

GCSE Biology (9 – 1)

Microscopy and Magnification

Name:

Group:

Instructions

- Read each question carefully before you begin to answer it.
- Use black ink or black ball-point pen for your answers.
- Fill in the boxes at the top of this page with your name and group.
- Attempt to answer every question in the booklet.
- Answer the questions in the spaces provided – there may be more space than you need in some answer spaces.
- Calculators may be used for this booklet.
- For any calculations, you **must** show all your working.
- Any and all drawings or graphs should be completed in pencil.



For markers use	
Question	Mark
1	/3
2	/6
3	/6
4	/6
5	/5
6	/6
7	/8
Total	/40
%	
Grade	

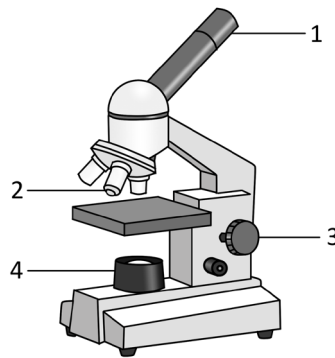
Information

- The maximum mark for this paper is 40 marks.
- The marks for each question are shown in brackets.
- Please be aware that good English and clear presentation are required in your answers.



1. Microscopes are essential tools in biology, enabling scientists to observe and study microscopic life.

a) The figure below shows a typical light microscope. Which label is pointing to the objective lenses?



Circle the letter of the correct answer.

A – 1

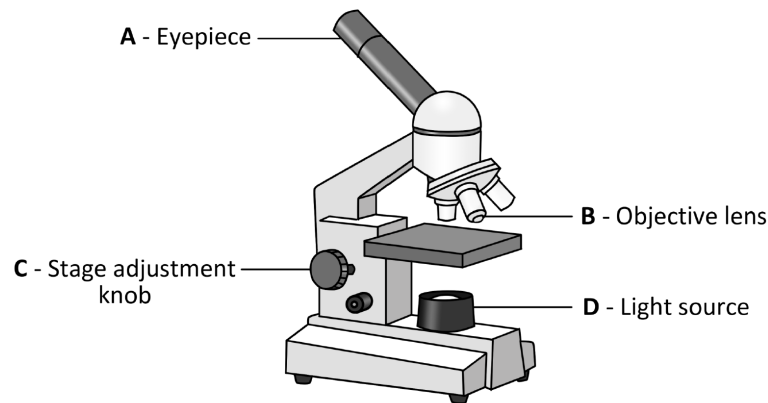
B – 2

C – 3

D – 4

(1 mark)

b) A student labelled a light microscope for a homework assignment. The figure below shows the student's work. Circle the letter of the correct answer.



Which label is incorrect?

A

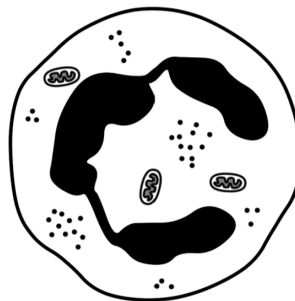
B

C

D

(1 mark)

c) The figure below shows a phagocytic cell that has been magnified 2500 times. The image diameter of the cell is 25mm. What is the actual diameter of the cell?



Circle the letter of the correct answer.

A – 10 mm

B – 10 μ m

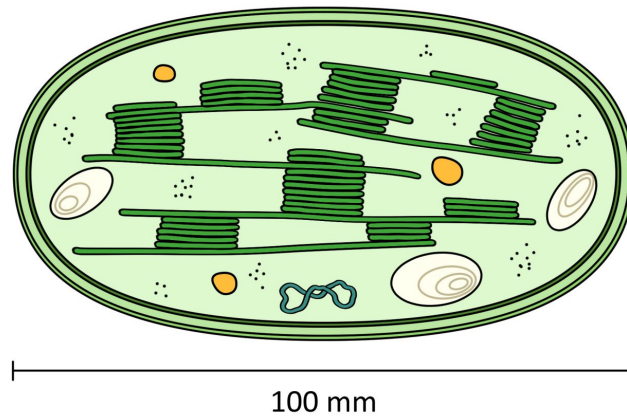
C – 12mm

D – 12 μ m

(1 mark)

(Total for Question 1 is 3 marks)

2. The figure below shows the structure of a chloroplast as seen using an electron microscope. The figure has been magnified 12500 times.



- a) What is the function of a chloroplast within a cell?

.....

 (1 mark)

- b) Convert 85 mm into μm .

.....
 (1 mark)

- c) Calculate the actual size of the chloroplast in the figure above. Give your answer to 3 significant figures.

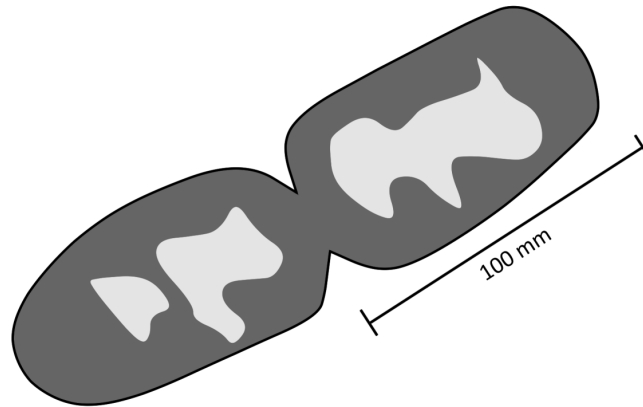
Use the equation:

$$\text{Magnification} = \frac{\text{image size}}{\text{actual size}}$$

Actual size = ... unit:
 (4 marks)

(Total for Question 2 is 6 marks)

3. The figure below shows a sample of Escherichia coli (E. coli) as seen under an electron microscope. The image has been magnified 50000 times.



- a) Why is an electron microscope used to see E. coli bacteria rather than a light microscope?

.....

(1 mark)

The figure shows E. coli bacteria dividing. Some species of bacteria are capable of dividing and doubling their numbers after just 20 minutes.

- b) Identify the process by which bacteria divide and increase in number.

.....

(1 mark)

- c) Calculate the actual size of **one** of the E. coli bacteria in the figure above. Give your answer to 3 significant figures.

Use the equation:

$$\text{Magnification} = \frac{\text{image size}}{\text{actual size}}$$

Actual size = ... unit:

(4 marks)

(Total for Question 3 is 6 marks)

4. A student is preparing a sample of onion cells to viewed under a light microscope. The figure below shows some of the apparatus used by the student.



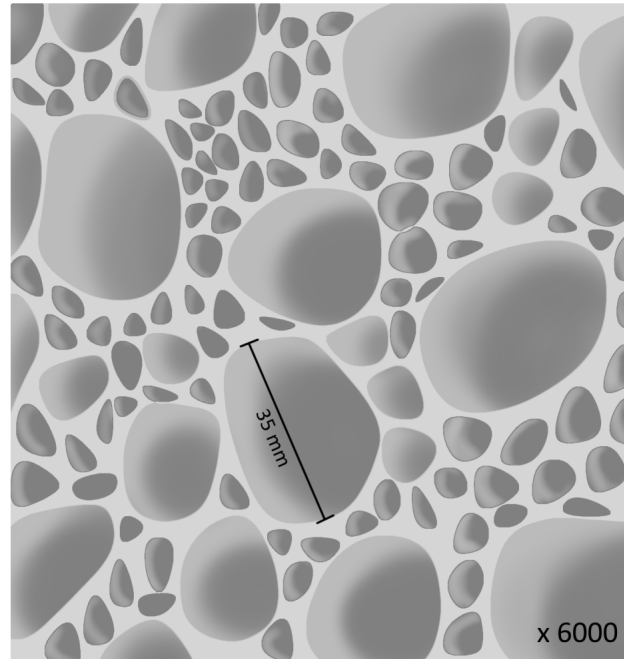
Describe the steps the student would need to take to be able to view the onion cells using the light microscope.

[illegible]

(6 marks)

(Total for Question 4 is 6 marks)

5. The figure below shows an electron micrograph showing a section through the vascular bundle of a leaf. The xylem tissue is visible in this section.



- a) Xylem tissue is found in the stems and leaves of plants.
State the function of xylem tissue within plants.

.....

(1 mark)

- b) Calculate the actual diameter of the xylem vessel from the figure above.
Give your answer to 3 significant figures.

Use the equation:

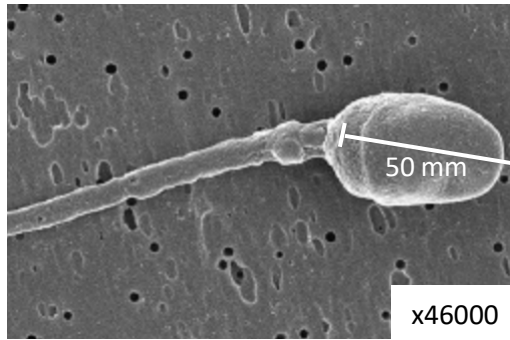
$$\text{Magnification} = \frac{\text{image size}}{\text{actual size}}$$

Actual size = ... unit:

(4 marks)

(Total for Question 5 is 5 marks)

6. The figure below shows a human sperm cell as seen under an electron microscope.



Sperm cells contain a haploid nucleus in the head section.

a) What is a haploid nucleus?

.....
.....

(1 mark)

b) State the type of cell division that produces sperm cells.

.....
.....

(1 mark)

c) Calculate the actual diameter of the head of the sperm cell from the figure above.
Give your answer to 3 significant figures.

Use the equation:

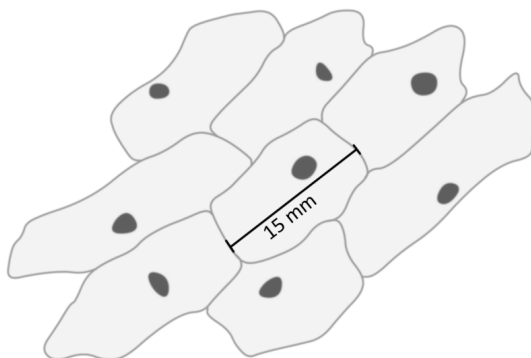
$$\text{Magnification} = \frac{\text{image size}}{\text{actual size}}$$

Actual size = ... unit:

(4 marks)

(Total for Question 6 is 6 marks)

7. A student views some plant cells under a light microscope. The figure below shows the image that the student can see.



The eyepiece of the light microscope has a magnification of x10 and the objective lens used has a magnification of x100.

- a) Calculate the magnification of the image of the plant cells above.

.....

.....

.....

.....

(2 marks)

The cells in the image above were stained before the student looked at them.

- b) Why were the cells stained?

.....

.....

.....

.....

(2 marks)

- c) Calculate the actual length of the numbered plant cell in the figure above.
Give your answer to 3 significant figures.

Use the equation:

$$\text{Magnification} = \frac{\text{image size}}{\text{actual size}}$$

Actual size = ... unit:

(4 marks)

(Total for Question 7 is 8 marks)