AQA Biology GCSE Teacher practical

B1.2

Required practical 1: Looking at cells

Specification references:

- Required practical activity 1: Use a light microscope to observe, draw and label a selection of plant and animal cells. A magnification scale must be included.
- B1.1.2 Animal and plant cells
- MS 1b, 1d, 3a
- WS 1.2
- AT 1 Use appropriate apparatus to record length and area
- AT 7 Use a microscope to make observations of biological specimens and produce labelled scientific drawings

Aims

In this practical students will use a light microscope to observe plant and animal cells under the microscope. Students will make labelled drawings of the cells they observe and calculate magnification.

Learning outcomes

After completing this practical, students should be able to:

Aiming for 4

- use a light microscope to observe cells
- identify the main sub-cellular structures in a cell
- calculate the total magnification
- prepare a microscope slide.

Aiming for 6

- use a light microscope to identify the main sub-cellular structures in a cell
- calculate the total magnification of the microscope
- take a measurement of the length of a cell, as viewed through the microscope
- calculate the length of a cell from a microscope observation
- prepare a microscope slide.

Aiming for 8

- use a light microscope to identify the main sub-cellular structures in a cell
- prepare a microscope slide
- calculate the total magnification
- use and rearrange the formula: $\text{Magnification} = \frac{\text{Observed cell length}}{\text{Actual cell length}}$
- measure the length and area of cells
- suggest reasons why some cells do not contain all cell structures.

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Teacher notes

Ideally, each student should work individually. However, due to the amount of microscopes available you may need to divide the class into small groups of two or three.

Differentiated student sheets are supplied for Aiming for 4, 6, and 8 students to offer varying levels of support.

Aiming for 4

Students may initially require help focusing their microscopes. It may also help to use a microscope connected to a projector to show students what they are aiming to see.

Students should be encouraged to make clear, accurate drawings of the cells. A biological drawing should not be shaded, the magnification should be added, and the drawing should be given a title.

Answers

1

Sub-cellular component	Leaf cell	Cheek cell	Red blood cell	Onion cell
nucleus	✓	✓		✓
cytoplasm	✓	✓	✓	✓
chloroplast	✓			✓
cell membrane	✓	✓	✓	✓
permanent vacuole	✓			✓
cell wall	✓			✓

(*4 marks, one for each correct column*)

2 **a** Magnifies the image. (*1 mark*)

b Support for the slide. (*1 mark*)

c To provide a clear image. (*1 mark*)

3 ×500 (*1 mark*)

Student follow up

1 **a** **i** A – cell membrane; B – nucleus; C – cytoplasm. (*3 marks*)

ii Controls the activities of the cell/contains the genetic material of the cell. (*1 mark*)

b To make cell features stand out more clearly. (*1 mark*)

c ×200 (*1 mark*)

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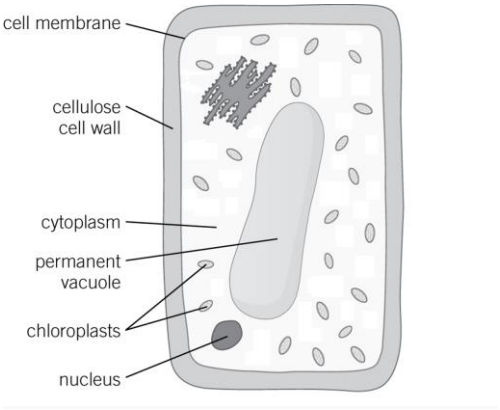
Aiming for 6

Students may initially require help focusing their microscopes. It may also help to use a microscope connected to a projector to show students what they are aiming to see.

Students should be encouraged to make clear, accurate drawings of the cells. A biological drawing should not be shaded, the magnification should be added, and the drawing should be given a title. Any calculations should show clear working.

Answers

1 a



Clear and accurate drawing/appropriate labels/correct magnification (*3 marks*)

b Nucleus – contains genetic material; chloroplast – contains chlorophyll for photosynthesis; vacuole – contains sap; cytoplasm – where many cell reactions take place; cell wall – gives structure to the cell; cell membrane – partially permeable membrane to control what enters/leaves the cell. (*6 marks*)

Ignore references to mitochondria/ribosomes, see answer below

c Ribosomes and mitochondria. (*2 marks*)

2 ×500 (*1 mark*)

3 a 0.005 mm (*1 mark*)

b ×400 (*1 mark*)

Extension

4 a i Nucleus. (*1 mark*)

ii Increases surface area of cell to enable it to carry more oxygen. (*1 mark*)

b i Chloroplasts. (*1 mark*)

ii Onion bulb is underground – does not photosynthesise. (*1 mark*)

Student follow up

1 25 mm (*1 mark*)

2 Length = 0.05 mm = 50 µm (*1 mark*)

3 Size of observed cell = $\frac{1.6}{10}$ = 0.16 mm

Actual cell size = $\frac{0.16}{100}$ = 0.016 mm = 16 µm (*2 marks*)

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Aiming for 8

Students should be encouraged to make clear, accurate drawings of the cells. A biological drawing should not be shaded, the magnification should be added, and the drawing should be given a title. Any calculations should show clear working, including an estimate of the area of the cells being observed.

As an extension students could be provided with slides of alternative body cells, such as epithelial cells, to identify the components of the specific cell and its adaptations. Alternatively they could look at bacterial cells and compare the structure and size of these cells with typical plant and animal cells.

Answers

1 a See answer to Aiming for 6 question 1a. (*3 marks*)

b Nucleus – contains genetic material; chloroplast – contains chlorophyll for photosynthesis; vacuole – contains sap, helps cell keep its shape; cytoplasm – where many cell reactions take place; cell wall – gives structure to the cell; cell membrane – partially permeable membrane to control what enters/leaves the cell. (*6 marks*)

Ignore references to mitochondria/ribosomes, see answer below

c Ribosomes and mitochondria. (*2 marks*)

2 ×500 (*1 mark*)

3 a i Nucleus. (*1 mark*)

ii Increases surface area of cell to enable it to carry more oxygen. (*1 mark*)

b i Chloroplasts. (*1 mark*)

ii Onion bulb is underground – does not photosynthesise. (*1 mark*)

4 a 0.005 mm (*1 mark*)

b 5 µm

c ×400 (*1 mark*)

Student follow up

1 25 mm (*1 mark*)

2 Length = 0.05 mm = 50 µm (*1 mark*)

3 Field of view $= \frac{1.6}{4} = 0.4$ mm

Size of cell $= \frac{0.4}{10} = 0.04$ mm

Cell size $= 0.04 \times 1000 = 40$ µm (*3 marks*)

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Technician notes

Safety

Students must take care when handling glass slides and be aware of how fragile they are.

Equipment

Each student, or small group of students, will need:

- light microscope with low and high power objective lenses
- demonstration microscope connected to projector (optional)
- transparent plastic ruler
- microscope slide and cover slip
- selection of samples: onion, *Elodea*, filamentous algae
- dilute iodine solution
- dropper pipette
- scalpel, scissors, forceps
- mounted needle
- blotting paper or filter paper
- range of prepared animal cells including cheek cells and red blood cells
- range of prepared plant cells including onion epidermal cells and leaf palisade cells
- if the Aiming for 8 extension is being attempted, a range of pre-prepared body cells, and/or bacterial cells showing a range of cell features

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