CB1b.1 Looking at cells

Your teacher may watch to see if you can:

- handle microscopes and slides carefully and safely.

Aim

To use a microscope to observe cells and sub-cellular structures.

Method 1: Examining pre-prepared slides of cells

Apparatus

- light microscope
- lamp
- prepared slides
- transparent ruler

- Handle slides with care.

A Set up your microscope on the lowest magnification objective lens. Work out the total magnification and measure the diameter of the field of view (by using the microscope to observe a transparent ruler).

B Put the next most powerful objective lens in place. Work out the magnification and by how much it has increased from the magnification in step A (e.g. moving from a ×10 to a ×50 is an increase of 5 times). Now divide the diameter of the field of view from step A by the increase in magnification to give you the new diameter of the field of view (e.g. if the field of view in step A was 2 mm, then 2÷5 = 0.4 mm). Do this for each objective lens. Record the total magnification and field of view diameter for each objective lens.

C Now go back to the lowest magnification objective lens and observe a prepared slide.

D Use higher magnifications to observe the cells. Estimate the sizes using your field of view diameters.

E Identify the cell parts. Have a look for mitochondria (you may not find any as they are very difficult to see).

Method 2: Examining your cheek cells

Apparatus

- light microscope
- lamp
- microscope slide
- coverslip
- methylene blue stain
- pipette
- paper towel
- water
- gloves
- wooden toothpick/ cocktail stick
- sterile wooden spatula/tongue depressor
- disinfectant

- Handle slides with care. Anything that you have put into your mouth should be placed in disinfectant after use. Wear gloves if using stains. Wear eye protection.

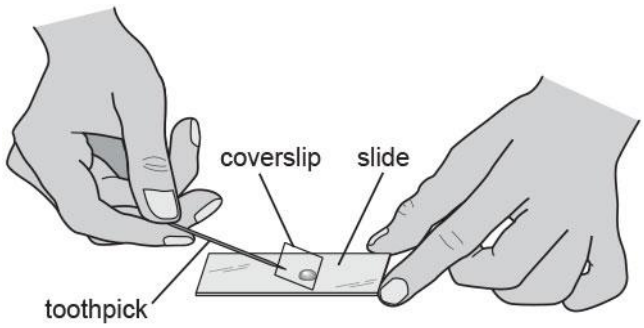
A Using the pipette, add a small drop of water to the slide.

B Stroke the inside of your cheek gently with the wooden spatula. You only want to collect loose cells, so do not scratch the inside of your mouth.

C Use the end of the spatula that has been in your mouth to stir the drop of water on the slide. Place the used spatula in disinfectant.

D Put on gloves and use a pipette to add a small drop of methylene blue stain. This makes cells easier to see.

E Place a coverslip onto the slide at a 45° angle on one edge of the drop. Then use a toothpick to gently lower the coverslip down onto the drop, as shown in the diagram on the right. Avoid trapping air bubbles, which appear as black-edged circles under a microscope.



F Touch a piece of paper towel to any liquid that spreads out from under the coverslip.

G Use the lowest magnification objective lens to observe the slide. The nuclei of the cheek cells will be dark blue.

H Use higher magnifications to observe the cells. Estimate the sizes using your field of view diameters.

I Identify the cell parts. Have a look for mitochondria (you may not find any as they are very difficult to see).

Method 3: Examining onion or rhubarb stem cells

Apparatus

- light microscope
- lamp
- microscope slide
- coverslip
- iodine stain
- pipette
- paper towel
- water
- forceps
- wooden toothpick
- piece of onion bulb or rhubarb stem
- gloves

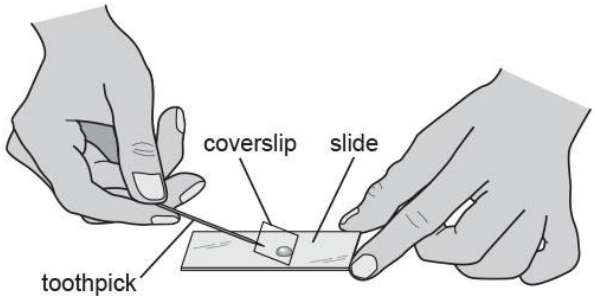
- Handle slides and microscopes with care. Wear gloves if using stains. Wear eye protection.

A If you are going to look at onion cells, put on gloves and use a pipette to add a drop of iodine solution to a microscope slide. If you are going to look at rhubarb, add a drop of water to a microscope slide.

B Using forceps, remove a very small piece of the thin 'skin' on the inside of the fleshy part of the onion. It is very thin indeed and quite tricky to handle. Or remove a thin piece of red 'skin' from a rhubarb stem.

C Place the small piece of skin on the drop on the slide.

D Place a coverslip onto the slide at a 45° angle on one edge of the drop. Then use a toothpick to gently lower the coverslip down onto the drop, as shown in the diagram on the right. Avoid trapping air bubbles, which appear as black-edged circles under a microscope.



E Touch a piece of paper towel to any liquid that spreads out from under the coverslip.

F Use the lowest magnification objective lens to observe the slide. Then use higher magnifications to observe the cells in more detail. Estimate sizes as you observe.

G Identify the cell parts. Have a look for mitochondria (you may not find any asthey are very difficult to see).

Method 4: Examining pondweed

Apparatus

- light microscope
- lamp
- microscope slide
- coverslip
- iodine stain
- pipette
- paper towel
- water
- forceps
- wooden toothpick
- piece of pondweed

- Handle slides and microscopes with care. Wear eye protection.

A Tear off a very small piece of pondweed leaf; a square with sides of up to 2 mm.

B Place the leaf sample onto a microscope slide and add a drop of water.

C Place a coverslip onto the slide at a 45° angle on one edge of the drop. Then use a toothpick to gently lower the coverslip down onto the drop, as shown in the diagram above. Avoid trapping air bubbles, which appear as black-edged circles under a microscope.

D Touch a piece of paper towel to any liquid that spreads out from under the coverslip.

E Use the lowest magnification objective lens to observe the slide.

F Use higher magnifications to observe the cells in more detail. Estimate sizes as you observe.

G Identify the cell parts. If you watch very carefully when you have the cells under a high magnification, you may well see the chloroplasts moving as the cytoplasm moves inside the cells.

Recording your results

1 Make a drawing of each type of cell that you examine. Label the parts and record the magnification.

2 Label the cells and their parts with any sizes that you have estimated using the diameter of the field of view.

I can…

- identify the parts of plant and animal cells
- calculate total magnification using a formula
- make drawings of plant and animal cells using a light microscope and identify their parts.
- estimate sizes using microscope fields of view.

1 Carry out some research into the history of cell biology and use your research to arrange the cards below into a table. Your table should show each scientist with their correct dates and discoveries, and how they communicated their ideas to the scientific community.

Theodor Schwann	1635–1703	The nucleus plays a role in making new cells.	scientific papers
Robert Brown	1810–1882	observed cells in cork using a microscope	talk to Linnaean Society
Matthias Schleiden	1632–1723	‘animalcules’ (now known as bacteria)	scientific papers
Robert Hooke	1804–1881	The nucleus plays a role in making new cells.	published a book called *Micrographia*
Antonie van Leeuwenhoek	1773–1858	All plant cells have a cell nucleus.	letters written to the Royal Society
Richard Altmann	1821–1902	Cells originate from division of existing cells.	talk to Linnaean Society
Rudolf Virchow	1852–1900	All plant cells have a cell nucleus.	treatise (a long, in-depth scientific essay)
Franz Bauer	1758–1840	mitochondria – structures in cells that carry out chemical reactions to keep the organism alive	scientific papers

2 Add one more row to your table to include one other scientist who has made a contribution to finding out about cells.

Extra challenge

3 **a** Explain how methods of communication between scientists have changed since van Leeuwenhoek’s day.

b What effect do you think this has had on the way in which research has been carried out over the last 300 years?

I can…

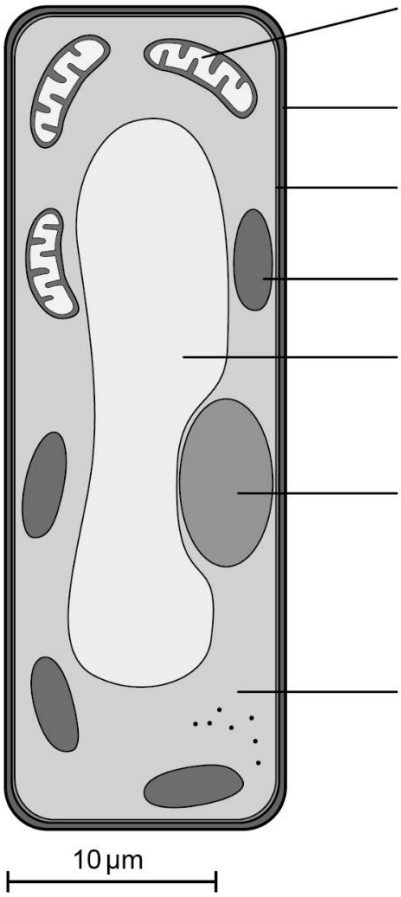
- understand how scientific methods and theories develop over time
- describe the functions of the sub-cellular structures commonly found in eukaryotic cells.

Name _____ **Class** _____ **Date** _____

S1 Draw a plant cell and label its parts, describing what each part does.

1 **a** Extend the label lines from the plant cell drawing to the correct names.

b Draw lines to link the name of each part with its function.



nucleus	where photosynthesis occurs
chloroplast	controls what enters and leaves the cell
cell membrane	where aerobic respiration occurs
cell wall	controls the cell's activities
cytoplasm	for support and protection
mitochondrion	where the cell's activities occur
large permanent vacuole	stores cell sap and helps to support the cell

2 **a** In which part would you find chlorophyll? _____

b In which part would you find ribosomes? _____

c What do ribosomes do? _____

3 Use the scale bar on the diagram to estimate the length of the cell. _____

At the end of this topic I can…

- identify the parts of plant and animal cells
- recall the parts of plant and animal cells
- make drawings of plant and animal cells using a light microscope and identify their parts
- describe the functions of the sub-cellular structures commonly found in eukaryotic cells
- estimate sizes using microscope fields of view
- **e**stimate sizes using scale bars.

CB1b.4 Organelles – Extend

Name _____ **Class** _____ **Date** _____

E1 An 'organelle' is a structure inside a cell with a specific function. Compare the organelles found in plant and animal cells.

1 a Tick the boxes to show which organelles are found in plant cells and which in animal cells.

Organelle	In plant cells?	In animal cells?	Function
chloroplast			
large permanent vacuole			
mitochondrion			
nucleus			
ribosomes			

b Fill in the function for each organelle.

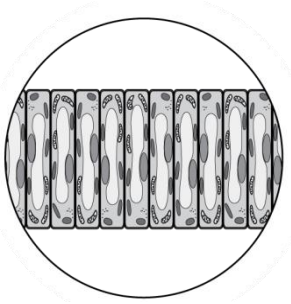
2 List the parts of a plant cell that are not organelles. _____

_____

3 The upper drawing on the right shows some cells through a microscope. The field of view is 0.2 mm. Estimate the width and height of the cells, giving your answer in micrometres.

Height _____

Width _____

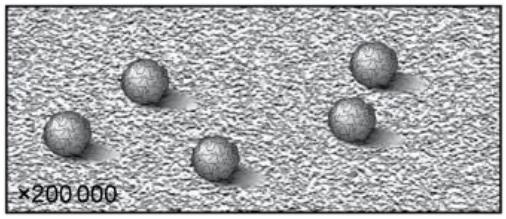


4 The lower drawing on the right shows a micrograph of a ribosome.

a Estimate the diameter of the ribosome in nanometres.

_____

b Draw a scale bar below the diagram to allow others to estimate the size of the ribosome more easily.

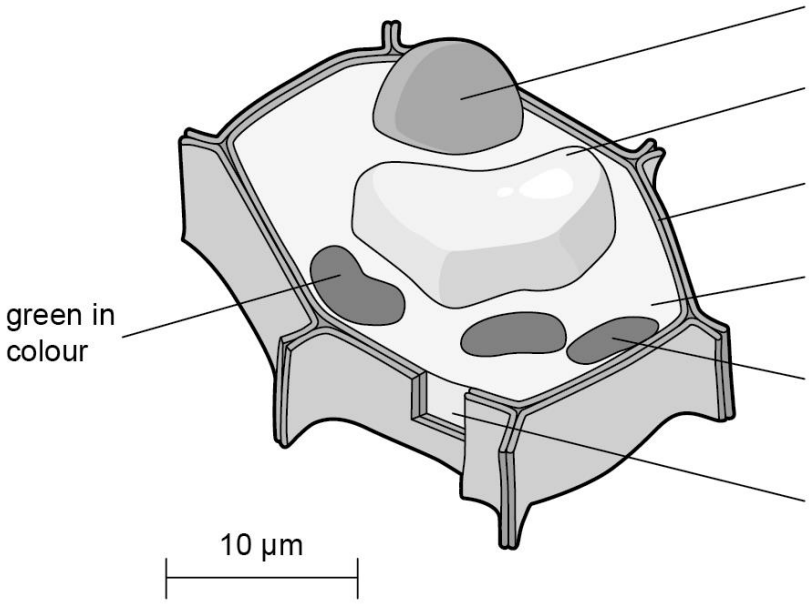


At the end of this topic I can…

- identify the parts of plant and animal cells
- recall the parts of plant and animal cells
- make drawings of plant and animal cells using a light microscope and identify their parts
- describe the functions of the sub-cellular structures commonly found in eukaryotic cells
- estimate sizes using microscope fields of view
- estimate sizes using scale bars.

Name _____ **Class** _____ **Date** _____

1 **a** Label the names of the sub-cellular parts of this cell.



b Is this cell from a plant or an animal? Explain your choice. _____

_____

c One part can sometimes be seen using a light microscope but it is not shown here. Draw it in on the diagram and label it with its name.

d What is the function of the part that you have drawn in? _____

_____

e What is the function of the largest part inside the cell? _____

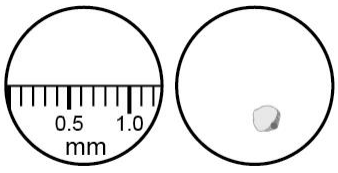
_____

f What other parts do both animal and plant cells have but which cannot be seen using a light microscope? _____

g The function of these parts is to make a certain substance. What substance do they make?

_____

2 A special type of glass slide with a very fine scale is viewed through a microscope. The image below on the left shows what is seen. Human fat cells are then observed using the same magnification, shown below on the right.



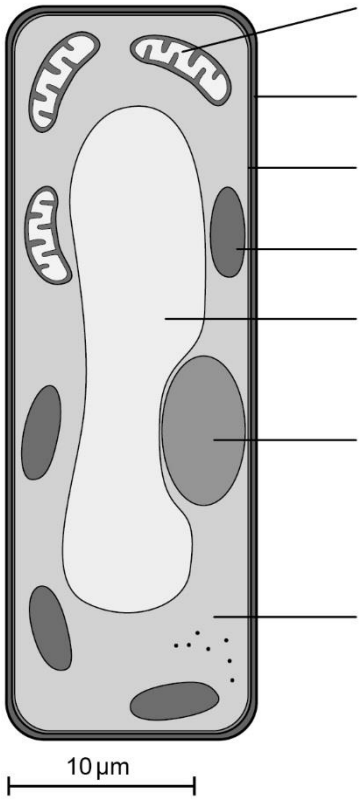
a What is the diameter of the field of view? _____

b Estimate the diameter of the fat cell. _____

3 Use the scale bar on the drawing of the cell at the top of the page to estimate the length of the green sub-cellular structures.

_____

1 The diagram shows a cell that is 40 µm tall and 10 µm wide.



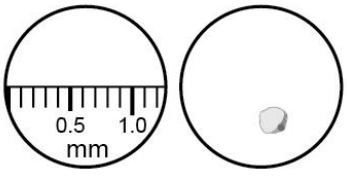
a Make of copy of the drawing at a magnification of ×3000.

b Add a suitable scale bar to show the size of the cell.

c The cell is one of the following: oak leaf cell, human liver cell, human eye (retina) cell, onion bulb cell, cat skin cell. Which type of cell is it? Explain your reasoning.

d Label the sub-cellular parts of the cell on your drawing, together with a description of each part's function.

1 The image below shows the view through a microscope when looking at a special type of slide with a fine scale on it.



a What is the diameter of the field of view?

b This type of slide cannot be used with a specimen on it. How would you use this slide to estimate the size of some human liver cells that are on a pre-prepared slide? Write out a short step-by-step method.

Extra challenge

2 Ribosomes were not identified until the 1950s, 300 years after Hooke and van Leeuwenhoek identified living cells. Explain why this was and what developments had taken place in that period to make this possible.

Name _____ **Class** _____ **Date** _____

Progression questions

Answer these questions.

1 How are animal cells different to plant cells?

_____

_____

2 What do the sub-cellular structures in eukaryotic cells do?

_____

_____

3 How can we estimate the sizes of cells and their parts?

_____

_____

Now circle the stars in the 'Start' row in the table showing how confident you are of your answers – more stars mean more confidence.

Question	**1**	**2**	**3**
Start	★★★★★	★★★★★	★★★★★

Assessment

Using a different colour, correct or add to your answers above. You may need to use the back of this sheet or another piece of paper. Then circle the stars in the 'Check' row in the table – more stars mean more confidence.

Question	**1**	**2**	**3**
Check	★★★★★	★★★★★	★★★★★

Feedback

What will you do next? Tick one box.

☐ strengthen my learning ☐ strengthen then extend ☐ extend

Note down any specific areas you need to improve.

_____

Action

You may now be given another activity. After this, note down any remaining areas you need to improve and how you will try to improve in these areas.

_____

_____