

# Foundation Support Workbook

## AQA GCSE Combined Science Biology topics

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### Answers

## Looking at cells with a microscope

- Cells can be studied using light microscopes and electron microscopes.
- An electron microscope can magnify more than a light microscope. (They can make cells look much bigger.)
- An electron microscope also has a higher resolving power. (They show more detail.)
- Cells contain small structures that do different jobs.
- Bacterial cells are much smaller and simpler than plant and animal cells.

1. Where in the cell do most chemical reactions take place?

Tick one box.

- Cell membrane
- Cytoplasm
- Nucleus

[1 mark]

2. Draw **one** line from each cell structure to the correct information about the structure.

Cell structure	Job
Nucleus	Where respiration takes place
Cell membrane	Controls the activities of the cell and contains DNA
Mitochondria	Where proteins are produced
Ribosomes	Controls the transport of substances into and out of the cell

[4 marks]

3. Name **two** cell structures from the list in question 1 that are not found in bacterial cells.

1 \_\_\_\_\_ 2 \_\_\_\_\_

4. Complete the sentence. Use a word from the box.

Some parts of a cell can such as \_\_\_\_\_ can only be seen with an electron microscope.

- Cell membrane    Nucleus    Ribosomes

[1 mark]

5. Complete the sentence. Use a word from the box.

The electron microscope shows more detail than a light microscope. This is because the electron microscope has a higher \_\_\_\_\_.

- Resolving power    Magnification

[1 mark]

## Sizes of cells and cell parts

- Magnification =  $\frac{\text{size of image}}{\text{size of real object}}$
- You can calculate the actual object size if you know the size of an image and the magnification.
- The size of cells and cell parts is in micrometres ( $\mu\text{m}$ ) or nanometres (nm).
- In standard form,  $\frac{1}{1000}$  is  $1 \times 10^{-3}$ ,  $\frac{1}{1000000}$  is  $1 \times 10^{-6}$  and  $\frac{1}{1000000000}$  is  $1 \times 10^{-9}$

1. A student looks at a plant cell using a light microscope.

The size of the image is 20 mm across. The actual size of cell is 0.02 mm.

Calculate the magnification of the image.

Use the equation: Magnification =  $\frac{\text{image size}}{\text{actual size}}$

Show Me Magnification =  $\frac{20 \text{ mm}}{0.02 \text{ mm}}$

Magnification = \_\_\_\_\_

[2 marks]

**Support**

Don't forget the  $\times$  sign.

2. A student looks at their own hair using a light microscope.

The size of the image is 0.75 cm. The actual hair has a width of 0.1 mm.

Calculate the magnification of the image.

Use the equation: Magnification =  $\frac{\text{image size}}{\text{actual size}}$

Show Me  $1 \text{ cm} = 10 \text{ mm}$  so  $0.75 \text{ cm} = 7.5 \text{ mm}$

Magnification =  $\frac{7.5}{0.1}$

Magnification = \_\_\_\_\_

[2 marks]

**Support**

To use the equation you need to convert the measurements to the same units.

**Support**

Check your answer is sensible. If the magnification is less than 1 you have made a mistake! Magnification is always  $>1$ .

3. An image of a cell is 3 mm across. The magnification of the microscope was  $\times 100$ .

a How big is the actual cell?

Use the equation: Magnification =  $\frac{\text{image size}}{\text{actual size}}$

Show Me Actual size =  $\frac{\text{image size}}{\text{magnification}}$

Actual size = \_\_\_\_\_

Actual size = \_\_\_\_\_ mm

[4 marks]

**Support**

You need to rearrange the equation for this calculation to find the actual size.

This equation is of the form  $a = \frac{b}{c}$ . To find c first multiply both sides by c then divide both sides by a.

b How big is the cell in micrometres ( $\mu\text{m}$ )?

Show Me  $1 \text{ mm} = 1000 \mu\text{m}$

Actual size of cell = \_\_\_\_\_  $\times 1000$

Actual size = \_\_\_\_\_ micrometres [1 mark]

4. A scientist looks at red blood cells with a microscope. In the image the size of one red blood cell is 4 mm.

The magnification is  $\times 500$ .

How big is the actual cell?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Actual size = \_\_\_\_\_ mm [3 marks]

5. A bacterium is 4  $\mu\text{m}$  in length.

Change the length into millimetres (mm). Give your answer in decimal form.

Show Me  $1 \mu\text{m} = \frac{1}{1000} \text{ mm}$

so  $4 \mu\text{m} = \frac{4}{1000} \text{ mm}$

Length = \_\_\_\_\_ mm [1 mark]

6. A ribosome is 20 nm across.

a Change the length into micrometres ( $\mu\text{m}$ ). Give your answer in standard form.

\_\_\_\_\_

Length = \_\_\_\_\_ micrometres [1 mark]

b Now change the length into millimetres (mm). Give your answer in standard form.

\_\_\_\_\_

Length = \_\_\_\_\_ mm [1 mark]

**Support**

Nanometres are **smaller** than millimetres. To convert from a smaller unit to a larger unit, divide. So to convert from 20 nm to  $\mu\text{m}$  you divide 20 by 1000.

## Cell division by mitosis

- New cells are needed as an organism grows or to repair damaged tissues.
- A cell grows in size, the DNA duplicates, then the cell divides into two. Each cell grows in size, and the cycle repeats. This is called the cell cycle.
- The process of how a cell divides in two is called mitosis.
- The nucleus of a cell contains chromosomes.
- Chromosomes are made from DNA and carry the genes.

1. When a cell divides by mitosis, two new cells are formed. What can you say about the genes in the new cells?

Tick **one** box.

The two cells are genetically different.

The two cells are genetically identical.

[1 mark]

2. The nucleus of every cell contains chromosomes.

Complete the following sentences.

Chromosomes are made from a substance called \_\_\_\_\_. Each chromosome contains many sets of instructions called \_\_\_\_\_. These control the activities of the \_\_\_\_\_.

[3 marks]

3. Human body cells have 46 chromosomes.

Complete the following sentences.

Show Me Before a cell can divide the chromosomes must be  duplicated . Therefore, during cell division the number of chromosomes is \_\_\_\_\_.

After cell division there are \_\_\_\_\_ chromosomes in each cell.

[3 marks]

4. Explain why mitosis must occur in a developing human embryo.

\_\_\_\_\_

\_\_\_\_\_ [2 marks]

**Support**

Look for clues in the question. You need to **explain why**, which means you have to link what happens to the reason. Use words that link one part of each sentence to the next part, such as 'because'.