnified 50 000 times on an electron micrograph.

How big will its diameter be in the electron micrograph?

A 1.25×10^{-1} mm

B 1.25×10^{0} mm

C 1.25×10^{1} mm

D 1.25×10^{2} mm

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39. 9700_w18_qp_13 Q: 3

When making measurements in experiments, which methods could have parallax errors?

1 using a calibrated eyepiece graticule to measure length

2 using a measuring cylinder to measure volume

3 using a ruler to measure length of a shoot

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

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40. 9700_m17_qp_12 Q: 2

A light microscope is used to observe two structures that are 200 nm apart.

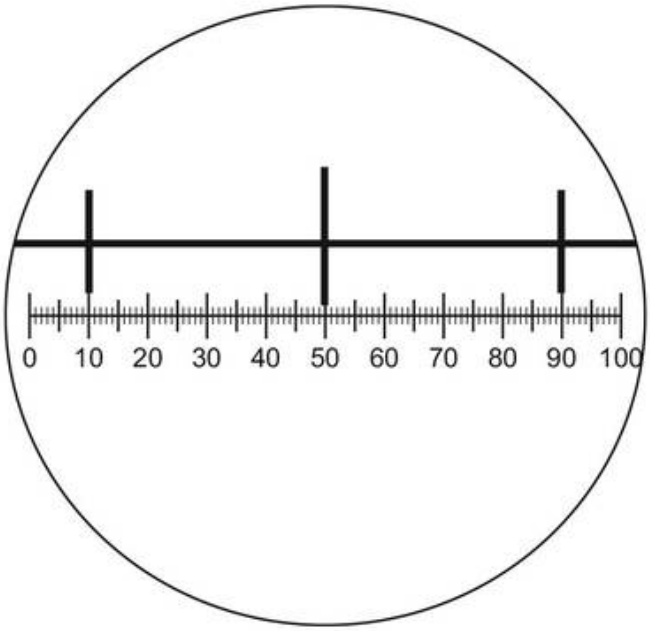
How far apart are the structures when the magnification is changed from ×40 to ×400?

A 2 μm **B** 20 μm **C** 200 nm **D** 2000 nm

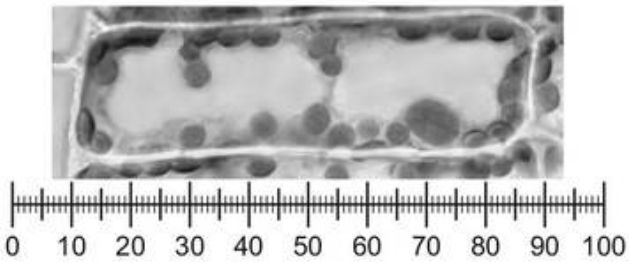
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41. 9700_m17_qp_12 Q: 3

The diagram shows a stage micrometer scale viewed through an eyepiece containing a graticule. The small divisions of the stage micrometer scale are 0.1 mm.



The stage micrometer scale is replaced by a slide of a plant cell.



What is the length of the nucleus in the plant cell?

A 0.8 mm **B** 8 μm **C** 25 μm **D** 200 μm

---

42. 9700_s17_qp_11 Q: 1

Which definition of the magnification of a drawing of a leaf is correct?

A the actual size of an object multiplied by the magnification of the microscope

B the difference in size between an actual object and a drawing of the object

C the increase in size of an object when observed using a microscope

D the size of the drawing of a specimen in comparison to the actual size

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43. 9700_s17_qp_11 Q: 4

Which lengths are equivalent to 1 μm?

1 1000 mm
2 0.001 nm
3 0.001 mm
4 1 000 000 nm
5 0.01 mm
6 1000 nm

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

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44. 9700_s17_qp_12 Q: 3

The recently discovered *Pandoravirus* measures 1000 nm in diameter.

The *Mimivirus* has a diameter of 400 nm.

What can be detected using a light microscope with a maximum resolution of 0.25 μm?

A both the *Mimivirus* and the *Pandoravirus*

B neither the *Mimivirus* nor the *Pandoravirus*

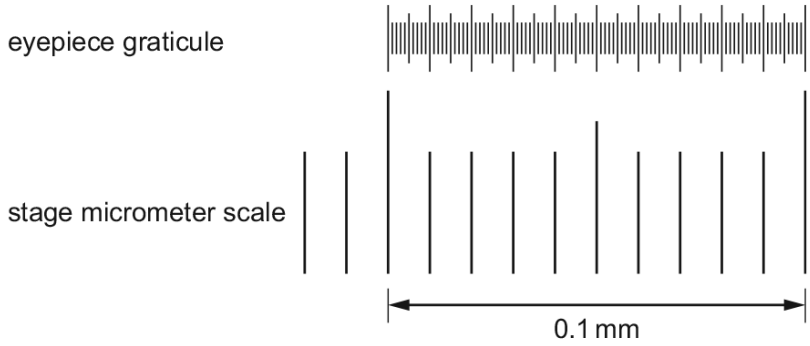
C the *Mimivirus,* but not the *Pandoravirus*

D the *Pandoravirus*, but not the *Mimivirus*

---

45. 9700_s17_qp_13 Q: 2

The diagram shows an eyepiece graticule and part of a stage micrometer scale as seen using ×100 magnification.



How is the value, in μm, of one eyepiece graticule unit calculated?

A divide 100 by 0.1 and multiply by 1000

B divide 100 by 0.1 and multiply by 1000 divided by 100

C multiply 0.1 by 1000 and divide by 100

D multiply 0.1 by 1000 and divide by 100 then divide again by 100

---

46. 9700_w17_qp_11 Q: 4

Which set of measurements is correct?

	diameter of capillary	diameter of red blood cell	thickness of cell surface membrane of red blood cell
A	7 μm	7 μm	7 nm
B	7 μm	7 nm	7 nm
C	0.7 mm	7 μm	7 nm
D	0.7 mm	0.7 mm	7 μm

---

47. 9700_w17_qp_11 Q: 5

The size of the measles virus is approximately 150 nm.

The *Mimivirus* is approximately 4.5 times larger than the measles virus, whilst the *Pandoravirus* is approximately 1.5 times larger than the *Mimivirus*.

Which viruses can be seen using **both** a light microscope with a maximum resolution of 0.25 μm **and** an electron microscope?

	measles virus	*Mimivirus*	*Pandoravirus*
A	✓	✓	✓
B	✗	✓	✓
C	✗	✗	✓
D	✗	✗	✗

key

✓ = can be seen

✗ = cannot be seen

---

48. 9700_w17_qp_12 Q: 1

Which equation for calculating the actual size of a specimen, A, or image size, I, or magnification, M, is correct?

A A = M ÷ I **B** A = I × M **C** I = M ÷ A **D** M = I ÷ A

---

49. 9700_w17_qp_13 Q: 1

Which statement about the light microscope is correct?

A As the smallest distance to see two points as distinct separate points decreases, the resolution also decreases.

B If the resolution is 220 nm, then a bacterium 0.2 μm in diameter will not be visible.

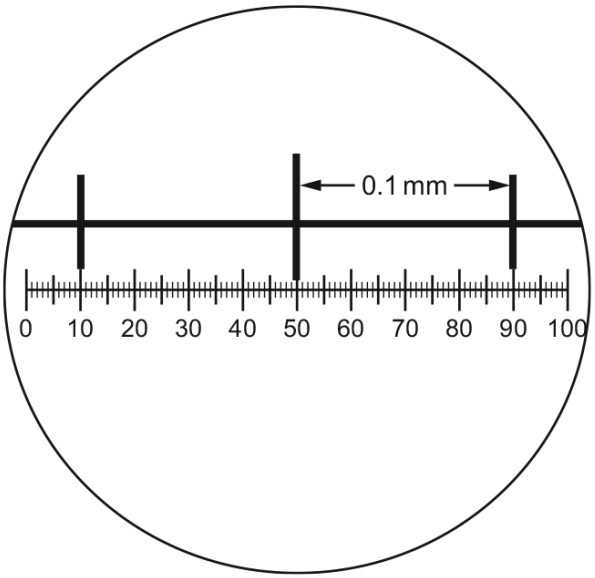
C If the wavelength of light is 600 nm, then two membranes 300 nm apart will be visible as two distinct membranes.

D Using visible light of a longer wavelength, such as red light, will improve the resolution.

---

50. 9700_w17_qp_13 Q: 2

The diagram shows a stage micrometer scale viewed with an eyepiece graticule, using a magnification of ×200.



Using the same magnification, a chloroplast is measured as 4 eyepiece graticule divisions long.

How long is the chloroplast?

A $1.0 \times 10^{1}\,\mu m$

B $4.0 \times 10^{2}\,\mu m$

C $2.5 \times 10^{-1}\,\mu m$

D $2.5 \times 10^{-2}\,\mu m$

---

51. 9700_m16_qp_12 Q: 1

A student has drawn a cell structure as seen using a light microscope.

The magnification of the drawing is ×600.

The length of the structure on the drawing is 6 mm.

What is the actual length of the cell structure?

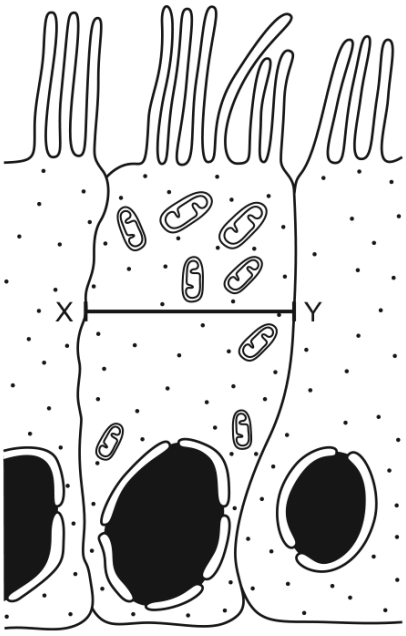
A $1 \times 10^{-1}\,\mu m$ **B** $1 \times 10^{0}\,\mu m$ **C** $1 \times 10^{1}\,\mu m$ **D** $1 \times 10^{2}\,\mu m$

---

52. 9700_s16_qp_11 Q: 2

The drawing from an electron micrograph shows a ciliated epithelial cell, magnified ×1500, which is found in the trachea.

Line X-Y shows the widest dimension of the cell.



What is the number of these cells that could be found along a 1 cm length of the trachea?

A 5 **B** 50 **C** 500 **D** 5000

---

53. 9700_s16_qp_12 Q: 1

A student was presented with a photomicrograph of a cell organelle. The magnification of the photomicrograph is known.

Which calculation of the actual length of the organelle in μm is correct?

A actual size in cm × 100 divided by the magnification

B actual size in mm × 100 divided by the magnification

C image size in cm × 1000 divided by the magnification

D image size in mm × 1000 divided by the magnification

---

54. 9700_s16_qp_13 Q: 1

An eyepiece graticule can be calibrated using a stage micrometer.

What is the correct reason why an eyepiece graticule is calibrated?

A An eyepiece graticule can be used to make measurements.

B An eyepiece graticule is magnified by the objective lens.

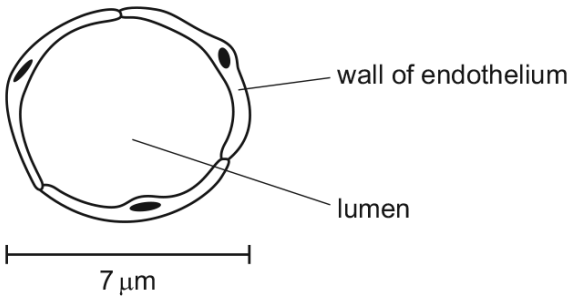
C An eyepiece graticule magnifies the specimen.

D An eyepiece graticule makes comparisons.

---

55. 9700_w16_qp_11 Q: 1

The diagram shows a transverse section through a blood capillary.



What is the magnification of the drawing?

A ×200 **B** ×245 **C** ×500 **D** ×5000

---

56. 9700_w16_qp_12 Q: 1

Until recently, the typical viruses known to science were 20 – 150 nm in size.

In 2003, the Mimivirus was discovered with a size of approximately 680 nm.

In 2013, the Pandoravirus was discovered which has a size of over 1000 nm.

Which viruses can be seen using **both** a light microscope with a maximum resolution of 0.25 μm and an electron microscope?

	typical virus	Mimivirus	Pandoravirus
A	✓	✓	✓
B	✗	✓	✓
C	✗	✗	✓
D	✗	✗	✗

key

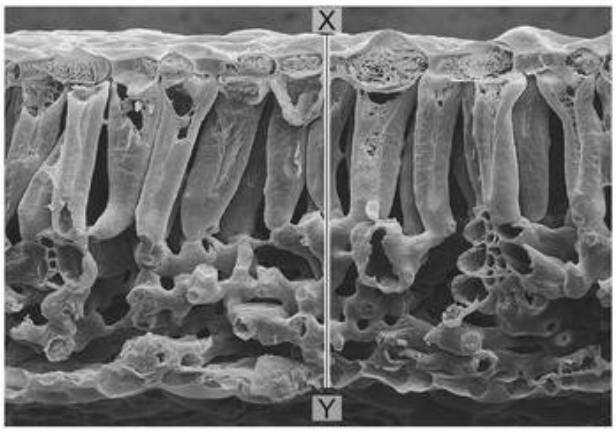
✓ = can be seen

✗ = cannot be seen

---

57. 9700_w16_qp_12 Q: 2

This electron micrograph of a section of a leaf has a magnification of ×210.



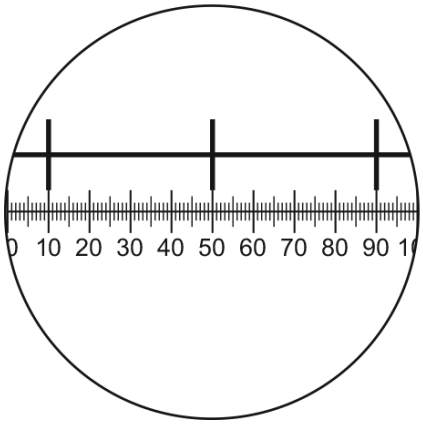
What is the actual length along the line X–Y?

A 2.43 μm **B** 24.3 μm **C** 243.0 μm **D** 2430 μm

---

58. 9700_w16_qp_12 Q: 4

The diagram shows a stage micrometer scale, with divisions 0.1 mm apart, viewed through an eyepiece containing a graticule.



What is the area of the field of view of the microscope at this magnification? (π = 3.14)

A $\pi \times 12.5 \times 12.5 = 4.9 \times 10^2\ \mu m^2$

B $\pi \times 50 \times 50 = 7.9 \times 10^3\ \mu m^2$

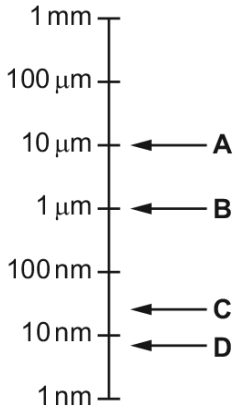
C $\pi \times 125 \times 125 = 4.9 \times 10^4\ \mu m^2$

D $\pi \times 250 \times 250 = 2.0 \times 10^5\ \mu m^2$

---

59. 9700_w16_qp_13 Q: 2

Which letter on the logarithmic scale corresponds to the size of a typical prokaryote?



---

60. 9700_w16_qp_13 Q: 3

Which calculation is used to find the actual length of an organelle from an image?

A image size ÷ magnification

B image size × magnification

C image size × resolution

D magnification ÷ image size

---

61. 9700_s15_qp_11 Q: 1

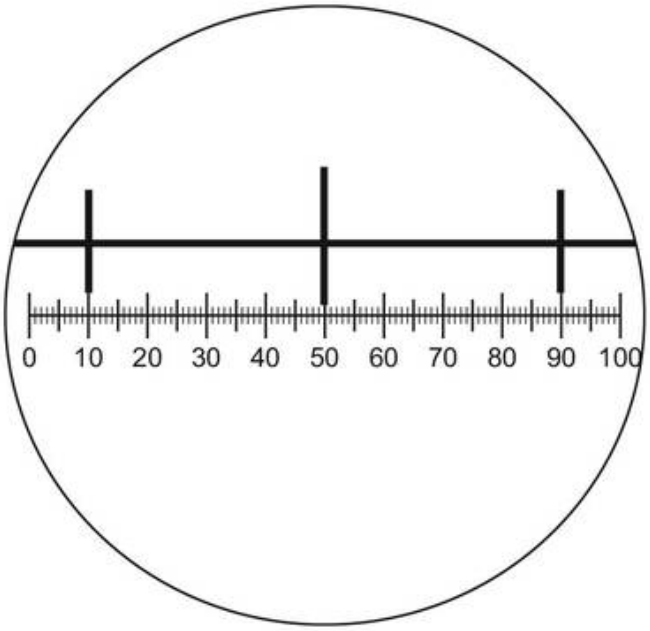
What are the appropriate units for measuring diameters of alveoli, diameters of white blood cells and the width of cell walls?

	diameters of alveoli	diameters of white blood cells	width of cell walls
A	mm	µm	µm
B	µm	mm	µm
C	µm	µm	nm
D	mm	mm	nm

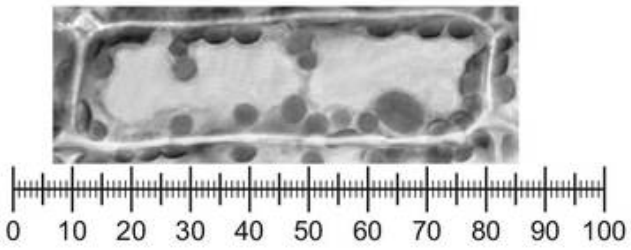
---

62. 9700_s15_qp_11 Q: 3

The diagram shows a stage micrometer scale on which the small divisions are 0.1 mm. It is viewed through an eyepiece containing a graticule.



The stage micrometer scale is replaced by a slide of a plant cell.

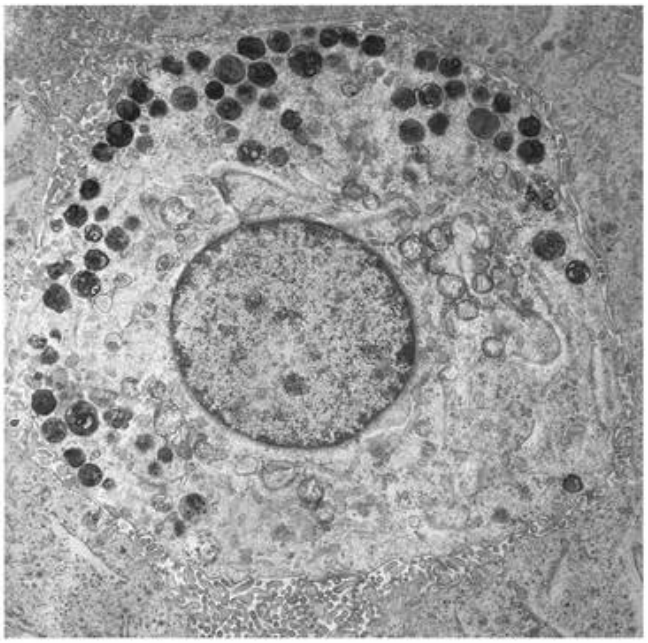


What is the width of a chloroplast?

A 0.5 mm **B** 10 μm **C** 50 μm **D** 100 μm

63. 9700_s15_qp_11 Q: 6

The electronmicrograph shows a cell.



×5700

What is the actual diameter of the nucleus?

A 0.6 μm **B** 6 μm **C** 35 μm **D** 350 μm

---

64. 9700_s15_qp_12 Q: 1

What is the diameter of a typical plant cell?

A 4.0×10^{1} μm

B 1.0×10^{0} μm

C 4.0×10^{2} nm

D 1.0×10^{2} nm

---

65. 9700_s15_qp_12 Q: 2

A specimen is viewed under a microscope using green light with a wavelength of 510 nm.

If the same specimen is viewed under the same conditions, but using red light with a wavelength of 650 nm instead, what effect will this have on the magnification and on the resolution of the microscope?

	magnification	resolution
A	decreased	remains the same
B	increased	increased
C	remains the same	decreased
D	remains the same	increased

---

66. 9700_s15_qp_13 Q: 2

Which statements about light microscopes are correct?

1 To calculate the magnification of a light microscope the eyepiece lens and objective lens magnifications are added together.

2 As the magnification increases the resolution decreases.

3 The resolution of a light microscope is limited by the wavelength of light.

4 The scale on a stage micrometer is resolved more clearly than an eyepiece graticule.

A 1, 2, 3 and 4

B 1, 3 and 4 only

C 2 and 3 only

D 2 and 4 only

---

67. 9700_w15_qp_11 Q: 2

Pancreatic cells have a diameter of 35 μm.

Red blood cells have a diameter of 7000 nm.

Which statement is correct?

A Pancreatic cells are 5 times larger than red blood cells.

B Pancreatic cells are 50 times larger than red blood cells.

C Pancreatic cells are 5 times smaller than red blood cells.

D Pancreatic cells are 50 times smaller than red blood cells.

---

68. 9700_w15_qp_12 Q: 2

Different units are used when measuring biological specimens.

Which measurement in mm has **not** been correctly converted into **both** μm and nm?

	mm	μm	nm
A	1.0	1.0×10^3	1.0×10^6
B	2.5	2.5×10^3	2.5×10^6
C	5.0	5.0×10^4	5.0×10^7
D	25.0	2.5×10^4	2.5×10^7

---

69. 9700_w15_qp_13 Q: 2

Different units are used when measuring biological specimens.

In which rows are the same measurements correctly expressed in each of the units shown in the column headings?

	mm	μm	nm
1	1.0	1.0×10^3	1.0×10^6
2	2.5	2.5×10^3	2.5×10^6
3	5.0	5.0×10^4	5.0×10^7
4	25.0	2.5×10^4	2.5×10^7

A 1, 2, 3 and 4

B 1, 2 and 4 only

C 1 and 2 only

D 3 and 4 only

1.2 Cells as the basic units of living organisms

70. 9700_m20_qp_12 Q: 2

Which cell structures can form vesicles?

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

key

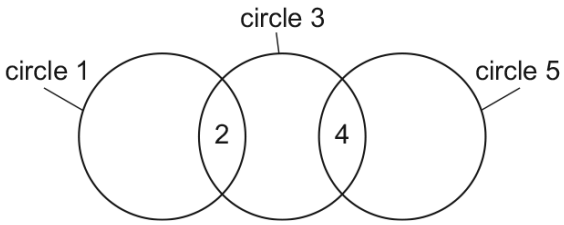
✓ = can form vesicles

✗ = cannot form vesicles

---

71. 9700_m20_qp_12 Q: 3

The diagram shows three circles, 1, 3 and 5, representing chloroplasts, mitochondria and typical prokaryotes.



Which row correctly identifies the three circles and some of the structures that are shared between them?

	circle 1	2	circle 3	4	circle 5
A	chloroplasts	circular DNA	mitochondria	80S ribosomes	prokaryotes
B	chloroplasts	80S ribosomes	mitochondria	circular DNA	prokaryotes
C	prokaryotes	circular DNA	mitochondria	circular DNA	chloroplasts
D	prokaryotes	70S ribosomes	chloroplasts	80S ribosomes	mitochondria

---

72. 9700_m20_qp_12 Q: 4

Which cell structures contain RNA?

1 centrioles

2 mitochondria

3 nucleus

4 ribosomes

A 1, 2, 3 and 4

B 1 and 2 only

C 2, 3 and 4 only

D 3 and 4 only

---

73. 9700_m20_qp_12 Q: 5

It is possible for a bacterium to synthesise a eukaryotic protein.

This involves introducing a eukaryotic gene into the bacterial DNA. The eukaryotic gene is then translated by the bacterium.

What explains why a bacterial cell can produce a eukaryotic protein but cannot produce a eukaryotic glycoprotein?

A Bacteria do not have rough endoplasmic reticulum.

B Bacteria do not have a nuclear envelope.

C Bacteria do not have mitochondria.

D Bacteria do not have Golgi bodies.

---

74. 9700_m20_qp_12 Q: 6

Which structures are found in typical prokaryotic cells and also in typical plant cells?

A cell walls

B histones

C telomeres

D tonoplasts

---

75. 9700_s20_qp_11 Q: 2

Which structures are found in typical eukaryotic cells?

1 70S ribosomes

2 80S ribosomes

3 linear DNA (chromosomes)

4 circular DNA

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1 and 4 only

D 2 and 3 only

---

76. 9700_s20_qp_11 Q: 5

The table shows a comparison between two features of a typical eukaryotic cell and a typical prokaryotic cell.

Which row shows the correct comparison between these cells?

	presence of centromeres		presence of telomeres	
	eukaryotic cell	prokaryotic cell	eukaryotic cell	prokaryotic cell
A	✓	✓	✗	✗
B	✓	✗	✓	✗
C	✗	✓	✗	✓
D	✗	✗	✓	✓

key

✓ = present

✗ = not present

---

77. 9700_s20_qp_12 Q: 3

Which row correctly shows a feature of a cell structure?

	site of protein synthesis	makes lysosomes
A	smooth endoplasmic reticulum	rough endoplasmic reticulum
B	ribosomes	Golgi body
C	rough endoplasmic reticulum	ribosomes
D	Golgi body	smooth endoplasmic reticulum

---

78. 9700_s20_qp_12 Q: 4

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

The functions were listed by a number.

1 organises microtubules to produce the spindle during cell division

2 synthesis of polypeptides

3 packaging of hydrolytic enzymes that will remain in the cell

The appearances were listed by a letter.

V membranes which surround an enclosed inner cavity

W non-membrane bound, spherical structures

X a double membrane with many 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	X	Y
B	W	Z	W
C	Y	W	Z
D	Y	Z	Z

---

79. 9700_s20_qp_12 Q: 5

The features of some cells and cell structures that make ATP are listed.

1 has outer boundary membrane and folded inner membrane

2 has peptidoglycan cell wall outside an outer boundary membrane

3 has a double boundary membrane and stacks of inner membranes

Which row identifies these components?

	1	2	3
A	bacterium	chloroplast	mitochondrion
B	chloroplast	bacterium	mitochondrion
C	chloroplast	mitochondrion	bacterium
D	mitochondrion	bacterium	chloroplast

---

80. 9700_s20_qp_12 Q: 6

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

Which feature have these prokaryotes lost during their evolution into mitochondria?

A cell wall

B circular chromosome

C internal membranes

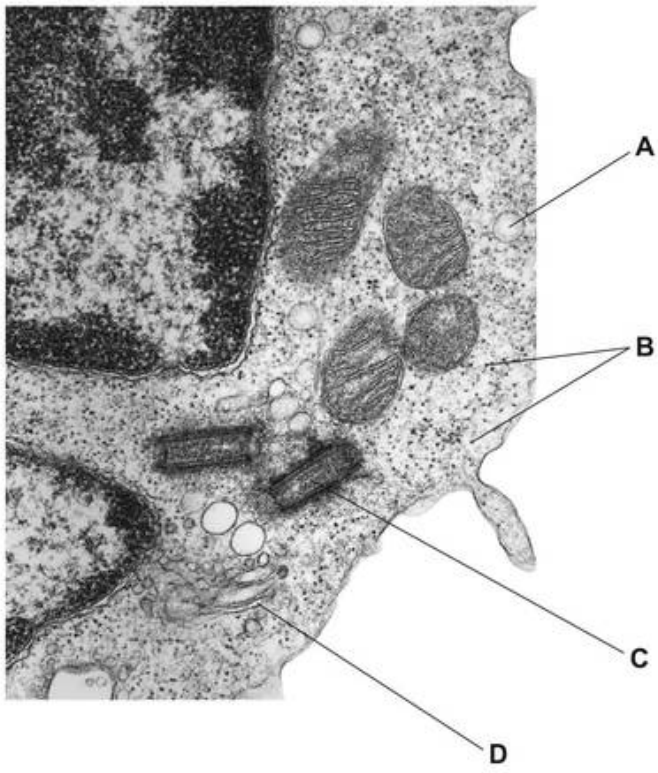
D ribosomes

---

81. 9700_s20_qp_13 Q: 2

The electron micrograph shows part of a eukaryotic cell.

Which cell structure is a site of protein synthesis?



---

82. 9700_s20_qp_13 Q: 3

Some stains can be used to identify cell structures in living cells.

A dilute solution of one stain causes the whole cell to appear blue.

The blue colour rapidly disappears in most cell structures. Those cell structures that release energy stay blue.

Which type of cell structure is likely to stay blue?

A endoplasmic reticulum

B Golgi body

C lysosome

D mitochondrion

---

83. 9700_s20_qp_13 Q: 4

A molecule of carbon dioxide is in the centre of a mitochondrion.

Assuming there are no other cell structures in its path, how many phospholipid layers will the carbon dioxide molecule have to pass through in order to leave the cell?

A 2 **B** 3 **C** 6 **D** 8

---

84. 9700_s20_qp_13 Q: 5

Which row identifies the type of ribosome found in each of the different structures?

	chloroplast	cytoplasm of eukaryotic cell	prokaryotic cell	mitochondrion
A	70S	70S	80S	70S
B	70S	80S	70S	70S
C	80S	70S	80S	80S
D	80S	80S	70S	80S

---

85. 9700_w20_qp_11 Q: 3

Insulin is a hormone synthesised from two polypeptide chains inside cells of the pancreas.

Which row shows the cell structures that are used in producing insulin and releasing it from the cells?

	Golgi body	lysosome	rough endoplasmic reticulum
A	✓	✓	✗
B	✓	✓	✓
C	✓	✗	✓
D	✗	✓	✓

key

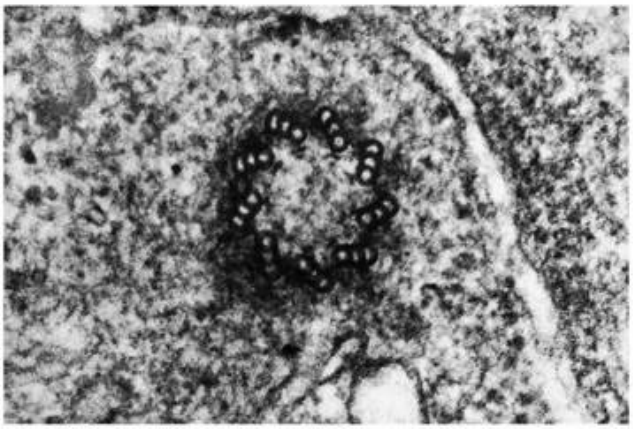
✓ = used

✗ = not used

---

86. 9700_w20_qp_11 Q: 4

The electron micrograph shows a cell structure in a eukaryotic cell.



Which statements about this cell structure are correct?

1 ATP is synthesised in this cell structure.

2 The cell structure is made of protein molecules.

3 The cell structure replicates during interphase of the cell cycle.

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

---

87. 9700_w20_qp_11 Q: 5

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

---

88. 9700_w20_qp_11 Q: 6

The DNA of typical prokaryotes is naked and circular.

Which statement describes how the DNA of eukaryotes differs from the DNA of typical prokaryotes?

A Only DNA of eukaryotes has a nuclear envelope around it and is a double helix.

B Only DNA of eukaryotes has a nuclear envelope around it and is circular.

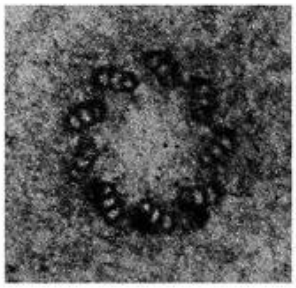
C Only DNA of eukaryotes has proteins attached to it and is a double helix.

D Only DNA of eukaryotes has proteins attached to it and is linear.

---

89. 9700_w20_qp_12 Q: 3

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



Which biological molecules are found in this structure?

1 nucleic acid

2 protein

3 phospholipid

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

90. 9700_w20_qp_12 Q: 4

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 mRNA passes through to the ribosome

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	V	W	Z
B	V	Z	Y
C	X	V	W
D	X	V	Z

---

91. 9700_w20_qp_12 Q: 5

Which are found in typical prokaryotic cells **and** in typical plant cells?

1 cell wall

2 circular DNA

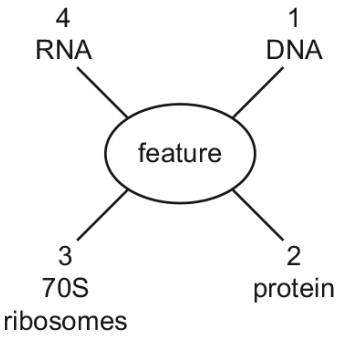
3 cytoplasm

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

---

92. 9700_w20_qp_12 Q: 6

The diagram shows some features that occur in organisms.

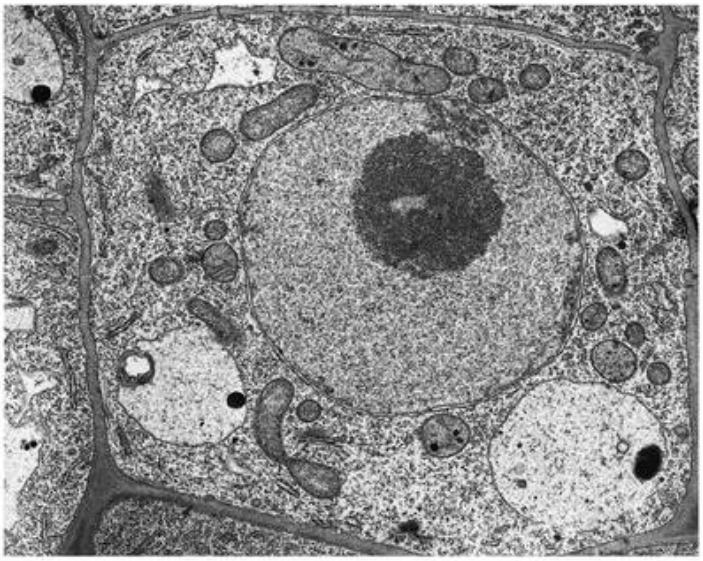


Which features can be present in viruses?

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

93. 9700_w20_qp_13 Q: 3

The electron micrograph shows some cell structures.



Some cell structures are listed.

1 nucleolus
2 chloroplast
3 microtubules
4 ribosomes
5 mitochondria
6 plasmodesmata

Which cell structures can be seen in the electron micrograph?

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

---

94. 9700_w20_qp_13 Q: 4

Which part of the cell is often continuous with the rough endoplasmic reticulum?

A cell surface membrane
B Golgi body
C mitochondrion
D nuclear envelope

---

95. 9700_w20_qp_13 Q: 5

Which statements about ATP are correct?

1 It is produced in chloroplasts.

2 It is used during protein synthesis.

3 It contains deoxyribose.

4 It is used in facilitated diffusion.

5 It is used to load sucrose into companion cells.

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

---

96. 9700_w20_qp_13 Q: 6

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 mRNA passes through to the ribosome

2 organises microtubules to produce the spindle during cell division

3 synthesis of lipids

The appearances were listed by letter.

V membranes which surround an enclosed inner cavity

W non-membrane-bound, spherical structures

X a double membrane with pores

Y non-membrane-bound, cylindrical structures

Z membrane-bound sacs, arranged as a flattened stack

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

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

---

97. 9700_m19_qp_12 Q: 4

Which structures are found in both chloroplasts and mitochondria?

1 70S ribosomes

2 80S ribosomes

3 circular DNA

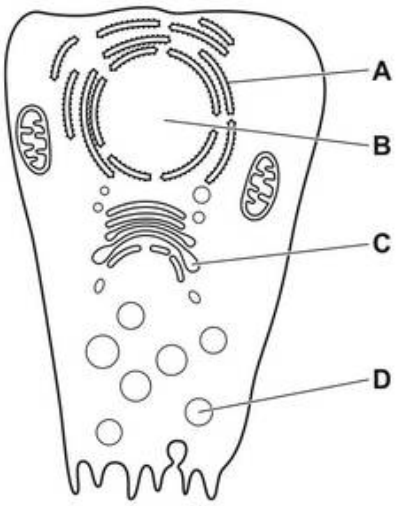
A 1 and 3 **B** 2 and 3 **C** 1 only **D** 3 only

---

98. 9700_m19_qp_12 Q: 5

Radioactively labelled amino acids are introduced into a cell that is actively secreting an enzyme.

In which cell structure will the radioactivity first become concentrated?



---

99. 9700_m19_qp_12 Q: 6

Ribosomes exist as separate subunits that are bound together during protein synthesis.

What do these subunits consist of?

A mRNA and protein

B mRNA and tRNA

C rRNA and protein

D rRNA and tRNA

---

100. 9700_s19_qp_11 Q: 2

Which features of cilia and root hairs are correct?

	increase cell surface area	cannot be resolved with the light microscope	contain vacuoles	more than one present on a cell
A	cilia	cilia	root hairs	root hairs
B	cilia	root hairs	cilia	cilia
C	root hairs	cilia	root hairs	cilia
D	root hairs	root hairs	cilia	root hairs

---

101. 9700_s19_qp_11 Q: 3

Which are functions of microtubules?

1 allowing movement of cilia in a bronchus

2 attachment of centromeres during metaphase

3 moving secretory vesicles around a cell

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

---

102. 9700_s19_qp_11 Q: 4

Some cell structures are listed.

1 mitochondria

2 nucleus

3 chloroplasts

4 ribosomes

What is the correct order of these cell structures when listed from largest to smallest?

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

---

103. 9700_s19_qp_11 Q: 5

Which cell structures have ribosomal RNA (rRNA)?

1 chloroplast

2 mitochondrion

3 nucleus

4 rough endoplasmic reticulum

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1, 2 and 4 only

D 2, 3 and 4 only

---

104. 9700_s19_qp_11 Q: 6

A cell structure in the macrophage destroys bacteria. Some bacteria stop this cell structure from functioning.

Which cell structure in the macrophage is stopped from functioning by the bacteria?

A Golgi body

B lysosome

C ribosome

D vesicle

---

105. 9700_s19_qp_12 Q: 3

Two different types of cell, P and Q, were broken up using ultrasound and their contents analysed. Both types of cell contained small circular DNA. The circular DNA from P all carried the same base sequence, but those from Q were of two types, with different base sequences.

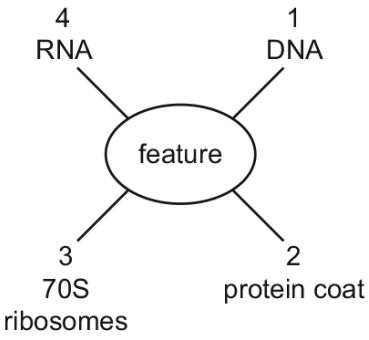
What may be concluded about the identity of cell types P and Q?

	P	Q
A	heart muscle fibres	root cortical cells
B	lymphocytes	mature red blood cells contaminated by bacteria
C	mature red blood cells	phloem sieve tube element
D	root cortical cells	leaf mesophyll cells

---

106. 9700_s19_qp_12 Q: 4

Which features shown in the diagram can be present in viruses?

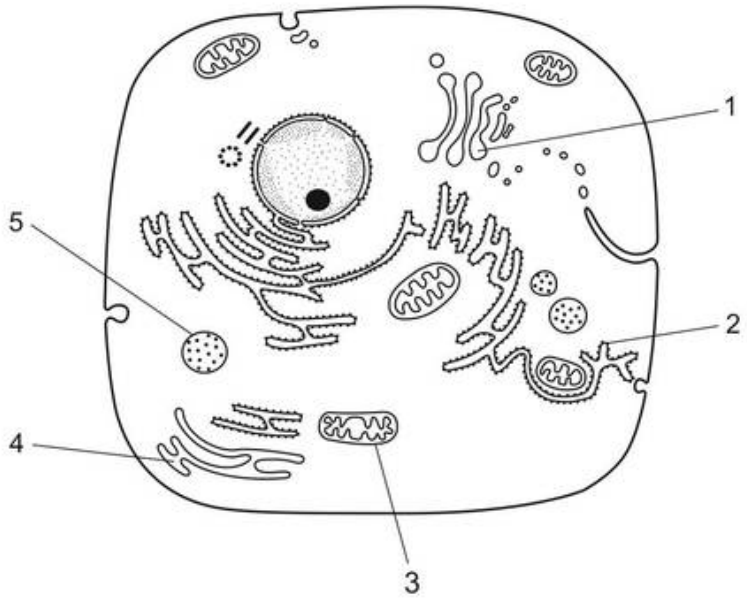


A 1, 2 and 3 **B** 1, 2 and 4 **C** 1, 3 and 4 **D** 2, 3 and 4

---

107. 9700_s19_qp_13 Q: 3

The diagram shows a typical animal cell as seen using an electron microscope.



Which of the numbered structures are needed for proteins to be secreted at the cell surface membrane?

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

---

108. 9700_s19_qp_13 Q: 4

Lysosomes vary in shape and size, making them difficult to identify.

What describes a lysosome?

A a vesicle containing enzymes, enclosed by a double membrane, that is budded off the endoplasmic reticulum

B a vesicle containing hydrolytic enzymes and surrounded by a single membrane, found only in phagocytes

C a vesicle enclosed by a single membrane, containing several different hydrolytic enzymes that may act inside or outside the cell

D a vesicle surrounded by a double membrane, containing enzymes which can hydrolyse damaged organelles in a cell

---

109. 9700_s19_qp_13 Q: 5

Which statements about ATP are correct?

1 It is produced in mitochondria only.

2 It can be hydrolysed to form ADP.

3 It contains deoxyribose.

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

---

110. 9700_s19_qp_13 Q: 6

A single-celled organism lives inside the body of a fish. This single-celled organism is rod-shaped, 700 μm long, enclosed in a cell wall and has cytoplasm containing thousands of copies of small, circular DNA.

Which statement about this single-celled organism is correct?

A It is a eukaryote, because it can be seen without using a microscope.

B It is a eukaryote, because it is too large to be a prokaryote.

C It is a plant, because it is enclosed in a cell wall.

D It is a prokaryote, because it has small, circular DNA in its cytoplasm.

---

111. 9700_w19_qp_11 Q: 1

Which cell structure contains cytoplasm?

A chloroplasts

B mitochondria

C plasmodesmata

D smooth endoplasmic reticulum

---

112. 9700_w19_qp_11 Q: 2

Some cell structures are listed in a particular order.

1 nucleus

2 ribosome

3 Golgi body

4 vesicle

What determines the order in which these cell structures are listed?

A sequence used in synthesis of a lipid

B sequence used in synthesis of an antibody

C size from largest to smallest

D size from smallest to largest

---

113. 9700_w19_qp_11 Q: 4

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

The functions were listed by a number.

1 mRNA passes through to the ribosome

2 synthesis of polypeptides

3 packaging of hydrolytic enzymes that will remain in the cell

The appearances were listed by a 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 functions with the appearance of the cell structure?

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

---

114. 9700_w19_qp_11 Q: 5

The antibiotic chloramphenicol inhibits protein synthesis in mitochondria and in some prokaryotes. Chloramphenicol does **not** inhibit protein synthesis in the cytoplasm of eukaryotic cells.

What would be the effect on the cells of a person being treated with chloramphenicol?

	rate of ATP production	transcription of nuclear DNA
A	decreases	decreases
B	decreases	no effect
C	increases	decreases
D	no effect	no effect

---

115. 9700_w19_qp_12 Q: 3

Which structures are found in animal cells and in plant cells?

1 centriole

2 lysosome

3 nucleolus

4 vacuole

A 1 and 3 only

B 2 and 4 only

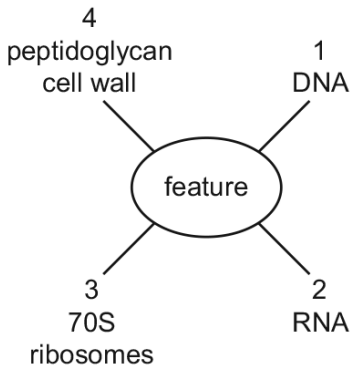
C 2, 3 and 4 only

D 1, 2, 3 and 4

---

116. 9700_w19_qp_12 Q: 4

Which features shown in the diagram can be present in eukaryotes?



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

---

117. 9700_w19_qp_12 Q: 5

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

The functions were listed by a number.

1 organises microtubules to produce the spindle during cell division

2 synthesis of polypeptides

3 synthesis of lipids

The appearances were listed by a 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 functions with the appearance of the cell structure?

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

---

118. 9700_w19_qp_12 Q: 6

Which types of RNA are present in prokaryotic cells and in eukaryotic cells?

	mRNA	rRNA	tRNA
A	✓	✓	✓
B	✓	✓	✗
C	✗	✓	✓
D	✗	✓	✗

key

✓ = present

✗ = not present

---

119. 9700_w19_qp_13 Q: 1

Plant cells are stained and then seen with a simple light microscope using daylight as the only light source.

Which cell structures are clearly visible at a magnification of ×400?

A chloroplast grana

B lysosomes

C nucleoli

D ribosomes

---

120. 9700_w19_qp_13 Q: 3

Which cell structures contain 70S ribosomes?

1 chloroplasts

2 mitochondria

3 nucleus

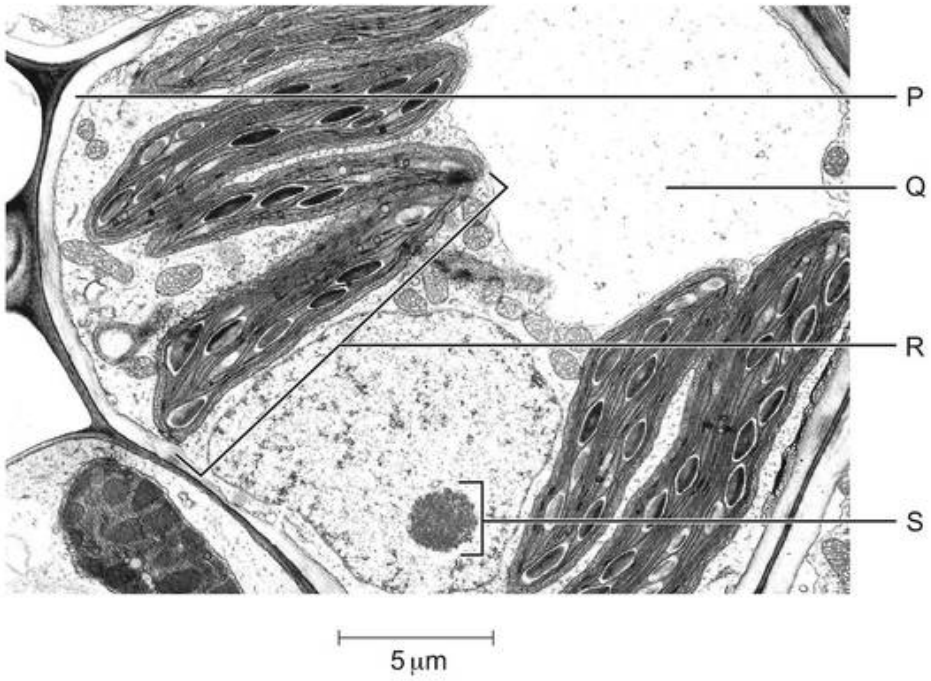
4 cytoplasm

A 1 and 2 only **B** 1 only **C** 2, 3 and 4 **D** 2 and 4 only

---

121. 9700_w19_qp_13 Q: 4

The electron micrograph shows part of a plant cell.



Which combination correctly identifies the labelled cell structures?

	P	Q	R	S
A	cell surface membrane	cytoplasm	mitochondrion	nucleus
B	cell surface membrane	vacuole	chloroplast	nucleus
C	cell wall	cytoplasm	mitochondrion	nucleolus
D	cell wall	vacuole	chloroplast	nucleolus

122. 9700_w19_qp_13 Q: 5

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

The functions were listed by a number.

1 mRNA passes through to the ribosome

2 organises microtubules to produce the spindle during cell division

3 packaging of hydrolytic enzymes that will remain in the cell

The appearances were listed by a 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	V	W	Y
B	V	Y	Z
C	X	W	Y
D	X	Y	Z

---

123. 9700_m18_qp_12 Q: 4

Which row correctly matches each cell structure with its function?

	microtubules	rough endoplasmic reticulum
A	allow vesicles to move within the cell	synthesises amino acids
B	form cilia and centrioles	produces ribosomes
C	form the spindle during prophase	transports proteins
D	move chromosomes during anaphase	makes triglycerides and phospholipids

---

124. 9700_m18_qp_12 Q: 5

Which animal cells would have the most extensive Golgi bodies?

A ciliated epithelial cells

B goblet cells

C red blood cells

D smooth muscle cells

---

125. 9700_m18_qp_12 Q: 6

Which of these processes will require ATP?

1 transport of water in the xylem

2 semi-conservative replication of DNA

3 facilitated diffusion of amino acids into the cell

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

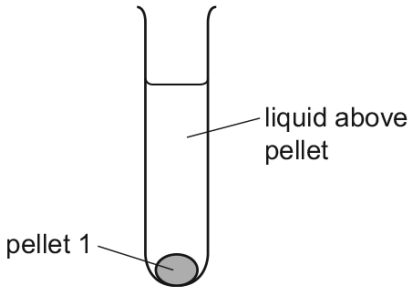
---

126. 9700_s18_qp_11 Q: 4

A scientist carried out an experiment to separate cell structures in animal cells.

The cells were broken open to release the cell structures.

This extract was filtered into a centrifuge tube and then spun in a centrifuge. The heaviest cell structure sank to the bottom forming pellet 1, as shown in the diagram.



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 cell structure. This cell structure sank to the bottom, forming pellet 2.

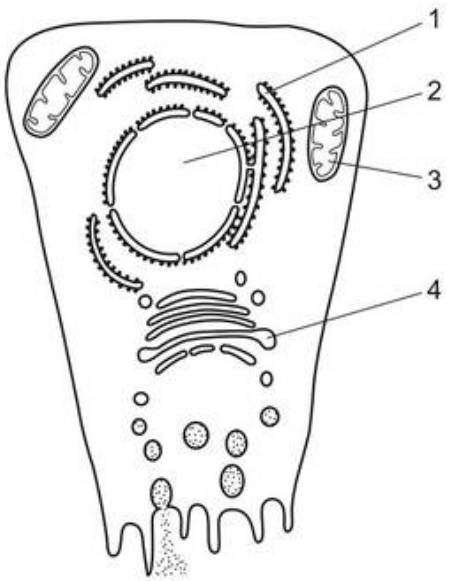
This procedure was repeated twice more to obtain pellet 3 and pellet 4, each containing a single type of cell structure.

Which row shows the order in which the cell structures were collected?

	pellet 1	pellet 2	pellet 3	pellet 4
A	nucleus	lysosomes	mitochondria	ribosomes
B	nucleus	mitochondria	lysosomes	ribosomes
C	ribosomes	lysosomes	mitochondria	nucleus
D	ribosomes	mitochondria	lysosomes	nucleus

127. 9700_s18_qp_11 Q: 5

Radioactively-labelled nucleotides are introduced into a cell.



In which cell structures will the radioactivity first become concentrated?

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

---

128. 9700_s18_qp_12 Q: 1

Some features of cells are listed.

1 cell wall

2 cell surface membrane

3 ribosomes

Which features can be found in plant cells and in prokaryotic cells?

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

---

129. 9700_s18_qp_12 Q: 3

Which type of cell contains the highest proportion of cell structures bound by a single membrane?

A ciliated epithelial cell

B goblet cell

C red blood cell

D smooth muscle cell

---

130. 9700_s18_qp_12 Q: 4

The table shows a variety of structures which may be found in cells.

Which row shows structures that could be found in the root cells of a plant?

	plasmodesmata	glycogen granules	Golgi body	mitochondria
A	✓	✓	✗	✗
B	✓	✗	✓	✓
C	✗	✓	✓	✓
D	✗	✗	✓	✓

key

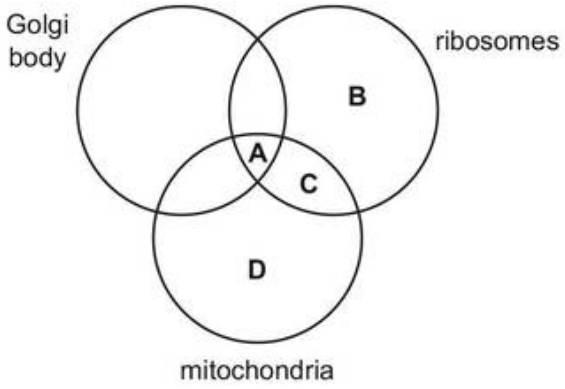
✓ = present

✗ = absent

---

131. 9700_s18_qp_12 Q: 5

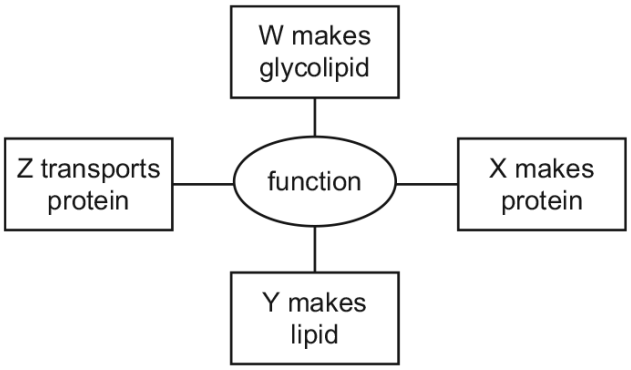
Which of these cell structures are present in *Plasmodium*?



---

132. 9700_s18_qp_13 Q: 2

The diagram shows functions of four cell structures, W, X, Y and Z.



Which row correctly matches the cell structure with the letter representing a function?

	Golgi body	ribosome	rough endoplasmic reticulum	smooth endoplasmic reticulum
A	W	X	Z	Y
B	X	Z	Y	W
C	Y	W	X	Z
D	Z	Y	W	X

---

133. 9700_s18_qp_13 Q: 3

Which cell structures produce ATP?

1 chloroplasts

2 mitochondria

3 nucleus

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

---

134. 9700_s18_qp_13 Q: 5

Which row could be correct for a virus?

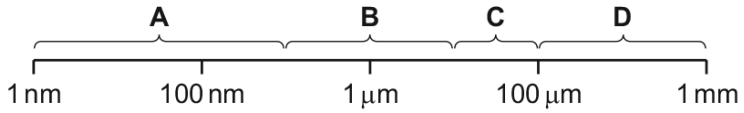
	carbohydrate	DNA	phospholipid	lipid	protein	RNA
A	✓	✓	✓	✓	✓	✓
B	✓	✗	✓	✗	✗	✓
C	✗	✓	✗	✗	✗	✓
D	✗	✓	✗	✗	✓	✗

key
✓ = present
✗ = not present

---

135. 9700_s18_qp_13 Q: 6

Which size range would include most prokaryotic cells?



---

136. 9700_w18_qp_11 Q: 3

Which cell structures may contain cisternae?

	chloroplast	endoplasmic reticulum	Golgi body	mitochondrion
A	✓	✓	✓	✗
B	✓	✗	✗	✓
C	✗	✓	✓	✗
D	✗	✓	✗	✓

key
✓ = may contain cisternae
✗ = does not contain cisternae

---

137. 9700_w18_qp_11 Q: 4

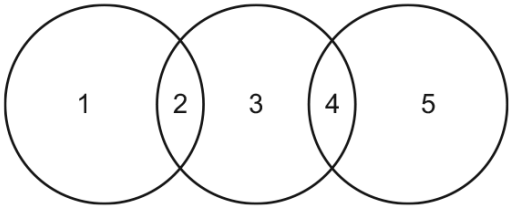
Which row correctly describes the function of the cell structures?

	lysosomes	mitochondria	smooth endoplasmic reticulum	Golgi body
A	digestion of unwanted structures	abundant in sites of active transport	processing of proteins	a stack of flattened sacs
B	digestion of unwanted structures	ATP synthesis	lipid production	glycoprotein production
C	spherical sacs containing hydrolytic enzymes	abundant in sites of active transport	lipid production	glycoprotein production
D	spherical sacs containing hydrolytic enzymes	ATP synthesis	glycoprotein production	lipid production

---

138. 9700_w18_qp_11 Q: 5

The diagram shows the relationship between various cells and their components.



Which row is correct?

	1	2	3	4	5
A	80S ribosome	eukaryotic cell	mitochondrion	70S ribosome	prokaryotic cell
B	chloroplast	plant cell	cell wall	prokaryotic cell	80S ribosome
C	circular DNA	nucleus	eukaryotic cell	mitochondrion	70S ribosome
D	prokaryotic cell	circular DNA	chloroplast	membrane bound	70S ribosome

---

139. 9700_w18_qp_12 Q: 1

What is the diameter of a typical prokaryote, such as *Streptococcus*?

A 7.5×10^{1} nm

B 7.5×10^{2} nm

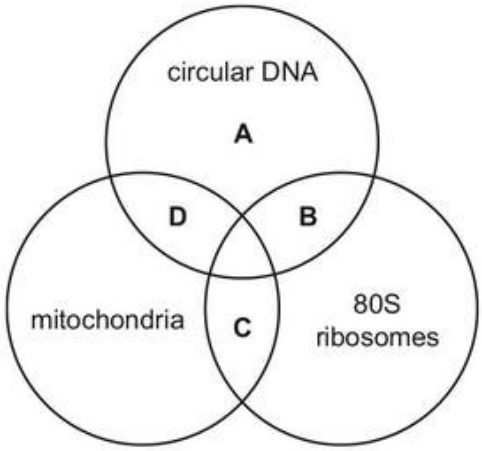
C 7.5×10^{0} μm

D 7.5×10^{1} μm

---

140. 9700_w18_qp_12 Q: 3

Which structures are present in a *Vibrio cholerae* cell?



---

141. 9700_w18_qp_12 Q: 4

The removal of a plant cell wall by enzyme digestion leaves an intact membrane-bound structure called a protoplast.

Which statement explains why protoplasts are easily damaged?

A Mitochondria stop producing ATP to maintain membrane integrity.

B Net movement of water is no longer limited by turgor.

C Secretory vesicles are unable to fuse with the cell surface membrane.

D The shape of the cell structures is changed by the loss of cell shape.

---

142. 9700_w18_qp_12 Q: 5

Which statements are correct for a green plant?

1 ATP is produced by mitochondria.

2 ATP is produced by chloroplasts.

3 ATP forms part of the DNA.

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

---

143. 9700_w18_qp_12 Q: 6

Which processes occur in eukaryotes and prokaryotes?

1 hydrolysis

2 mitosis

3 transcription

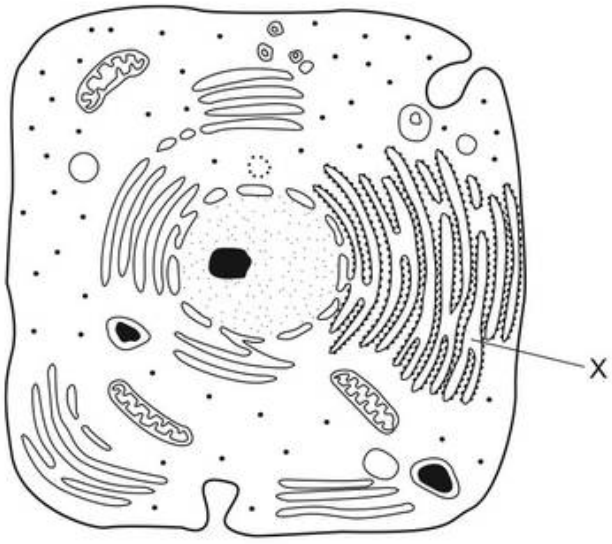
4 translation

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

---

144. 9700_w18_qp_13 Q: 4

The diagram is a drawing from an electron micrograph of a typical animal cell.



What is the function of the membrane system labelled X?

A lipid synthesis only

B protein synthesis and transport

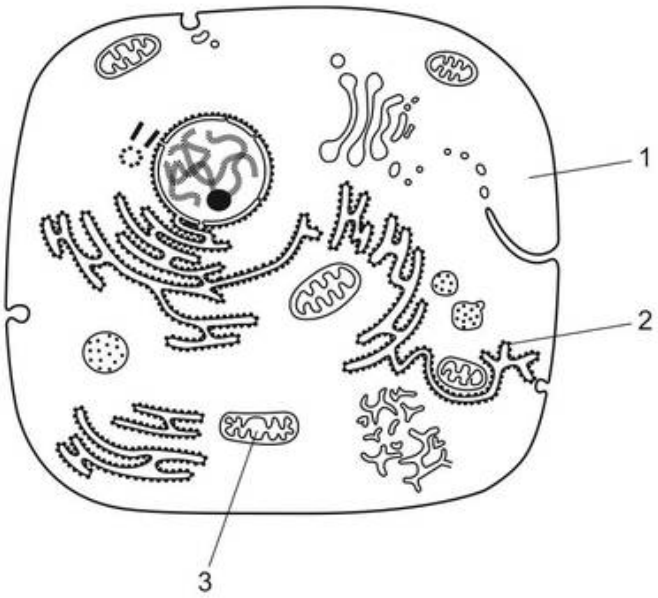
C protein synthesis only

D protein transport only

---

145. 9700_w18_qp_13 Q: 5

The diagram is a drawing from an electron micrograph of a typical animal cell.



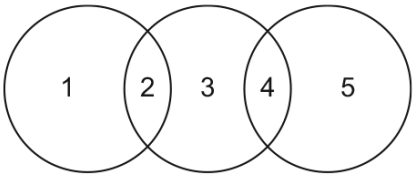
Where would nucleic acid be found?

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

---

146. 9700_w18_qp_13 Q: 6

The diagram shows some similarities between chloroplasts, mitochondria and typical prokaryotes.



Which row is correct?

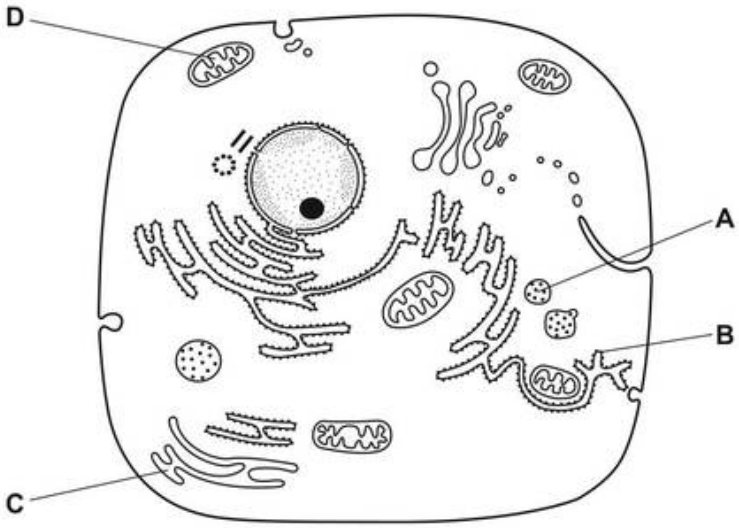
	1	2	3	4	5
A	chloroplasts	circular DNA	mitochondria	linear DNA	prokaryotes
B	mitochondria	70S ribosomes	chloroplasts	linear DNA	prokaryotes
C	mitochondria	linear DNA	chloroplasts	70S ribosomes	prokaryotes
D	prokaryotes	70S ribosomes	mitochondria	70S ribosomes	chloroplasts

---

147. 9700_m17_qp_12 Q: 1

The diagram shows the ultrastructure of a typical animal cell.

Which structure synthesises and transports lipids?



---

148. 9700_m17_qp_12 Q: 4

Some features of cells are listed.

1 cytoplasm

2 cell surface membrane

3 ribosomes

Which features are found in **both** animal and prokaryotic cells?

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

---

149. 9700_m17_qp_12 Q: 5

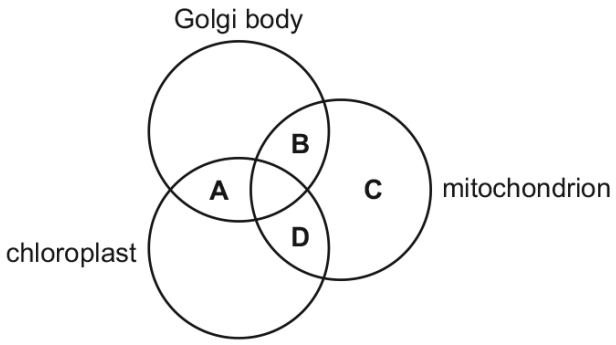
Which size of ribosomes is found in chloroplasts?

A 60S **B** 70S **C** 80S **D** 90S

---

150. 9700_m17_qp_12 Q: 6

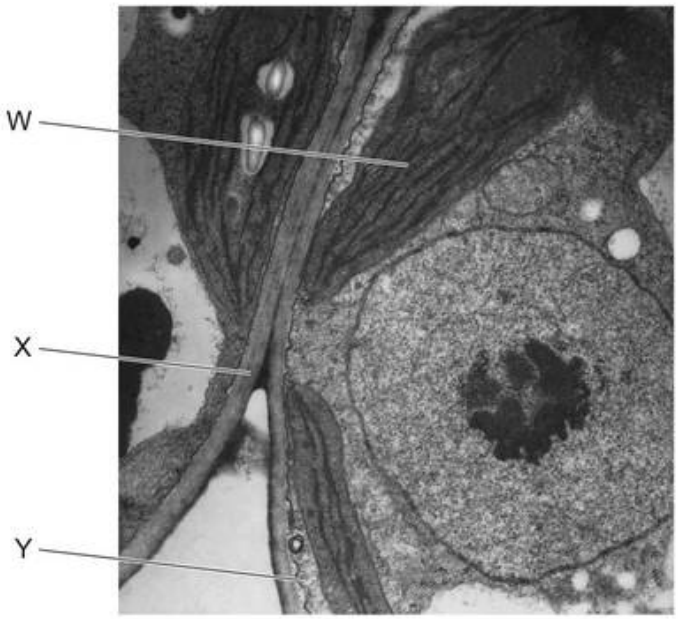
In which of these organelles is ATP synthesised?



---

151. 9700_s17_qp_11 Q: 2

The electron micrograph shows part of two cells.



Which labelled features identify these cells as eukaryotic?

A W, X and Y **B** W and X only **C** W only **D** X only

---

152. 9700_s17_qp_11 Q: 3

Plant cells are fixed, stained and viewed using a student microscope. The light source was natural light.

What would be clearly visible at ×400 magnification?

A cristae of mitochondria

B grana of chloroplasts

C nucleoli

D ribosomes

---

153. 9700_s17_qp_11 Q: 5

Some secretory cells synthesise and release glycoproteins.

What is the correct order of the sequence of events as they occur in the secretory cell?

1 exocytosis

2 product accumulates in secretory vesicle

3 mRNA binds to ribosomes

4 synthesis of glycoprotein

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

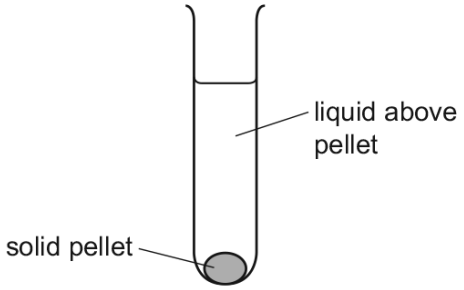
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154. 9700_s17_qp_11 Q: 6

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. He then broke the cells open with a blender to release the organelles.

The extracted mixture was filtered and then spun in a centrifuge at a speed to separate the heaviest organelle. This sank to the bottom, forming a 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 organelle. This organelle sank to the bottom, to form a solid pellet, 2.

He repeated this procedure twice more to obtain pellet 3 and pellet 4, each containing a single organelle.

What is the function of the organelle extracted in pellet 3?

A digestion of old organelles

B production of ATP

C synthesis of mRNA

D synthesis of protein

---

155. 9700_s17_qp_12 Q: 1

Which organelles are enclosed in a single phospholipid bilayer and contain hydrolytic enzymes?

A endocytotic vesicles

B Golgi body

C lysosomes

D mitochondria

---

156. 9700_s17_qp_12 Q: 2

The DNA of prokaryotes is naked and circular.

Which statement describes how the DNA of eukaryotes differs from that of prokaryotes?

A It has a nuclear envelope around it and is a double helix.

B It has a nuclear envelope around it and is circular.

C It has proteins attached to it and is a double helix.

D It has proteins attached to it and is linear.

---

157. 9700_s17_qp_12 Q: 4

What are found in chloroplasts **and** mitochondria?

1 DNA

2 70S ribosomes

3 mRNA

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

---

158. 9700_s17_qp_13 Q: 1

Where are cisternae found in a cell?

1 endoplasmic reticulum

2 Golgi body

3 mitochondrion

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

---

159. 9700_s17_qp_13 Q: 3

It is possible for a bacterium to synthesise a eukaryotic protein.

This involves introducing a eukaryotic gene into the bacterial DNA, which can be translated.

What explains why a bacterial cell can produce a eukaryotic protein but cannot produce a eukaryotic glycoprotein?

A Bacteria do not have 70S ribosomes.

B Bacteria do not have a nuclear envelope.

C Bacteria do not have Golgi bodies.

D Bacteria do not have mitochondria.

---

160. 9700_s17_qp_13 Q: 4

Which structures are found in **both** typical eukaryotic cells **and** typical prokaryotic cells?

1 70S ribosomes

2 80S ribosomes

3 circular DNA

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

---

161. 9700_w17_qp_11 Q: 2

An electron micrograph of a cell shows large quantities of rough endoplasmic reticulum and many Golgi bodies.

What type of cell is being viewed?

A bacterium

B guard cell

C lymphocyte

D mesophyll

---

162. 9700_w17_qp_11 Q: 3

Which cell structures can form vesicles?

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

key

✓ = can form vesicles

✗ = cannot form vesicles

---

163. 9700_w17_qp_12 Q: 2

One of the smallest viruses is the polio virus, which has a diameter of approximately 30 nm.

In 2003, the *Mimivirus* was discovered which has a diameter of approximately 680 nm.

In 2013, the *Pandoravirus* was discovered which has a diameter of approximately 1000 nm.

Which row correctly matches a cell structure with a virus that has a similar approximate size?

	polio virus	*Mimivirus*	*Pandoravirus*
A	lysosome	nucleolus	nucleus
B	nucleolus	lysosome	mitochondrion
C	nucleolus	mitochondrion	lysosome
D	ribosome	lysosome	mitochondrion

---

164. 9700_w17_qp_12 Q: 3

Which cell components are present in **all** prokaryotic cells?

	cell surface membrane	cell wall	endoplasmic reticulum	flagellum
A	✓	✓	✗	✓
B	✓	✓	✗	✗
C	✓	✗	✓	✗
D	✗	✓	✓	✓

key

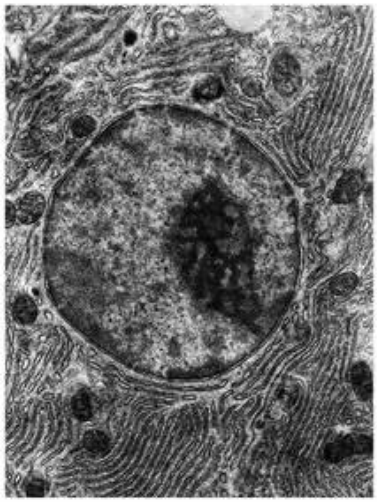
✓ = present

✗ = not present

---

165. 9700_w17_qp_12 Q: 4

The electron micrograph shows part of an animal cell.



What will be synthesised in large quantities in this cell?

1 ATP

2 glucose

3 RNA

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

---

166. 9700_w17_qp_12 Q: 5

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

Which feature have the prokaryotes lost during their evolution into mitochondria?

A cell wall

B circular chromosome

C endoplasmic reticulum

D ribosomes

---

167. 9700_w17_qp_12 Q: 6

Which statement is correct?

A A virus is composed of a protein coat which may surround RNA or DNA.

B Eukaryotic plant cell walls contain peptidoglycans in addition to cellulose.

C Plasmodesmata and centrioles are found in all plant cells.

D Prokaryotic cells contain 80S ribosomes which they use to manufacture proteins.

---

168. 9700_w17_qp_13 Q: 3

A cell was supplied with cytosine labelled with radioactive carbon.

In which cell structure would radioactivity be detected first?

A endoplasmic reticulum

B Golgi body

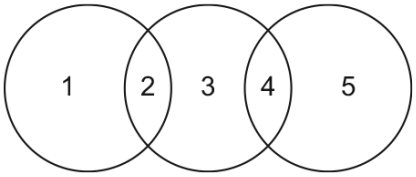
C nucleus

D ribosome

---

169. 9700_w17_qp_13 Q: 4

The diagram shows some similarities between chloroplasts, mitochondria and typical prokaryotes.



Which row is correct?

	1	2	3	4	5
A	chloroplasts	circular DNA	mitochondria	80S ribosomes	prokaryotes
B	chloroplasts	80S ribosomes	mitochondria	circular DNA	prokaryotes
C	prokaryotes	circular DNA	mitochondria	circular DNA	chloroplasts
D	prokaryotes	70S ribosomes	chloroplasts	80S ribosomes	mitochondria

---

170. 9700_w17_qp_13 Q: 5

Which statement supports the fact that mature plant cells can carry out the same role as lysosomes?

A A range of hydrolytic enzymes can be found within mature plant vacuoles.

B Glycogen, found within vesicles, can be hydrolysed to glucose molecules.

C Single membrane-bound vesicles are formed from plant Golgi bodies.

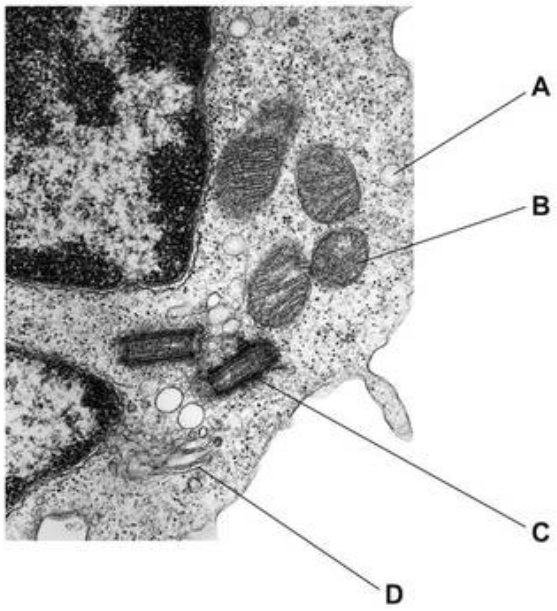
D Vesicles, formed from smooth endoplasmic reticulum, contain enzymes.

---

171. 9700_m16_qp_12 Q: 2

The electron micrograph shows part of a eukaryotic cell.

Which of the labelled organelles is a site of protein synthesis?



---

172. 9700_m16_qp_12 Q: 3

Inside a cell, a damaged mitochondrion can be surrounded and enclosed by a membrane to form a vesicle.

What happens after the fusion of a lysosome with the vesicle?

A ATP production by the mitochondrion increases.

B Enzymes from the lysosome repair the mitochondrion.

C Hydrolytic enzymes catalyse the breakdown of the mitochondrion.

D The mitochondrion is released from the cell by exocytosis.

---

173. 9700_m16_qp_12 Q: 4

Which units are the most appropriate to record the diameter of a lymphocyte and a red blood cell?

	lymphocyte	red blood cell
A	mm	mm
B	mm	μm
C	μm	mm
D	μm	μm

---

174. 9700_m16_qp_12 Q: 5

Which structures will be present in a cell that causes cholera?

1 circular DNA

2 naked DNA

3 70S ribosomes

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

---

175. 9700_s16_qp_11 Q: 1

Which of the cell organelles will be clearly visible under the high power (×400) of the light microscope?

	lysosomes	endoplasmic reticulum	mitochondria	chloroplasts
A	✓	✓	✗	✗
B	✓	✗	✓	✗
C	✗	✓	✓	✓
D	✗	✗	✗	✓

key

✓ = clearly visible

✗ = not clearly visible

---

176. 9700_s16_qp_11 Q: 3

What are correct locations of ribosomes in the typical eukaryotic cell?

1 free in the cytoplasm

2 attached to the outside of the endoplasmic reticulum

3 attached to the inside of the endoplasmic reticulum

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

---

177. 9700_s16_qp_11 Q: 4

Visking tubing is an artificial partially permeable membrane used to demonstrate diffusion. Glucose molecules can pass through the pores in the membrane which are approximately 2.4 nm in diameter.

Which of the following could pass through the pores?

1 bacteria

2 haemoglobin

3 ribosomes

4 glycogen

A 1 and 3 **B** 2 and 4 **C** 2 only **D** none of the above

---

178. 9700_s16_qp_11 Q: 5

What are found in both chloroplasts and typical prokaryotic cells?

A 70S ribosomes and circular DNA

B 70S ribosomes only

C 80S ribosomes and circular DNA

D circular DNA only

---

179. 9700_s16_qp_12 Q: 2

Which statements about **both** mitochondria and chloroplasts are correct?

1 They contain 80S ribosomes.

2 They contain circular DNA molecules.

3 They produce ATP.

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

---

180. 9700_s16_qp_12 Q: 3

Which range of sizes would include most eukaryotic cells?

A 1×10^2 nm to 1 μm

B 1 μm to 1×10^1 μm

C 1×10^1 μm to 1×10^2 μm

D 1×10^2 μm to 1×10^3 μm

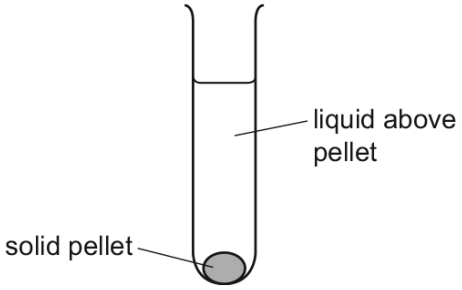
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181. 9700_s16_qp_12 Q: 4

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. He then broke the cells open with a blender to release the organelles.

The extracted mixture was filtered and then spun in a centrifuge at a speed that separates the heaviest organelle. This organelle sank to the bottom, forming a 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 organelle. This organelle sank to the bottom, forming a solid pellet, 2.

He repeated this procedure twice more to obtain pellet 3 and pellet 4, each containing a single organelle.

What is the function of the organelle extracted in pellet 4?

A digestion of old organelles

B production of ATP

C production of mRNA

D synthesis of protein

---

182. 9700_s16_qp_13 Q: 2

For which cell component would nanometres be the most appropriate unit of measurement?

A a cell surface membrane

B a chloroplast

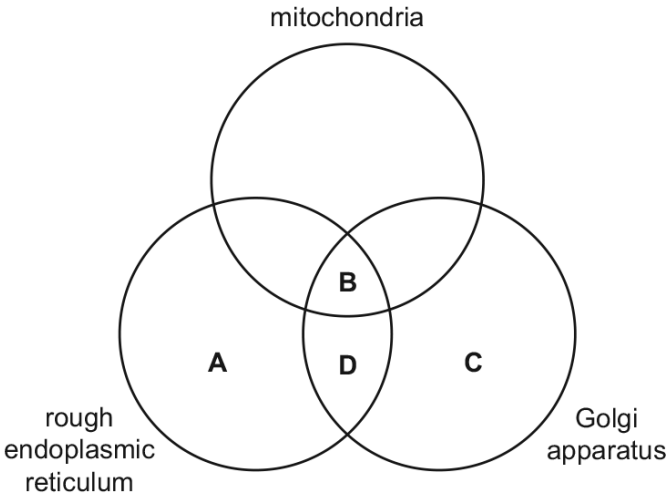
C a mitochondrion

D a nucleolus

---

183. 9700_s16_qp_13 Q: 3

Which organelles are required for the formation of lysosomes containing hydrolytic enzymes?



---

184. 9700_s16_qp_13 Q: 4

What are found in **both** chloroplasts and mitochondria?

A 70S ribosomes only

B 70S ribosomes and circular DNA

C 80S ribosomes and circular DNA

D circular DNA only

---

185. 9700_s16_qp_13 Q: 5

Which types of RNA are found in **both** prokaryotic and eukaryotic cells?

	mRNA	rRNA	tRNA
A	✓	✓	✓
B	✓	✓	✗
C	✗	✓	✓
D	✗	✓	✗

key

✓ = present

✗ = absent

---

186. 9700_w16_qp_11 Q: 2

A culture of human cells had its cell surface membranes removed, releasing the cell contents.

This material became contaminated by bacteria.

The material was then centrifuged, separating out the various cell structures according to size and mass.

Which cell structure would be separated out along with the bacteria?

A endoplasmic reticulum

B mitochondria

C nuclei

D ribosomes

---

187. 9700_w16_qp_11 Q: 3

Which parts of a cell contain ribosomes?

1 chloroplast

2 mitochondrion

3 nucleus

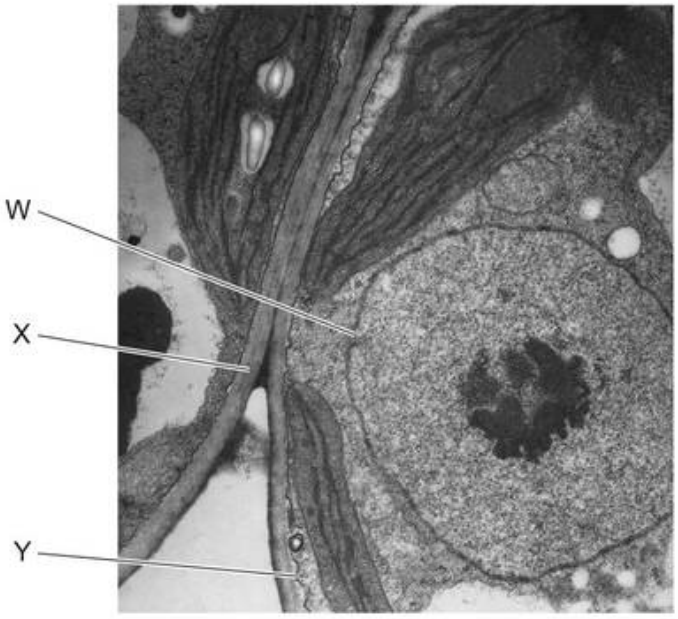
4 cytoplasm

A 1, 2, 3 and 4 **B** 1, 2 and 3 only **C** 1, 2 and 4 only **D** 3 and 4 only

---

188. 9700_w16_qp_11 Q: 4

The electron micrograph shows part of two eukaryotic cells.



Which features are also found in prokaryotes?

A W only **B** X only **C** X and Y only **D** W, X and Y

---

189. 9700_w16_qp_11 Q: 5

Which of the structures are found in 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

---

190. 9700_w16_qp_12 Q: 3

What is the correct order in which organelles function to make and secrete an enzyme?

A nucleolus → ribosome → Golgi body → vesicle

B nucleolus → smooth endoplasmic reticulum → lysosome → vesicle

C nucleus → rough endoplasmic reticulum → Golgi body → vesicle

D nucleus → smooth endoplasmic reticulum → lysosome → vesicle

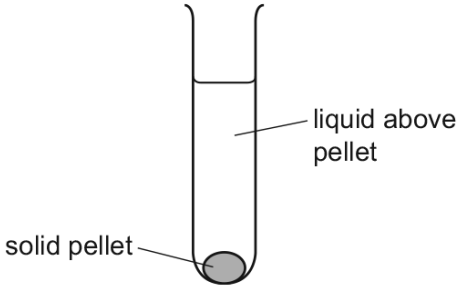
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191. 9700_w16_qp_12 Q: 5

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. He then broke the cells 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 organelle. This sank to the bottom, forming a 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 organelle. This organelle sank to the bottom, forming a solid pellet, 2.

He repeated this procedure twice more to obtain pellet 3 and pellet 4, each containing a single organelle.

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

A digestion of old organelles

B production of ATP

C production of mRNA

D synthesis of protein

---

192. 9700_w16_qp_12 Q: 6

Which is a correct comparison between a typical prokaryotic cell and a typical eukaryotic cell?

	prokaryote	eukaryote
A	circular DNA only	linear DNA only
B	naked DNA	DNA associated with protein
C	rough endoplasmic reticulum present	smooth endoplasmic reticulum and rough endoplasmic reticulum present
D	ribosomes approximately 22 nm diameter	ribosomes approximately 18 nm in diameter

---

193. 9700_w16_qp_13 Q: 1

Which structure is **only** found in typical eukaryotic animal cells?

A cell surface membrane

B centriole

C Golgi body

D ribosome

---

194. 9700_w16_qp_13 Q: 4

Which statement is correct?

A Prokaryotes and chloroplasts have circular DNA where genes carrying the code for cell walls are located.

B Prokaryotes and chloroplasts have 70S ribosomes that are the sites for translation and polypeptide synthesis.

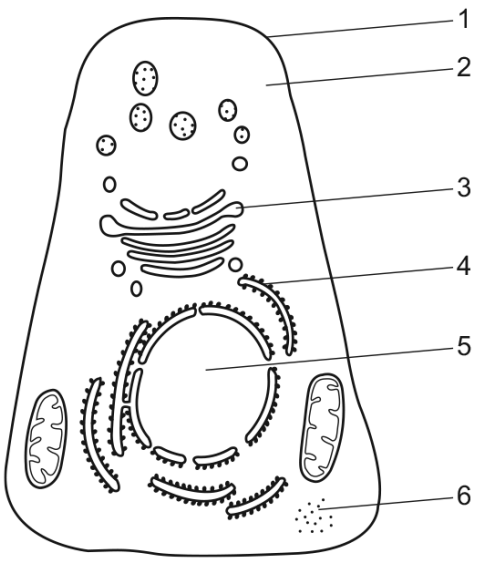
C Prokaryotes and mitochondria have an outer membrane and a separate inner, folded membrane where ATP synthesis occurs.

D Prokaryotes and mitochondria have double-stranded linear DNA where genes carrying coded information are located.

---

195. 9700_w16_qp_13 Q: 5

The diagram shows a typical animal cell.



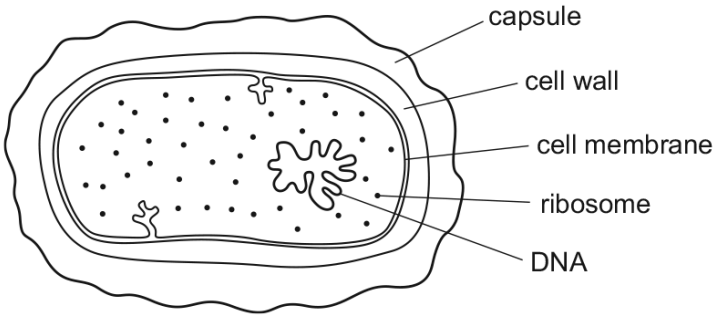
Which features are also found in **both** plant cells and prokaryotic cells?

	1	2	3	4	5	6
A	✓	✓	✓	✓	✓	✓
B	✓	✓	✗	✗	✗	✓
C	✓	✗	✗	✓	✗	✗
D	✗	✓	✓	✓	✓	✗

key
✓ = present
✗ = absent

196. 9700_s15_qp_11 Q: 2

The diagram shows a high-power drawing of a bacterium.



Which three components are found in **both** this bacterium and an animal cell?

A capsule, cell membrane and cell wall

B capsule, DNA and ribosome

C cell membrane, cell wall and DNA

D cell membrane, DNA and ribosome

---

197. 9700_s15_qp_11 Q: 4

Which structures are found in typical eukaryotic cells?

1 70S ribosomes

2 80S ribosomes

3 linear DNA (chromosomes)

4 circular DNA

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1 and 4 only

D 2 and 3 only

---

198. 9700_s15_qp_11 Q: 5

What is the function of the nucleolus?

A The formation and breakdown of the nuclear envelope.

B The formation of rough endoplasmic reticulum.

C The synthesis of ribosomal proteins.

D The synthesis of rRNA.

---

199. 9700_s15_qp_12 Q: 3

What is the function of plasmodesmata in plant cells?

A to act as a barrier to water soluble substances

B to allow active transport of ions and sucrose between cells

C to allow the symplastic movement of substances between cells

D to enable cells to recognise each other

---

200. 9700_s15_qp_12 Q: 4

Which size of ribosome is found in both chloroplasts and mitochondria?

A 60S **B** 70S **C** 80S **D** 90S

---

201. 9700_s15_qp_12 Q: 5

Which function is correct for the description of the cell structure?

	function	cell structure
A	organises microtubules to produce the spindle	membrane-bound sacs, arranged as a flattened sac
B	packages hydrolytic enzymes used in cell	non-membrane bound cylindrical structures
C	synthesises lipids	membranes which surround an enclosed inner cavity
D	synthesises polypeptides	membrane bound spherical structure

---

202. 9700_s15_qp_12 Q: 6

Ribosomes consist of two subunits, each containing rRNA. An analysis of **all** the 70S ribosomes from a single cell of the bacterium, *Escherichia coli*, showed that there were:

- 38 000 rRNA molecules
- 2 main types of rRNA molecule
- 19 000 copies of each type of rRNA molecule

How many 70S ribosomes were there in the *E. coli* cell?

A 9500 **B** 19 000 **C** 38 000 **D** 76 000

---

203. 9700_s15_qp_13 Q: 1

What are found in both mitochondria and typical prokaryotic cells?

A 70S ribosomes and circular DNA

B 70S ribosomes only

C 80S ribosomes and circular DNA

D circular DNA only

---

204. 9700_s15_qp_13 Q: 6

What is the diameter of a typical prokaryote, such as *Streptococcus*?

A 7.5×10^{1} nm

B 7.5×10^{2} nm

C 7.5×10^{0} μm

D 7.5×10^{1} μm

---

205. 9700_w15_qp_11 Q: 1

Which size of ribosome is found in chloroplasts and typical prokaryotic cells?

A 60S **B** 70S **C** 80S **D** 90S

---

206. 9700_w15_qp_11 Q: 6

Which order of organelles is correct when a protein is synthesised and secreted?

A Golgi body → lysosome → ribosome → nucleus

B nucleus → ribosome → Golgi body → vesicle

C ribosome → nucleus → lysosome → Golgi body

D vesicle → Golgi body → nucleus → ribosome

---

207. 9700_w15_qp_12 Q: 1

Which size of ribosome is found in mitochondria?

A 60S **B** 70S **C** 80S **D** 90S

---

208. 9700_w15_qp_12 Q: 3

Which features of microvilli and root hairs are correct?

	increase cell surface area	cannot be resolved with the light microscope	contain vacuoles	more than one present on a cell
A	microvilli	microvilli	root hairs	root hairs
B	microvilli	root hairs	microvilli	microvilli
C	root hairs	microvilli	root hairs	microvilli
D	root hairs	root hairs	microvilli	root hairs

---

209. 9700_w15_qp_12 Q: 4

Lysosomes have a variety of different shapes and sizes, making them difficult to identify.

What describes a lysosome?

A a vesicle containing enzymes, enclosed by a double membrane, that is budded off the endoplasmic reticulum

B a vesicle containing hydrolytic enzymes and surrounded by a single membrane, found only in phagocytes

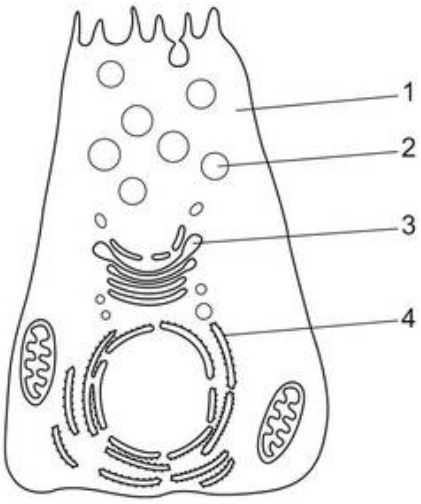
C a vesicle enclosed by a single membrane, containing several different hydrolytic enzymes that may act inside or outside the cell

D a vesicle surrounded by a double membrane, containing enzymes which can hydrolyse damaged organelles in a cell

---

210. 9700_w15_qp_12 Q: 5

Radioactively-labelled amino acids were introduced into a tracheal cell that uses them to make mucus (a glycoprotein).



What route will the amino acids take?

	first → last			
A	1	2	3	4
B	1	4	3	2
C	4	1	2	3
D	4	3	2	1

---

211. 9700_w15_qp_13 Q: 1

Which size of ribosome is found in chloroplasts?

A 60S **B** 70S **C** 80S **D** 90S

---

212. 9700_w15_qp_13 Q: 3

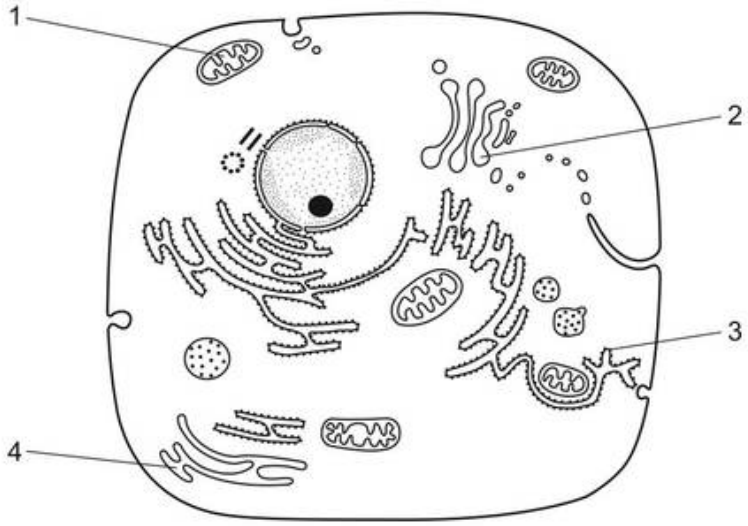
Which features of cilia and root hairs are correct?

	increase cell surface area	cannot be resolved with the light microscope	contain vacuoles	more than one present on a cell
A	cilia	cilia	root hairs	root hairs
B	cilia	root hairs	cilia	cilia
C	root hairs	cilia	root hairs	cilia
D	root hairs	root hairs	cilia	root hairs

---

213. 9700_w15_qp_13 Q: 4

The diagram shows a typical animal cell. Each labelled structure is involved with the synthesis of biological molecules.



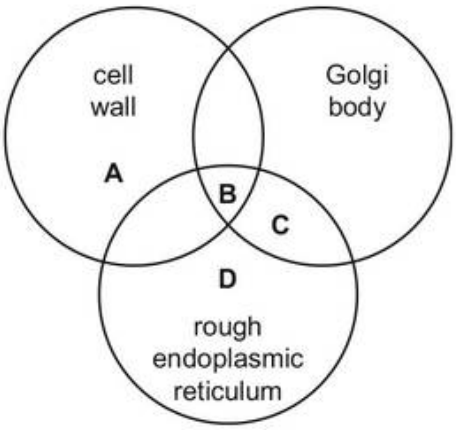
Within which structures are glycoproteins, proteins and steroids synthesised?

	glycoproteins	proteins	steroids
A	2	3	1
B	2	3	4
C	4	2	3
D	4	1	2

---

214. 9700_w15_qp_13 Q: 5

What is present in a *Vibrio cholerae* cell?



---

215. 9700_w15_qp_13 Q: 6

What is correct for a typical prokaryotic cell?

	cell wall	cell diameter	ribosomes
A	cellulose	1-5 μm	70S
B	cellulose	5-40 μm	70S and 80S
C	peptidoglycan	1-5 μm	70S
D	peptidoglycan	5-40 μm	70S and 80S

Chapter 1

Cell structure

1.1 Cells as the basic units of living organisms

1. 9700_s17_qp_21 Q: 1

(a) Each of the statements **A** to **D** describes a structure found in eukaryotic cells.

Identify the structure that is described in each statement.

A An organelle that contains 70S ribosomes.

.....

B A thread-like structure composed of DNA and histone proteins.

.....

C The organelle that modifies and packages proteins for secretion.

.....

D The structure that synthesises rRNA and combines it with proteins.

.....

[4]

(b) Prokaryotes and plant cells have cell walls.

Outline the composition of the cell wall of a prokaryote **and** the composition of the cell wall of a plant cell to show how they differ.

.....

.....

.....

.....

.....[2]

[Total: 6]

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2. 9700_s17_qp_22 Q: 1

(a) In multicellular organisms, the structure of different cell types is adapted to their function. Within these cells there are a number of different organelles, each with a particular function.

Table 1.1 contains information about the structure and function of five different types of cell. The table also includes, for each type of cell, one example of a cell organelle that is essential for the function to be carried out.

Complete Table 1.1.

Table 1.1

type of cell	function of cell	example of organelle required to carry out function
palisade mesophyll		chloroplast
Leydig	synthesis of steroid hormones	
	production of secretory vesicles for release of antibody	Golgi body
root hair cell	active uptake of mineral ions from the soil	
pancreas acinar	synthesis of enzymes	

[5]

(b) A tissue is a collection of one or more types of cell, specialised to carry out a particular function.

An organ can be considered a structural unit within an organism that:
- consists of more than one type of tissue
- performs a particular function.

The aorta is the main artery of the body.

Explain, with reference to its structure and function, whether the aorta may be described as a tissue or an organ.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 9]

3. 9700_w17_qp_23 Q: 1

Fig. 1.1 is a transmission electron micrograph of a part of an animal cell.

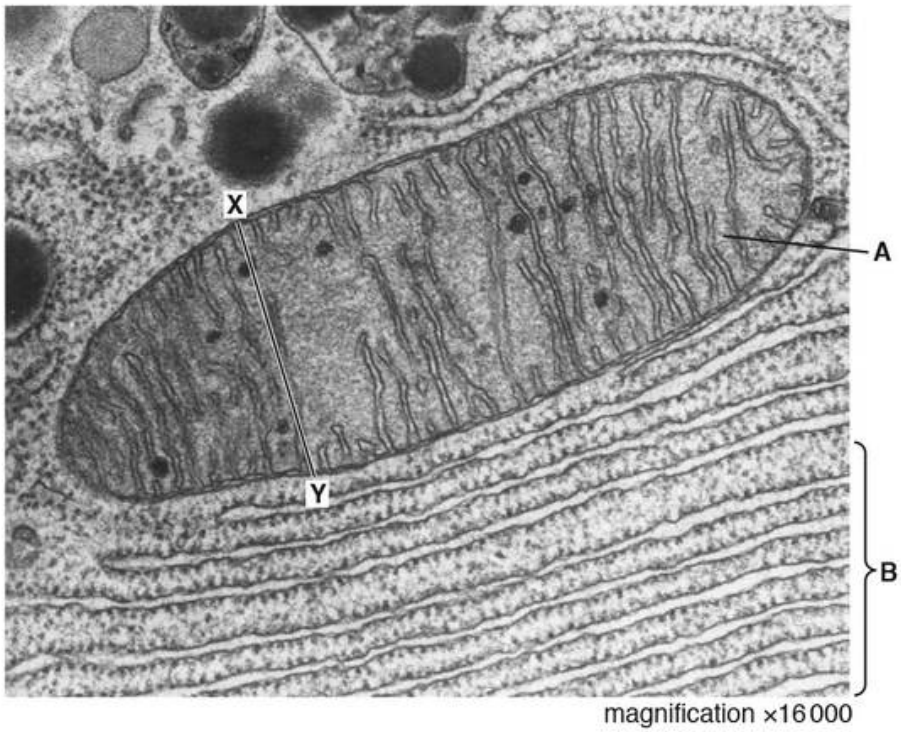


Fig. 1.1

(a) Calculate the actual width of the organelle labelled **A**, as shown by line **X–Y**.

State the formula that you will use and show your working.

Give your answer in μm and to one decimal place.

formula

..... μm [3]

(b) (i) Name the organelle **A** and state its role in cells.

name .....

role .....

.....

.....[2]

(ii) Name the cell structure labelled **B** and state **one** reason for your answer.

name .....

reason .....

.....

.....[2]

[Total: 7]

4. 9700_M16_qp_22 Q: 2

Fig. 2.1 shows a root tip cell in interphase.

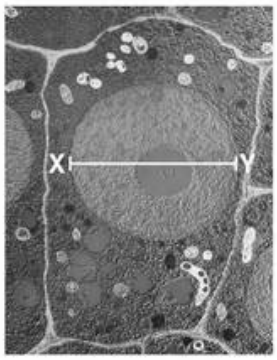


Fig. 2.1

(a) The actual diameter of the nucleus between **X** and **Y** is 9.0 µm.

Calculate the magnification of the plant cell shown in Fig. 2.1.

Write down the formula for magnification and use it to make your calculation. Show your working.

formula

magnification × ..... [3]

(b) Describe the structure of a nucleus.

.....

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 6]

5. 9700_w15_qp_21 Q: 1

Fig. 1.1 is an electron micrograph of a mitochondrion.

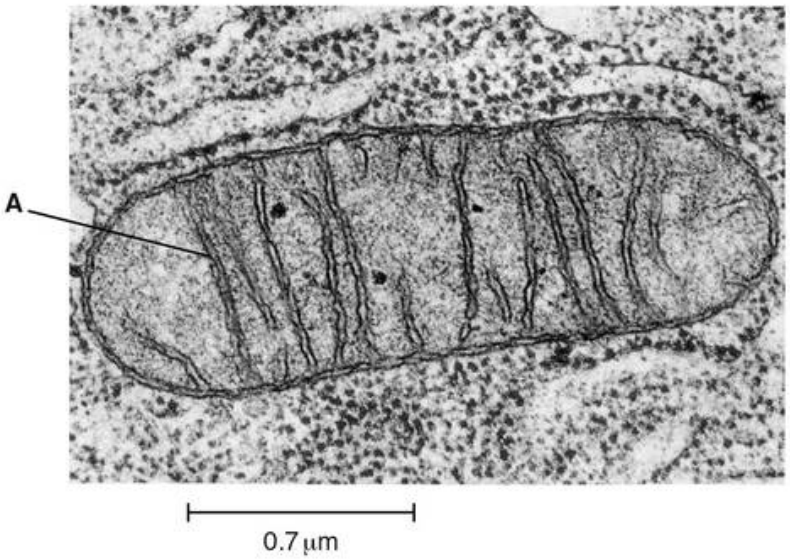


Fig. 1.1

(a) State the function of mitochondria.

..... [1]

(b) Name structure **A**.

..... [1]

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

Show your working.

magnification × ..... [2]

(d) Explain why the light microscope could **not** be used to produce the image in Fig. 1.1.

.....

.....

.....

.....

..... [2]

(e) Scientists think that mitochondria were once prokaryotes. The evidence for this is that mitochondria have features in common with prokaryotes.

State two features that mitochondria have in common with prokaryotes.

1. .....

2. .....
[2]

[Total: 8]

Appendix A

Chapter 1

CELLS

1. An actively growing cell is supplied with radioactive amino acids.

   Which cell component would first show an increase in radioactivity?

   A Golgi body

   B mitochondrion

   C nucleus

   D rough endoplasmic reticulum

2. Which pair of organelles has internal membranes?

   A chloroplasts and mitochondria

   B chloroplasts and nuclei

   C mitochondria and ribosomes

   D nuclei and ribosomes

3. Which combination is found in a prokaryotic cell?

	endoplasmic reticulum	DNA	RNA	nucleus
A	✓	✓	✗	✗
B	✓	✗	✗	✓
C	✗	✓	✓	✗
D	✗	✗	✓	✓

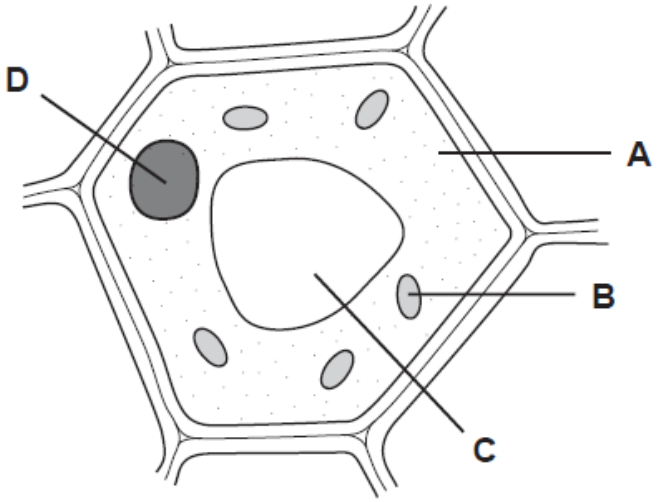
key
✓ pres
✗ abse

4. What is the order of size of cell components?

	largest → smallest			
A	mitochondria	ribosomes	starch grains	nuclei
B	nuclei	chloroplasts	mitochondria	ribosomes
C	ribosomes	mitochondria	chloroplasts	starch grains
D	starch grains	mitochondria	chloroplasts	ribosomes

5. The diagram shows the structure of a typical plant cell.

Which cell component is also present in prokaryotes?



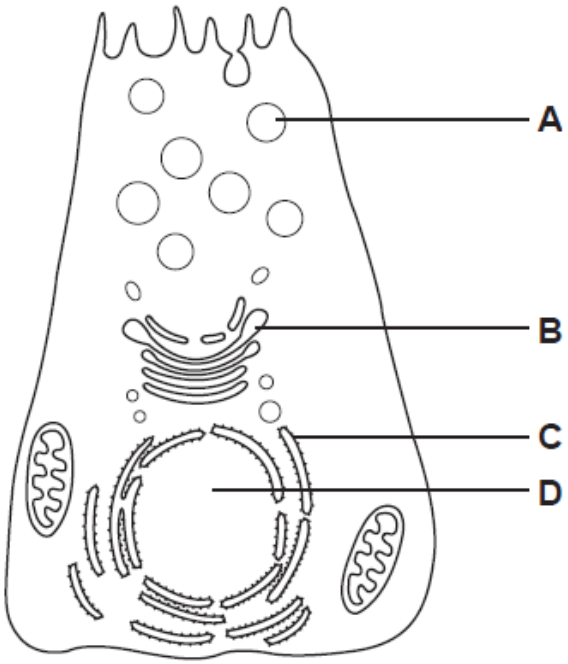
6. What is responsible for the high resolution of the electron microscope?

A high magnification

B short wavelength of the electron beam

C use of heavy metal stains

D very thin sections

7.	Radioactively-labelled amino acids are introduced into a cell. In which cell structure will the radioactivity first become concentrated? 
8.	What is the function of nucleoli? **A** the formation and breakdown of the nuclear envelope **B** the formation of centromeres **C** the formation of ribosomes **D** the organisation of the spindle during nuclear division
9.	What identifies a cell as a prokaryote? **A** The DNA is associated with protein. **B** The DNA is in a circular form. **C** The DNA is in the form of a double spiral. **D** The DNA is surrounded by a membrane system.

10. A lysosome measures 0.4 µm in diameter.

What is the diameter in nm?

A 4 nm **B** 40 nm **C** 400 nm **D** 4000 nm

11. What describes resolution in microscopy?

A the ability to distinguish between two objects that are very close together

B the clarity of the image formed by the microscope

C the number of times the image has been magnified by the objective lens

D the power of the microscope to focus on very small objects

12. What is a function of the smooth endoplasmic reticulum?

A aerobic respiration

B intracellular digestion

C synthesis of steroids

D transport of proteins

13. For which process is the large surface area of the cristae in the mitochondria important?

A energy radiation

B enzyme reaction

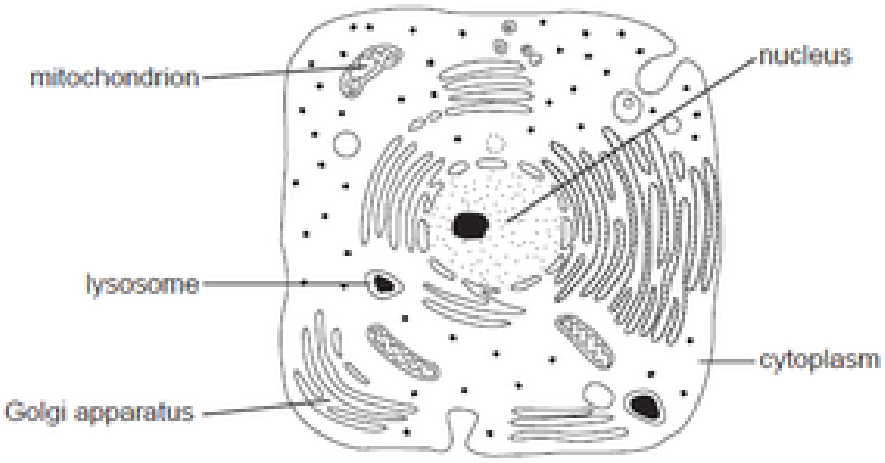
C gaseous exchange

D protein synthesis

14. What is the resolution, in nanometres, of an electron microscope and of a light microscope?

	electron microscope	light microscope
A	0.5	20
B	0.5	200
C	5.0	20
D	5.0	200

15. The diagram shows a drawing of an electron micrograph of a cell.



Which structures are surrounded by double membranes?

	Golgi apparatus	lysosome	mitochondrion	nucleus	cytoplasm
A	✓	✓	✓	✓	✓
B	✓	✗	✗	✗	✗
C	✗	✗	✓	✓	✗
D	✗	✓	✗	✗	✓

16. In which animal cells would Golgi apparatus be most abundant?

A ciliated epithelial cells

B goblet cells

C red blood cells

D smooth muscle cells

17. Which is a feature of all prokaryotic cells?

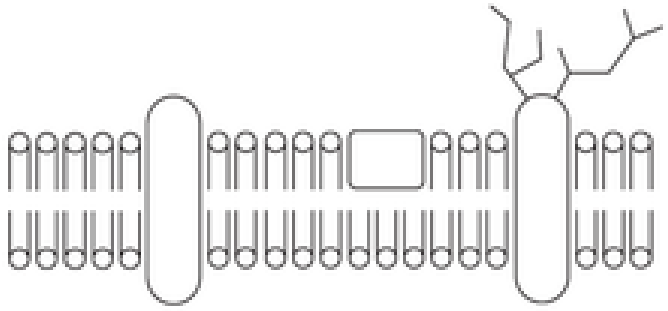
A absence of cell surface membrane

B division by mitosis

C presence of mitochondria

D presence of ribosomes

18. The diagram shows a cell surface membrane. The lipid bilayer has an approximate width of 8 nm.



How many times has the diagram been magnified?

A 2.5×10^2 **B** 2.5×10^4 **C** 2.5×10^6 **D** 2.5×10^8

19. The diameter of living cells varies considerably.

Typical diameters are:

a prokaryote, such as *Streptococcus*	-	750 nm
a eukaryotic cell, such as a white blood cell	-	15 μm

Given these measurements, the diameter of the white blood cell is how many times greater than the prokaryote?

A x 2 **B** x 20 **C** x 50 **D** x 200

20. Membranous sacs containing products of metabolism are formed by the endoplasmic reticulum in cells.

Where are these products used?

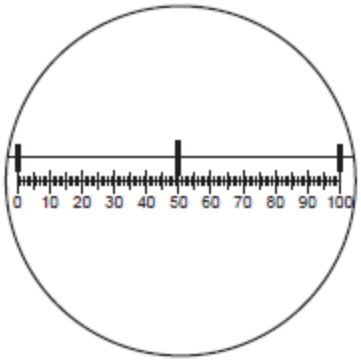
A inside and outside the cell

B inside lysosomes only

C inside the cell only

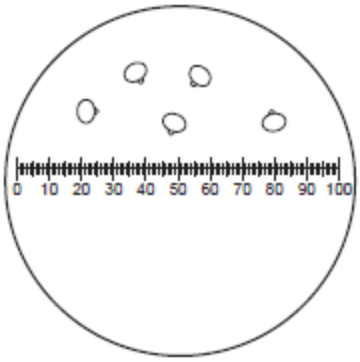
D outside the cell only

21. The diagram shows a graduated slide, with divisions of 0.1 mm viewed using an eyepiece graticule.



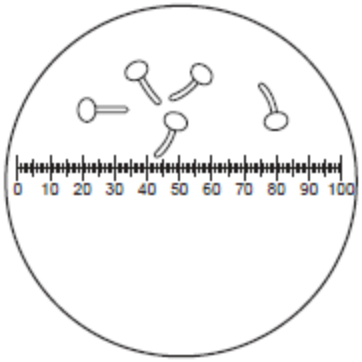
Pollen grains were grown in a sugar solution and viewed using the eyepiece graticule. Diagram 1 shows the pollen grains at first and diagram 2 shows them after four hours.

diagram 1



at start

diagram 2



after 4 hours

What is the growth rate of the pollen tubes?

A $5\,\mu mh^{-1}$ **B** $10\,\mu mh^{-1}$ **C** $5\,mmh^{-1}$ **D** $10\,mmh^{-1}$

22. In 1985, a giant bacterium, *Epulopiscium fishelsoni*, was discovered.

Which cell structure(s) would be present in *Epulopiscium* enabling biologists to classify this organism as prokaryotic?

A a cellulose cell wall outside the plasma membrane

B a pair of centrioles close to the nuclear area

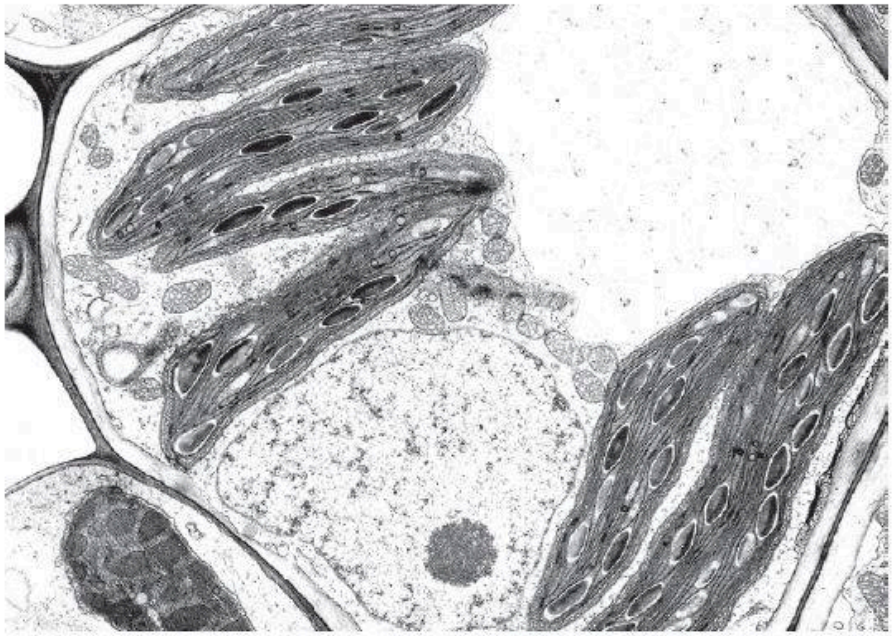
C circular DNA lying free in the cytoplasm

D smooth endoplasmic reticulum throughout the cytoplasm

23. What is the order of size of cell components?

	largest → smallest			
A	centrioles	mitochondria	lysosomes	nucleoli
B	mitochondria	nucleoli	lysosomes	centrioles
C	nucleoli	mitochondria	centrioles	lysosomes
D	nucleoli	centrioles	mitochondria	lysosomes

24. The magnification of this electron micrograph is 5×10^3.



What is the actual size of the nucleolus?

A 0.2 µm **B** 0.5 µm **C** 2 µm **D** 20 µm

25. Which structure is present in cells of eukaryotes but not present in cells of prokaryotes?

A 70s ribosome

B chromatin

C mesosome

D plasmid

26. What are the appropriate units for measuring diameters of alveoli, diameters of white blood cells and the width of cell walls?

	diameters of alveoli	diameters of white blood cells	width of cell walls
A	mm	µm	µm
B	µm	mm	µm
C	µm	µm	nm
D	mm	mm	nm

27. Cells which do not have nucleoli die because they do not have

A centrioles and cannot divide.

B mitochondria and cannot release energy.

C mRNA and cannot transcribe DNA.

D ribosomes and cannot synthesise protein.

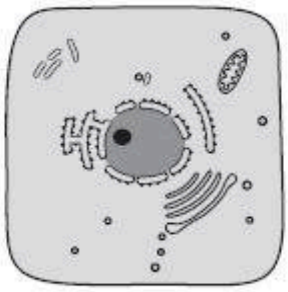
28. What describes the features of an electron microscope?

	maximum magnification	resolution / nm	specimen
A	2.5×10^3	2.5×10^2	dead
B	2.5×10^4	5.0×10^{-1}	living
C	2.5×10^5	5.0×10^{-1}	dead
D	5.0×10^5	2.5×10^2	living

29. Which structures are measured using these units?

	10^{-3} m	10^{-6} m	10^{-9} m
A	chloroplast	ribosome	nucleus
B	nucleus	chloroplast	xylem vessel
C	ribosome	xylem vessel	chloroplast
D	xylem vessel	nucleus	ribosome

30. The diagram below is drawn from an electron micrograph of an animal cell.



Which represents the same cell, seen under a light (optical) microscope at ×400 magnification?

A



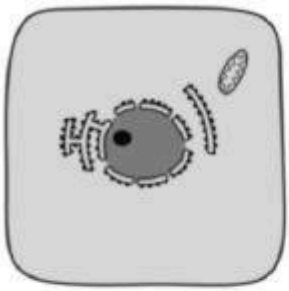
B



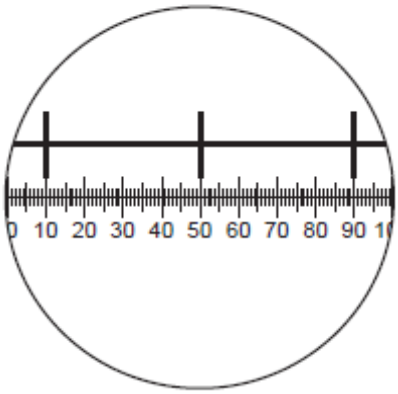
C



D



31. The diagram shows a stage micrometer, with divisions 0.1mm apart, viewed through an eyepiece containing a graticule.



What is the area of the field of view of the microscope at this magnification? ($\pi = 3.14$)

A $\pi \times 12.5 \times 12.5 = 4.9 \times 10^2\,\mu m^2$

B $\pi \times 55 \times 55 = 9.5 \times 10^3\,\mu m^2$

C $\pi \times 125 \times 125 = 4.9 \times 10^4\,\mu m^2$

D $\pi \times 250 \times 250 = 2.0 \times 10^5\,\mu m^2$

32. Which structures are found in both animal and plant cells?

1 centriole

2 lysosome

3 nucleolus

4 vacuole

A 1 and 3 only

B 2 and 4 only

C 2, 3 and 4 only

D 1, 2, 3 and 4

33. Which observations suggest that a cell is eukaryotic?

	cytoplasm includes endoplasmic reticulum	protein molecules are associated with the DNA	ribosomes distributed through the cytoplasm
A	✓	✗	✓
B	✗	✓	✗
C	✗	✗	✗
D	✓	✓	✓

key

✓ = found in eukaryotes

✗ = not found in eukaryotes

34. When making measurements in experiments, which methods have parallax errors?

1 using a calibrated eyepiece graticule to measure length

2 using a measuring cylinder to measure volume

3 using a ruler to measure length of a shoot

A 1 and 2 only

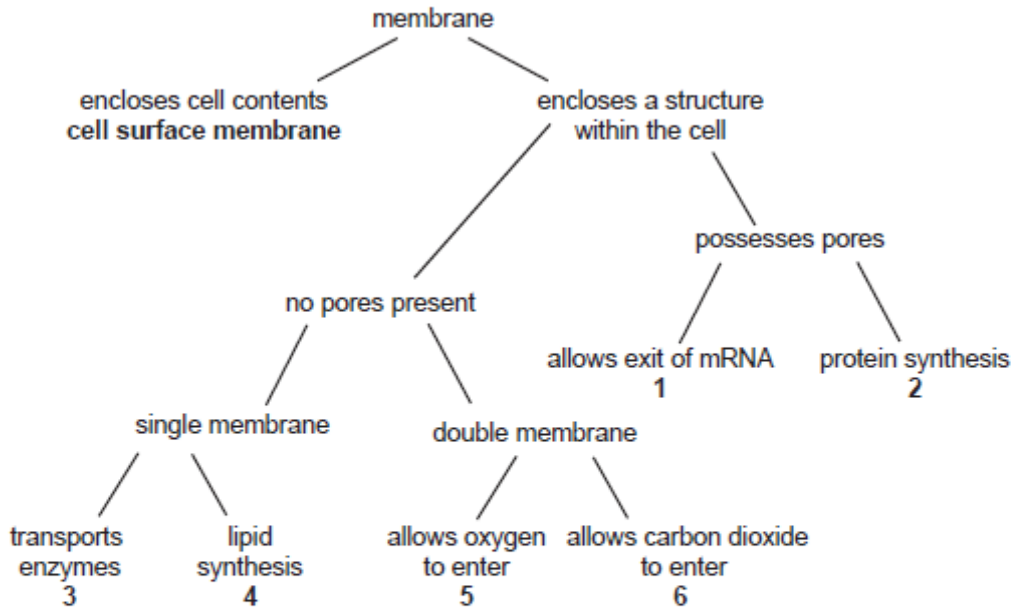
B 2 and 3 only

C 3 and 1 only

D 1, 2 and 3

35. Membranes within and at the surface of cells have different roles.

The diagram allows the identification of the various organelles within the cell, by describing the membrane structure and function.



Which of the outcomes shown below correctly identifies the organelles that possess the membrane and function concerned?

	1	2	3	4	5	6
A	chloroplast	vesicle	smooth ER	rough ER	nucleolus	mitochondrion
B	nucleolus	rough ER	vesicle	smooth ER	nucleus	mitochondrion
C	nucleus	rough ER	vesicle	smooth ER	mitochondrion	chloroplast
D	nucleus	smooth ER	mitochondrion	rough ER	vesicle	chloroplast

36. The enzyme lysozyme secreted from tear glands forms deposits on contact lenses.

Which ingredient would be effective in a contact lens cleaner for removing these deposits?

A ethanol

B lysosomes

C pH buffers

D proteases

37. A cell organelle measures 4×10^{-1} mm in diameter.

What is the diameter in μm?

A 4×10^{1} μm **B** 4×10^{2} μm **C** 4×10^{3} μm **D** 4×10^{4} μm

38. In the following table, which is the correct comparison between light and electron microscopes?

	light microscope		electron microscope	
	resolution	magnification	resolution	magnification
A	high	high	low	low
B	high	low	low	high
C	low	high	high	low
D	low	low	high	high

39. Which structures are present in a typical plant cell?

	centrioles	cilia	mitochondria	vacuole
A	✓	✓	✗	✗
B	✓	✗	✗	✓
C	✗	✓	✓	✗
D	✗	✗	✓	✓

key
✓ = present
✗ = absent

40. Plant cells are stained and then viewed through a light microscope.

Which structures would be clearly visible at a magnification of ×400?

A chloroplast grana

B lysosomes

C nucleoli

D ribosomes

41. Using a stage micrometer scale, one unit of an eyepiece graticule was calculated as 0.005 mm. The diameter of a spongy mesophyll cell was counted as 3.5 units on the eyepiece graticule.

What is the estimate of the diameter of the cell?

A 0.18 μm **B** 1.8 μm **C** 18.0 μm **D** 180 μm

42. Membranous sacs containing products of metabolism are formed by the endoplasmic reticulum in cells.

Where are these products used?

A inside and outside the cell

B inside lysosomes only

C inside the cell only

D outside the cell only

43. Which of the structures are found in photosynthetic prokaryotes?

1 cell surface membrane

2 cellulose wall

3 mesosomes

4 ribosomes

5 chloroplasts

A 1, 2, 3 and 4 only

B 1, 2, 4 and 5 only

C 1, 3 and 4 only

D 2, 3 and 5 only

44. A human aorta has a lumen width of 2 cm.

A human red blood cell has a diameter of 7 μm.

How many red blood cells could be laid end to end across the diameter of the aorta lumen?

A 2.9×10^{-3} **B** 2.9×10^{-2} **C** 2.9×10^{2} **D** 2.9×10^{3}

45. Which feature is a characteristic of prokaryotic organisms?

A a cell wall

B circular DNA

C mitochondria

D rough endoplasmic reticulum

46. What is meant by *resolution* in light microscopy?

A the product of the magnifications of the eyepiece and the objective lenses

B the shortest distance between two objects that can be seen as separate

C the size of the smallest object that can be seen

D twice the wavelength of the light used to illuminate the specimen

47. From which cell organelle are nucleic acids absent?

A chloroplast

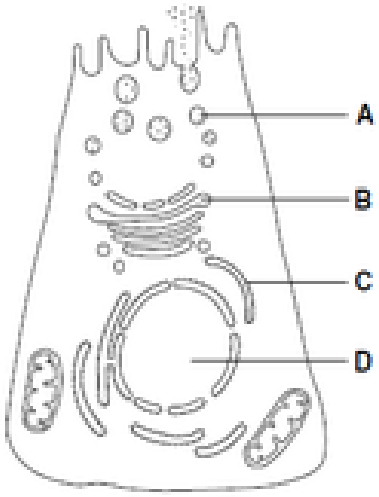
B Golgi body

C mitochondrion

D ribosome

48. The diagram is taken from an electron micrograph of a cell which secretes digestive enzymes.

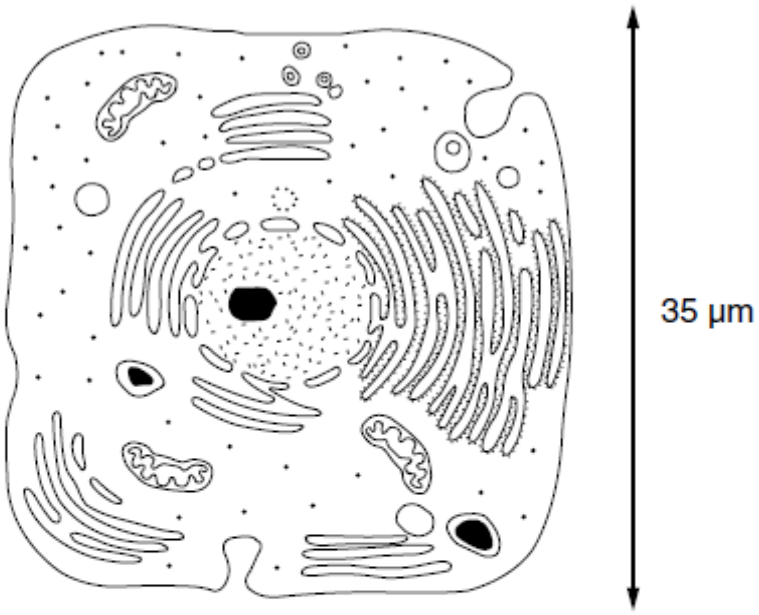
Where are these enzymes made?



49. What is the resolution, in nanometres, of an electron microscope and of a light microscope?

	electron microscope	light microscope
A	0.5	20
B	0.5	200
C	5.0	20
D	5.0	200

50. The diagram shows a drawing of an electronmicrograph.



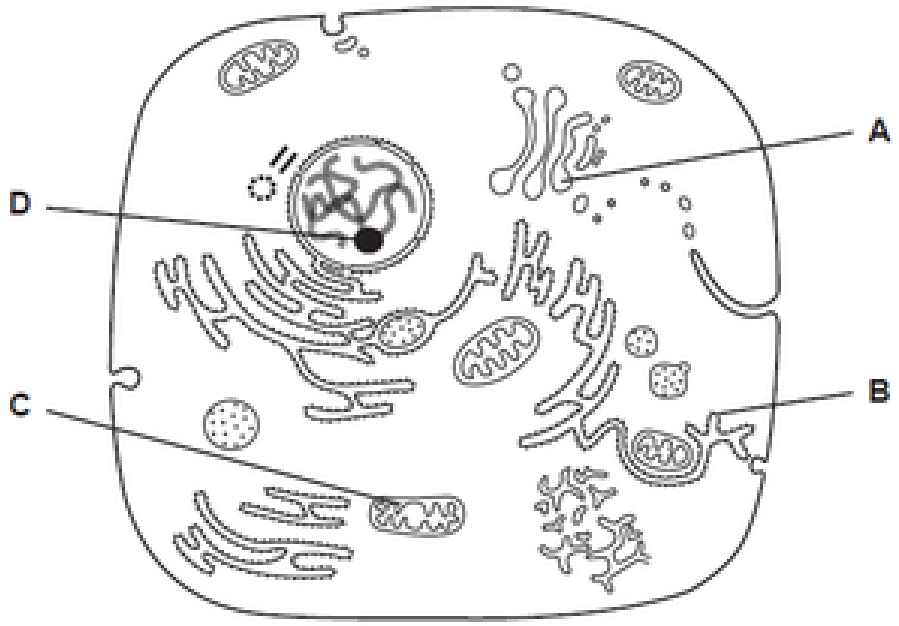
What is the approximate length of one mitochondrion in this cell?

A 5 to 6 µm

B 7 to 8 µm

C 8 to 10 µm

D 10 to 15 µm

51.	The diagram shows the ultrastructure of a eukaryotic cell. Which organelle does **not** contain nucleic acid? 
52.	Which cell structure can be seen only with an electron microscope? **A** cell surface membrane **B** cell wall **C** chromosome **D** nucleolus
53.	When **not** involved in protein synthesis, ribosomes exist as separate subunits. What do these subunits consist of? **A** mRNA and lipid **B** mRNA and tRNA **C** rRNA and lipid **D** rRNA and protein

54. Which components are present in prokaryotic cells?

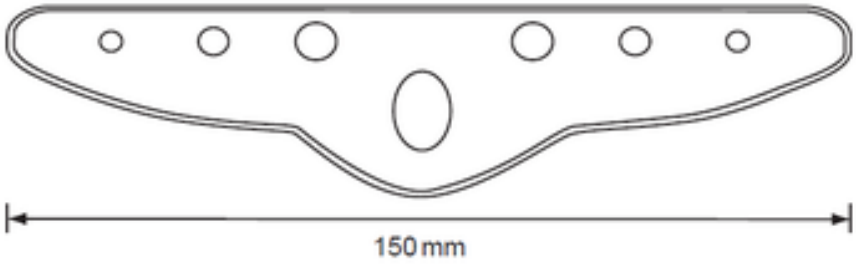
A chloroplasts, DNA, nuclear envelope

B chromosomes, mitochondria, nuclear envelope

C cytoplasm, DNA, mitochondria

D cytoplasm, DNA, ribosomes

55. The diagram is a plan of a transverse section through a leaf, drawn using a x5 eyepiece and a x8 objective lens of a microscope.



The actual distance across the leaf section is 7.5 mm. What is the magnification of the diagram?

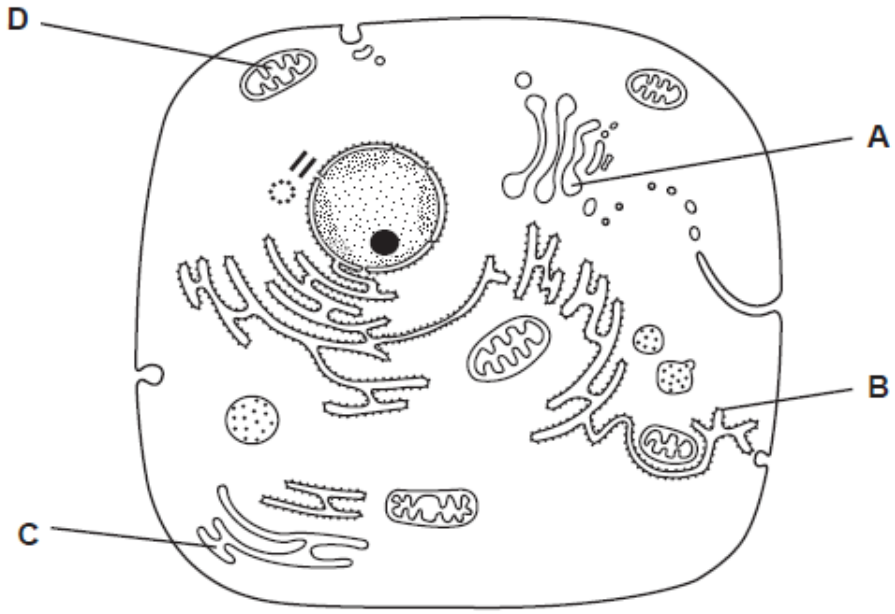
A x5 **B** x8 **C** x20 **D** x40

56. What describes the features of an electron microscope and its use?

	maximum magnification	resolution / nm	specimen used
A	x 2 500	250	dead
B	x 25 000	0.5	living
C	x 250 000	0.5	dead
D	x 500 000	250	living

57. The diagram shows the ultrastructure of a typical animal cell.

Which structure synthesises and transports lipids and steroids?



58. Which structures are found in plant cells but not in animal cells?

A centrioles

B mitochondria

C nucleoli

D plasmodesmata

59. What is the correct order of size of organelles?

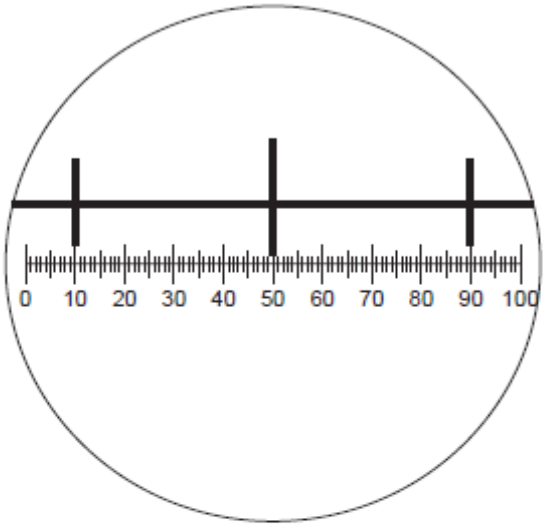
	largest →			smallest
A	mitochondrion	nucleus	lysosome	ribosome
B	mitochondrion	nucleus	ribosome	lysosome
C	nucleus	mitochondrion	lysosome	ribosome
D	nucleus	mitochondrion	ribosome	lysosome

60. An amino acid enters a cell and is used to synthesise an enzyme secreted by the cell.

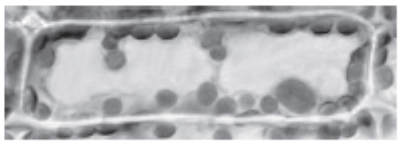
What is the sequence of cell components involved in this pathway?

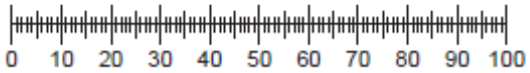
	first →			last
A	endoplasmic reticulum	Golgi apparatus	ribosome	exocytotic vesicle
B	endoplasmic reticulum	ribosome	Golgi apparatus	cell surface membrane
C	ribosome	Golgi apparatus	endoplasmic reticulum	cell surface membrane
D	ribosome	endoplasmic reticulum	Golgi apparatus	exocytotic vesicle

61. The diagram shows a stage micrometer on which the small divisions are 0.1 mm. It is viewed through an eyepiece containing a graticule.



The stage micrometer is replaced by a slide of a plant cell.

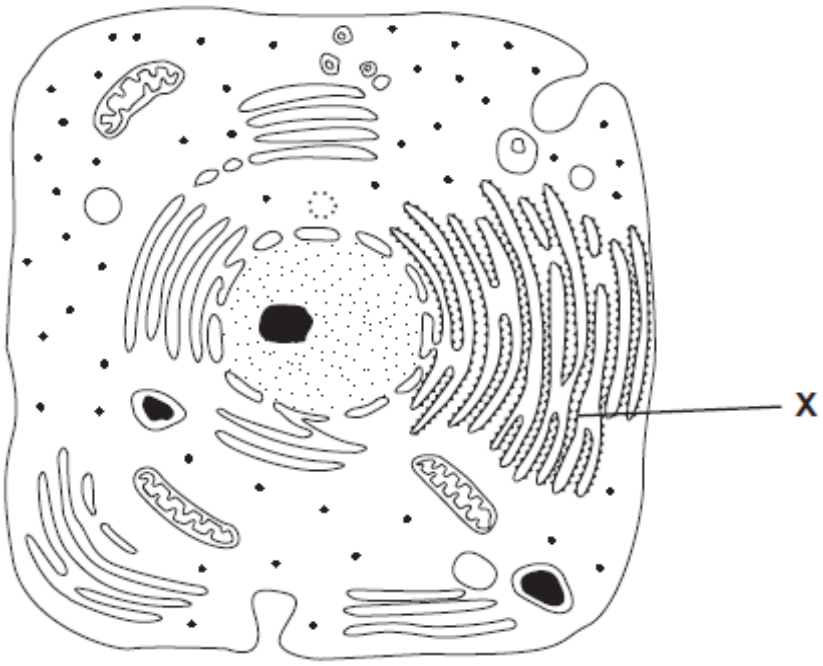




What is the width of a chloroplast?

A 5 μm **B** 10 μm **C** 50 μm **D** 100 μm

62. The diagram shows an electron micrograph of a typical animal cell.



What is the function of the membrane system labelled **X**?

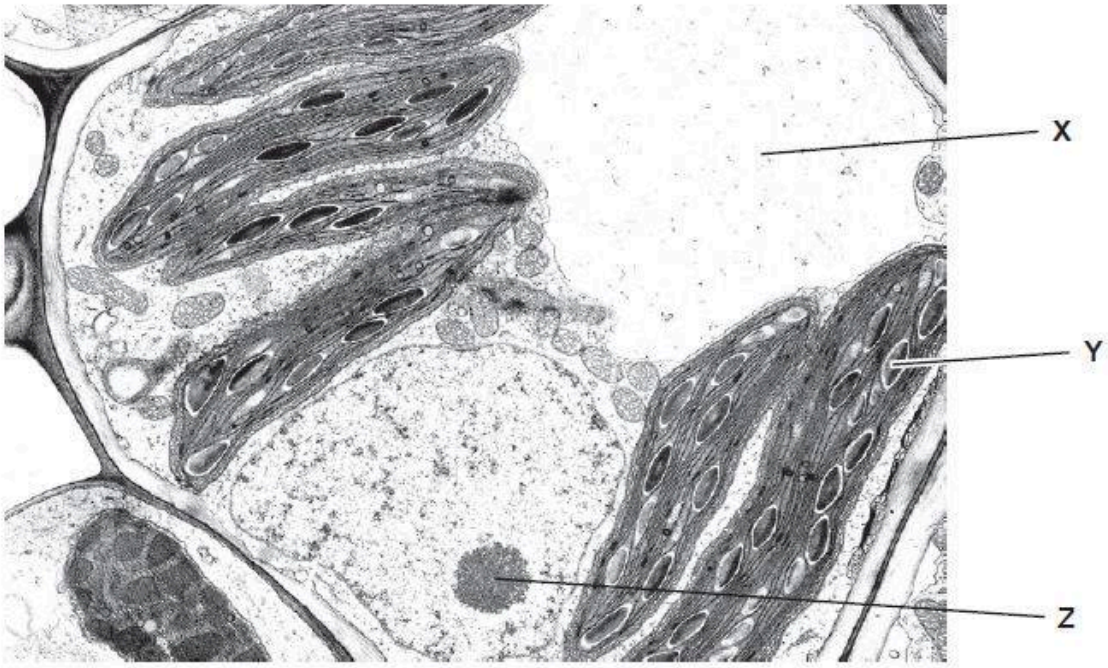
A carbohydrate metabolism

B lipid synthesis

C protein synthesis

D protein synthesis and transport

63. The diagram shows an electron micrograph of a plant cell.



What do structures **X**, **Y** and **Z** contain?

	X	Y	Z
A	air	chlorophyll	protein
B	mineral ions	starch	DNA and RNA
C	water	mineral ions	starch
D	starch	DNA and RNA	mineral ions

64. Which organelles are found in the cells of both eukaryotes and prokaryotes?

A chloroplasts

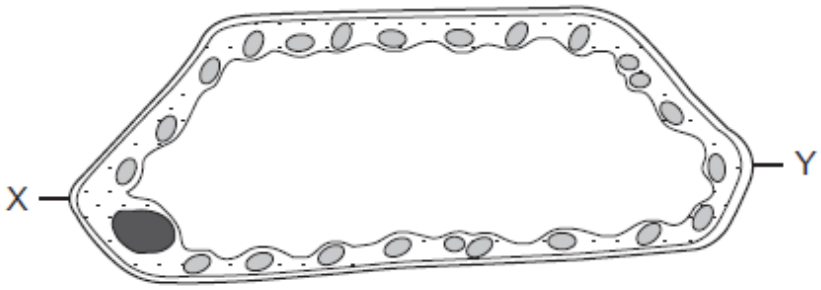
B Golgi apparatus

C mitochondria

D ribosomes

65. The diagram shows a high-power drawing of a plant cell.

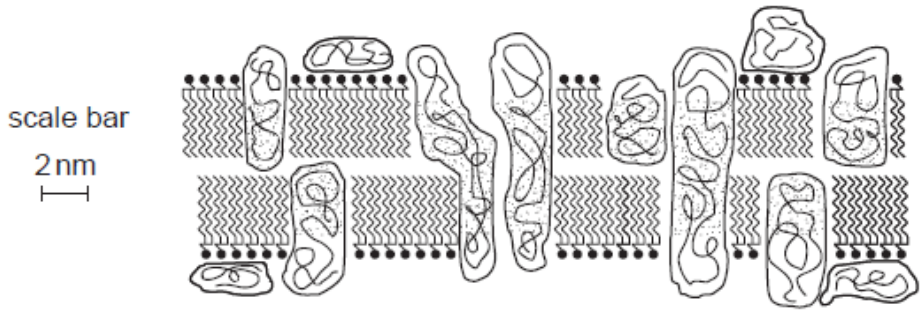
The actual length of the cell between X and Y was 160 μm.



What is the magnification of the cell?

A × 50 **B** × 100 **C** × 500 **D** × 1000

66. The diagram shows part of a membrane around a vacuole of a plant cell.



What is the width of the membrane?

A 7.5×10^{-3} m

B 7.5×10^{-6} m

C 7.5×10^{-9} m

D 7.5×10^{-12} m

67. A specimen is viewed under a microscope using green light with a wavelength of 510 nm.

If the same specimen is viewed under the same conditions, but using red light with a wavelength of 650 nm instead, what effect will this have on the magnification and on the resolution of the microscope?

	magnification	resolution
A	decreased	decreased
B	increased	increased
C	remains the same	increased
D	remains the same	decreased

68. A student is asked to study two photographs, taken at the same magnification, of a palisade mesophyll cell, one using a high quality light microscope and the other using an electron microscope.

The student observed

1 the cisternae of the Golgi apparatus

2 the grana in the chloroplasts

3 the two membranes of the nuclear envelope

4 the vacuole enclosed by a tonoplast

Which features can be seen because of the higher resolution of the electron microscope?

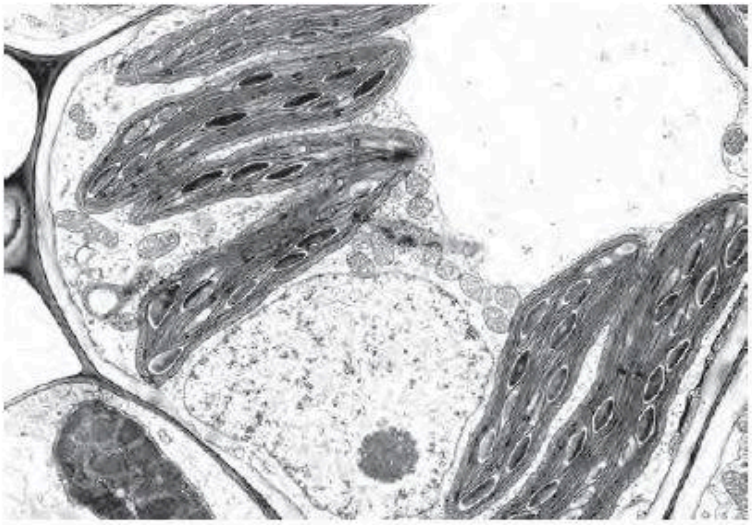
A 1, 2 and 3

B 1, 2 and 4

C 1, 3 and 4

D 2, 3 and 4

69. The diagram shows a photomicrograph. Its magnification is ×2800.



What is the diameter of the nucleolus?

A 2.5 μm **B** 5 μm **C** 10 μm **D** 20 μm

70. Which eyepiece and objective lens combination enables you to see the greatest number of cells in the field of view?

	eyepiece	objective
A	×5	×10
B	×10	×10
C	×5	×40
D	×10	×40

71. From which cell organelle are nucleic acids absent?

A chloroplast

B Golgi apparatus

C mitochondrion

D ribosome

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

Which feature have the prokaryotes lost during their evolution into mitochondria?

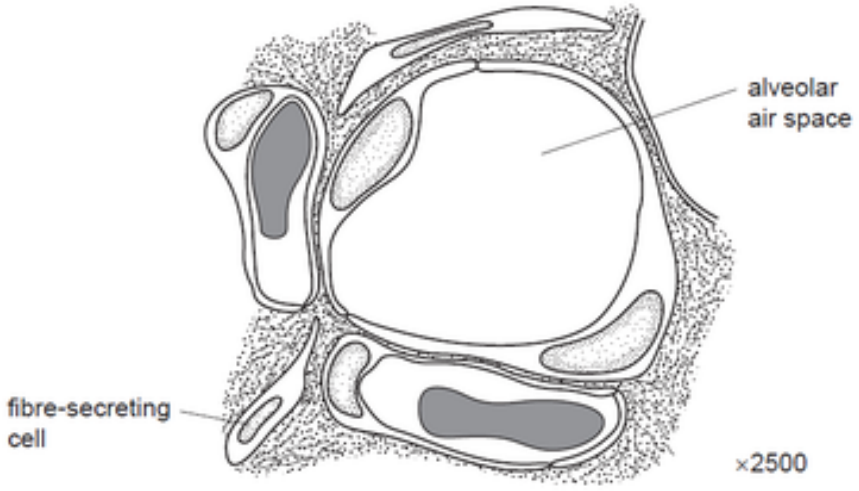
A cell wall

B circular chromosome

C endoplasmic reticulum

D ribosomes

73. The diagram is a drawing made from an electron micrograph showing a cross-section of an alveolus and two adjacent capillaries.



What is the shortest distance travelled by an oxygen molecule diffusing from the alveolar air space into one of the red blood cells?

A 1.0 µm **B** 3.0 µm **C** 10.0 µm **D** 30.0 µm

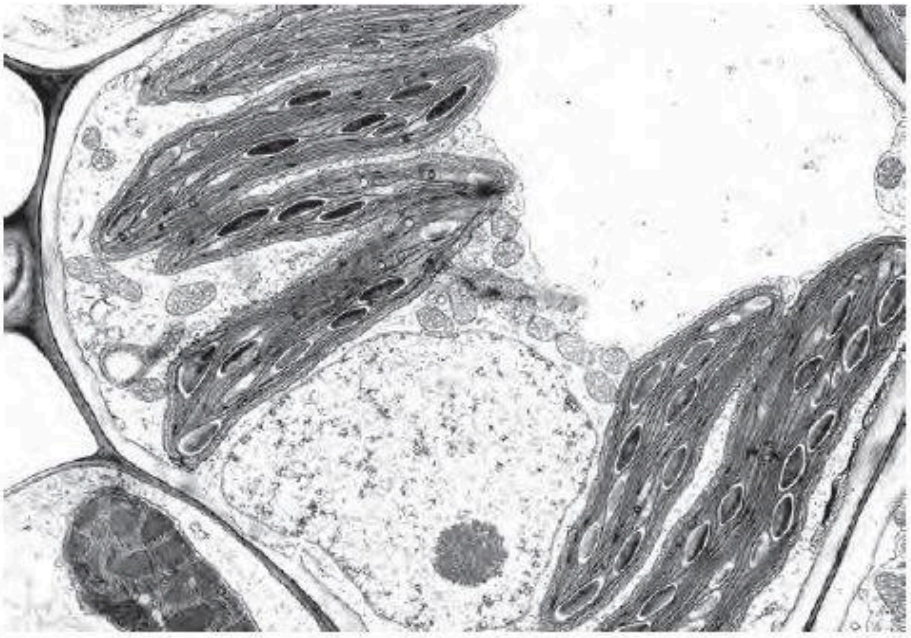
74. Which combination is found in a prokaryotic cell?

	endoplasmic reticulum	DNA	RNA	nucleus
A	✓	✓	✗	✗
B	✓	✗	✗	✓
C	✗	✓	✓	✗
D	✗	✗	✓	✓

key
✓ = present
✗ = absent

75.	Which cell structure can be seen only with an electron microscope? **A** cell surface membrane **B** chromosome **C** nucleolus **D** vacuole
76.	A lymphocyte has a diameter of 1×10^{-2} millimetres (mm). What is the diameter in nanometres (nm)? **A** 1×10^{1} **B** 1×10^{2} **C** 1×10^{3} **D** 1×10^{4}
77.	What is a function of the smooth endoplasmic reticulum? **A** protein synthesis **B** protein transport **C** steroid synthesis **D** steroid transport

78. The photomicrograph of a cell has a 2 cm scale line labelled 5 μm.



What is the magnification of the photomicrograph?

A 1×10^3 **B** 2×10^3 **C** 4×10^3 **D** 5×10^3

79. Which is a feature of all prokaryotic cells?

A absence of cell surface membrane

B division by mitosis

C presence of cellulose cell wall

D presence of ribosomes

80. Which of the cell organelles, when appropriately stained, will be clearly visible under the high power (×400) of the light microscope?

	lysosomes	endoplasmic reticulum	mitochondria	chloroplasts
A	✓	✓	✗	✗
B	✓	✗	✓	✗
C	✗	✓	✓	✓
D	✗	✗	✗	✓

key
✓ = visible
✗ = not visible

81. Which is correct about the organelles listed in the table?

		carries out transcription	contains enzymes	contains ribosomes
1	lysosomes	no	yes	no
2	mitochondria	yes	no	yes
3	rough endoplasmic reticulum	yes	yes	yes
4	vacuoles	no	yes	no

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

82. The graticule and stage micrometer are used to measure cells.

Which is the correct reason why the graticule calibrated?

A The graticule can be used to make measurements.

B The graticule is magnified by the objective lens.

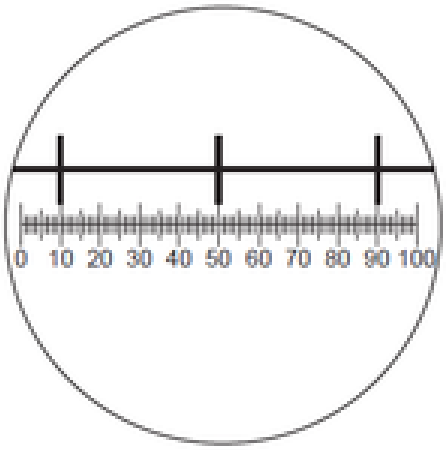
C The graticule magnifies the specimen.

D The graticule makes comparisons.

83. What are the characteristics of a prokaryotic cell?

	DNA structure	endoplasmic reticulum	plasmids	ribosomal size
A	circular	absent	present	small
B	circular	present	absent	large
C	linear	absent	present	small
D	linear	present	absent	large

84. The diagram shows a stage micrometer, with divisions 0.1 mm apart, viewed through an eyepiece containing a graticule.



The same eyepiece is now used to examine a blood smear.

How many graticule divisions will cover the diameter of a white cell of 10 μm?

A 1 **B** 4 **C** 10 **D** 20

85. Which steps are needed to find the actual width of a xylem vessel viewed in transverse section using a ×40 objective lens?

1 Convert from mm to μm by multiplying by 10^{-3}.

2 Calibrate the eyepiece graticule using a stage micrometer on ×10 objective lens.

3 Measure the width of the xylem vessel using an eyepiece graticule.

4 Multiply the number of eyepiece graticule units by the calibration of the eyepiece graticule.

A 1, 2, 3 and 4

B 2, 3 and 4 only

C 1 and 2 only

D 3 and 4 only

86. The diameter of living cells varies considerably.

The typical diameters are

a eukaryote, such as a white blood cell 1.5×10^{1} μm

a prokaryote, such as *Streptococcus* 7.5×10^{2} nm

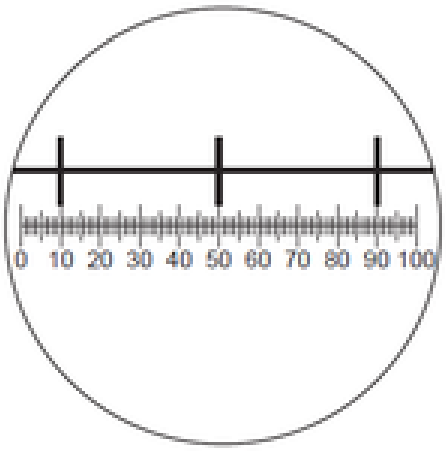
Use these measurements to find the maximum number of each cell type which could fit along a line 1 cm long.

	number of white blood cells	number of *Streptococcus cells*
A	6.7×10^{3}	1.3×10^{5}
B	6.7×10^{2}	1.3×10^{4}
C	6.7×10^{1}	1.3×10^{3}
D	6.7×10^{0}	1.3×10^{2}

87. Cells consist of a number of different components.

Which row shows the components present (✓) in both a prokaryotic and eukaryotic cell?

	lysosomes	Golgi apparatus	ribosomes	cell surface membrane
A		✓		✓
B	✓	✓		
C			✓	✓
D	✓		✓	

88.	The graticule and stage micrometer are used to measure cells. Which is the correct reason why the graticule calibrated? **A** The graticule can be used to make measurements. **B** The graticule is magnified by the objective lens. **C** The graticule magnifies the specimen. **D** The graticule makes comparisons.
89.	The diagram shows a stage micrometer, with divisions 0.1 mm apart, viewed through an eyepiece containing a graticule.  The same eyepiece is now used to examine a blood smear. How many graticule divisions will cover the diameter of a white cell of 10 μm? **A** 1 **B** 4 **C** 10 **D** 20

90. What are the characteristics of a prokaryotic cell?

	DNA structure	endoplasmic reticulum	plasmids	ribosomal size
A	circular	absent	present	small
B	circular	present	absent	large
C	linear	absent	present	small
D	linear	present	absent	large

91. What is the diameter of a typical prokaryote, such as *Streptococcus*?

A 7.5×10^{1} nm

B 7.5×10^{2} nm

C 7.5×10^{0} μm

D 7.5×10^{1} μm

92. Which cell components contain ribosomes?

1 chloroplast

2 mitochondrion

3 nucleus

4 cytoplasm

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1 and 2 only

D 3 and 4 only

93. Where would cristae be found in a cell?

1 endoplasmic reticulum

2 Golgi apparatus

3 mitochondrion

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

94. Which cell components are present in **all** prokaryotic cells?

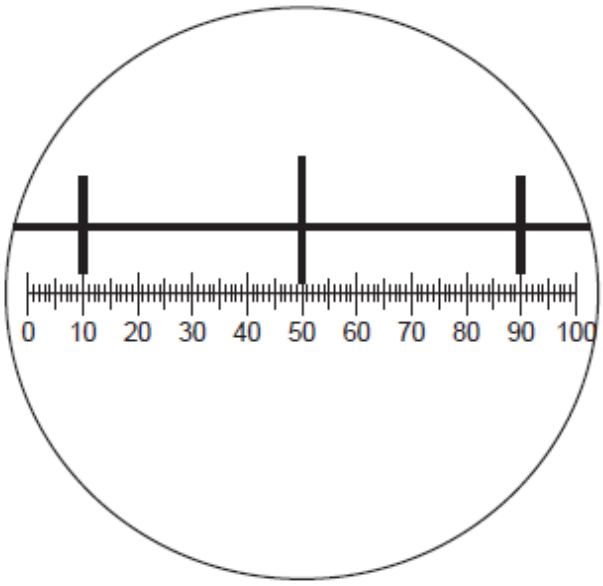
	cell surface membrane	cell wall	endoplasmic reticulum	flagellum
A	✓	✓	✗	✓
B	✓	✗	✓	✗
C	✓	✓	✗	✗
D	✗	✓	✓	✓

key

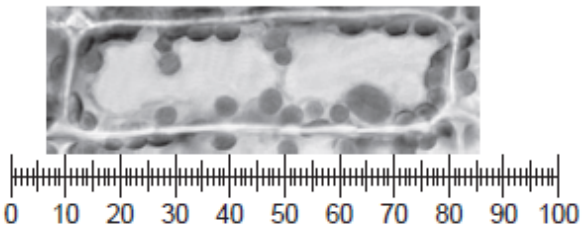
✓ = present

✗ = not present

95. The diagram shows a stage micrometer on which the small divisions are 0.1 mm. It is viewed through an eyepiece containing a graticule.



The stage micrometer is replaced by a slide of a plant cell.



What is the length of the nucleus?

A 0.8mm **B** 8 μm **C** 25 μm **D** 200 μm

96. In general, eukaryotic cells undergo division much slower than prokaryotic cells.

What is the reason for this?

A Eukaryotes break down the nuclear membrane during mitosis.

B Eukaryotes have many more mitochondria than prokaryotes.

C Prokaryotes do not contain any centrioles.

D Prokaryotic cells are a lot smaller than eukaryotic cells.

97.	Where would cisternae be found in a cell? 1 endoplasmic reticulum 2 Golgi apparatus 3 mitochondrion **A** 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 1 only
98.	Ribosomes exist as separate subunits that bind together during protein synthesis. What do these subunits consist of? **A** mRNA and protein **B** mRNA and tRNA **C** rRNA and protein **D** rRNA and tRNA
99.	Which cell components contain mRNA? 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

100. Which processes occur in eukaryotes and prokaryotes?

1 hydrolysis

2 mitosis

3 transcription

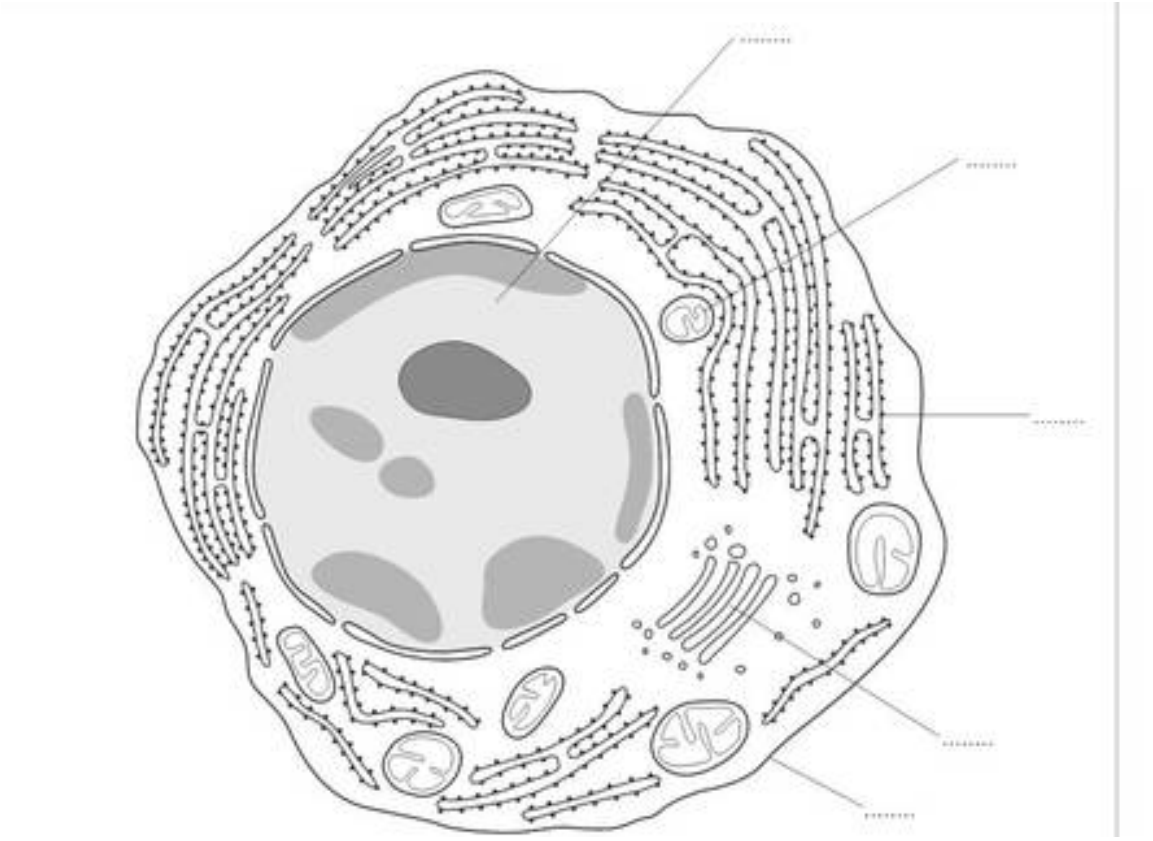
4 translation

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

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.



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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.

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

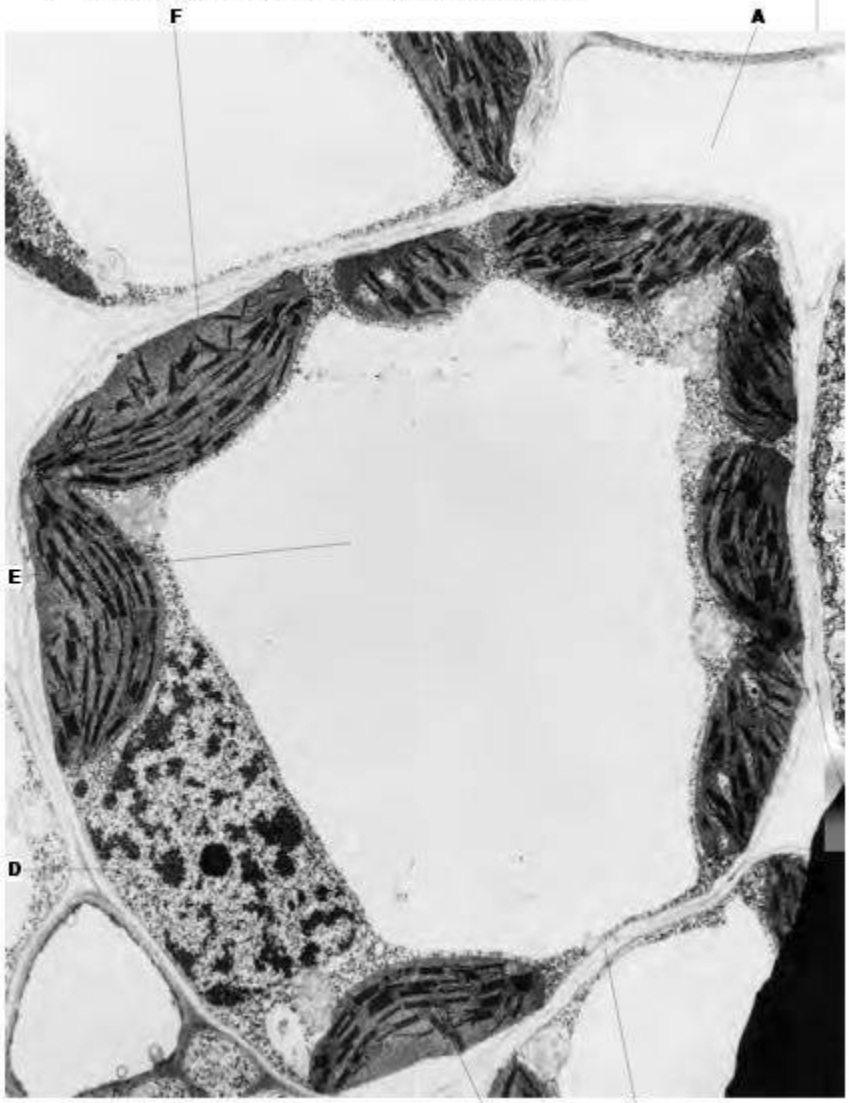


Fig. 4.1

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(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 .....

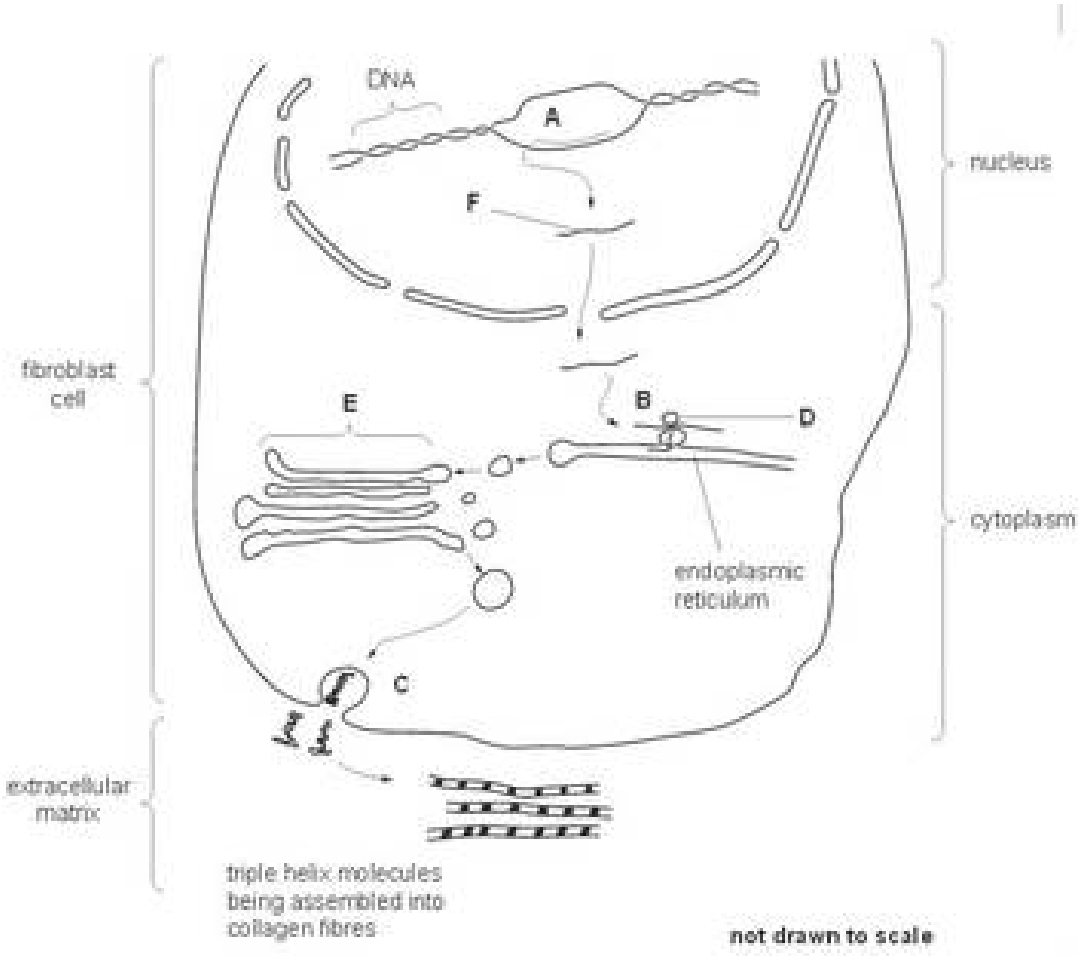
[3]

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.

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(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]

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Q.4.

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

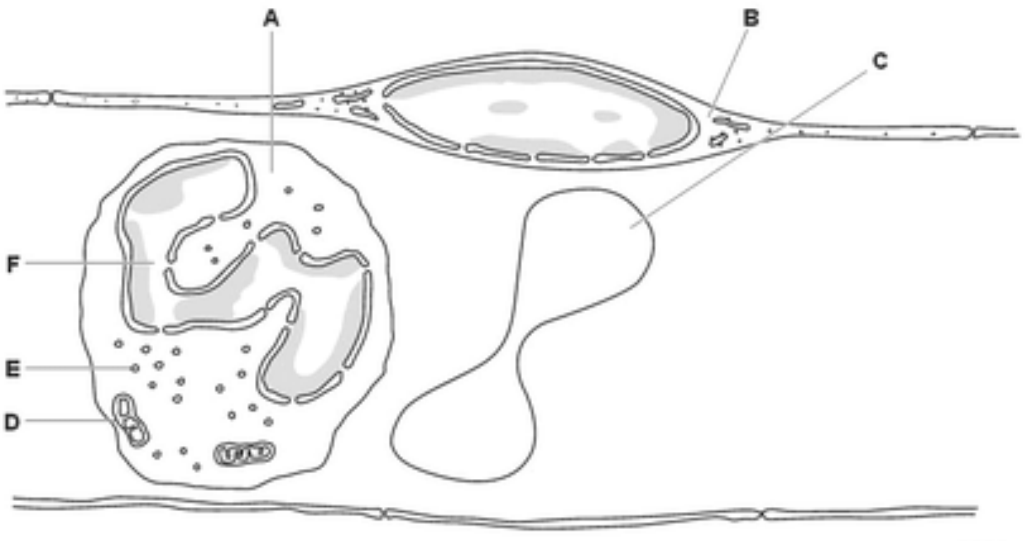


Fig. 1.1

(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 .....

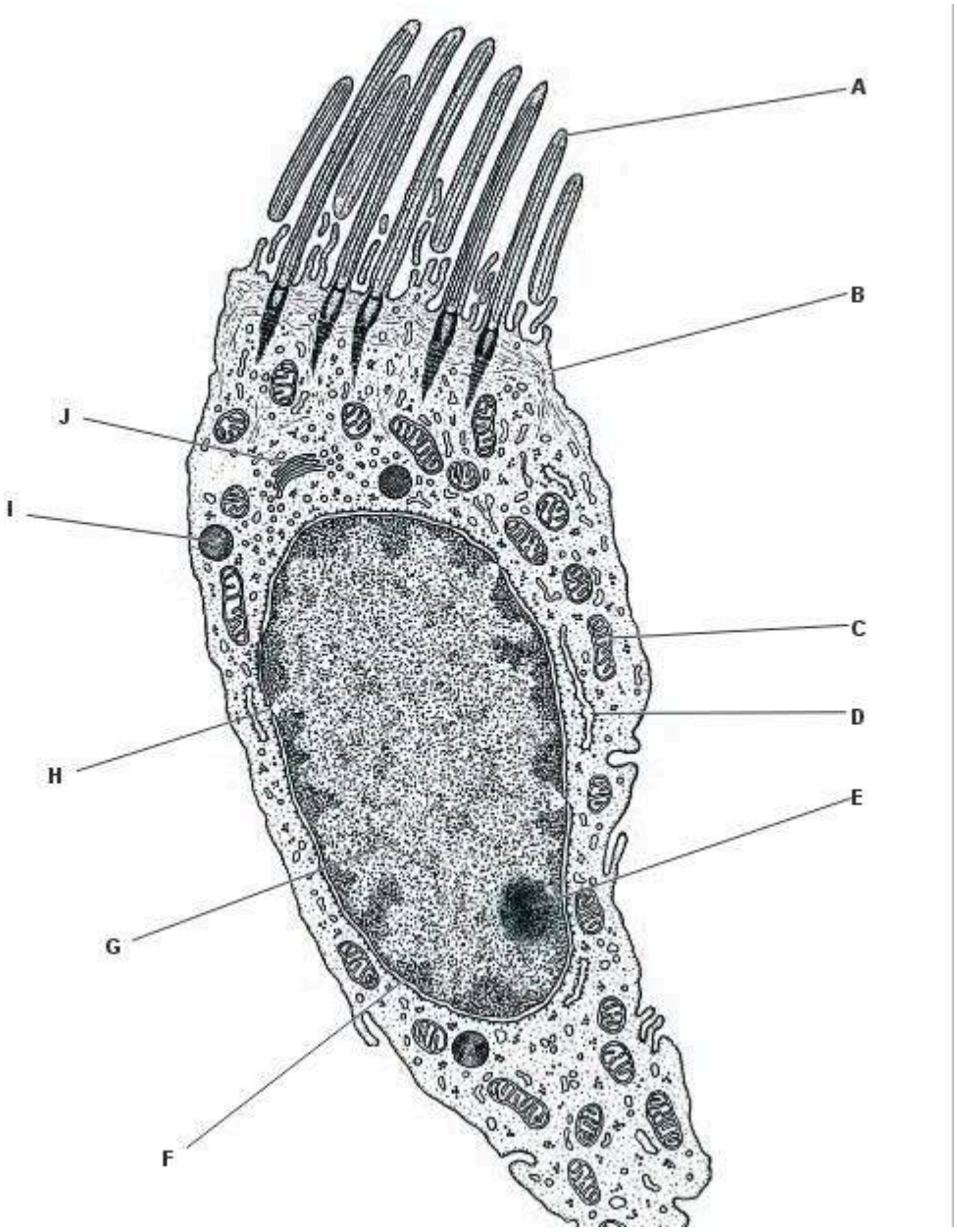
E .....

F .....[3]

Q.5.

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



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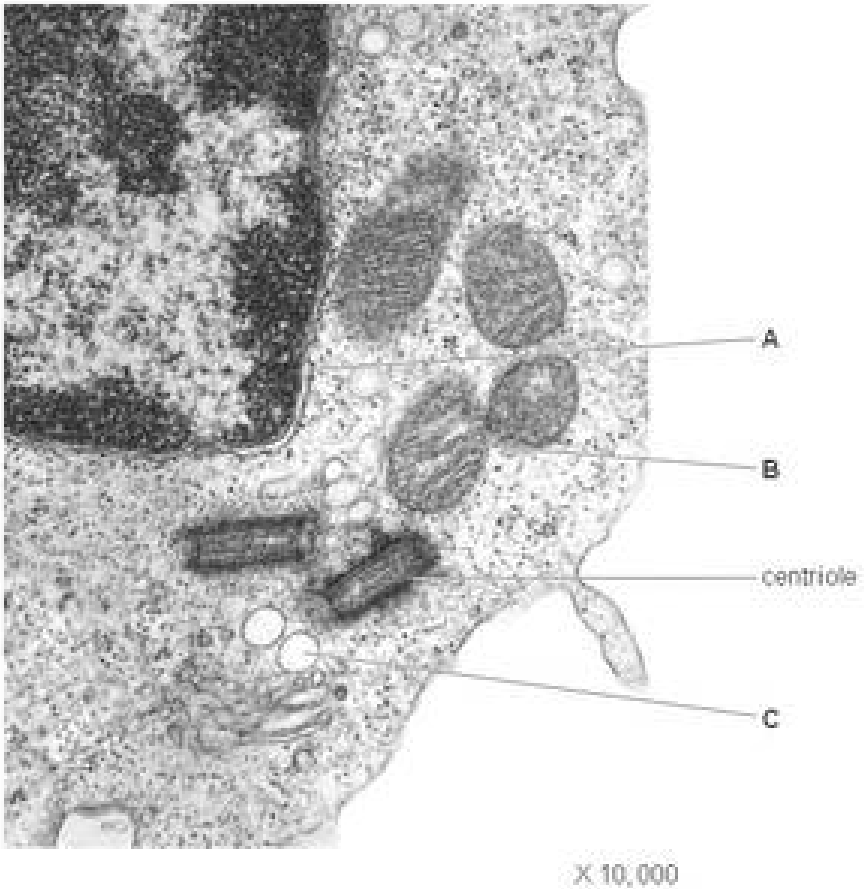
(a) Complete the table below by writing the appropriate letter from Fig. 1.1 to indicate the structure that carries out each of the functions listed. The first one has been completed for you.

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.



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(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.

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

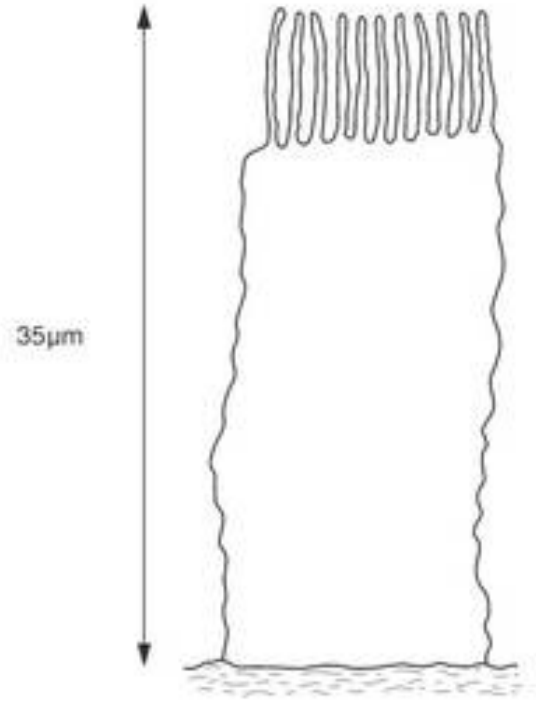


Fig. 1.1

(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]

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

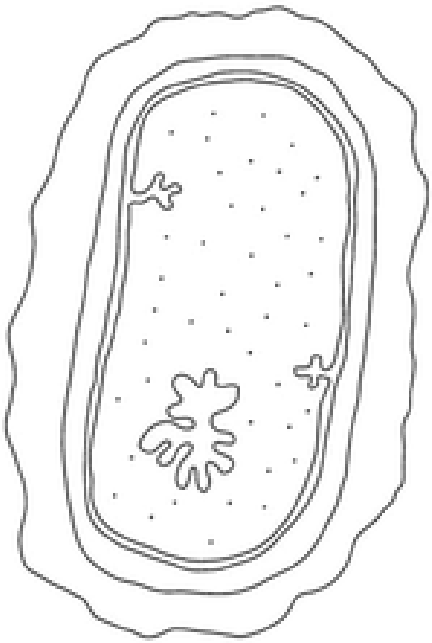


Fig. 1.2

(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. .....

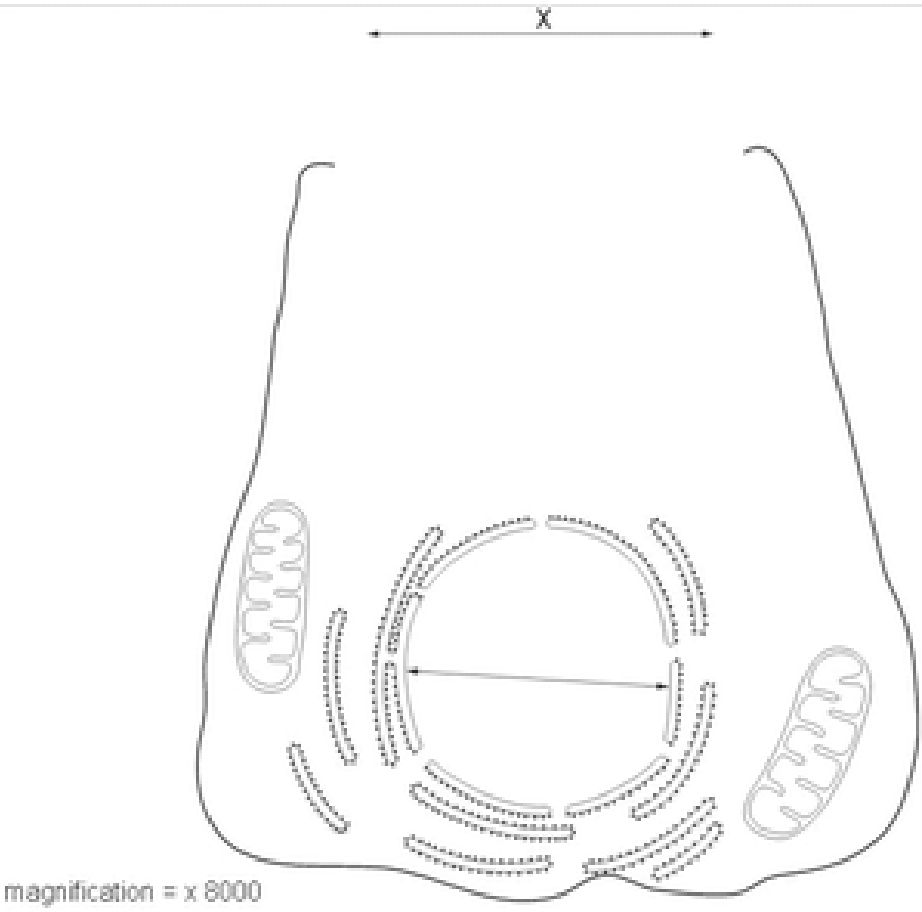
3. .....[3]

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.

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(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]

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

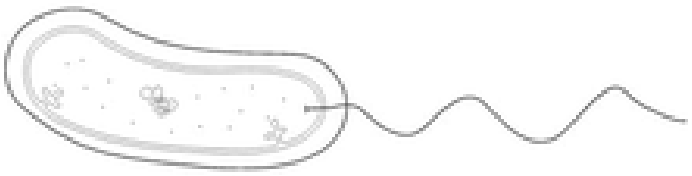


Fig. 1.2

(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.

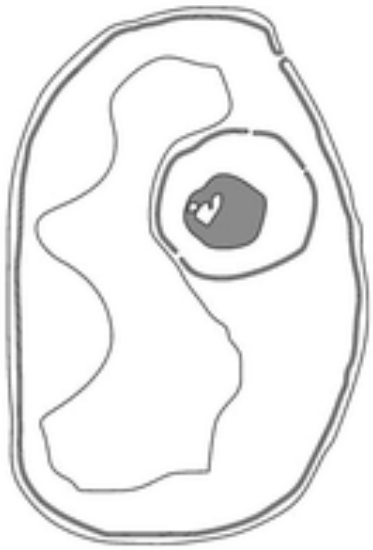


Fig. 1.1

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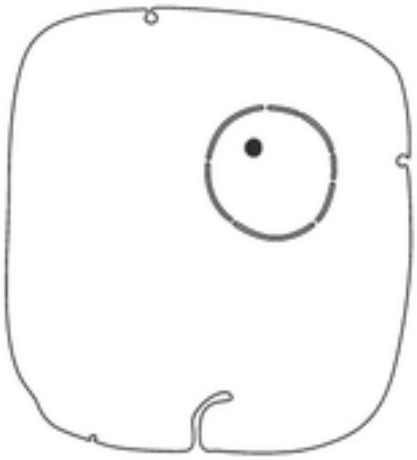


Fig. 1.2

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

.....

.....

.....

.....[2]

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(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.

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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]

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(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.

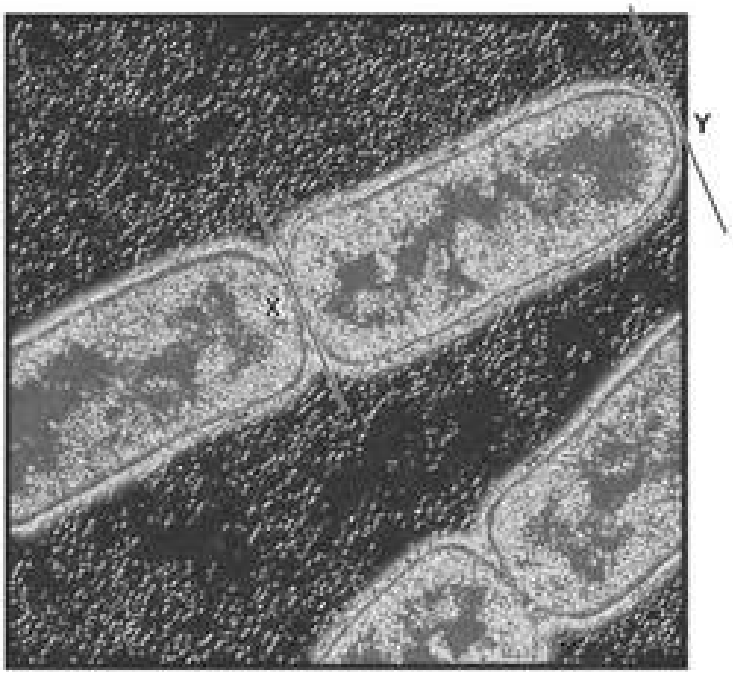


Fig. 4.1

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(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 × .....[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.

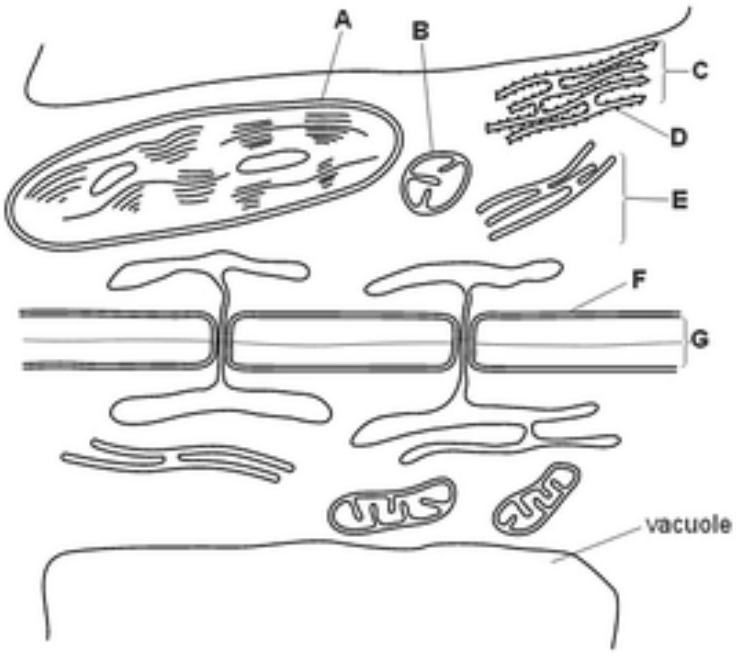


Fig. 2.1

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(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]

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(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.

.....

.....

.....

.....

.....

.....

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.....

.....

..... [4]

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

Describe the roles of plasmodesmata in transport in plants.

.....

.....

.....

.....

.....

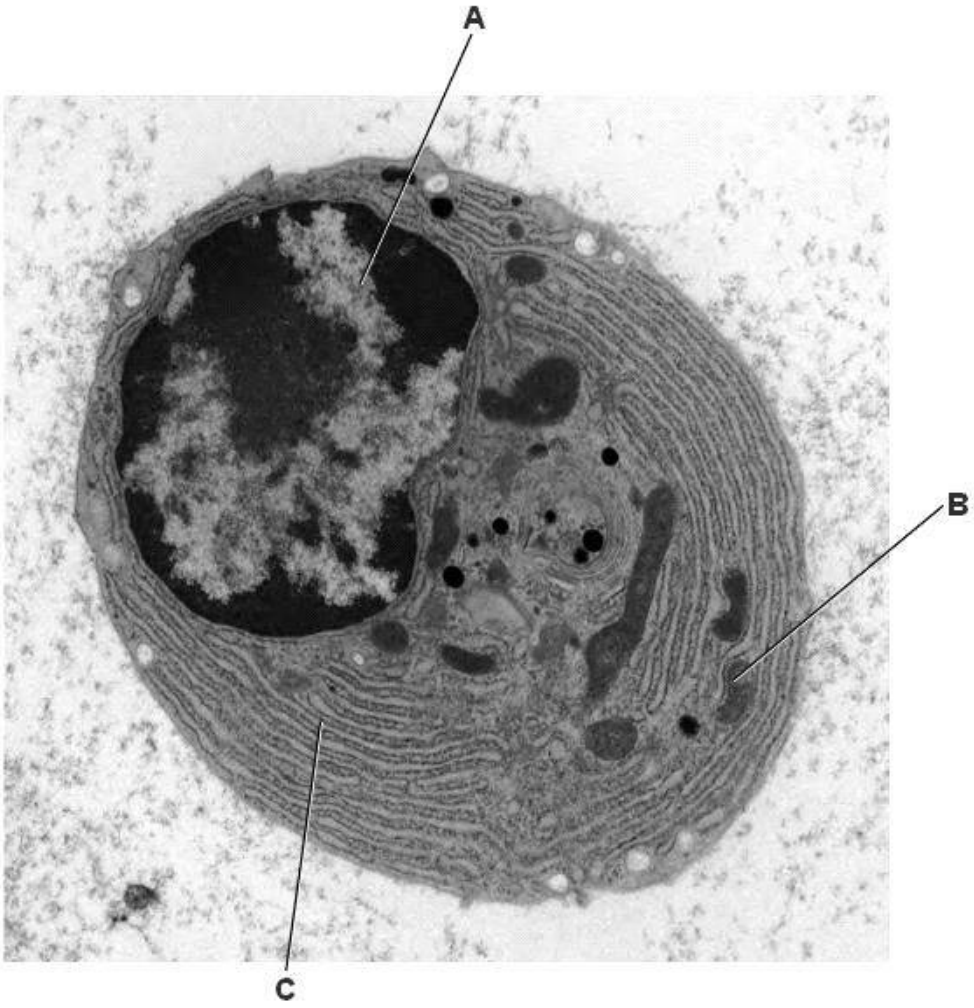
..... [3]

[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.

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A
B
C

(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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Q.14.

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

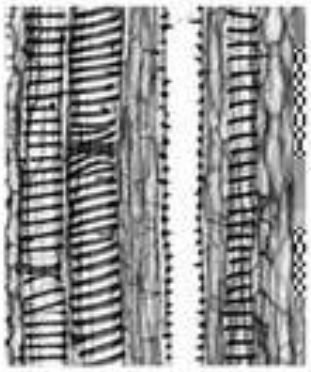


Fig. 2.1

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(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*.

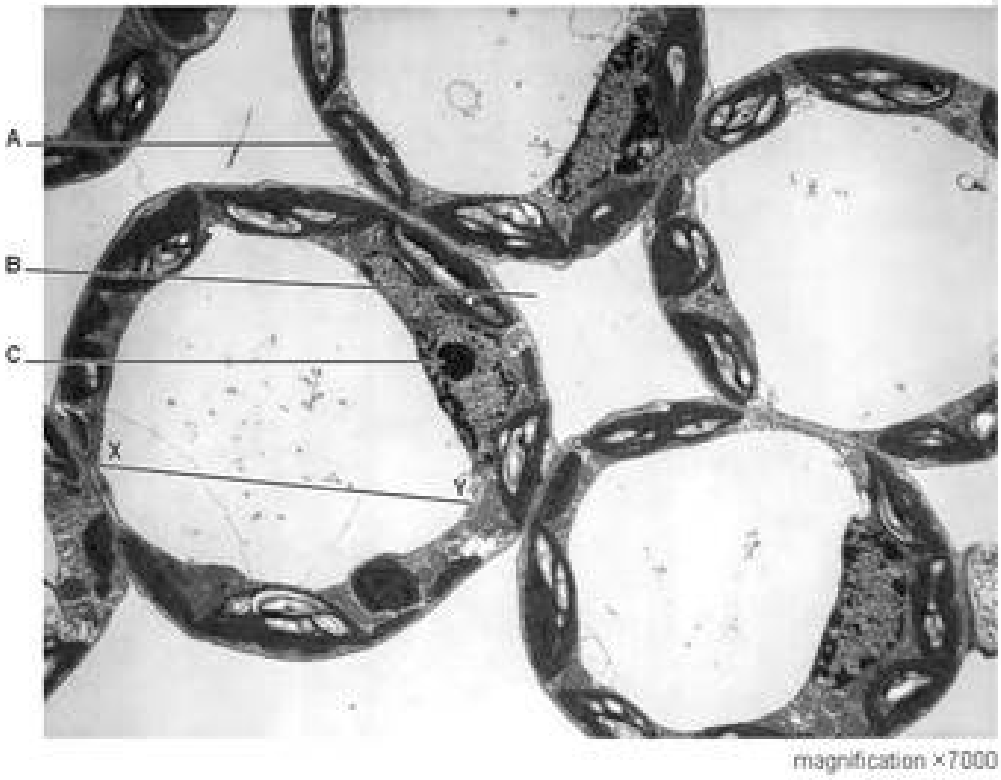


Fig. 1.1

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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.

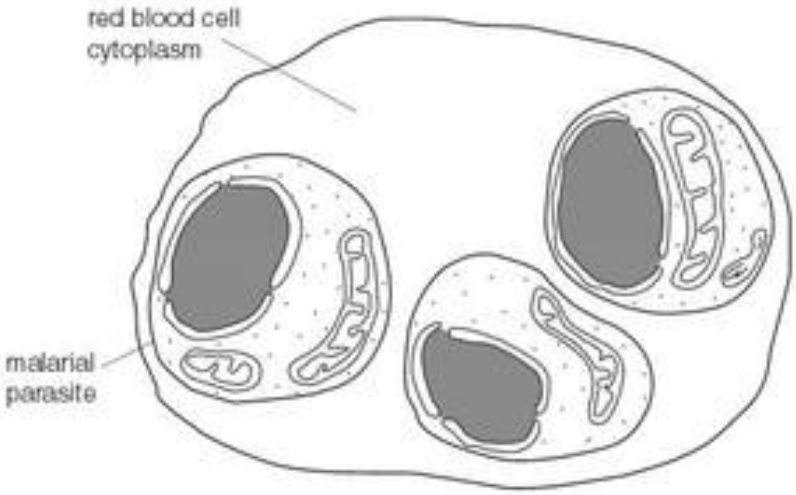


Fig. 5.1

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

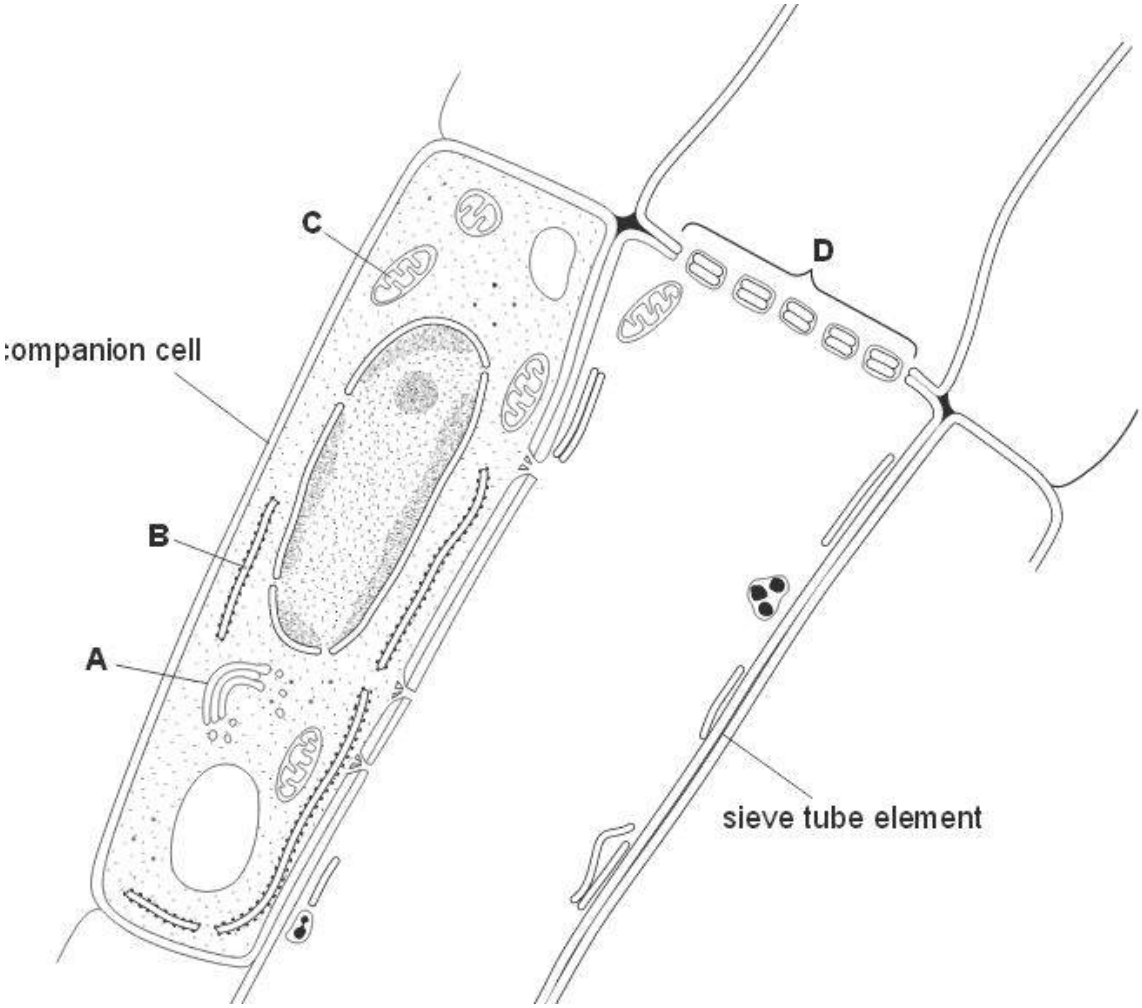
1. .....

2. .....[2]

Q.17.

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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]

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(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.

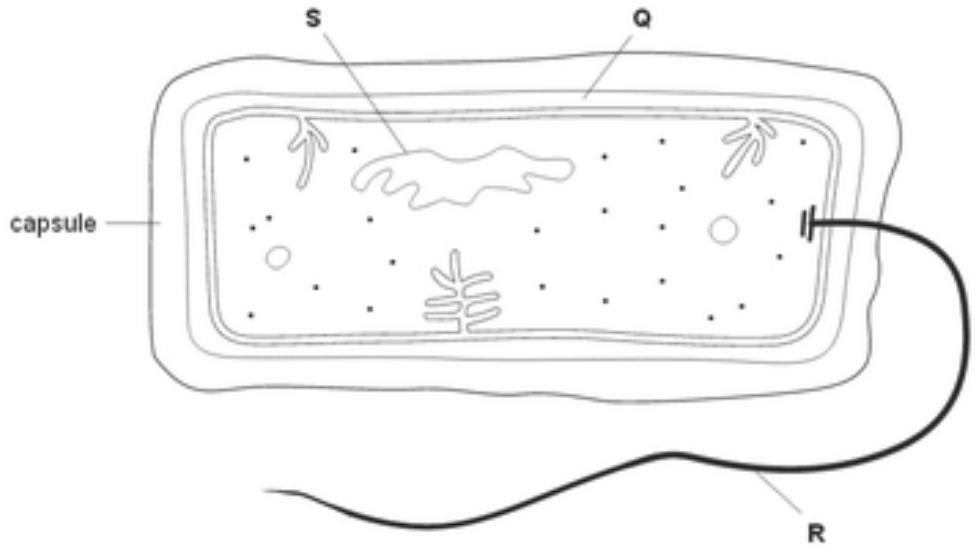


Fig. 4.1

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(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.

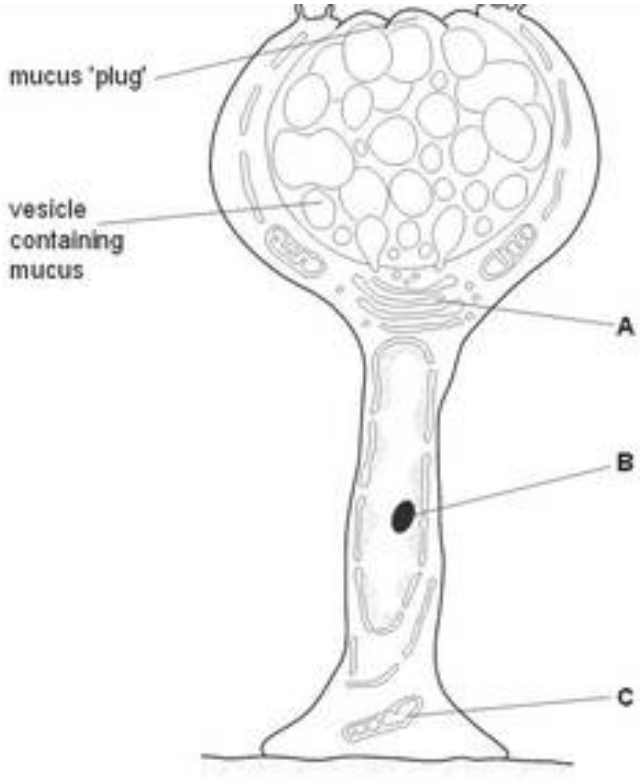


Fig. 1.1

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(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.

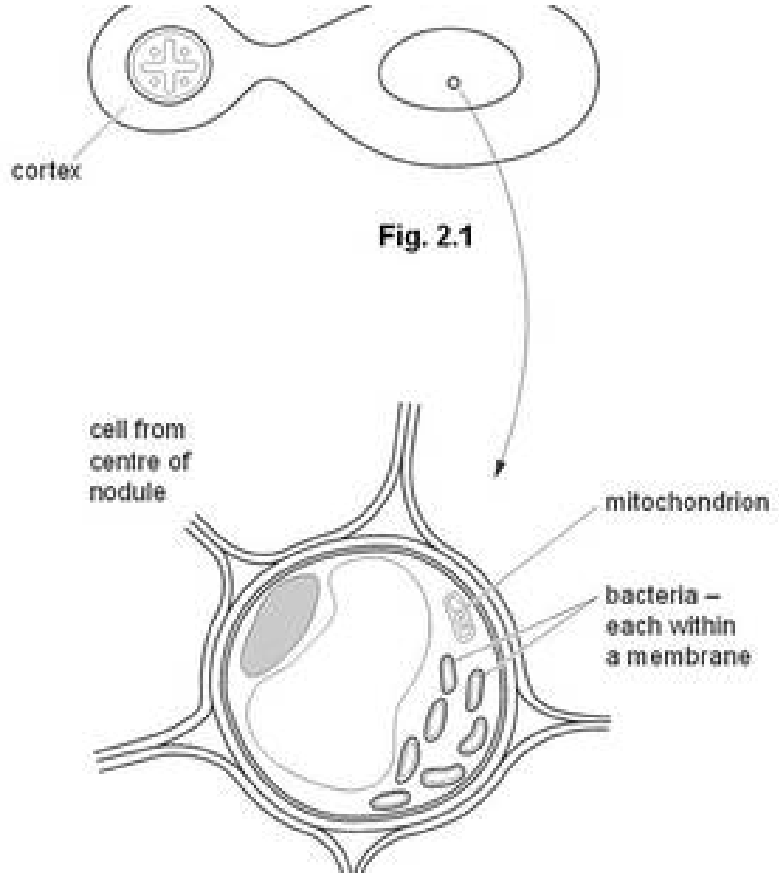


Fig. 2.1

(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]

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

.....

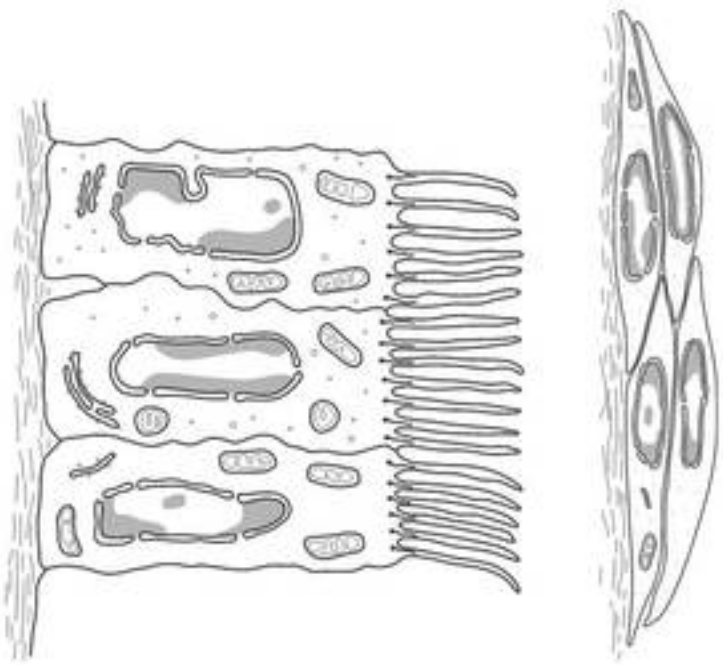
.....

.....

.....[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.



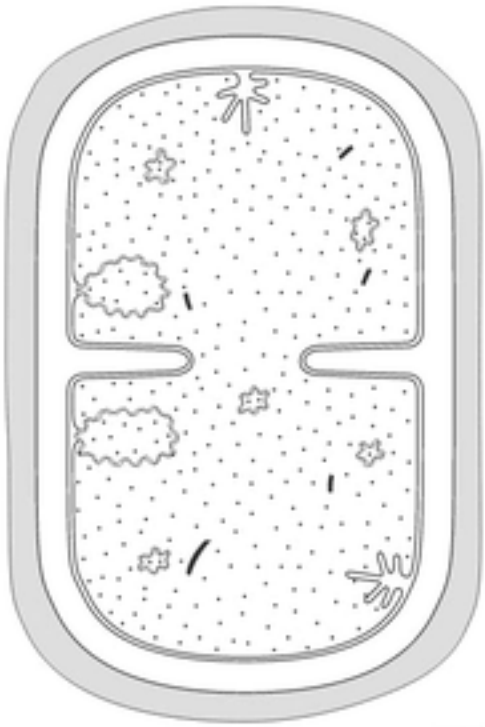
(a) Using label lines and the following letters, label the structures **A** to **C** on Fig. 3.1.

A cilia
B nuclear membrane (nuclear envelope)
C endoplasmic reticulum [3]

Q.22.

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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.

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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**.

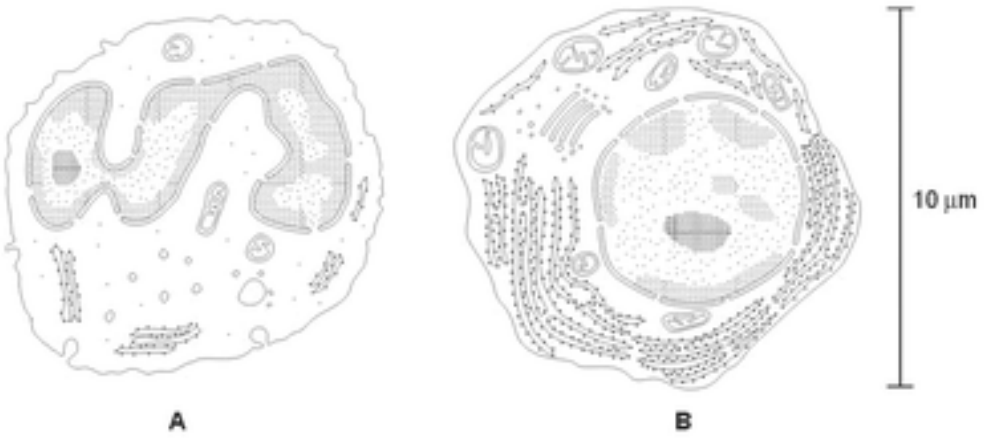


Fig. 1.1

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

feature	cell **A**	cell **B**

[3]

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(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.

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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.

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

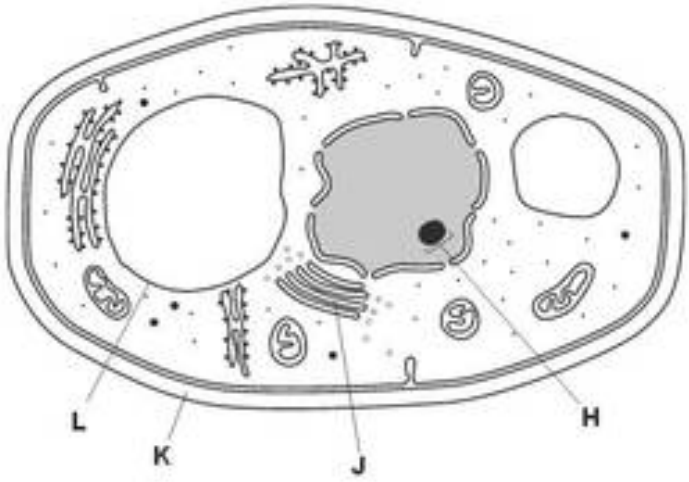


Fig. 5.1

(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]

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(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.

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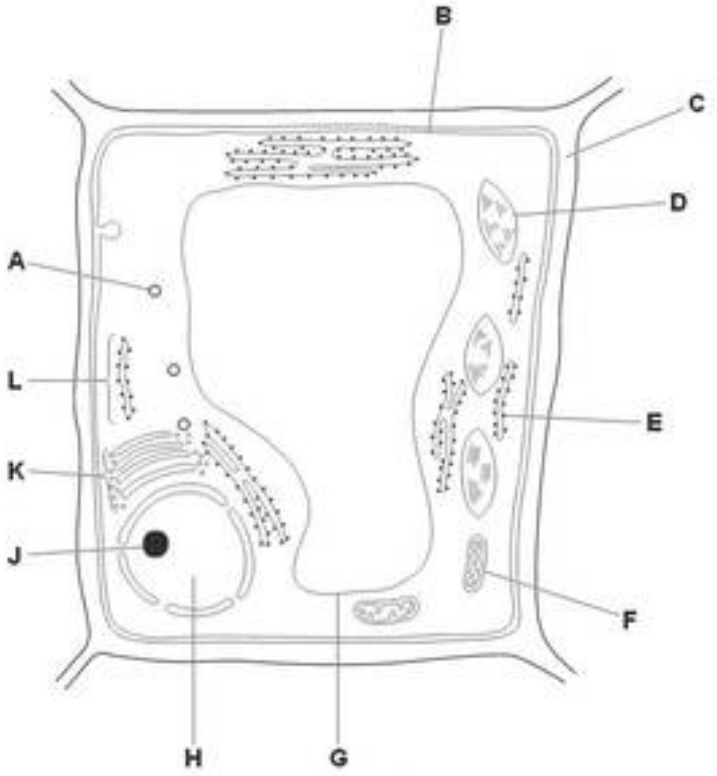


Fig. 5.2

(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]

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(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		

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(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*.

5

.....

.....

.....

.....

.....

..... [3]

Q.28.

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

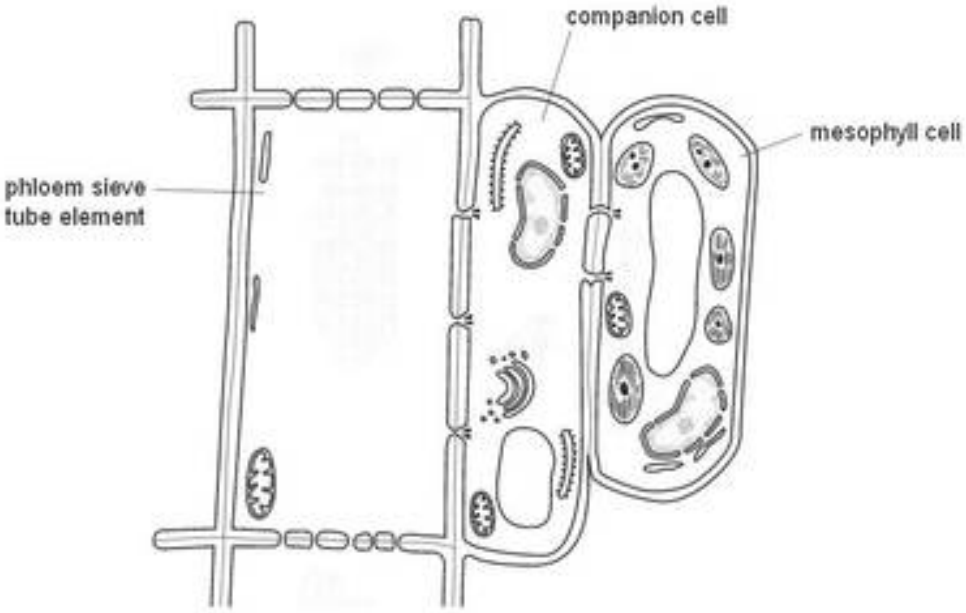


Fig. 6.1

(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.

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

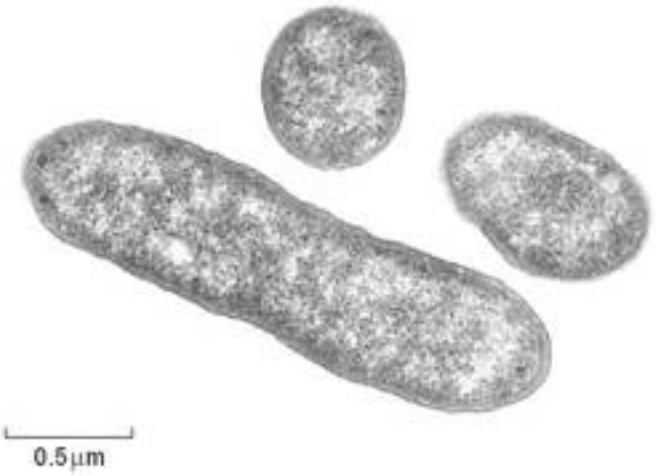


Fig. 1.1

(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]

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(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.

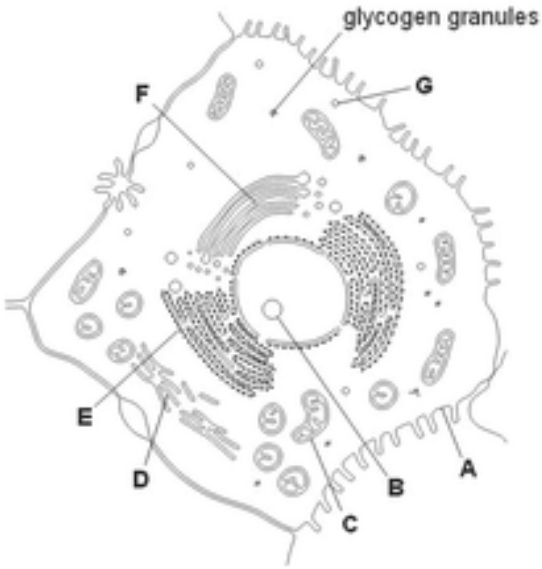


Fig. 1.1

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(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.

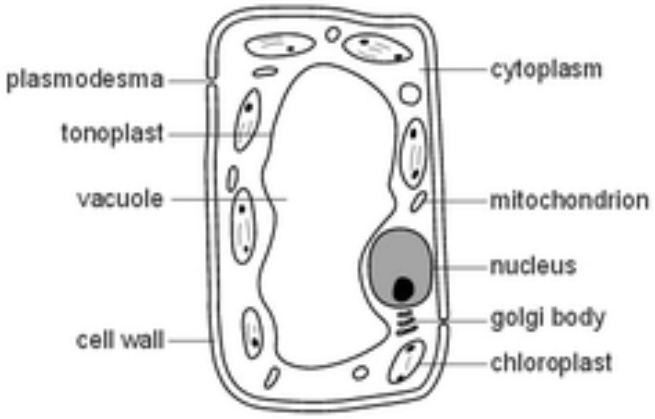


Fig. 1.1

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

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(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 μm. Calculate the magnification of the cell shown in Fig. 1.1.

Show your working.

magnification × ..... [2]

Q.32.

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

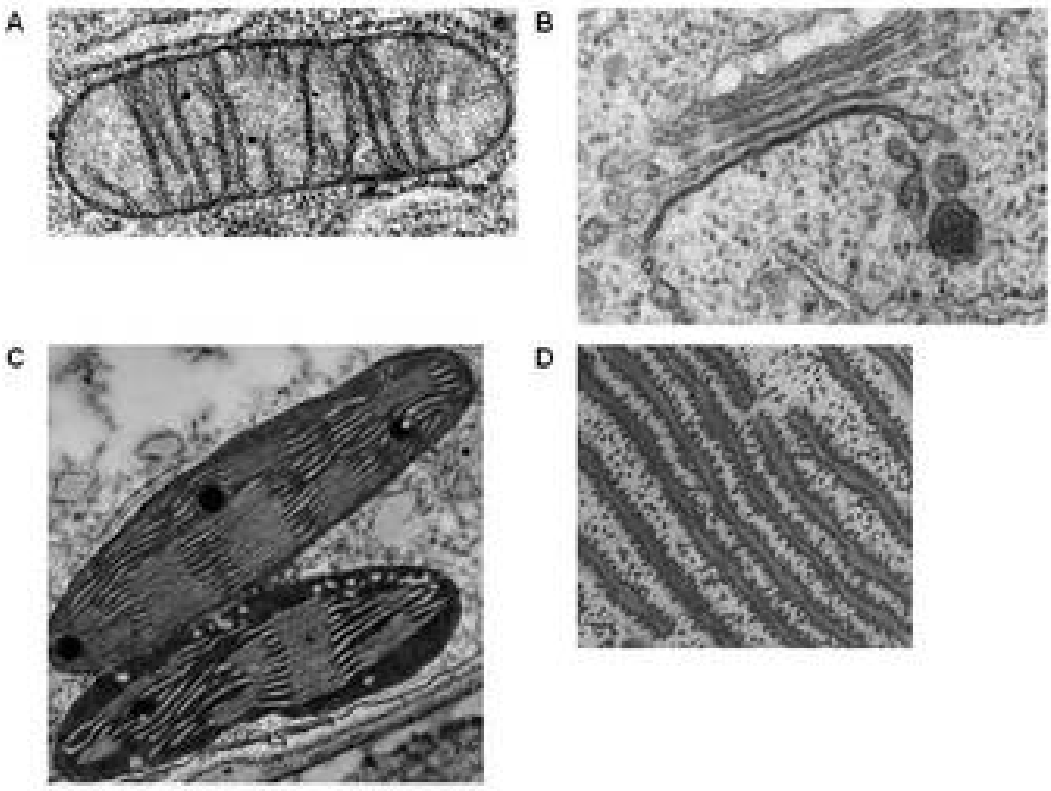


Fig. 1.1

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]

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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.

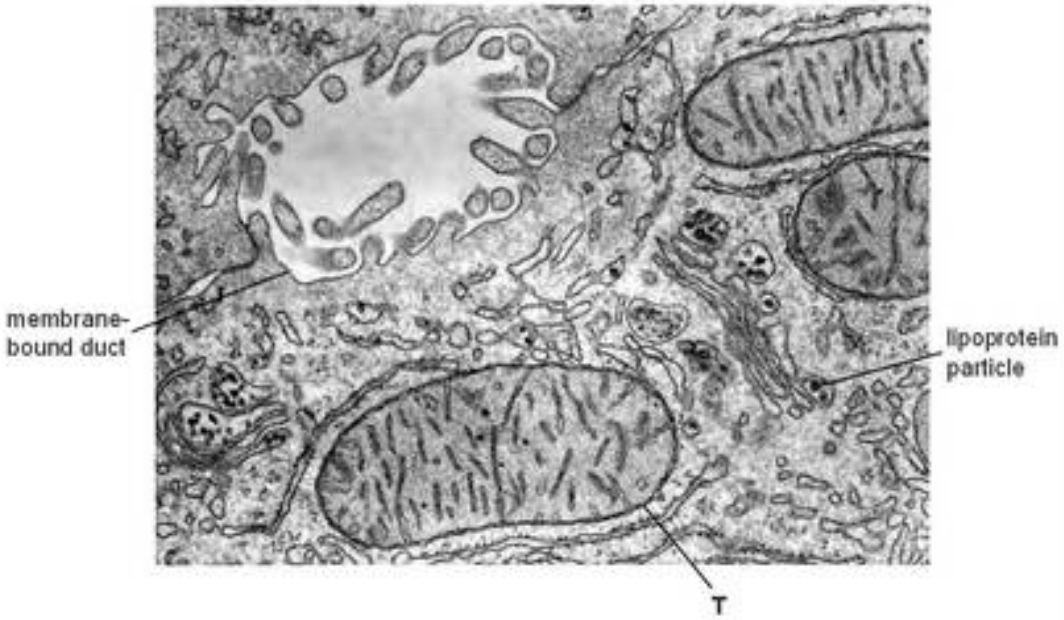


Fig. 4.1

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

.....

.....

.....

.....

.....

.....[3]

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(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.

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

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

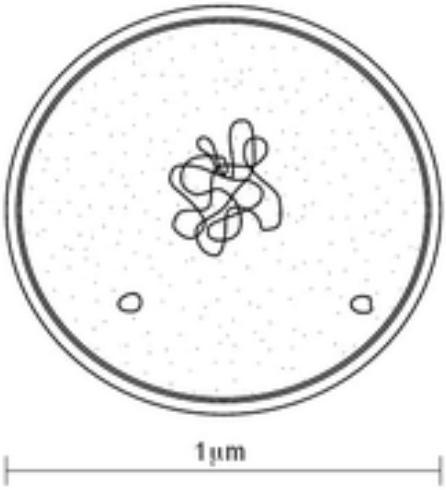


Fig. 4.1

(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.

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(c) State the advantages of light microscopy, rather than electron microscopy, for studies of the cell cycle.

.....

.....

.....

.....

.....

.....

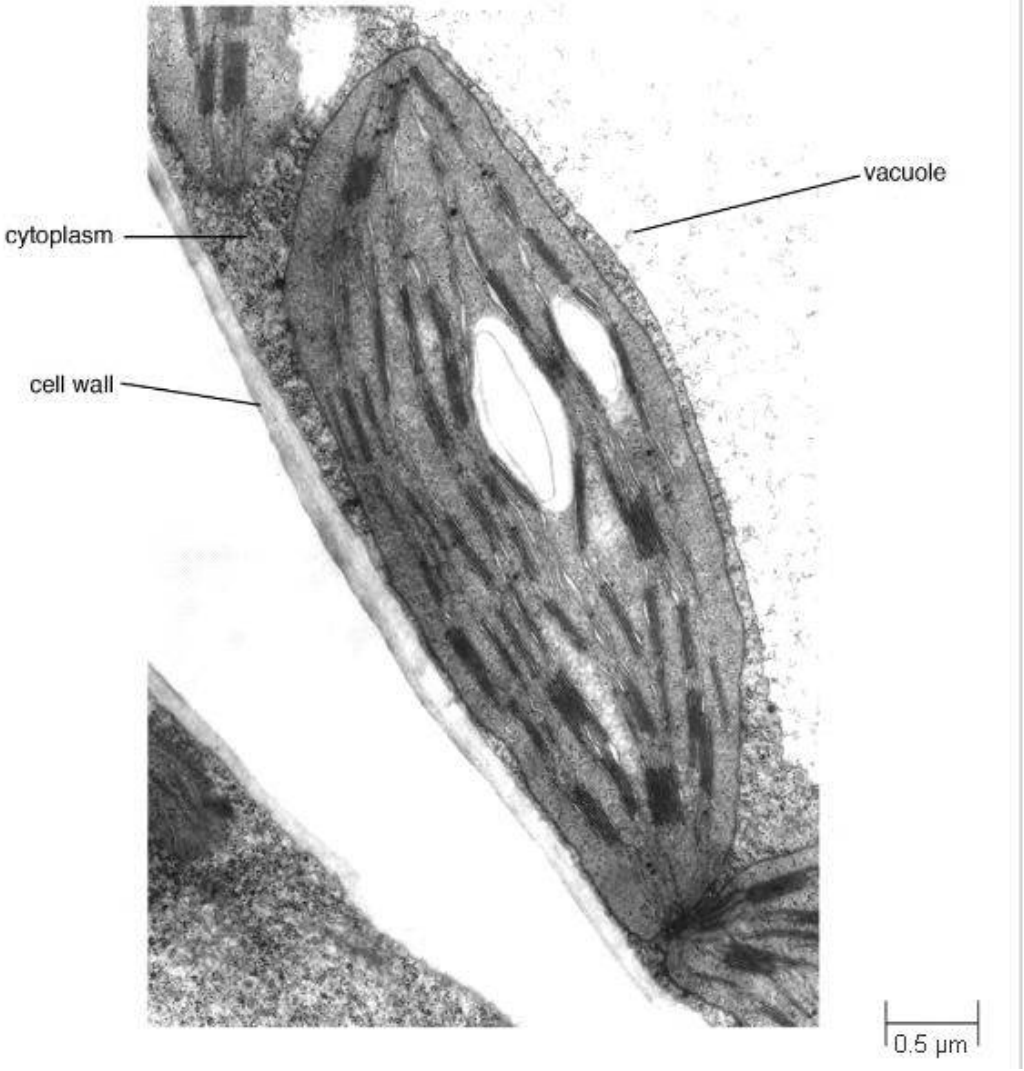
.....

..... [3]

Q.36.

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

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

Answer = ...[1]

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(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]

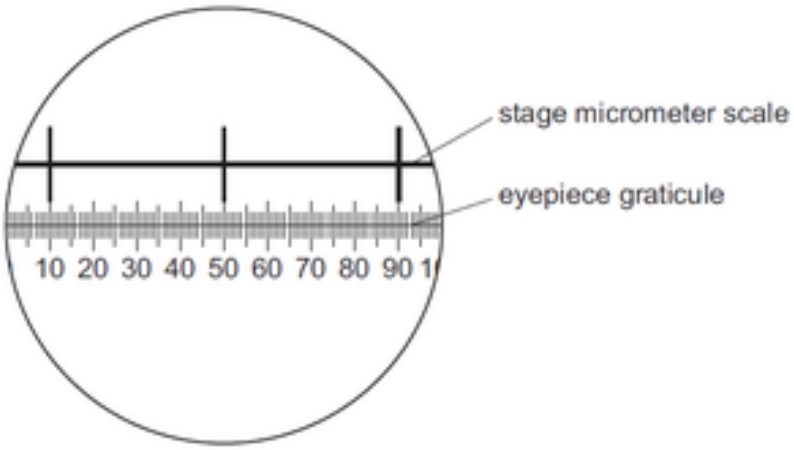
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Cell Structure – AS 9700 Biology June 2022

1. June/2022/Paper_11/No.1

A student used a stage micrometer scale to calibrate an eyepiece graticule.

The diagram shows the view of both the stage micrometer scale and the eyepiece graticule seen by the student. The divisions on the stage micrometer scale are 0.1 mm apart.



The student removed the stage micrometer scale and viewed a slide with blood cells on it. The same lenses were used so that the magnification remained unchanged.

The student measured the diameter of one of the white blood cells on the slide using the eyepiece graticule and recorded that it was 8 eyepiece units.

What is the correct diameter of this white blood cell in micrometers?

A 0.2 **B** 0.8 **C** 20 **D** 800

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2. June/2022/Paper_11/No.2

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 mRNA passes through to the ribosome

2 produces the mitotic spindle during cell division

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

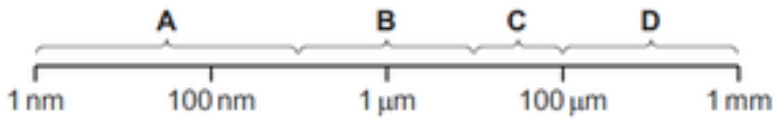
Z membrane-bound sacs, arranged as a flattened stack

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

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

3. June/2022/Paper_11/No.3

Which size range would include most prokaryotic cells?



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4. June/2022/Paper_11/No.4

What is present in a typical prokaryotic cell **and** a typical eukaryotic cell?

A 70S ribosomes

B centrioles

C circular DNA in the cytoplasm

D starch granules

5. June/2022/Paper_11/No.5

Which statement about viruses is correct?

A They all have a capsid made of protein.

B They all contain RNA.

C They all have an outer envelope made of phospholipids.

D They all contain 80S ribosomes.

6. June/2022/Paper_11/No.15

Some processes occurring in cells are listed.

1 endocytosis of water into cells

2 exocytosis of enzymes from cells

3 facilitated diffusion of glucose into red blood cells

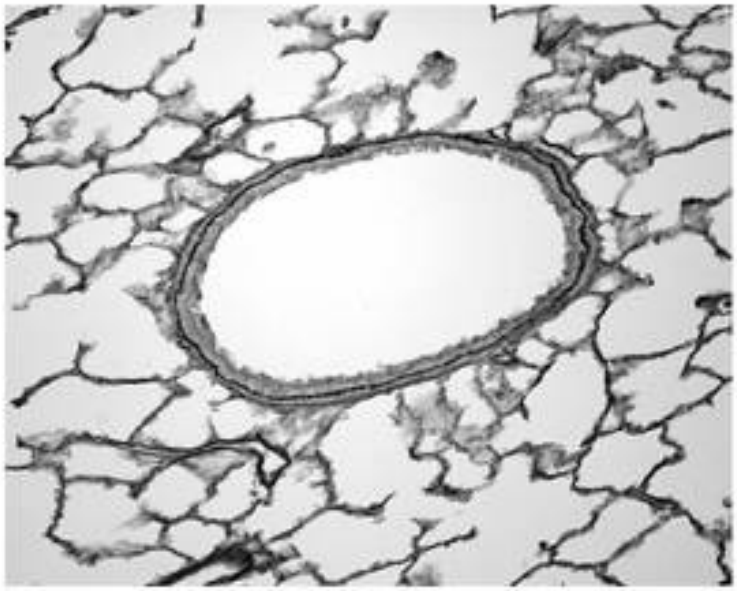
4 phagocytosis of dead cells by macrophages

Which processes use ATP?

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

7. June/2022/Paper_12/No.1

The photomicrograph shows a bronchiole and alveoli.



The magnification of the image is ×360.

What is the maximum diameter of the bronchiole lumen?

A 14 μm **B** 80 μm **C** 140 μm **D** 170 μm

8. June/2022/Paper_12/No.2

A specimen is observed twice with a microscope, firstly using green light with a wavelength of 510 nm and then using red light with a wavelength of 650 nm.

What happens to the magnification and resolution when using red light compared to green light?

	magnification	resolution
A	decreases	remains the same
B	increases	increases
C	remains the same	decreases
D	remains the same	increases

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9. June/2022/Paper_12/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 produces the mitotic spindle during cell division

2 synthesis of polypeptides

3 synthesis of lipids

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 functions with the appearance of the cell structure?

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

10. June/2022/Paper_12/No.4

What is found in chloroplasts **and** mitochondria?

A 70S ribosomes only

B 70S ribosomes and circular DNA

C 80S ribosomes and circular DNA

D circular DNA only

11. June/2022/Paper_12/No.5

Which feature is correct for all known viruses?

A capsid made of lipid and protein

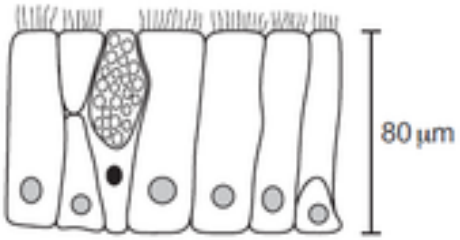
B DNA core

C outer envelope of phospholipid

D non-cellular structure

12. June/2022/Paper_13/No.1

The diagram shows a section through epithelium found in part of the respiratory system.



What is the magnification of the diagram?

A ×35 **B** ×350 **C** ×3500 **D** ×35 000

13. June/2022/Paper_13/No.2

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 mRNA passes through to the ribosome

2 synthesis of polypeptides

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 functions with the appearance of the cell structure?

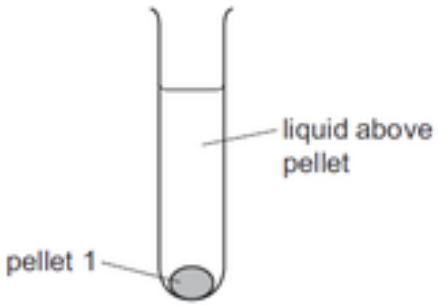
	1	2	3
A	V	X	Y
B	V	Z	Z
C	X	W	Z
D	X	Z	W

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14. June/2022/Paper_13/No.3

An experiment was carried out to separate the cell structures in an animal cell.

The cells were broken open. The extract was filtered and put into a centrifuge tube. This tube was then spun so that the heaviest cell structure sank to the bottom first, forming pellet 1, as shown.



The liquid above pellet 1 was poured into a clean centrifuge tube and spun again at a higher speed to separate the next heaviest cell structure. This cell structure sank to the bottom, forming pellet 2.

This procedure was repeated twice to obtain pellet 3 and pellet 4, each containing a single cell structure.

What is a function of the cell structure extracted in pellet 1?

A digestion of old organelles

B production of ATP

C production of mRNA

D synthesis of protein

15. June/2022/Paper_13/No.5

Which row shows a comparison that is **not** correct between a typical prokaryotic cell and a typical eukaryotic plant cell?

	prokaryotic cell	eukaryotic plant cell
A	DNA not associated with histones	DNA associated with histones
B	no endoplasmic reticulum present	endoplasmic reticulum present
C	peptidoglycan cell walls	cellulose cell walls
D	all ribosomes approximately 18 nm in diameter	all ribosomes approximately 22 nm in diameter

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16. June/2022/Paper_13/No.6

It is suggested that primitive prokaryotic cells may be ancestors of certain organelles in eukaryotic cells.

Which organelle is most similar in composition to a typical prokaryote?

A Golgi bodies

B lysosomes

C mitochondria

D nucleoli

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17. June/2022/Paper_23/No.1

The trachea of the gas exchange system branches into two airways, each of which enters a lung.

(a) Name the airways that branch from the trachea to enter the lungs.

..... [1]

(b) The lower part of the trachea receives blood from arteries that branch from the aorta. Different arteries carry blood from the heart to the alveoli of the lungs.

State the differences between the arteries supplying the lower part of the trachea and the arteries that supply blood to the alveoli of the lungs.

.....

.....

.....

.....

.....

..... [2]

(c) Fig. 1.1 is a photomicrograph of a section through part of the trachea.

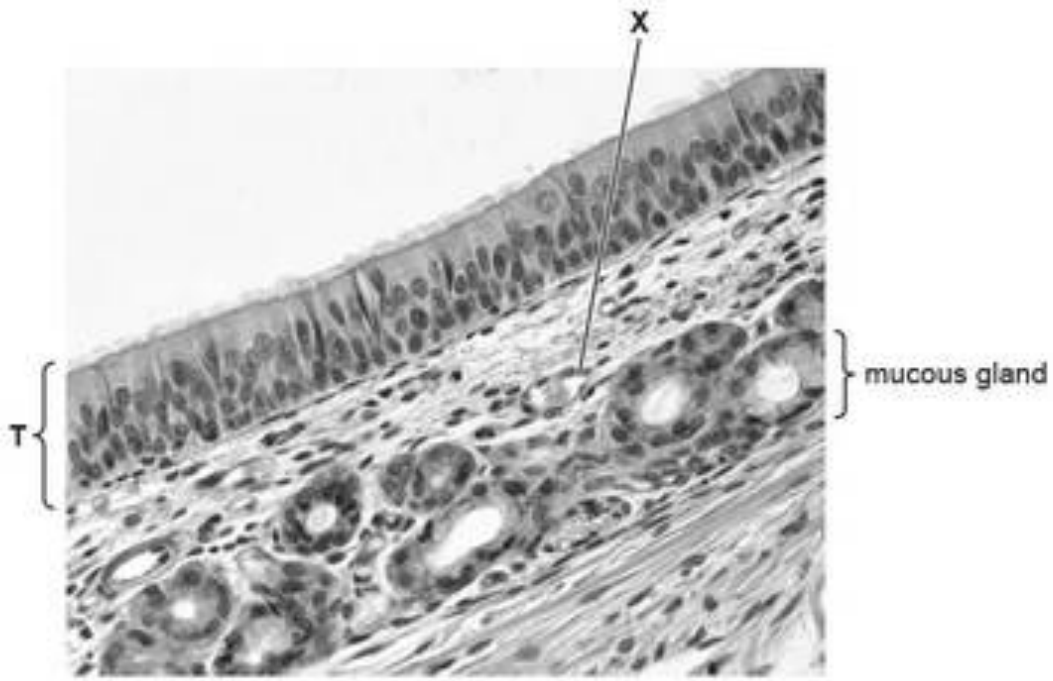


Fig. 1.1

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(i) In Fig. 1.1, one of the tissues in the trachea is labelled **T**.

Describe the structural features of tissue **T** visible in Fig. 1.1.

.....

.....

.....

.....

.....

.....

.....

..... [3]

(ii) Identify structure **X** in Fig. 1.1 **and** outline the features that helped your identification.

structure **X** = ...

.....

.....

.....

.....

.....

.....

.....

..... [3]

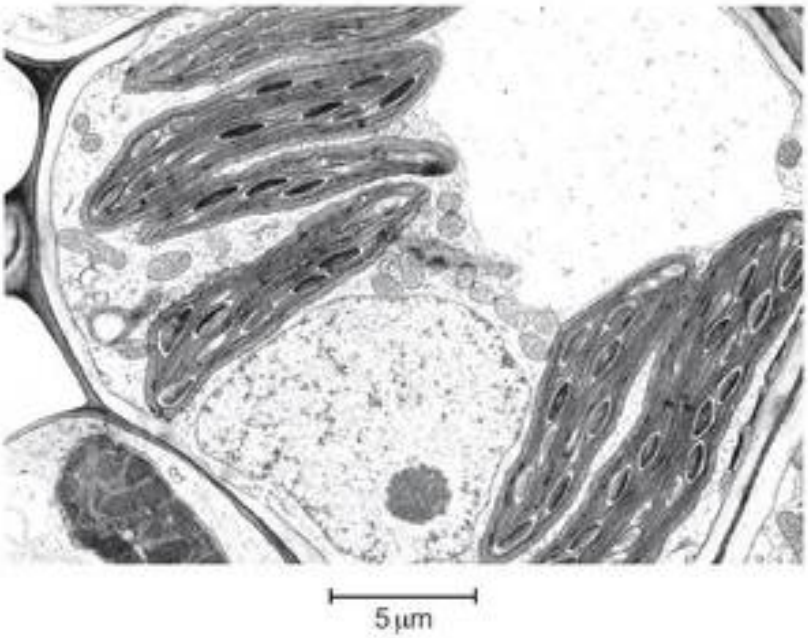
[Total: 9]

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Cell Structure – AS 9700 Biology Nov 2022

1. Nov/2022/Paper_11/No.1

The photomicrograph shows part of a plant cell.



What is the magnification of the cell?

A ×250 **B** ×400 **C** ×1000 **D** ×4000

2. Nov/2022/Paper_11/No.12

Which row matches each organelle with its function?

	microtubules	rough endoplasmic reticulum	Golgi body	centrioles
A	make cilia and spindle	separates some processes from cytoplasm	makes lysosomes	assemble the spindle during nuclear division
B	move vesicles within the cell	assembles amino acids to make proteins	contains enzymes for destroying worn out parts of the cell	move chromosomes apart during anaphase
C	move chromatids apart during anaphase	modifies proteins which may be released from cell	makes glycoproteins	move cilia
D	form part of the cytoskeleton	makes triglycerides and phospholipids	modifies proteins by adding carbohydrates	move individual cells

3. Nov/2022/Paper_11/No.3

Where are 80S ribosomes found?

1 chloroplasts

2 cytoplasm of eukaryotes

3 mitochondria

4 cytoplasm of prokaryotes

A 1, 2 and 3 **B** 1 and 3 only **C** 2 only **D** 4 only

4. Nov/2022/Paper_11/No.5

Which feature, when present in an organism, enables it to be identified as a prokaryote?

A cytoplasmic DNA

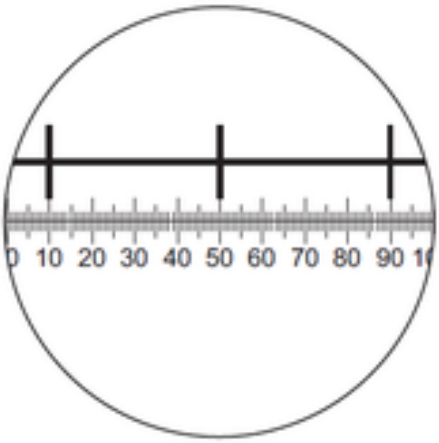
B cell wall

C nucleus

D ribosomes

5. Nov/2022/Paper_12/No.1

The diagram shows a stage micrometer, with divisions 0.10 mm apart, viewed through an eyepiece containing a graticule.



The area of the field of view of the microscope can be calculated using this formula.

$$\text{area} = \pi r^2$$

A student calculated the area of the field of view of the microscope using the information provided and a value for π of 3.142.

Which answer has been rounded correctly to an appropriate number of significant figures?

A $0.04909\,\text{mm}^2$

B $5 \times 10^{-2}\,\text{mm}^2$

C $4.909 \times 10^{4}\,\mu\text{m}^2$

D $4.91 \times 10^{4}\,\mu\text{m}^2$

6. Nov/2022/Paper_12/No.2

Where are cisternae found in a cell?

1 endoplasmic reticulum

2 Golgi body

3 mitochondria

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

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7. Nov/2022/Paper_12/No.3

Which row matches the functions to the cell structures?

	vacuole	nucleolus	ribosomes	lysosomes
A	stores water, sugar and pigment	manufactures messenger RNA	protein synthesis	involved in cell recognition
B	exports proteins	manufactures ribosomal RNA	lipid synthesis	involved in cell recognition
C	stores water, sugar and pigment	manufactures ribosomal RNA	protein synthesis	contains enzymes
D	exports proteins	manufactures messenger RNA	lipid synthesis	contains enzymes

8. Nov/2022/Paper_12/No.4

Which structures are found in prokaryotes **and** eukaryotes?

A cell membrane and nucleus

B cell membrane and ribosomes

C nucleus and mitochondria

D mitochondria and ribosomes

9. Nov/2022/Paper_12/No.12

The photomicrograph shows the appearance of onion epidermal cells after they have been soaked in solution X for one hour.



What fills the space labelled Y?

A air

B cytoplasm

C solution X

D water

10. Nov/2022/Paper_13/No.1

The electron micrograph shows a chloroplast from a tobacco leaf.



If the actual length of this chloroplast measured along X–Y is 10 μm, what is the magnification of the image?

A ×6.3 **B** ×63 **C** ×630 **D** ×6300

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11. Nov/2022/Paper_13/No.12

Some cell structures are listed.

1 endoplasmic reticulum

2 Golgi body

3 mitochondrion

4 chloroplast

Which cell structures do **not** contain cristae?

A 1, 2, 3 and 4

B 1, 2 and 4 only

C 1 and 2 only

D 3 and 4 only

12. Nov/2022/Paper_13/No.4

Which row is correct for typical prokaryotic cells **and** mitochondria?

	feature	prokaryotic cells	mitochondria
A	70S ribosomes	no	yes
B	circular DNA	yes	no
C	peptidoglycans	yes	no
D	small size, 1–5 μm long	no	no

13. Nov/2022/Paper_13/No.5

Which statement is correct?

A A virus is composed of a protein coat which surrounds RNA or DNA.

B Suberin and cellulose are found in all plant cell walls.

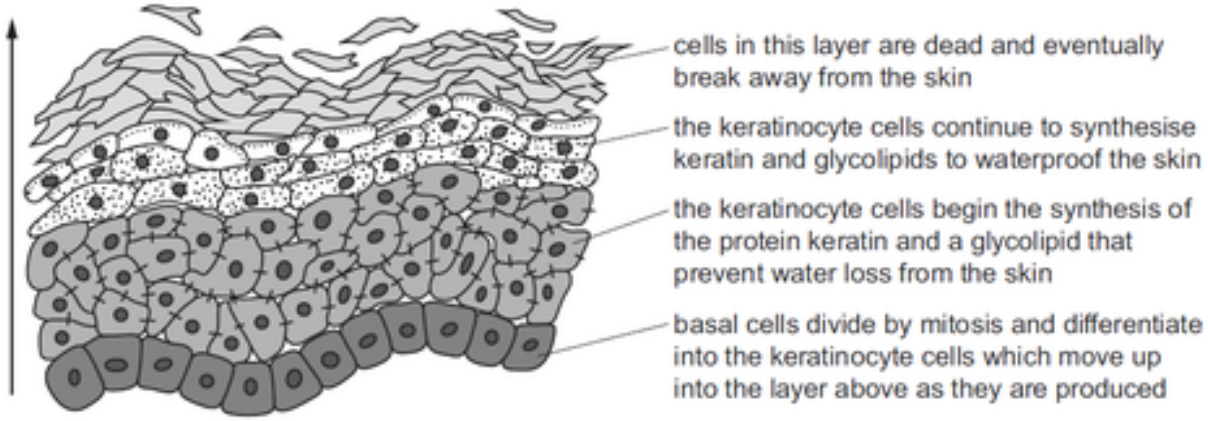
C Plasmodesmata and centrioles are found in all plant cells.

D Prokaryotic cells contain an endoplasmic reticulum to synthesise proteins.

14. Nov/2022/Paper_13/No.20

The diagram shows the epidermis of human skin. This is formed of four layers of cells.

Cells in each layer have specific functions which are outlined on the diagram. As the cells are produced, they move upwards as shown by the arrow.



Which row shows cells that are acting as stem cells in the skin epidermis and an organelle needed by the keratinocytes?

	cells that are acting as stem cells	organelle needed by the keratinocytes
A	basal cells only	centrioles
B	basal cells only	Golgi body
C	basal cells and keratinocytes	centrioles
D	basal cells and keratinocytes	Golgi body

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15. Nov/2022/Paper_21/No.1(a _ b)

(a) Fig. 1.1 is a transmission electron micrograph showing a section of a human liver cell.



Fig. 1.1

(i) Name organelles **A** and **B** shown in Fig. 1.1.

A .....

B .....

[2]

(ii) In liver cells, enzymes are attached to the membrane of smooth endoplasmic reticulum.

With reference to the functions of smooth endoplasmic reticulum, suggest the advantages of having enzymes attached to the membrane rather than free in the lumen.

.....

.....

.....

.....

.....

..... [3]

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(b) Explain the advantages of using a transmission electron microscope compared with a light microscope when viewing a liver cell.

.....

.....

.....

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.....

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..... [3]

[Total: 8]

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16. Nov/2022/Paper_22/No.2(a _ b)

Human cytomegalovirus (HCMV) is a common virus affecting humans. In people with a fully functioning immune system, infection by HCMV usually causes no, or only mild, symptoms.

Fig. 2.1**A** is a diagram of a section through HCMV. In Fig. 2.1**B**, only the outer part of HCMV is sectioned.

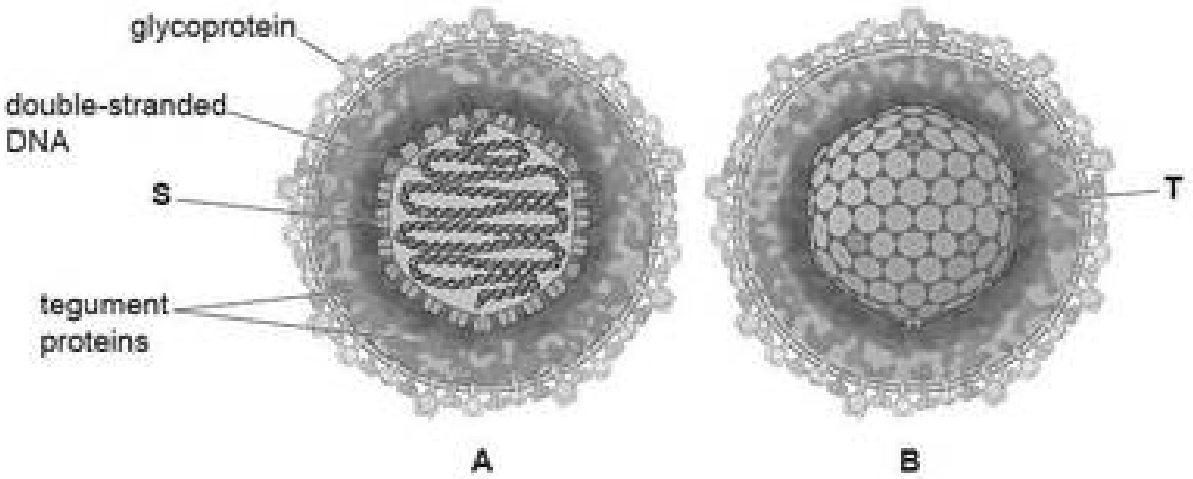


Fig. 2.1

The viral DNA shown in Fig. 2.1 contains genes that code for proteins important in viral replication and viral structure, including viral DNA polymerase and proteins known as tegument proteins.

Viruses can only replicate in host cells as they need to use processes and contents of the host cell. Complete viral particles that are released from the host cell are known as virions.

(a) Structure **S** in Fig. 2.1**A** is a subunit of structure **T** in Fig. 2.1**B**.

Name the chemical compound used to make structure **S and** name structure **T**.

S .....

T .....

[2]

(b) The actual diameter of the HCMV shown in Fig. 2.1 is 0.17 micrometres (μm).

Calculate the actual diameter of the virus in nanometres (nm).

..... [1]

(c) Suggest the role of viral DNA polymerase within the host cell.

..... [1]

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17. Nov/2022/Paper_22/No.5(b)

(b) After final processing in the Golgi body, collagen is released to the outer surface of the cell by exocytosis.

Complete the passage to describe the process of exocytosis.

After final processing in the Golgi body,

.....

.....

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.....

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.....

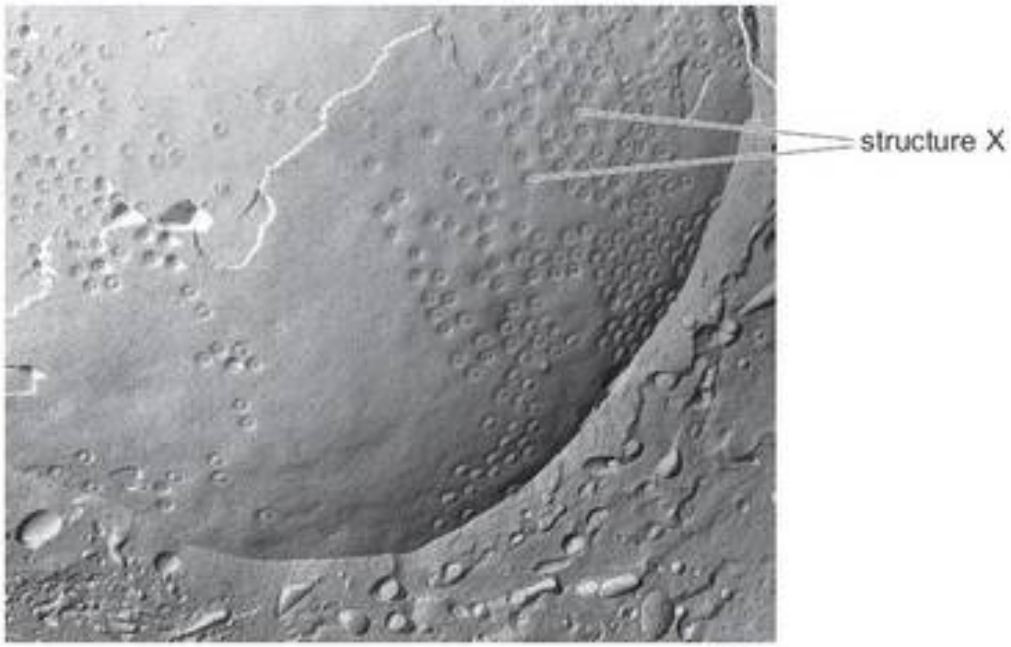
..... [3]

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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.



×20000

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.

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

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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

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

Which cells contain a tonoplast?

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

key

✓ = contain tonoplast

✗ = do not contain tonoplast

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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	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key

✓ = supports

✗ = does not support

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.

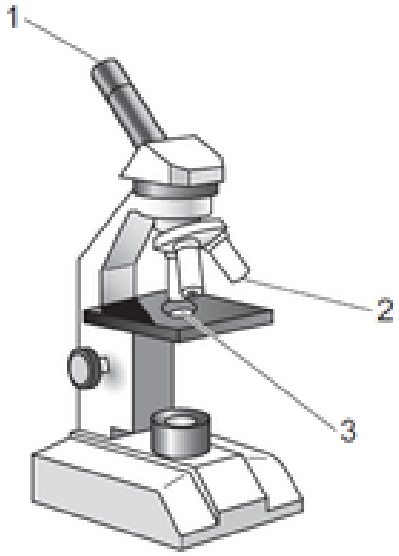
C The receptors for ligands are always found on the inside of cells.

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

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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.



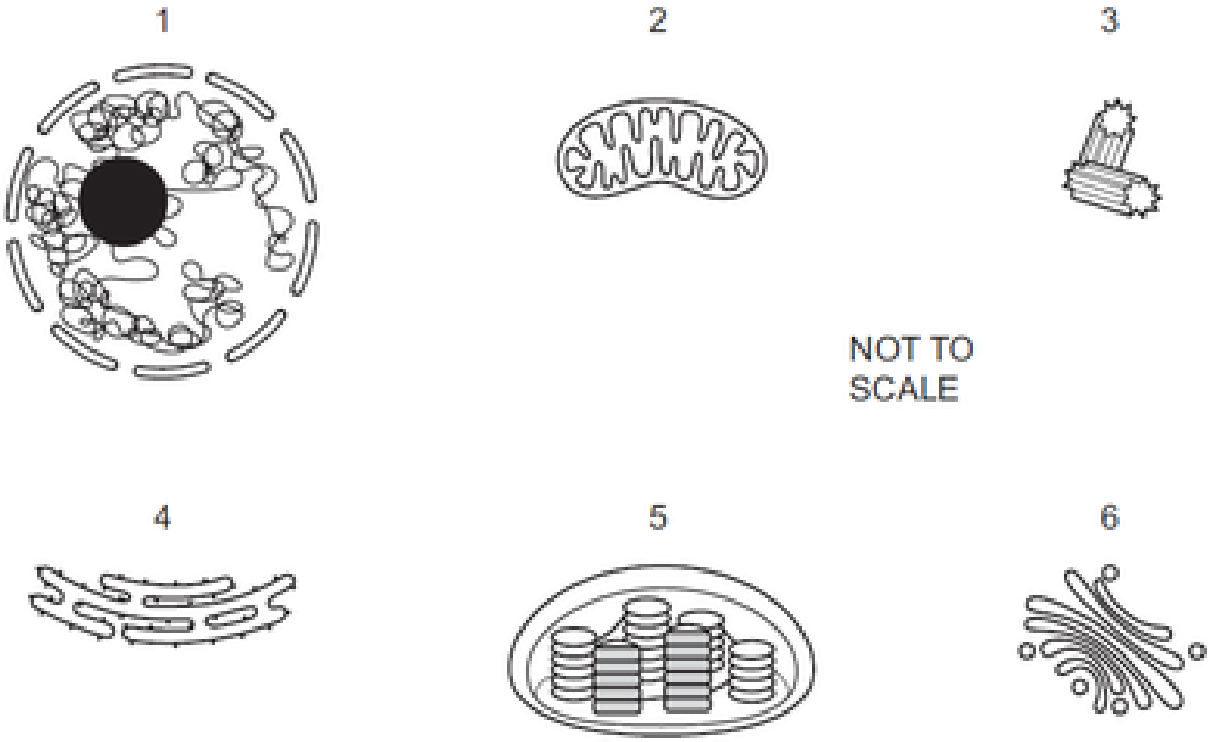
Which row shows the correct locations for the placement of a graticule and a micrometer scale on the microscope shown?

	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

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

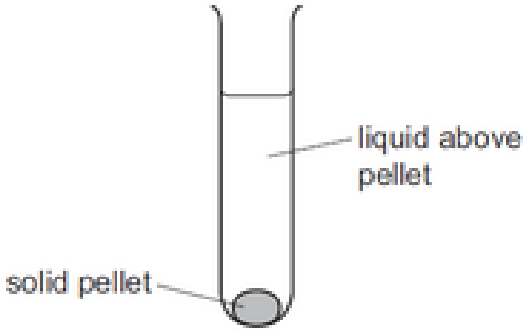
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12. June/2023/Paper_9700/12/No.4

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

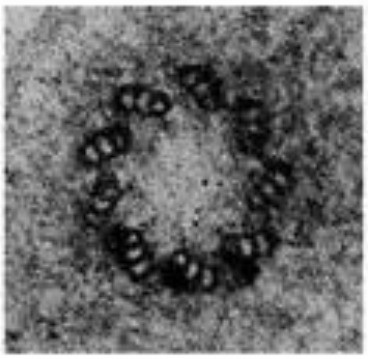
B *Paramecium* cell of diameter 200 μm

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

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

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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

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

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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*.

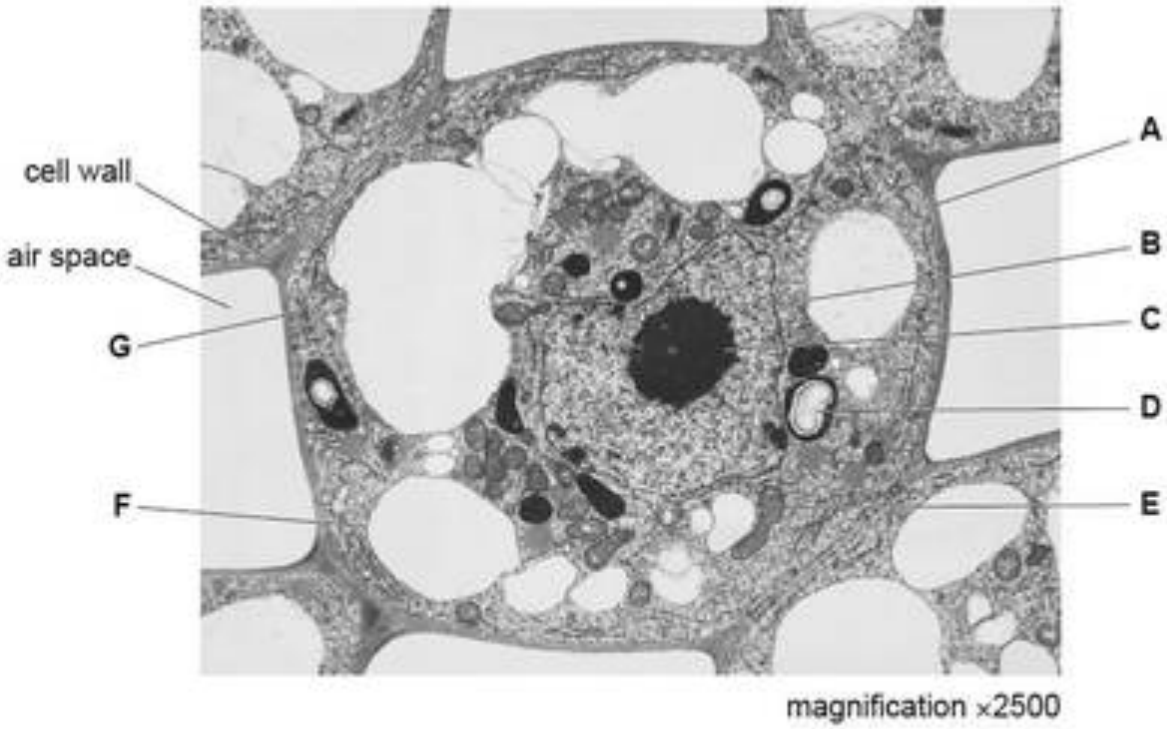


Fig. 1.1

(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.

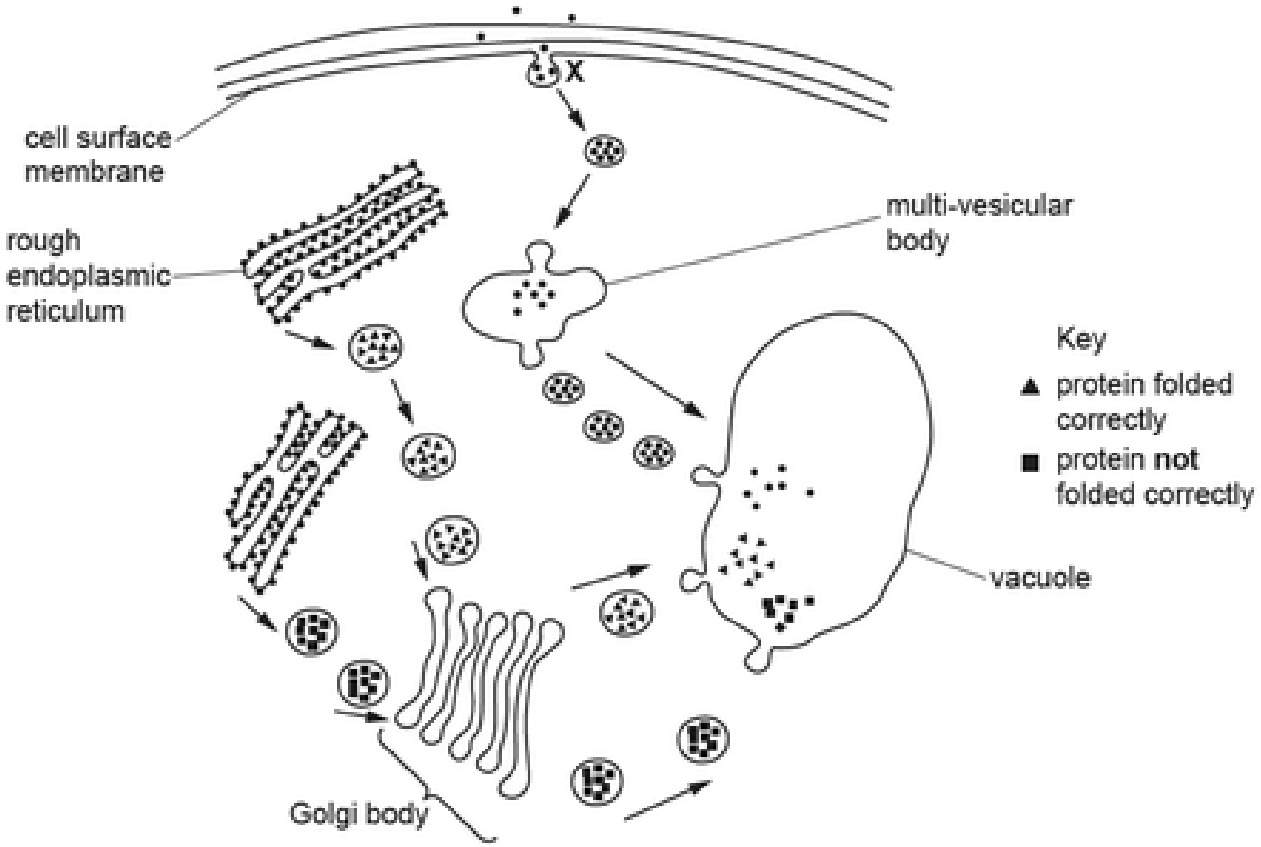


Fig. 1.2

(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.

.....

.....

.....

.....

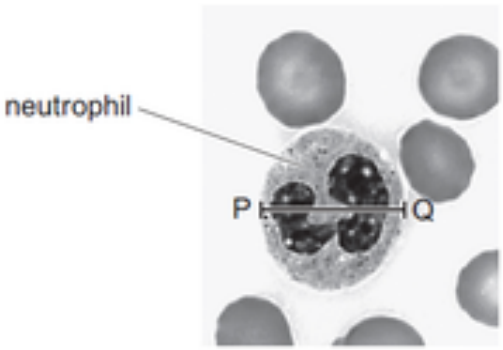
.....

..... [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

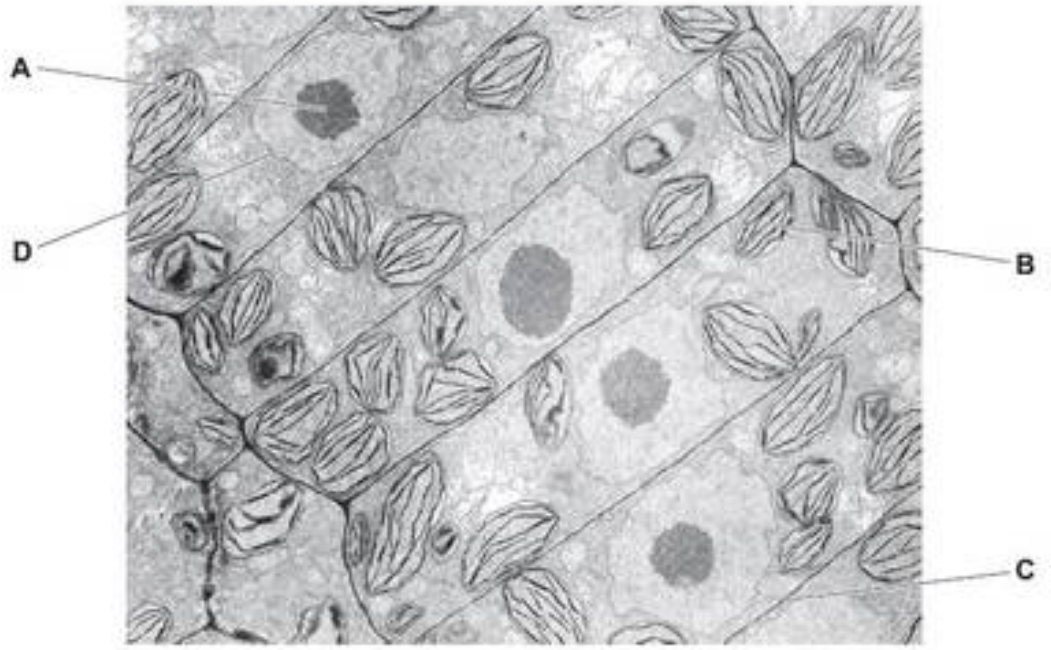
D 3 and 4 only

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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.

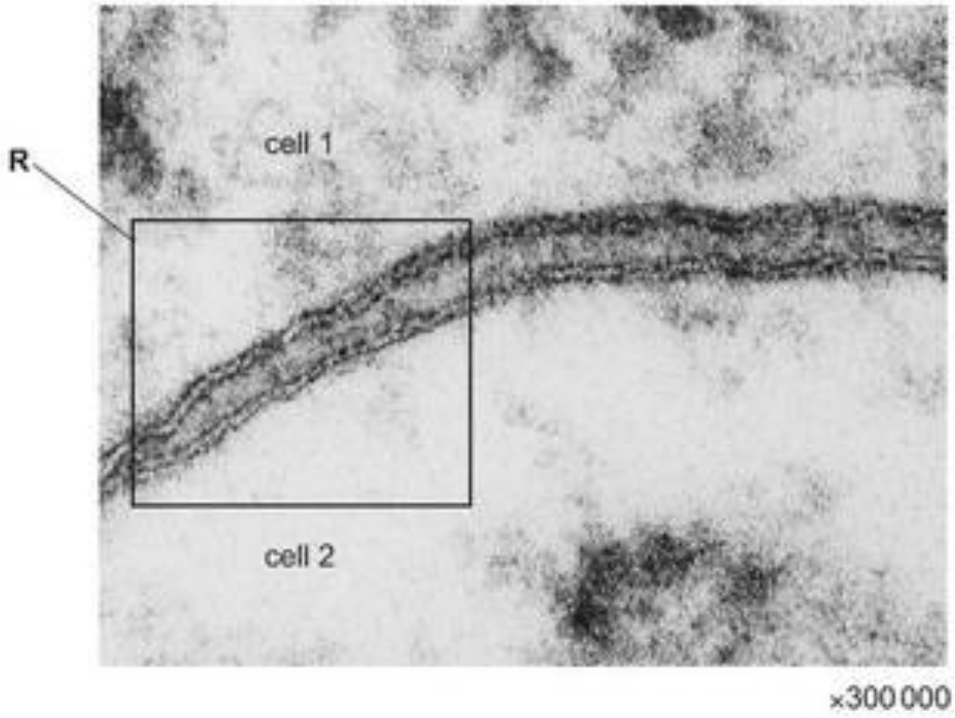


Fig. 1.1

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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Cell Structure – AS 9700 November 2023

1. Nov/2023/Paper_ 9700/11/No.1

Until recently, the typical viruses known to science were 20–150 nm in size.

In 2003, the Mimivirus was discovered with a size of approximately 680 nm.

In 2013, the Pandoravirus was discovered which has a size of over 1000 nm.

Which viruses can be seen using a light microscope with a maximum resolution of 0.25 µm **and** an electron microscope?

	typical virus	Mimivirus	Pandoravirus
A	✓	✓	✓
B	✗	✓	✓
C	✗	✗	✓
D	✗	✗	✗

key

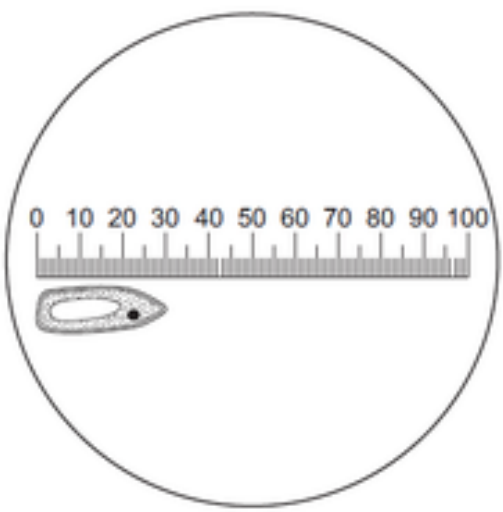
✓ = can be seen

✗ = cannot be seen

2. Nov/2023/Paper_ 9700/11/No.2

The diagram shows an eyepiece graticule and a cell viewed through a microscope. When the eyepiece graticule was calibrated at this magnification, the whole length of the graticule shown covered 12 divisions of a stage micrometer scale.

There were 100 divisions in 10 mm of the stage micrometer.



What is the actual length of the cell?

A 2.5 µm **B** 3.6 µm **C** 360 µm **D** 3 mm

3. Nov/2023/Paper_ 9700/11/No.3

Tay-Sachs disease results in a build-up of lipids in cells.

Which cell structure does **not** function correctly in this disease?

A Golgi body

B lysosome

C mitochondrion

D smooth endoplasmic reticulum

4. Nov/2023/Paper_ 9700/11/No.4

Which animal cells would have the most extensive Golgi bodies?

A ciliated epithelial cells

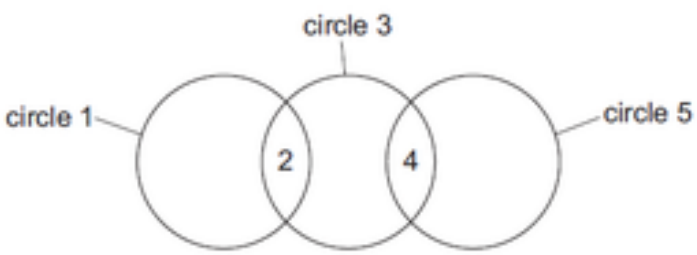
B goblet cells

C red blood cells

D smooth muscle cells

5. Nov/2023/Paper_ 9700/11/No.5

The diagram shows three circles, 1, 3 and 5, and the shared structures, 2 and 4.



Which row correctly identifies the three circles and some of the structures that are shared between them?

	circle 1	2	circle 3	4	circle 5
A	chloroplasts	circular DNA	mitochondria	80S ribosomes	prokaryotes
B	chloroplasts	80S ribosomes	mitochondria	circular DNA	prokaryotes
C	prokaryotes	circular DNA	mitochondria	circular DNA	chloroplasts
D	prokaryotes	70S ribosomes	chloroplasts	80S ribosomes	mitochondria

6. Nov/2023/Paper_ 9700/11/No.6

Which row about the genetic material in animal cells and prokaryotic cells is correct?

	animal cells contain linear DNA	prokaryotic genetic material is surrounded by a double membrane	prokaryotic genetic material is double-stranded DNA
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✗	✓

key

✓ = correct

✗ = not correct

7. Nov/2023/Paper_ 9700/11/No.7

What is present in **all** viruses?

A uracil

B ribose

C thymine

D guanine

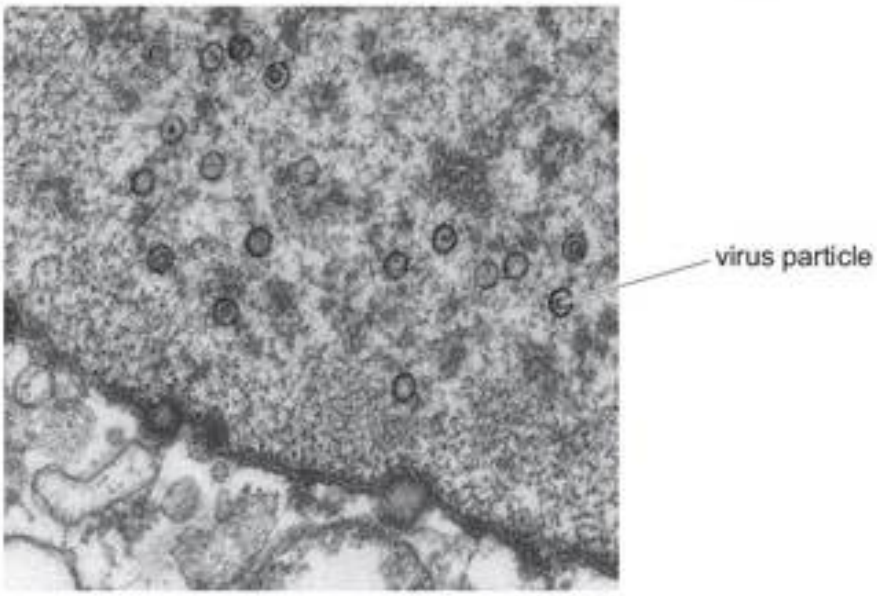
8. Nov/2023/Paper_ 9700/12/No.1

Which combination of lenses for a light microscope will give the greatest magnification?

	eyepiece lens	objective lens
A	×5	×100
B	×10	×40
C	×15	×40
D	×15	×100

9. Nov/2023/Paper_ 9700/12/No.2

The diagram shows an electron micrograph of virus particles in a human nucleus.



×24 000

What is the diameter of the labelled virus particle?

A 1.5×10^{0} µm

B 1.5×10^{-2} µm

C 1.5×10^{0} nm

D 1.5×10^{2} nm

10. Nov/2023/Paper_ 9700/12/No.3

What is correct about the synthesis and release of the glycoprotein mucin in goblet cells?

1 The protein is produced on ribosomes and a carbohydrate chain is added in the Golgi body.

2 The glycoproteins are packed into vesicles in the Golgi body forming lysosomes.

3 Secretory vesicles containing the glycoprotein move from the Golgi body and fuse with the cell surface membrane.

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

11. Nov/2023/Paper_ 9700/12/No.4

What are functions of microtubules?

1 allowing movement of cilia in a bronchus

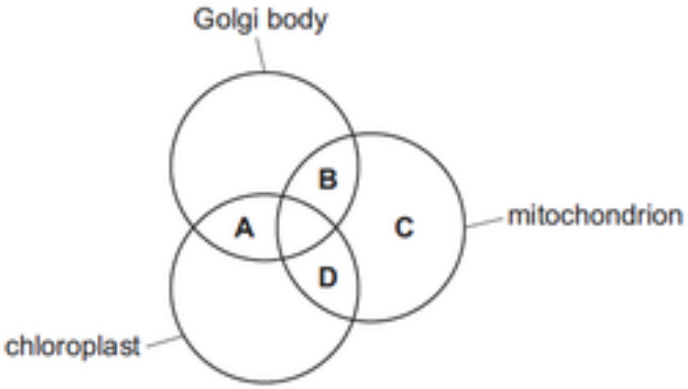
2 attachment to centromeres during metaphase

3 moving secretory vesicles around a cell

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

12. Nov/2023/Paper_ 9700/12/No.5

Which organelles contain nucleic acids?



13. Nov/2023/Paper_ 9700/12/No.6

Some features of cells are listed.

1 cell wall

2 cell surface membrane

3 ribosomes

Which features can be found in plant cells **and** in prokaryotic cells?

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

14. Nov/2023/Paper_ 9700/12/No.7

Which bonds are present in **all** viruses?

1 phosphodiester

2 peptide

3 covalent

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

15. Nov/2023/Paper_ 9700/12/No.8

A student carried out the Benedict's test on four different concentrations of glucose solution and then recorded the time taken for the first appearance of a colour change (the end-point).

The student found it difficult to identify the first appearance of a colour change and consistently timed each solution for two seconds after the colour change first appeared. This introduced a source of error into the experiment.

Which statements about this error are correct?

1 The effect of the error will be reduced if the student performs three repeats at each concentration of glucose.

2 The error will prevent the student from identifying which solution has the highest concentration of glucose.

3 The error is systematic as the student consistently timed each solution for two seconds after the end-point.

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

16. Nov/2023/Paper_ 9700/13/No.1

Which statement about light microscopy is correct?

A As the resolution increases, the magnification increases.

B As the magnification increases, the image always becomes clearer.

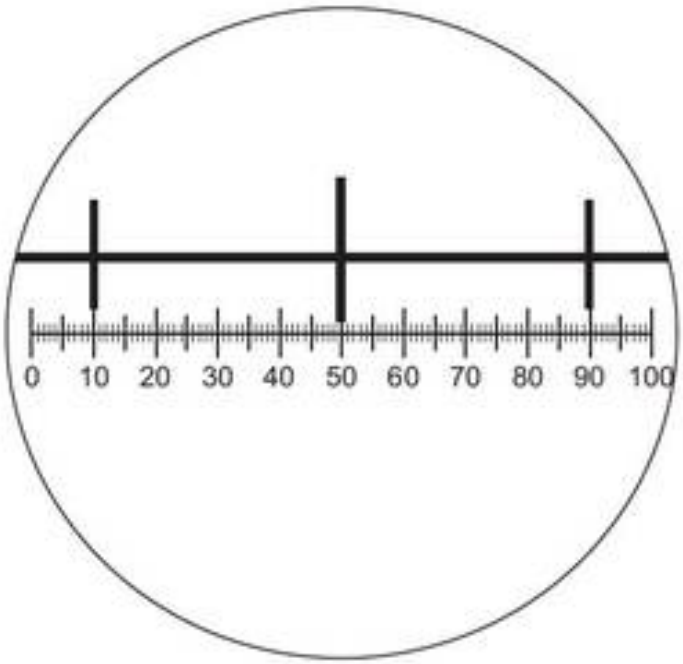
C The resolution will decrease as coloured light of increasing wavelengths is used.

D Magnification and resolution are terms that relate to the same factor.

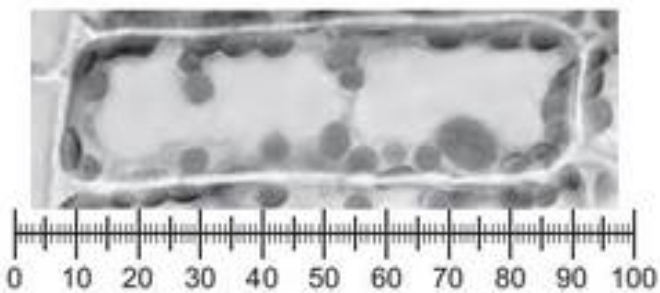
17. Nov/2023/Paper_ 9700/13/No.2

The diagram shows a stage micrometer scale viewed through an eyepiece containing a graticule.

The small divisions of the stage micrometer scale are 0.1 mm.



The stage micrometer scale is replaced by a slide of a plant cell.



What is the maximum actual length of the nucleus in the plant cell?

A 8 µm **B** 25 µm **C** 200 µm **D** 0.8 mm

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18. Nov/2023/Paper_ 9700/13/No.3

What is the correct order for the involvement of the cell structures in the synthesis and secretion of an enzyme?

1 cell surface membrane

2 Golgi body

3 nucleus

4 rough endoplasmic reticulum

A 1 → 2 → 3 → 4

B 2 → 1 → 3 → 4

C 3 → 4 → 2 → 1

D 4 → 3 → 2 → 1

19. Nov/2023/Paper_ 9700/13/No.4

Centrioles, cilia, microtubules and microvilli are structures found in eukaryotic cells.

Which statement about these cellular structures is correct?

A Centrioles, cilia and microvilli are composed of microtubules.

B Centrioles play a role in mitosis and semi-conservative DNA replication.

C Cilia and microvilli both increase the cell surface area for absorption.

D Microtubules are made of protein and form the spindle in mitosis.

20. Nov/2023/Paper_ 9700/13/No.5

Which description of plasmodesmata is correct?

A They are channels through plant cell walls, lined by the cell surface membrane.

B They are channels through plant cell walls that are formed from proteins.

C They are channels required for the movement of water through the apoplast pathway.

D They can become lignified and form pits in the walls of xylem vessel elements.

21. Nov/2023/Paper_ 9700/13/No.6

Which cell organelle does **not** have nucleic acids?

A chloroplast

B Golgi body

C mitochondrion

D ribosome

22. Nov/2023/Paper_ 9700/13/No.7

Which processes occur in eukaryotes **and** prokaryotes?

1 hydrolysis

2 mitosis

3 transcription

4 translation

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

23. Nov/2023/Paper_ 9700/13/No.8

Which bonds are present in **all** viruses?

1 covalent

2 ester

3 phosphodiester

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

24. Nov/2023/Paper_ 9700/21/No.2

Fig. 2.1 is a transmission electron micrograph showing a section of a specialised epithelial cell found in the lining of the stomach. This cell produces extracellular proteins that are released into the bloodstream.

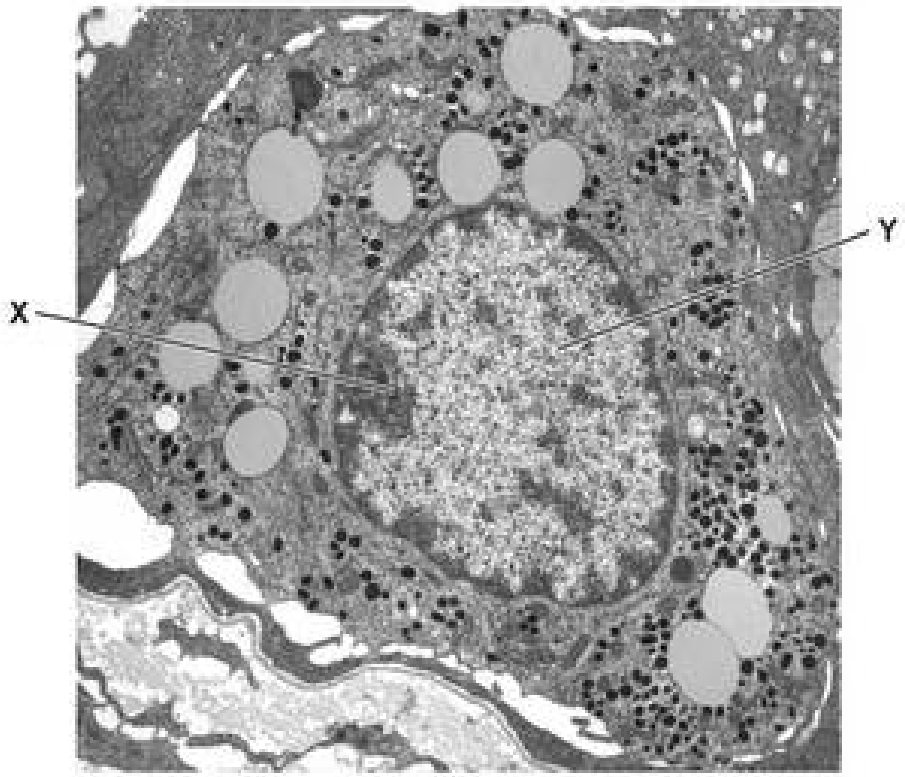


Fig. 2.1

(a) Outline the role of structure **X** and structure **Y**, as shown in Fig. 2.1, in the production of extracellular proteins.

structure **X** .....

.....

.....

structure **Y** .....

.....

.....

[2]

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(b) The cell in Fig. 2.1 releases ghrelin, a small protein that acts as a cell signalling molecule.

Fig. 2.2 shows the sequence of amino acids in a ghrelin molecule.

The amino acid serine (Ser) in position 3 in Fig. 2.2 has been modified by the addition of a saturated fatty acid chain.

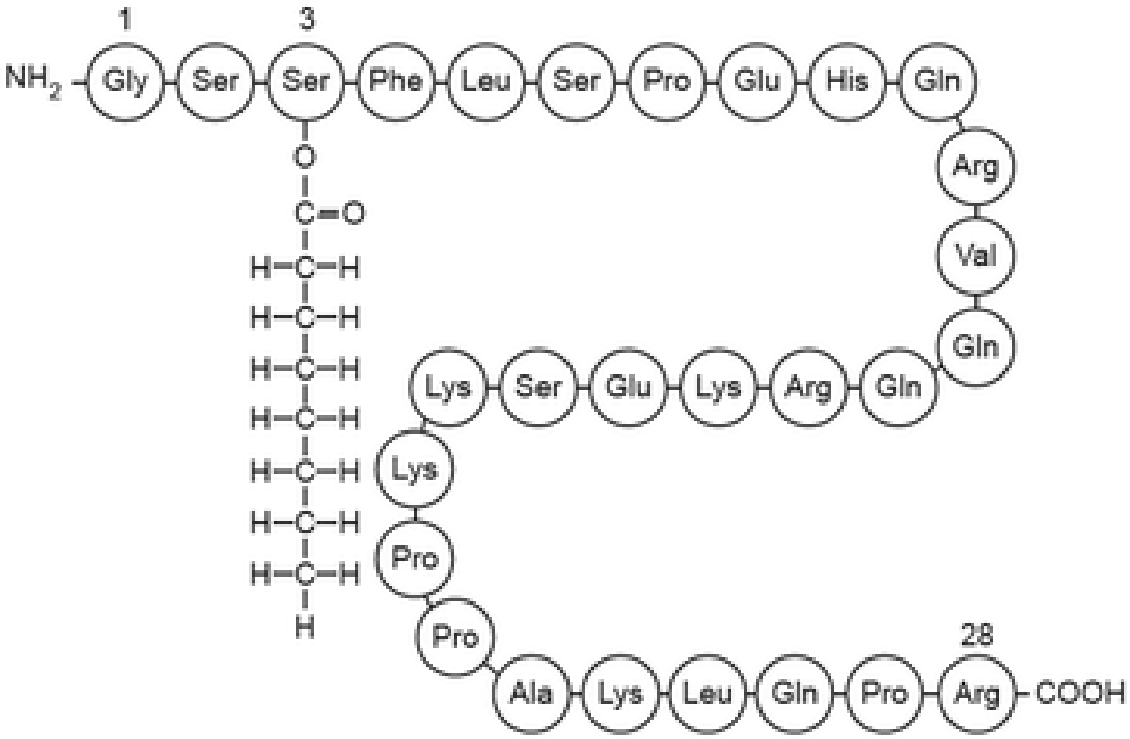


Fig. 2.2

(i) State the level of protein structure shown in Fig. 2.2.

..... [1]

(ii) State **one** similarity between the structure of a saturated fatty acid molecule and an amino acid molecule.

.....

.....

..... [1]

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(iii) The addition of the fatty acid chain allows ghrelin to function as a cell signalling molecule.

Suggest how the addition of this fatty acid chain allows a ghrelin molecule to act as a cell signalling molecule.

.....

.....

.....

.....

.....

.....

..... [3]

(c) Scientists have discovered that the gene coding for ghrelin contains 5000 base pairs. This is a much larger number of base pairs than is needed to code for the ghrelin molecule shown in Fig. 2.2.

(i) Calculate the percentage of base pairs found in the gene that codes for the ghrelin molecule shown in Fig. 2.2.

Show your working and give your answer to one decimal place.

..... [2]

(ii) The primary transcript produced from the ghrelin gene is a longer molecule than the mRNA found in the cytoplasm.

Explain how the primary transcript is modified before translation.

.....

.....

.....

.....

..... [2]

[Total: 11]

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25. Nov/2023/Paper_ 9700/22/No.1

During interphase and mitosis of the cell cycle, the chromosomes within a cell go through a number of changes. Each chromosome is composed of DNA complexed with proteins.

(a) In interphase, individual chromosomes are too diffuse (long and thin) to be visible using a microscope. In this stage, the chromosomal material is known as chromatin.

State the term used to describe the proteins that are complexed with DNA and form part of chromatin.

..... [1]

(b) When viewed through a microscope, a chromosome is most clearly visible during the metaphase stage of mitosis.

Complete Fig. 1.1 to produce a labelled diagram of the metaphase stage of mitosis in an **animal** cell with **two** chromosomes.

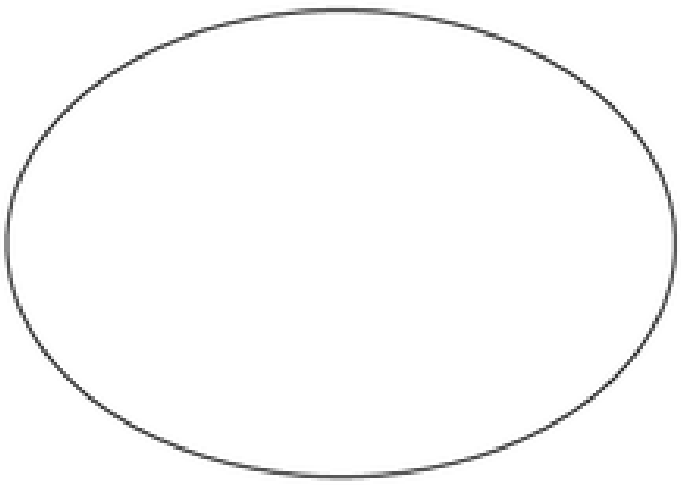


Fig. 1.1

[3]

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(c) Outline the changes that occur to the structure and behaviour of a chromosome:

- from the start of the S phase to the end of interphase
- during prophase of mitosis.

.....

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 7]

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