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

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

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

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	✗	✗	✗	✓

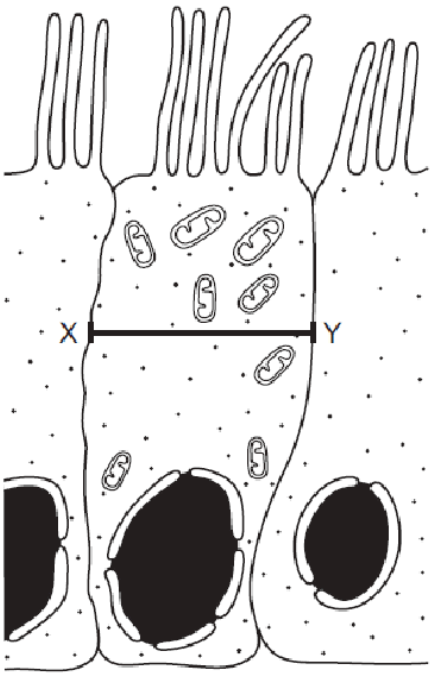
key

✓ = clearly visible

✗ = not clearly visible

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

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

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

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

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

A endocytotic vesicles

B Golgi body

C lysosomes

D mitochondria

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.

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*

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

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

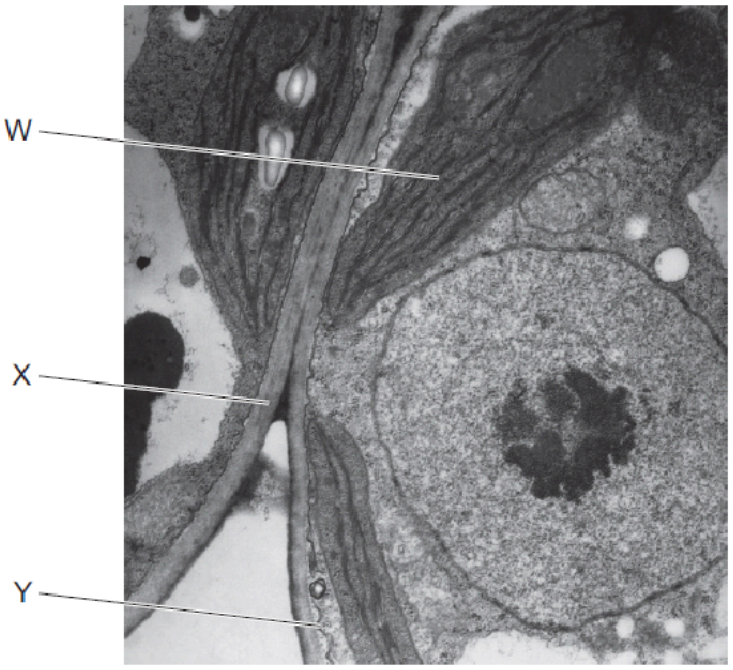
A the actual size of an object multiplied by the magnification of the microscope

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

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

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

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

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.

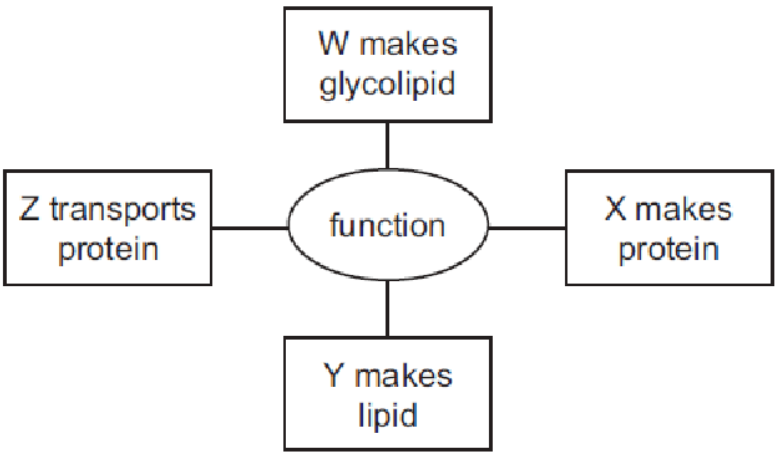
A 1, 2, 3 and 4

B 1 and 2 only

C 2, 3 and 4 only

D 3 and 4 only

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

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

4 When mucus is secreted from a goblet cell these events take place.

1 addition of carbohydrate to protein

2 fusion of the vesicle with the cell surface membrane

3 secretion of a glycoprotein

4 separation of a vesicle from the Golgi body

What is the sequence in which these events take place?

A $1 \rightarrow 4 \rightarrow 2 \rightarrow 3$

B $1 \rightarrow 4 \rightarrow 3 \rightarrow 2$

C $4 \rightarrow 1 \rightarrow 2 \rightarrow 3$

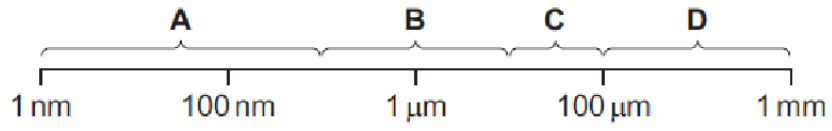
D $4 \rightarrow 1 \rightarrow 3 \rightarrow 2$

5 Which row could be correct for a virus?

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

key
✓ = present
✗ = not present

6 Which size range would include most prokaryotic cells?



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

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

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

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?

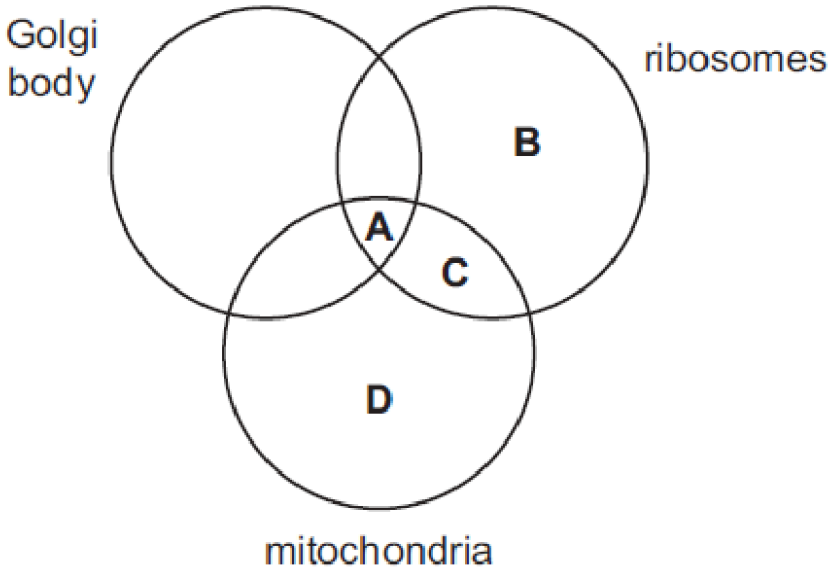
	plasmodesmata	glycogen granules	Golgi body	mitochondria
A	✓	✓	✗	✗
B	✓	✗	✓	✓
C	✗	✓	✓	✓
D	✗	✗	✓	✓

key

✓ = present

✗ = absent

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



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?

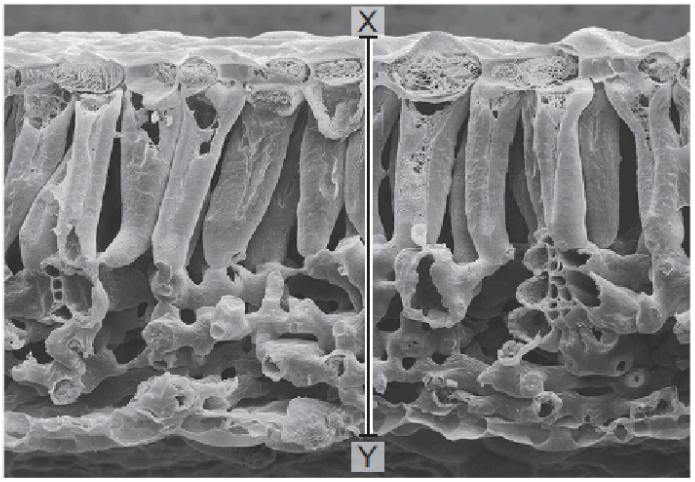
	typical virus	Mimivirus	Pandoravirus
A	✓	✓	✓
B	✗	✓	✓
C	✗	✗	✓
D	✗	✗	✗

key

✓ = can be seen

✗ = cannot be seen

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

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

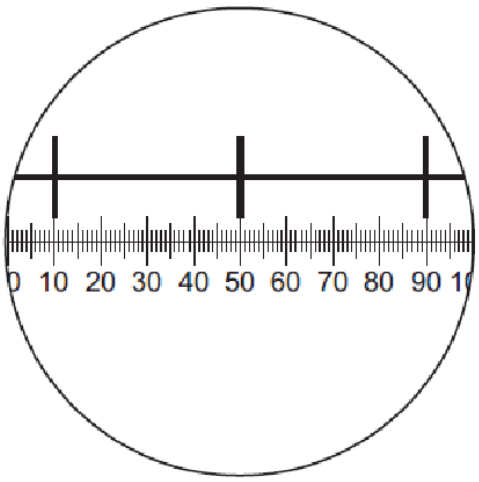
A nucleolus → ribosome → Golgi body → vesicle

B nucleolus → smooth endoplasmic reticulum → lysosome → vesicle

C nucleus → rough endoplasmic reticulum → Golgi body → vesicle

D nucleus → smooth endoplasmic reticulum → lysosome → vesicle

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)

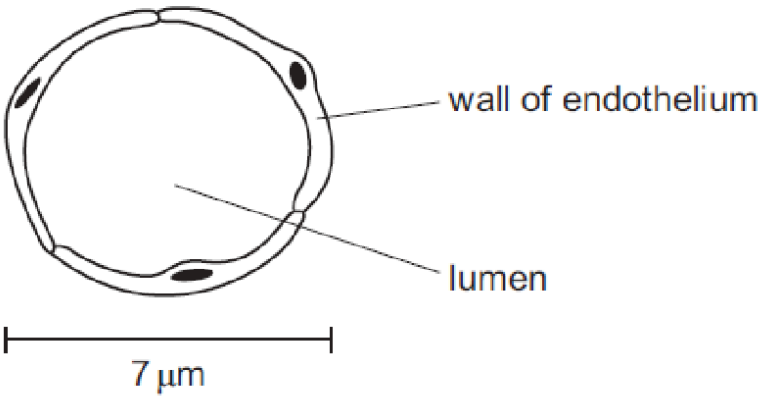
A $\pi \times 12.5 \times 12.5 = 4.9 \times 10^2\ \mu m^2$

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

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

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

3 Which parts of a cell contain ribosomes?

1 chloroplast

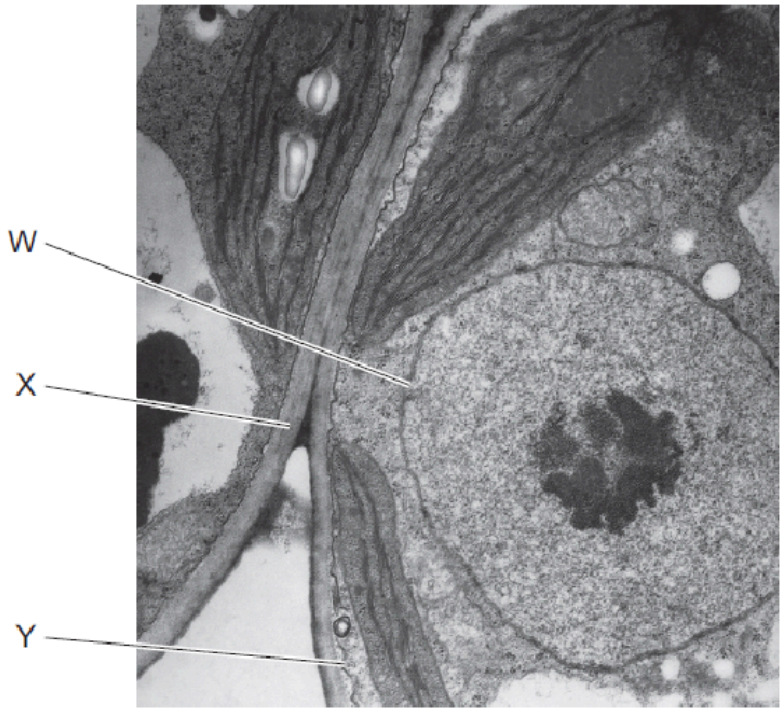
2 mitochondrion

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

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

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