

**Cambridge Assessment
International Education**

AS Level | 9700

BIOLOGY

TOPICAL P1

With Answer Keys

All Variants

Question Bank from 2016 to 2023

Classified in 11 Chapter and 64 Sub-topics

Questions Order New to Old

References of repeated Questions added

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Chapter 1

CELL STRUCTURE

A Level

Biology Topical Paper 1

Iram Habib Malik



In this chapter

You will read the following topics:

1.1: The Microscope in cell Studies

1.1.1: Microscopes, Magnification and units

1.1.2: Microscopy with stage micrometer and eyepiece graticule scale

1.2: Cells as the Basic Units of Living Organisms

1.2.1: Organelles

1.2.2: ATP

1.2.3: Prokaryotic cell

1.2.4: Virus

STUDENTS RESOURCE

Topic 1.1.1: Microscopes, Magnification and Units

2023

9700/13/M/J/23/Q1

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

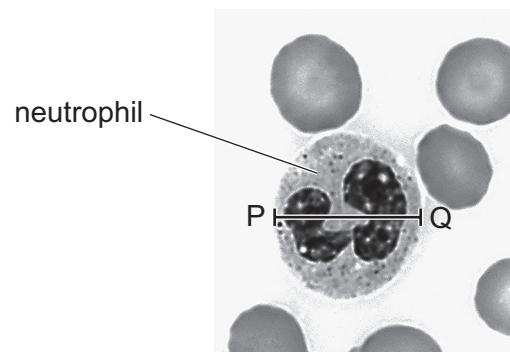
- A DNA molecule of diameter 2 nm
- B *Paramecium* cell of diameter 200 μm
- C phospholipid bilayer of width 8 nm
- D ribosome of diameter 20 nm

9700/12/F/M/23/Q1

2 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)?

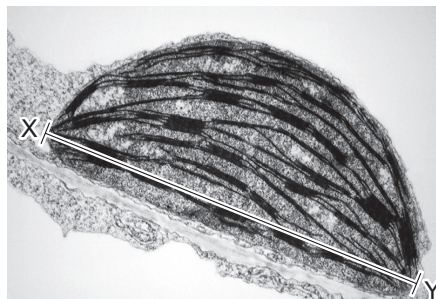
- A $\frac{\text{length of line PQ in mm} \times 1000}{\text{magnification of photomicrograph}}$
- B $\frac{\text{length of line PQ in mm} \times 10\,000}{\text{magnification of photomicrograph}}$
- C $\frac{\text{magnification of photomicrograph}}{\text{length of line PQ in mm} \times 1000}$
- D $\frac{\text{magnification of photomicrograph}}{\text{length of line PQ in mm} \times 10\,000}$



2022

9700/13/O/N/22/Q1

3 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 $\times 6.3$
- B $\times 63$
- C $\times 630$
- D $\times 6300$

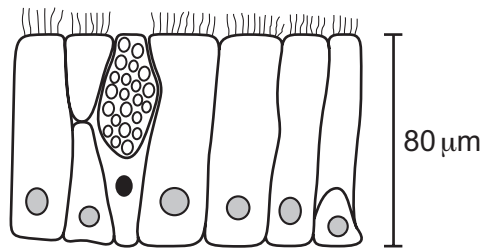
9700/11/O/N/22/Q1

- 4 The photomicrograph shows part of a plant cell.



What is the magnification of the cell?

- A ×250 B ×400 C ×1000 D ×4000
- 5 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

2021

9700/12/O/N/21/Q1

- 6 A scale bar on an electron micrograph is 2 cm long and represents an actual length of 1 μm.

What is the magnification of the electron micrograph?

- A ×200 B ×2000 C ×20 000 D ×200 000

STUDENTS RESOURCE

9700/11/O/N/21/Q2

7 Which equations correctly show the relationship between magnification, image size and actual size in microscopy?

1 magnification = $\frac{\text{image size}}{\text{actual size}}$

2 magnification = $\frac{\text{actual size}}{\text{image size}}$

3 actual size = $\frac{\text{image size}}{\text{magnification}}$

4 actual size = $\frac{\text{magnification}}{\text{image size}}$

A 1 and 3

B 1 and 4

C 2 and 3

D 2 and 4

9700/13/M/J/21/Q1

8 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

9700/12/M/J/21/Q2

9 The mean width of mitochondria in an electron micrograph is 6 mm.

The magnification of the electron micrograph is ×9600.

What is the actual mean width of the mitochondria?

A 6×10^{-3} mm

B 6×10^{-4} mm

C 6×10^{-2} μm

D 6×10^3 μm

9700/11/M/J/21/Q2

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

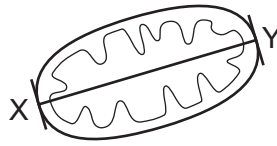
What happens to the magnification and resolution when using green light compared to red light?

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

STUDENTS RESOURCE

9700/11/M/J/21/Q1

- 11 The diagram shows a mitochondrion drawn from an electron micrograph.

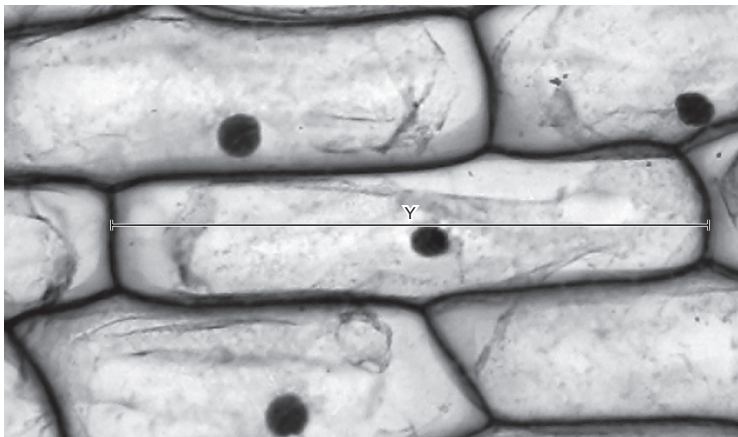


The actual length of the mitochondrion, using the line X–Y, is 3000 nm.
What is the magnification of the drawing of the mitochondrion?

- A $\times 100$ B $\times 1000$ C $\times 10\,000$ D $\times 100\,000$

9700/11/F/M/21/Q1

- 12 The photomicrograph shows onion cells.



The actual length of the onion cell labelled Y is $350\ \mu\text{m}$.
What is the magnification of the photomicrograph?

- A $\times 2.5$ B $\times 25$ C $\times 40$ D $\times 400$

2020

9700/13/O/N/20/Q1

- 13 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

9700/13/O/N/20/Q2

- 14 The actual diameter of a prokaryotic cell is $0.5\ \mu\text{m}$. An electron micrograph of the cell has a magnification of $\times 50\,000$.

What is the diameter of the cell in the image?

- A $2.5 \times 10^{-1}\ \text{mm}$ B $2.5 \times 10^0\ \text{mm}$ C $2.5 \times 10^1\ \text{mm}$ D $2.5 \times 10^2\ \text{mm}$

9700/12/O/N/20/Q1

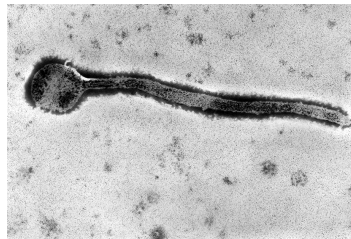
- 15 The size of the measles virus, *Morbillivirus*, is approximately 150 nm. The *Mimivirus* is approximately 4.5 times larger than *Morbillivirus*, whilst the *Pandoravirus* is approximately 1.5 times larger than the *Mimivirus*. Which viruses can be seen using a light microscope with a maximum resolution of 0.25 μm and using an electron microscope?

	<i>Morbillivirus</i>	<i>Mimivirus</i>	<i>Pandoravirus</i>
A	✓	✓	✓
B	x	✓	✓
C	x	x	✓
D	x	x	x

key
 ✓ = can be seen
 x = cannot be seen

9700/12/O/N/20/Q2

- 16 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

9700/13/M/J/20/Q1

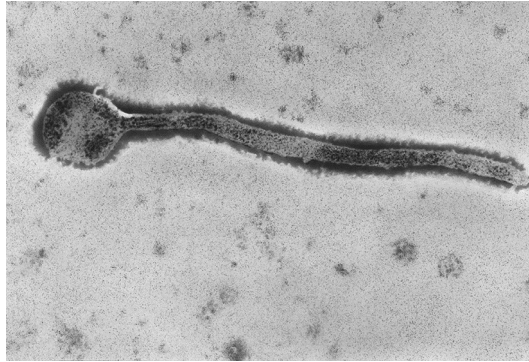
- 17 A student was given a photomicrograph of a cell and told the magnification of the image. The student was asked to calculate the actual size of the cell. Which row in the table explains how to do this?

	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	$I \times M$

STUDENTS RESOURCE

9700/12/M/J/20/Q2

- 18 The electron micrograph shows a type of virus at a magnification of $\times 30\,000$.



What is the length of the virus?

- A 2.2×10^3 nm C 2.2×10^1 nm
B 2.2×10^2 nm D 2.2×10^0 nm

9700/12/M/J/20/Q1

- 19 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

9700/11/M/J/20/Q3

- 20 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 $\times 10$ B $\times 40$ C $\times 100$ D $\times 1000$

2019

9700/13/O/N/19/Q2

- 21 How many nanometres are there in one millimetre?

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

9700/12/O/N/19/Q2

22 The diameter of living cells varies considerably.

The diameter of a typical eukaryotic cell is $1.5 \times 10^1 \mu\text{m}$.

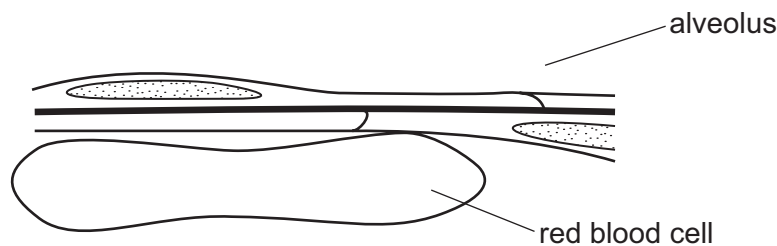
The diameter of a typical prokaryotic cell is $7.5 \times 10^2 \text{nm}$.

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 <i>Streptococcus</i> 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

9700/11/O/N/19/Q3

23 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 $\times 5000$.



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

9700/13/M/J/19/Q1

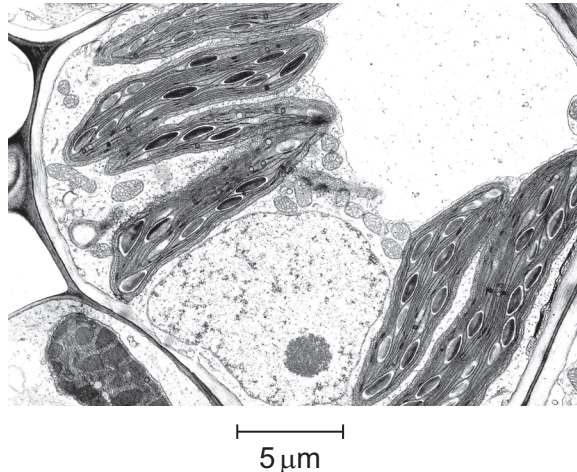
24 Which combination of lenses for a light microscope will give the greatest magnification?

	eyepiece lens	objective lens
A	$\times 5$	$\times 100$
B	$\times 10$	$\times 40$
C	$\times 15$	$\times 40$
D	$\times 15$	$\times 100$

STUDENTS RESOURCE

9700/13/M/J/19/Q2

- 25 The photomicrograph shows some mesophyll tissue from a dicotyledonous leaf.



What is the magnification of the photomicrograph?

- A $\times 280$ B $\times 2800$ C $\times 3570$ D $\times 7000$

9700/12/M/J/19/Q1

- 26 The actual length of a cell structure is $8 \mu\text{m}$.

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 C steps 2, 3 and 5
 B steps 1, 4 and 6 D steps 2, 4 and 5

9700/12/M/J/19/Q2

- 27 What is the typical resolution of a microscope using daylight as a light source with a $\times 10$ eyepiece lens and a $\times 40$ objective lens?

- A 0.20 nm B 200 nm C $100 \mu\text{m}$ D $400 \mu\text{m}$

STUDENTS RESOURCE

9700/11/M/J/19/Q1

- 28 A student was told that the actual length of a cell structure is $5\ \mu\text{m}$.
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 $r \times s \times t$

2018

9700/12/O/N/18/Q2

- 29 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

9700/12/M/J/18/Q2

- 30 Which of these statements about light microscopy are correct?

- The greater the resolution of a light microscope, the greater the detail that can be seen.
- The greater the magnification of a light microscope, the greater the detail that can be seen.
- Increasing the magnification of a light microscope up to its limit of resolution allows more detail to be seen.
- 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 C 1 and 2 only
B 1, 3 and 4 only D 4 only

9700/11/M/J/18/Q1

31 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

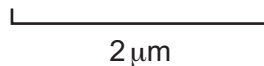
9700/11/M/J/18/Q3

32 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 C 5 × 10¹ mm
 B 5 × 10⁰ mm D 5 × 10² mm

9700/12/F/M/18/Q2

33 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

9700/12/F/M/18/Q3

34 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

STUDENTS RESOURCE

2017

9700/13/O/N/17/Q1

- 35 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.

9700/12/O/N/17/Q1

- 36 Which equation for calculating the actual size of a specimen, A, or image size, I, or magnification, M, is correct?
- A $A = M \div I$ B $A = I \times M$ C $I = M \div A$ D $M = I \div A$

9700/11/O/N/17/Q4

- 37 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

9700/12/M/J/17/Q3

- 38 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*

9700/11/M/J/17/Q4

- 39 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

9700/11/M/J/17/Q1

- 40 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

9700/12/F/M/17/Q2

- 41 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 $\times 40$ to $\times 400$?
- A $2\ \mu\text{m}$ B $20\ \mu\text{m}$ C 200 nm D 2000 nm

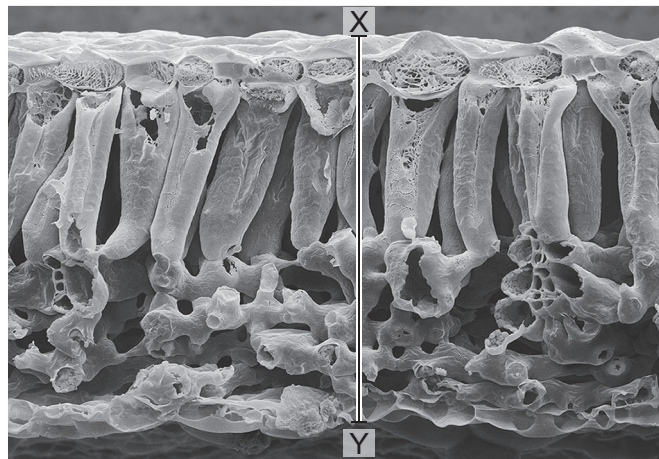
2016

9700/13/O/N/16/Q3

- 42 Which calculation is used to find the actual length of an organelle from an image?
- A image size \div magnification
 - B image size \times magnification
 - C image size \times resolution
 - D magnification \div image size

9700/12/O/N/16/Q2

- 43 This electron micrograph of a section of a leaf has a magnification of $\times 210$.



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

- A $2.43\ \mu\text{m}$ B $24.3\ \mu\text{m}$ C $243.0\ \mu\text{m}$ D $2430\ \mu\text{m}$

9700/12/O/N/16/Q1

44 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	x	✓	✓
C	x	x	✓
D	x	x	x

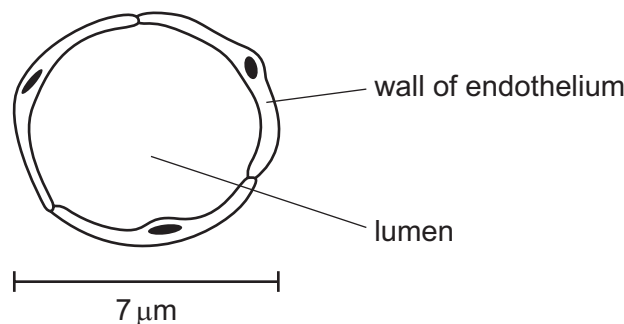
key

✓ = can be seen

x = cannot be seen

9700/11/O/N/16/Q1

45 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

9700/12/M/J/16/Q1

46 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

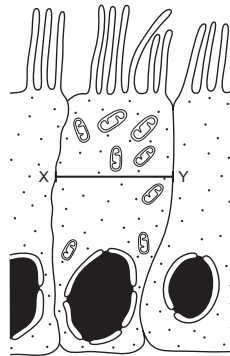
D image size in mm × 1000 divided by the magnification

STUDENTS RESOURCE

9700/11/M/J/16/Q2

- 47 The drawing from an electron micrograph shows a ciliated epithelial cell, magnified $\times 1500$, 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
- 9700/12/F/M/16/Q1
- 48 A student has drawn a cell structure as seen using a light microscope.

The magnification of the drawing is $\times 600$.

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

What is the actual length of the cell structure?

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

STUDENTS RESOURCE

Topic 1.1.2: Microscopy with Stage Micrometer and Eyepiece Graticule Scale

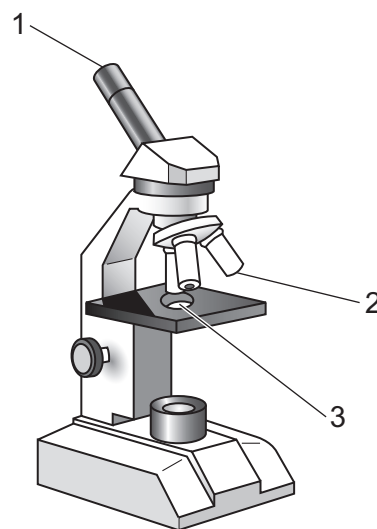
2023

9700/12/M/J/23/Q1

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

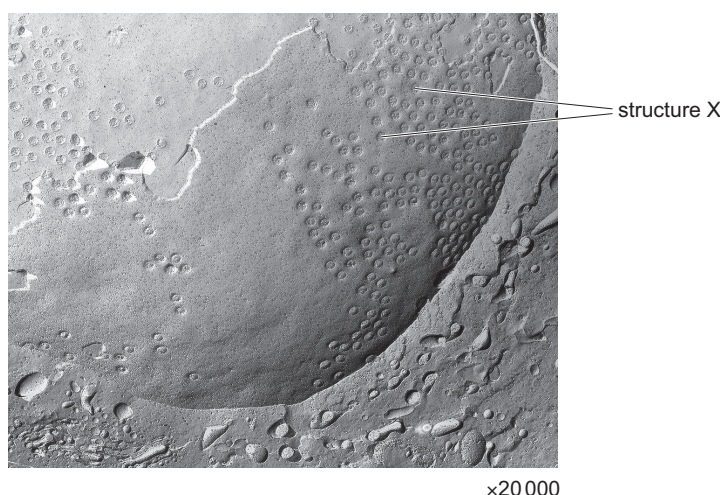
Which row shows the correct locations for the placement of a graticule and a micrometer scale on the microscope shown?

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



9700/11/M/J/23/Q1

- 2 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.



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.

9700/12/F/M/23/Q4

- 3 The electron micrograph shows some cells from a root.
Which cell structure is **not** usually found in cells from a root?



9700/12/F/M/23/Q2

- 4 A student calibrated an eyepiece graticule using a stage micrometer.
- Each division of the stage micrometer was 0.01 mm.
 - With a $\times 10$ magnification objective lens, 10 eyepiece graticule units matched 10 divisions on the stage micrometer.

The same microscope was used with a $\times 40$, instead of a $\times 10$, 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.

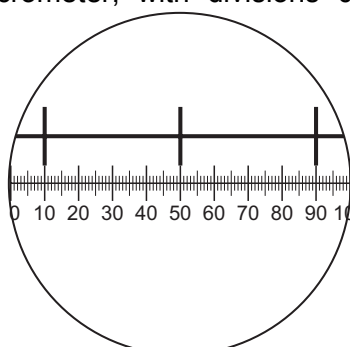
What is the best estimate for the diameter of the alveolus?

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

2022

9700/12/O/N/22/Q1

- 5 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.

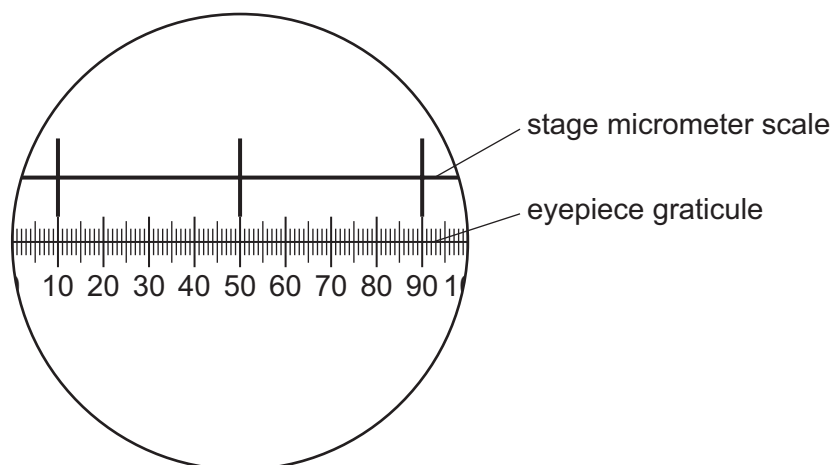
Which answer has been rounded correctly to an appropriate number of significant figures?

- A** 0.04909 mm^2 **B** $5 \times 10^{-2} \text{mm}^2$ **C** $4.909 \times 10^4 \mu\text{m}^2$ **D** $4.91 \times 10^4 \mu\text{m}^2$

9700/11/M/J/22/Q1

- 6** 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

2021

9700/12/O/N/21/Q2

- 7** The eyepiece of a microscope is fitted with an eyepiece graticule and a stage micrometer scale is placed on the microscope.

Which statements about the stage micrometer scale are correct?

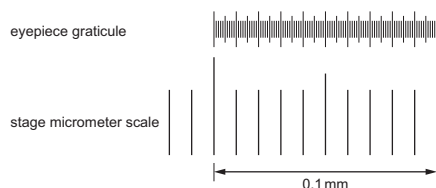
- 1 The scale can be used to measure the actual length of cells directly.
- 2 The scale allows you to calibrate the eyepiece graticule.
- 3 Less of the scale is visible as the objective lens changes from $\times 10$ to $\times 40$.

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

STUDENTS RESOURCE

9700/13/M/J/21/Q2

- 8 The diagram shows an eyepiece graticule and part of a stage micrometer scale as seen using $\times 100$ magnification.



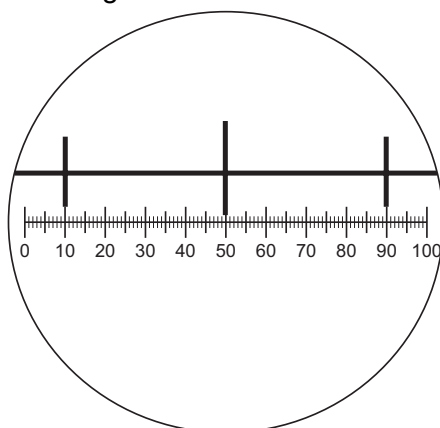
Which is the correct method for calculating the value of one eyepiece graticule unit in micrometres (μm)?

- A divide 100 by 0.1 then multiply by 1000
- B divide 100 by 0.1 then multiply by 1000 divided by 100
- C multiply 0.1 by 1000 then divide by 100
- D multiply 0.1 by 1000 then divide by 100 then divide again by 100

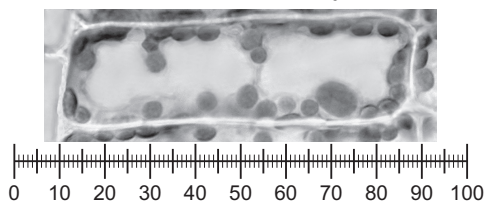
2020

9700/11/O/N/20/Q2

- 9 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.



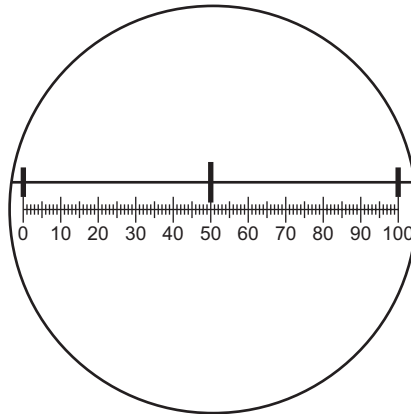
What is the actual length of the nucleus in the plant cell?

- A $8 \mu\text{m}$
- B $25 \mu\text{m}$
- C $200 \mu\text{m}$
- D 0.8 mm

STUDENTS RESOURCE

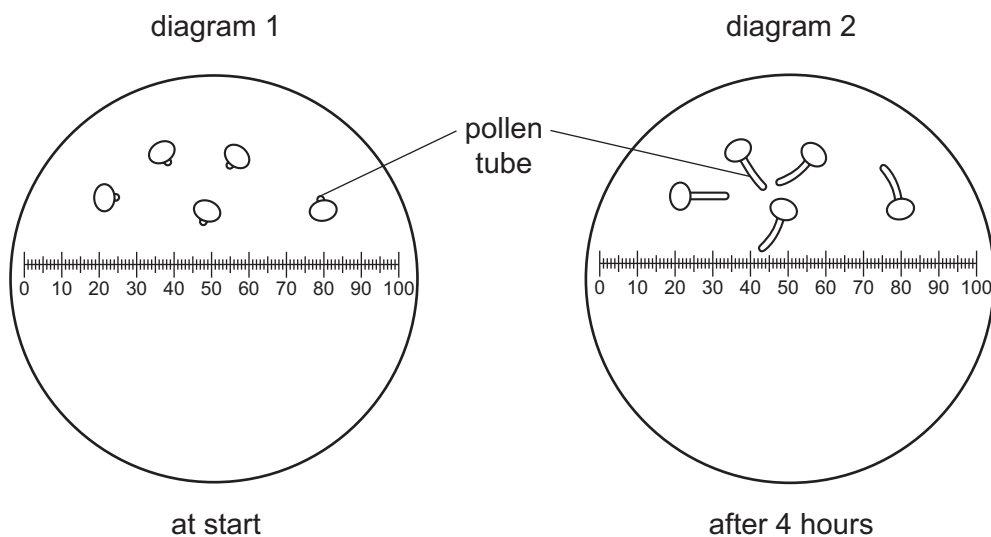
9700/11/M/J/20/Q4

- 10 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?

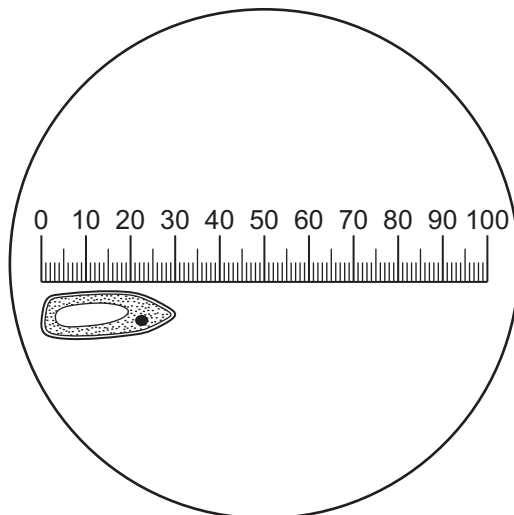
- A** $5\ \mu\text{mh}^{-1}$ **B** $10\ \mu\text{mh}^{-1}$ **C** $5\ \text{mmh}^{-1}$ **D** $10\ \text{mmh}^{-1}$

STUDENTS RESOURCE

9700/12/F/M/20/Q1

- 11 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

2019

9700/12/O/N/19/Q1

- 12 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

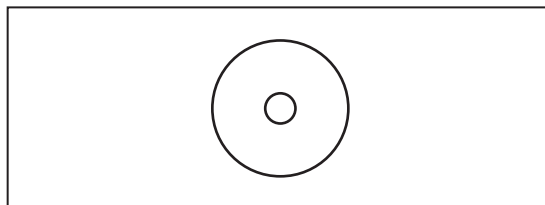
- A 1 and 3 B 2 and 3 C 2 only D 3 only

STUDENTS RESOURCE

2018

9700/11/O/N/18/Q2

- 13 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 $\times 40$. 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 $\times 40$ '.

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 $\times 40$.
 - D The image size in the drawing was smaller than $\times 40$.
- 9700/13/M/J/18/Q1
- 14 Which steps are needed to find the actual width of a xylem vessel viewed in transverse section using a $\times 10$ objective lens?
- 1 Convert from mm to μm by multiplying by 10^{-3} .
 - 2 Calibrate the eyepiece graticule using a stage micrometer on $\times 4$ 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

9700/11/M/J/18/Q2

- 15 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 $\times 40$ 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

9700/12/F/M/18/Q1

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

Which of these statements about eyepiece graticules are correct?

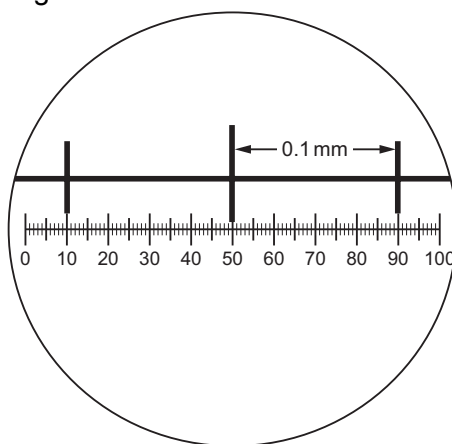
- 1 They measure the actual length of cells in micrometres.
- 2 They help biologists to draw cells with correct proportions.
- 3 They change in size when the objective lens is changed from $\times 10$ to $\times 40$.

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

2017

9700/13/O/N/17/Q2

17 The diagram shows a stage micrometer scale viewed with an eyepiece graticule, using a magnification of $\times 200$.



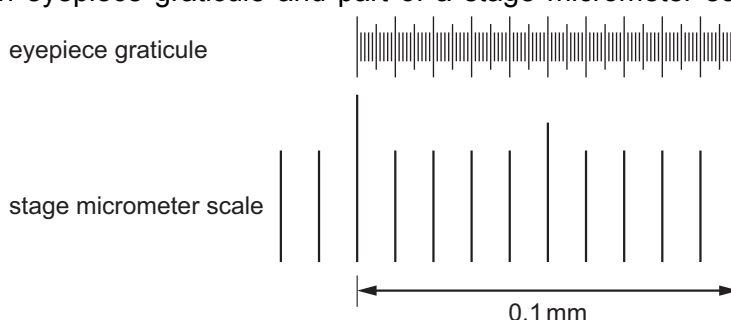
Using the same magnification, a chloroplast is measured as 4 eyepiece graticule divisions long.

How long is the chloroplast?

A $1.0 \times 10^1 \mu\text{m}$ **B** $4.0 \times 10^2 \mu\text{m}$ **C** $2.5 \times 10^{-1} \mu\text{m}$ **D** $2.5 \times 10^{-2} \mu\text{m}$

9700/13/M/J/17/Q2

18 The diagram shows an eyepiece graticule and part of a stage micrometer scale as seen using $\times 100$ magnification.

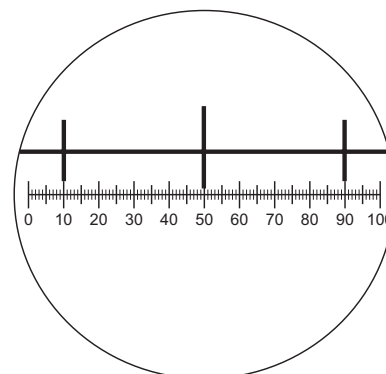


How is the value, in μm , of one eyepiece graticule unit calculated?

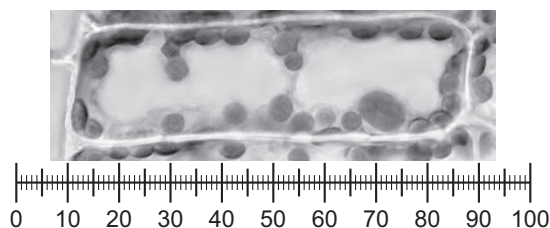
- A** divide 100 by 0.1 and multiply by 1000
- B** divide 100 by 0.1 and multiply by 1000 divided by 100
- C** multiply 0.1 by 1000 and divide by 100
- D** multiply 0.1 by 1000 and divide by 100 then divide again by 100

9700/12/F/M/17/Q3

- 19 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.



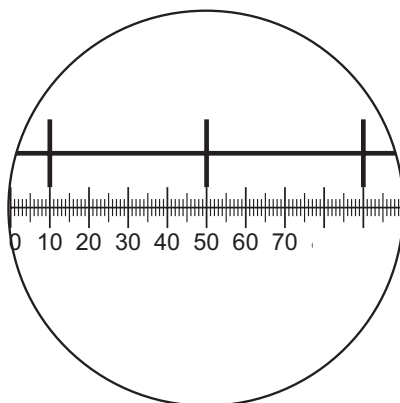
What is the length of the nucleus in the plant cell?

- A 0.8 mm B $8\ \mu\text{m}$ C $25\ \mu\text{m}$ D $200\ \mu\text{m}$

2016

9700/12/O/N/16/Q4

- 20 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? ($\pi = 3.14$)

- A $\pi \times 12.5 \times 12.5 = 4.9 \times 10^2\ \mu\text{m}^2$ C $\pi \times 125 \times 125 = 4.9 \times 10^4\ \mu\text{m}^2$
 B $\pi \times 50 \times 50 = 7.9 \times 10^3\ \mu\text{m}^2$ D $\pi \times 250 \times 250 = 2.0 \times 10^5\ \mu\text{m}^2$

9700/13/M/J/16/Q1

- 21 An eyepiece graticule can be calibrated using a stage micrometer. What is the correct reason why an eyepiece graticule is calibrated?

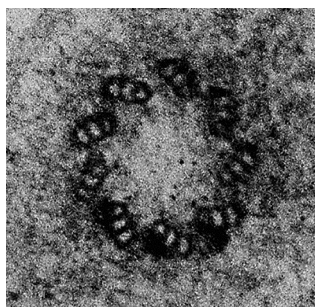
- A An eyepiece graticule can be used to make measurements.
 B An eyepiece graticule is magnified by the objective lens.
 C An eyepiece graticule magnifies the specimen.
 D An eyepiece graticule makes comparisons.

Topic 1.2.1: Organelles

2023

9700/13/M/J/23/Q2

- 1 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

9700/13/M/J/23/Q3

- 2 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

9700/11/M/J/23/Q2

- 3 Which cell structures can form vesicles?

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

key
 ✓ = can form vesicles
 ✗ = cannot form vesicles

STUDENTS RESOURCE

9700/11/M/J/23/Q3

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 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

9700/11/M/J/23/Q4

5 Which cells contain a tonoplast?

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

key
 ✓ = contain tonoplast
 x = do not contain tonoplast

9700/11/M/J/23/Q5

6 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