Stile

Cells

Would you eat lab-grown meat?

Teaching Plan and Lab Guide

Lab-grown meat
Scientists can produce meat using cultured cells instead of livestock.

Version 1.0

Contents

Teaching Plan

Lab Guide

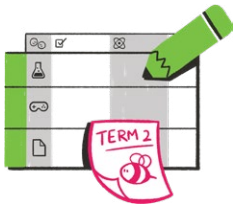
Everything in one place

Stile is a complete science curriculum. Our digital lessons and hard-copy booklets are designed to help students be the best learners they can be and to give you the tools to do what you do best: teach.

Teacher resources

Student resources

Before class



Find out everything you need to know from the unit's **Teaching Plan** and **Lab Guide**.

In **Prepare Mode** for each lesson, you can:
- Read the detailed teaching notes
- Print a copy to refer to in class
- Customise resources for the needs of your students

Stile X phone app
- Front-load the unit's scientific terminology through flashcards and quizzes

During class

Within **Teach Mode** you can:
- Implement explicit teaching with learning goals and Key Questions
- Use videos, images and text to guide your instruction
- Facilitate discussion with live brainstorms and polls
- View student data instantly to inform your teaching

Stile Digital
- Engage in real-world phenomena through:
  - Practical activities
  - Research projects
  - Classroom lessons
  - Hands-on activities
  - Breaking news
  - Extension lessons
  - Engineering challenges
  - Open-ended investigations

After class

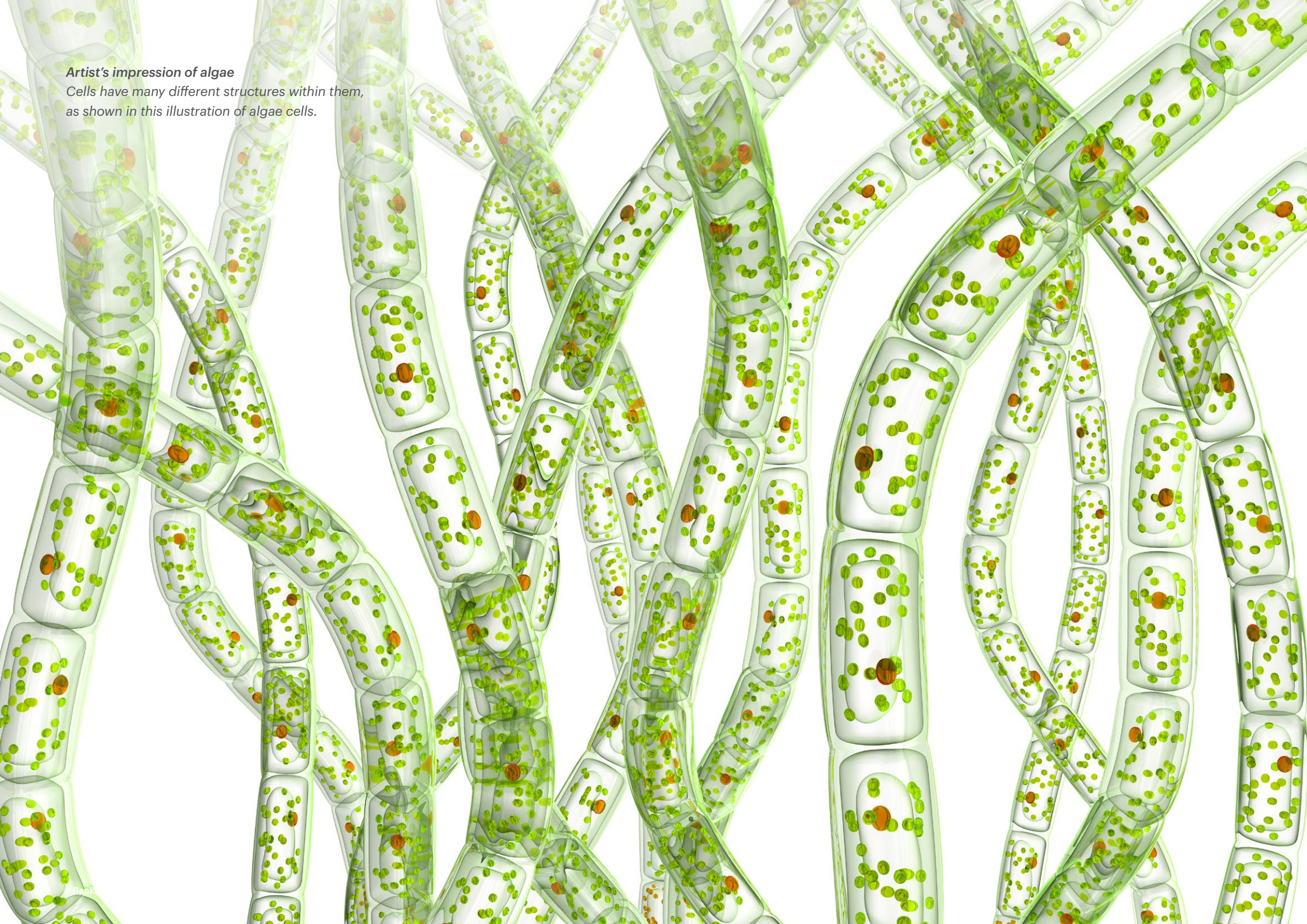
To **Analyse** student work:
- View data in Analyse Mode to determine your next teaching steps
- See a bird's-eye view of student progress in the Markbook
- Release model answers to students
- Provide written feedback where it matters most

Stile X booklets
- Consolidate and revise material learned in class by:
  - Creating structured revision notes
  - Recording definitions in the glossary
  - Completing practice test questions

Stile X phone app
- 60-second summary videos recap key ideas from the Stile lesson

Scan here to view **The Stile Guide**, the essential guide to supercharging your teaching with Stile

< Back to Contents



Artist's impression of algae
Cells have many different structures within them, as shown in this illustration of algae cells.

Teaching Plan

< Back to Contents

Storyline and real-world phenomenon

Could a $300,000 hamburger hold the key to feeding our growing population?

Scientists have discovered a way to produce meat using cultured cells instead of livestock. This discovery is paving the way for more ethical and sustainable food production methods, and could change the way we eat meat forever. Students will chew their way through this unit to discover the fascinating world of cells, and their potential to help solve a range of global issues.

Big ideas

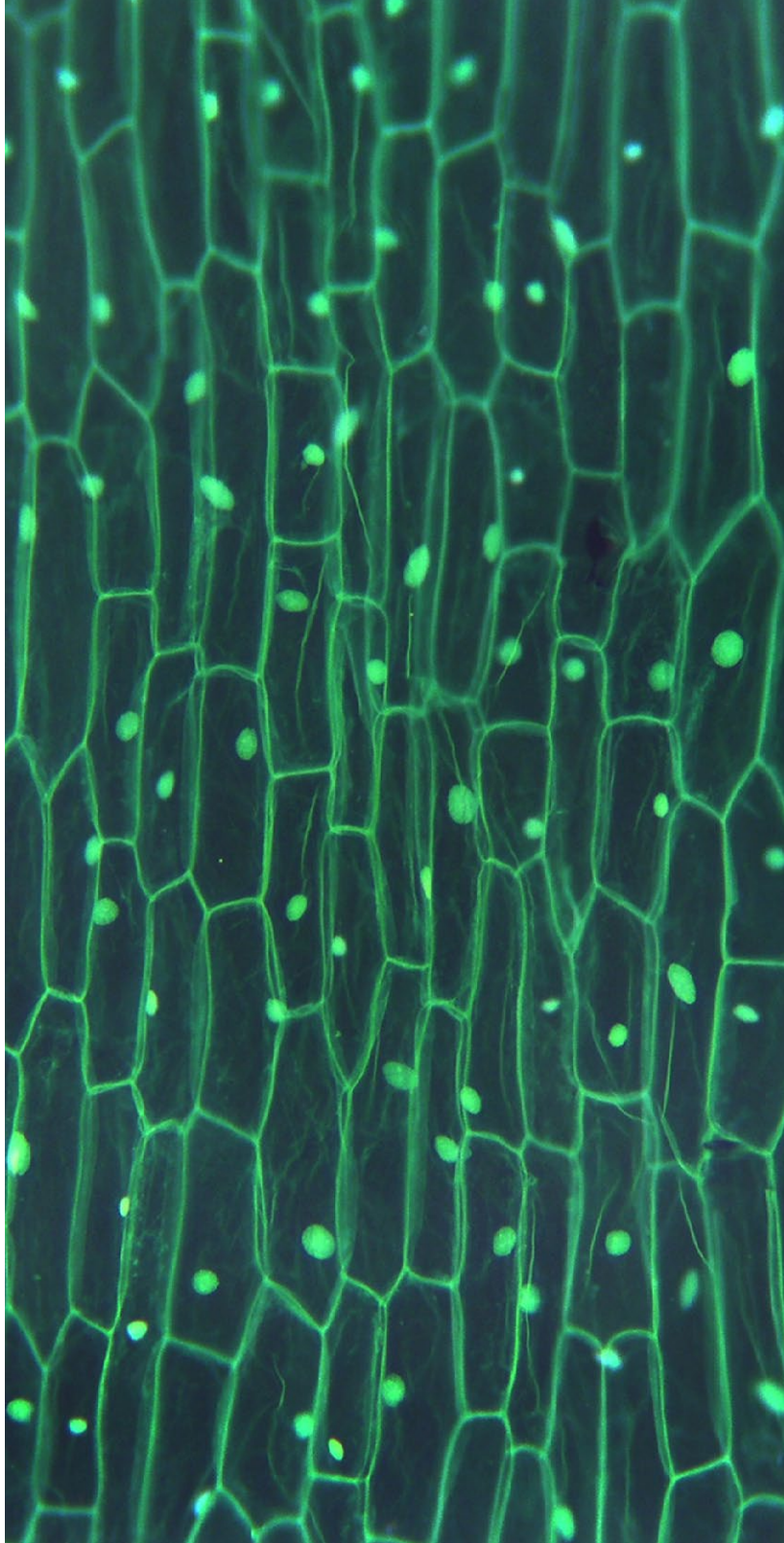
- What is cell theory?
- How do microscopes work?
- What are the main structures within cells and their functions?
- What are specialised cells?

Highlights

- Participate in a Socratic seminar to explore cultured meat from a range of perspectives
- Make a cell model
- Prepare a résumé for a specialised cell
- Build a cell and learn about its organelles
- Explore the main parts of a microscope and their functions
- End of unit test

*In this unit students meet Executive Director of Food Frontier, **Thomas King**, and developmental and stem cell biologist, **Dr Amy Wong**. Thomas King is helping to promote the cultured meat movement in Australia.*

< Back to Contents



This unit at a glance

This unit is designed to take five weeks, with four 45-minute class sessions per week.

The **real-world phenomena** of plant-based meat drives the unit and connections are made to demonstrate advances in science, engineering, and technology.

Students apply **science inquiry practices** as they develop an understanding of cell models.

Students learn how the **structure** of an organelle is related to a cell's **function** within a system.

Students learn different specialised cell structures have different functions. They **propose relationships** between the structures and their functions.

This **summative assessment** assesses students' curriculum-aligned knowledge.

Cells

- Introduction: Battle of the burgers
- Pre-test: Cells
- Career Profile: Food innovator
- Career Profile: Stem cell researcher
- 1.1 Living or non-living?
- 1.1 Check-in: Living or non-living?
- 1.2 The building blocks of life
- 1.3 One cell or many?
- 1.4 Levels of organisation
- 1.2–1.4 Check-in: The building blocks of life
- 1.5 Sizes of cells
- 1.6 Cell theory
- 2.1 Introduction to microscopes
- 2.1 Check-in: Introduction to microscopes
- 2.2 Using a microscope
- 2.3 Measuring with microscopes
- 3.1 Parts of a cell
- 3.1 Check-in: Parts of a cell
- 3.2 Animal vs. plant cells
- 3.2 Check-in: Animal vs. plant cells
- 3.3 Cells under the microscope
- 3.3 Check-in: Cells under the microscope
- 3.4 Observing plant and animal cells
- 3.5 Make a cell model
- 4.1 Specialised cells
- 4.1 Check-in: Specialised cells
- 4.2 Putting cells to work
- 4.3 Mythbusters – Cell division
- Socratic seminar: Feeding the future with cultured meat
- Glossary: Cells
- Test: Cells

Students discover the diversity of cell biology and the potential impact of new research on **science as a human endeavour**.

Regular **formative assessment** provides a quick check of student progress throughout the unit.

Students zoom in on the magical world of microscopy, and learn how the microscope changed the way we study cells.

Students **develop a physical model** that represents all parts of a plant or animal cell, and analyse its limitations.

Students engage in a **scientifically founded discussion** from the perspective of a variety of stakeholders in relation to lab-grown meat.

- Classroom lesson
- Extension lesson
- Pre-test
- Check-in
- Glossary
- Test
- Breaking news
- Practical activity
- Research project
- Hands-on activity
- Engineering challenge
- Open-ended investigation

This icon indicates lessons that have additional revision and consolidation material available in **Stile X**, our hard-copy study booklet and accompanying app.

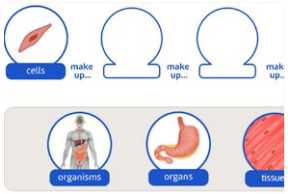
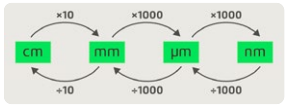
Unit storyline

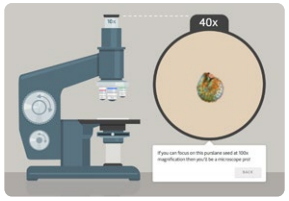
Throughout this unit, students engage with cells, looking at how they make up living things, their size and then finally their structure and the organelles inside them. The use of multiple phenomena supports students to develop scientific skills and understanding. The progression of these phenomena, and how they are observed within lessons, is detailed below.

Phenomenon	Lesson
Cultured beef can be grown in the lab 	**Introduction: Battle of the burgers** – Students engage with the real-world context of a $300,000 hamburger made from cells in a lab – They demonstrate their prior knowledge of cells
Classifying something as living means they have all seven life processes 	**1.1 Living or non-living?** – Students classify a range of living and non-living things – They explore what "living" means and the seven life processes

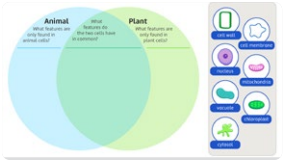
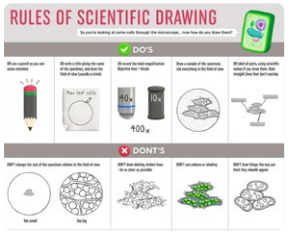
Phenomenon	Lesson
Cells are microscopic and are the building blocks of all living things 	**1.2 The building blocks of life** – Students describe why items are made from cells – They use a simulation to learn how to focus a compound light microscope
Organisms exist as both unicellular and multicellular 	**1.3 One cell or many?** – Students observe and compare unicellular and multicellular organisms – They individually research a specific single-celled organism of their choosing

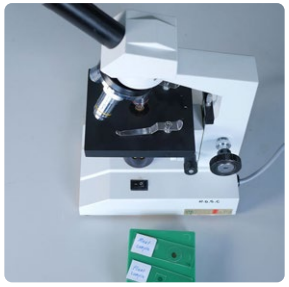
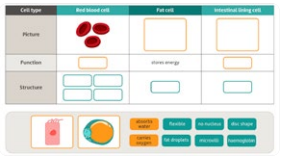
Unit storyline

Phenomenon	Lesson
Multicellular organisms consist of many different parts working together 	**1.4 Levels of organisation** – Students identify the complex organisation of a human body from cells to organ systems – They create analogies to explain the organisation
Cells are microscopic 	**1.5 Sizes of cells** – Students compare the size of a cell to other objects – They learn about using micrometres and nanometres to describe cells and then convert between them

Phenomenon	Lesson
Microscopes allow us to see microscopic objects 	**2.1 Introduction to microscopes** – Students learn about the three types of microscopes and their uses – They use a simulation to focus on the light compound microscope and how to use it
Cells contain organelles, which means *little organs* 	**3.1 Parts of a cell** – Students are introduced to the structures and functions of the main cell organelles, focusing on plant cells – They take a 360° video or virtual reality journey through a plant cell

Unit storyline

Phenomenon	Lesson
Animal and plant cells have different features to meet specific functions 	**3.2 Animal vs. plant cells** – Students explore animal and plant cell similarities and differences – They explore why some of these differences occur
Scientific drawings help communicate science observations 	**3.3 Cells under the microscope** – Students learn the rules of scientific drawing and apply these skills when completing their own drawings

Phenomenon	Lesson
Plant and animal cells have unique differences 	**3.4 Observing plant and animal cells** – Students compare and contrast plant and animal cells using a microscope – They describe the structural differences between the two cell types
Cells can differentiate to meet specific functional needs 	**4.1 Specialised cells** – Students learn that cell specialisation allows specific functions to be carried out by an organism – They look in depth at examples from both animal and plant cells

Curriculum alignment

This unit focuses on cells, with students coming to recognise that they are the building blocks of living things. Students will compare and contrast plant and animal cells as well as develop scientific drawing and microscope skills.

Detailed alignment information can be found at the links below.

Click here to view curriculum alignment for Version 8.4 of the Australian Curriculum

Click here to view curriculum alignment for Version 9 of the Australian Curriculum

Click here to view alignment for the NSW Syllabus for the Australian Curriculum

Click here to view curriculum alignment for the Victorian Curriculum

Click here to view curriculum alignment for the Western Australian Curriculum

Prior knowledge

This unit is written with the assumption that students have some existing subject knowledge.

Before beginning this unit, students should be familiar with:

- Classifying organisms (**Classification and Biodiversity** unit)
- Knowledge of abiotic and biotic factors (**Food Chains and Food Webs** unit)

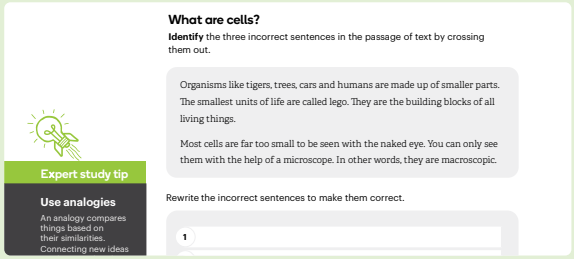
Stile X: Cells

What's in the Stile X booklet?

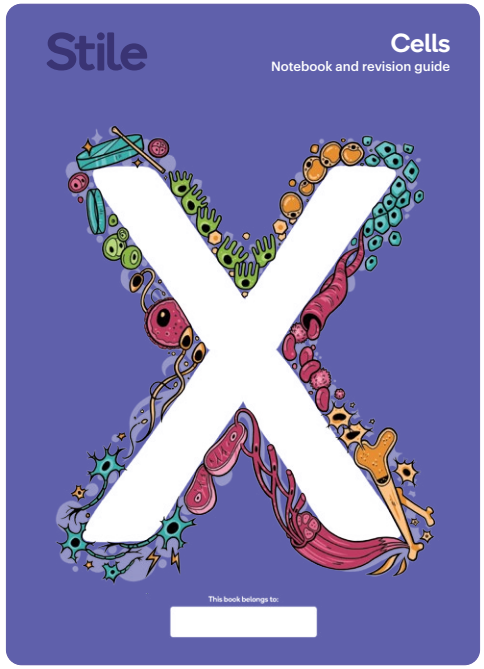
Model how to complete the structured **revision notes** as students fill in sections of these pages in class. Any remaining sections can be done at home before the next lesson. As students become more familiar with Stile X, increase independent use both at home and in class.

This unit includes **revision notes** for:

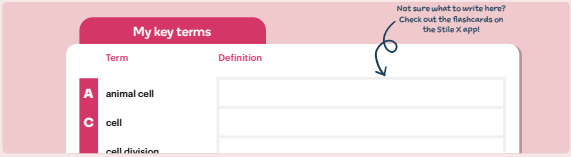
- Living or non-living?
- The building blocks of life
- One cell or many?
- Levels of organisation
- Sizes of cells
- Introduction to microscopes
- Parts of a cell
- Animal vs. plant cells
- Cells under the microscope
- Specialised cells



Read **expert study tips** aloud and discuss them in class to help students build important study skills.

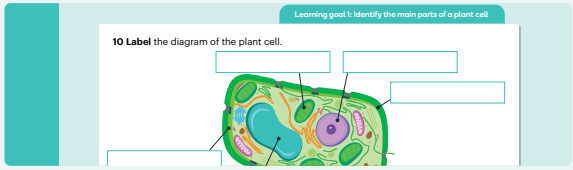


When you see a bolded word in Stile, ask students to turn to the **glossary** pages to record the definition in their own words.



The **practice test** is perfect for revision. Fast finishers can even complete questions as an extension activity during class time. Each question addresses a learning goal from the unit's core lessons.

- Describe the features that distinguish living things from non-living things
- Describe what cells are
- Classify organisms as either unicellular or multicellular
- Describe the levels of organisation in multicellular organisms
- Describe the sizes of cells compared to other small objects
- Convert between units of measurement, including micrometres and nanometres
- Distinguish between the main types of microscope
- Identify the parts of a light microscope
- Describe how to use and handle a microscope safely
- Identify the main parts of a plant cell
- Describe the functions of these parts
- Compare and contrast the features of plant cells and animal cells
- Apply the rules of scientific drawing to draw cells under a microscope
- Describe what specialised cells are
- Explain how the structure of a specialised cell helps with its function



Assessment

Stile's assessment tasks require students to apply general capabilities, skills and knowledge to explain phenomena and solve problems. We recommend using the formative assessment opportunities listed to gauge student progress, which will guide your next teaching steps. Self-assessment opportunities are also included in both Stile and Stile X to encourage metacognitive monitoring. Summative assessment tasks are designed to show what a student has learned throughout the unit and can be used to inform your reporting.

Formative assessment

Key Questions

A Key Question is an opportunity for students to demonstrate their progress against a learning goal. Stile lessons include one Key Question for each learning goal. Using the in-class analytics available in Teach Mode, you can use Key Questions to make quick, frequent judgements about student progress. We strongly recommend that you focus on these questions when providing written feedback.

Check-ins

Seven check-in lessons have been included as a formative assessment opportunity in the unit. Check-ins contain self-marking multiple choice and drag and drop questions that will give you a quick snapshot of student learning at pivotal points in the unit. Student results in a check-in assessment will help you determine whether students are ready to progress to the next phase in the learning cycle, or whether further teaching is required.

Lesson type	Lesson name	Question types	Time
Check-in	1.1 Check-in: Living or non-living?	Multiple choice	5–10 minutes
Check-in	1.2–1.4 Check-in: The building blocks of life	Multiple choice	5–10 minutes
Check-in	2.1 Check-in: Introduction to microscopes	Multiple choice, drag and drop	5–10 minutes
Check-in	3.1 Check-in: Parts of a cell	Multiple choice, drag and drop	5–10 minutes
Check-in	3.2 Check-in: Animal vs. plant cells	Multiple choice	5–10 minutes
Check-in	3.3 Check-in: Cells under the microscope	Multiple choice	5–10 minutes
Check-in	4.1 Check-in: Specialised cells	Multiple choice	5–10 minutes

Summative assessment

Test

This unit contains a test to provide summative assessment of student learning across the whole unit.

Lesson type	Lesson name	Question types	Time
Test	Test: Cells	Multiple choice, drag and drop, written response	45–65 minutes

Scientific skills

One project within this unit can be used as a summative assessment of science inquiry skills.

Lesson type	Lesson name	Question types	Time
Research project	Socratic seminar: Feeding the future with cultured meat	Written response	60 minutes

Important things to know about this unit

Character conversations

Thomas King, Dr Amy Wong, cow, animal cell, Leo the light microscope and plant cell are included as characters throughout the unit, and speech bubbles are used as a bridge between sections of the lesson and to provide light humour. Where character conversations appear, they should be read in the same way as other sections of text. You might read the conversations aloud, or ask students to “play” the role of a specific character within the lesson.

Learning goals

While student curiosity and questioning drive the learning, the design of the unit as a whole supports students to make sense of phenomena and design solutions. The use of learning goals guides them toward specific outcomes in each lesson, so that their learning builds toward understanding the phenomenon and designing a solution to the problem. Evidence shows that students who know what is expected of them are more likely to engage in the learning process and achieve better learning outcomes (Hattie, 2012).

Your learning goal...

By the end of this lesson you will be able to:

1. Describe the features that distinguish living things from non-living things

Cell Organelles Music Festival poster

This unit has an accompanying poster about a cell organelle analogy, available for purchase from the Stile Shop **here**. Display this poster on your classroom wall as students will love cell organelles likened to a music festival!

Important things to know about this unit

Parent email template

This unit includes a pre-written email template that you can use to inform parents about what students are learning in class. You'll find a link to this template in the teacher notes at the bottom of the unit's folder in your Stile subject or you can go to **stileapp.com/go/parentemailcells**

Copy the text, paste it into an email, and modify it to suit. This is a great way to bridge the gap between school and home, and engage parents in their child's learning.

Resources

Lab Guide
The end of this document contains a Lab Guide that includes the materials and methods for this unit's hands-on and practical activities. Pages from the Lab Guide are also linked in the teaching notes of the relevant Stile lesson.

For each practical activity, hands-on activity, engineering challenge or open-ended investigation you'll find:

- Demo videos, which can be viewed before class to help with preparation, or shown to students during class for extra scaffolding
- Handy tips and tricks for making the activity a success
- A RiskAssess template
- An expected final outcome

Student supplies
Each student will need:

- A device to access Stile lessons
- A Stile X booklet for this unit
- A pen or pencil to complete answers in Stile X
- Coloured pencils to complete mindful colouring activities in Stile X

Lesson Planning Guide

Week 1 · Week 2 · Week 3 · Week 4 · Week 5

The guide below is based on four 45-minute sessions per week.
Click here to download an editable version of this planning guide.

	Lesson name	Learning goals	Preparation required	Ice breaker	Core of lesson	To close	Revision and mastery
Session 1	**Introduction: Battle of the burgers**		Review teaching notes in Prepare Mode Collect Stile X booklets for this unit Find out more about using Stile X in **The Stile Guide** **Send parent email template** 10 minutes	As a class, watch a video about cultured meat then complete a poll about eating cultured meat	Students explore cultured meat and the reason it is needed, they also tap into their prior knowledge about cells	Introduce students to the *Creative Questions* thinking routine and encourage them to come up with at least one question for each of the prompts Hand out Stile X booklets and activate Stile X app	Stile X app: Flashcards Glossary term: cell
Session 2	**Career Profile: Food innovator** *and* **Career Profile: Stem cell researcher**		Review the answers that students provided in **Pre-test: Cells** to provide an idea of students' prior knowledge Review the questions students recorded in their reflection to inform any future discussions or inquiry Review teaching notes in Prepare Mode 35 minutes	As a class, watch the video explaining who Thomas King is and what he does, then discuss what they heard	Students look at the work of Dr Amy Wong and how stem cells are improving treatments and being used for research	Students select an area of scientific research and investigate how and why stem cells are being used	Stile X app: Flashcards
Session 3	**1.1 Living or non-living?** MATERIALS REQUIRED	1. Describe the features that distinguish living things from non-living things	Review teaching notes in Prepare Mode Print and cut out the **picture set** 20 minutes	As a class, introduce the activity of identifying living and non-living things	Students classify living and non-living things with the materials provided	Ask students to propose how living things are different from dead things	Stile X app: Flashcards
Session 4	**1.1 Living or non-living?** *continued*	1. Describe the features that distinguish living things from non-living things	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode 30 minutes	As a class, discuss what living means and watch a video on life processes	Students contrast the seven life processes that classify something as living with non-living things Direct students to the corresponding Stile X revision notes to complete the question: Identify the living things by colouring them in. Leave the non-living things uncoloured	Ask students to reflect on their learning using the *I used to think, but now I think* thinking routine Assign **1.1 Check-in: Living or non-living?** as homework to be completed before the next lesson	Stile X app: Flashcards Stile X app: Living or non-living? video Stile X Revision notes: Living or non-living?

	Lesson name	Learning goals	Preparation required	Ice breaker	Core of lesson	To close	Revision and mastery
Session 5	**1.2 The building blocks of life**	1. Describe what cells are	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode 20 minutes	As a class, review answers to **1.1 Check-in: Living or non-living?**	Students define cells and then justify if the given everyday objects are made of cells	Ask students to reflect on their learning using the *Headlines* thinking routine Direct students to the corresponding Stile X revision notes to complete the question: List ten different things made of cells that you have seen, smelled, touched or heard	Stile X app: The building blocks of life video Stile X Revision notes: The building blocks of life Glossary terms: multicellular organism, unicellular organism
Session 6	**1.3 One cell or many?**	1. Classify organisms as either unicellular or multicellular	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode 20 minutes	As a class, observe the videos of an amoeba and a water flea and ask students to record their observations	Students compare unicellular and multicellular organisms and then research a single-celled organism	Ask students to reflect on their learning using the *Connect, Extend, Challenge* thinking routine Direct students to the corresponding Stile X revision notes to complete the question: Complete the following diagrams to understand the meanings of the concepts of unicellular organism and multicellular organism	Stile X app: Flashcards Stile X app: One cell or many? video Stile X Revision notes: One cell or many? Glossary terms: tissue, organ
Session 7	**1.4 Levels of organisation**	1. Describe the levels of organisation in multicellular organisms	Provide feedback on the Key Questions from the previous lessons in Analyse Mode Review teaching notes in Prepare Mode 30 minutes	As a class, brainstorm the difference between a cell and an organ then discuss the responses	Students watch a video on levels of organisation in the body and then look at creating their own analogy for the organisation in an organism Direct students to the corresponding Stile X revision notes to complete the question: Read the passage and highlight the names of each level of organisation	Ask students to reflect on their learning using the *I used to think, but now I think* thinking routine Assign **1.2–1.4 Check-in: The building blocks of life** as homework to be completed before the next lesson	Stile X app: Flashcards Stile X app: Levels of organisation video Stile X Revision notes: Levels of organisation
Session 8	**1.5 Sizes of cells**	1. Describe the sizes of cells compared to other small objects 2. Convert between units of measurement, including micrometres and nanometres	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode 20 minutes	As a class, review answers to **1.2–1.4 Check-in: The building blocks of life**	Students explore the sizes of cells and convert between the microscopic units of measurement Direct students to the corresponding Stile X revision notes to complete the question: Demonstrate how units relate to each other by completing the table	Ask students to reflect on their learning using the *Very Important Points* reflection strategy	Stile X app: Flash Quiz 1 Stile X app: Sizes of cells video Stile X Revision notes: Sizes of cells Glossary terms: micrometre, nanometre

Lesson Planning Guide

Week 1 · Week 2 · **Week 3** · Week 4 · Week 5

	Lesson name	Learning goals	Preparation required	Ice breaker	Core of lesson	To close	Revision and mastery
Session 9	**2.1 Introduction to microscopes** MATERIALS REQUIRED	1. Distinguish between the main types of microscope 2. Identify the parts of a light microscope 3. Describe how to use and handle a microscope safely	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode Collect a compound light microscope for demonstration *Optional: print* **microscope licences** *for the end of the lesson* 25 minutes	As a class, watch the video and learn about the three types of microscopes	Using simulation and an in-class example, students learn the theory behind using a light microscope Direct students to the corresponding Stile X revision notes to complete the question: Label the parts of the microscope	Ask students to reflect on their learning using the *Connect, Extend, Challenge* thinking routine Assign **2.1 Check-in: Introduction to microscopes** as homework to be completed before the next lesson	Stile X app: Flashcards Stile X app: Introduction to microscopes video Stile X Revision notes: Introduction to microscopes
Session 10	**2.2 Using a microscope** MATERIALS REQUIRED	1. Describe how a specimen's orientation appears under the microscope 2. Draw and describe how some everyday objects appear under the microscope	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode Collect the required materials listed in the **Lab Guide** Prepare 1 cm^2 squares of printed text containing the letter "e" in advance Complete the **Risk Assessment Template** 40 minutes	As a class, review answers to **2.1 Check-in: Introduction to microscopes**	Students use a compound light microscope to view a range of specimens looking specifically at orientation and different magnifications	Ask students to reflect on their learning using the *Very Important Points* reflection strategy	Stile X app: Flashcards
Session 11	**2.3 Measuring with microscopes** MATERIALS REQUIRED	1. Calculate the sizes of very small objects using a microscope	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode Collect the required materials listed in the **Lab Guide** Complete the **Risk Assessment Template** 30 minutes	Students revise learning from **1.5 Sizes of cells** and practise calculating the length using a smaller object in comparison	Students use a compound light microscope and count the specimens that fit in a field of view to calculate the length of one specimen	Ask students to reflect on their learning using the *Connect, Extend, Challenge* thinking routine	Stile X app: Flashcards
Session 12	**3.1 Parts of a cell** MATERIALS REQUIRED	1. Identify the main parts of a plant cell	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode Collect the required materials: coloured pencils, printed copies of the augmented reality **plant cell PDF**, devices or phones, Quiver app: **Download on the Apple Store** or **Get it on Google Play**, *Optional: Virtual reality headsets (available in the* **Stile Shop***)* 40 minutes	Ask students to brainstorm the organs of the human body and what they do	Students use an interactive to build their own plant cell and make their own 3D cell using the Quiver app	Ask students to explore a plant cell using virtual reality so they can imagine the inside of a plant cell	Stile X app: Flashcards Stile X app: Parts of a cell video Stile X Revision notes: Parts of a cell Glossary term: organelle

	Lesson name	Learning goals	Preparation required	Ice breaker	Core of lesson	To close	Revision and mastery
Session 13	**3.1 Parts of a cell** *continued* MATERIALS REQUIRED	2. Describe the functions of these parts	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode 30 minutes	As a class, recap the main parts of the cell that were looked at in the last session	Students look at the function of organelles that they have identified in the previous session and then get creative exploring an organelle of their choice Direct students to the corresponding Stile X revision notes to complete the question: Describe the function of organelles by completing the paragraph with words from the box	Ask students to reflect on their learning using the *Connect, Extend, Challenge* thinking routine Assign **3.1 Check-in: Parts of a cell** as homework to be completed before the next lesson	Stile X app: Flashcards Stile X app: Parts of a cell video Stile X Revision notes: Parts of a cell Glossary term: organelle
Session 14	**3.2 Animal vs. plant cells**	1. Compare and contrast the features of plant cells and animal cells	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode 20 minutes	As a class, review answers to **3.1 Check-in: Parts of a cell**	Students consider different needs of plants and animals to compare features of their cells and use an interactive to distinguish them under a microscope Direct students to the corresponding Stile X revision notes to complete the question: Identify the differences in cell structure between plants and animals by filling in the blanks	Ask students to reflect on their learning using the *I used to think, but now I think* thinking routine Assign **3.2 Check-in: Animal vs. plant cells** as homework to be completed before the next lesson	Stile X app: Flash Quiz 2 Stile X app: Animal vs. plant cells video Stile X Revision notes: Animal vs. plant cells Glossary terms: cell wall, chloroplast, mitochondrion, cell membrane, vacuole, nucleus, cytosol
Session 15	**3.3 Cells under the microscope**	1. Apply the rules of scientific drawing to draw cells under a microscope	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode 20 minutes	As a class, review answers to **3.2 Check-in: Animal vs. plant cells**	Students learn about the rules of scientific drawing and then observe micrograph photos to practise scientific drawing and labelling of cells Direct students to the corresponding Stile X revision notes to complete the question: Draw a scientific drawing of *Spirogyra sp.*, a type of algae, using the photo as a reference	Ask students to reflect on their learning using the *Very Important Points* reflection strategy Assign **3.3 Check-in: Cells under the microscope** as homework to be completed before the next lesson	Stile X app: Flashcards Stile X app: Cells under the microscope video Stile X Revision notes: Cells under the microscope
Session 16	**3.4 Observing plant and animal cells** MATERIALS REQUIRED	1. Use a microscope to observe and draw plant and animal cells 2. Describe similarities and differences between plant and animal cells	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode Collect the required materials listed in the **Lab Guide** Complete the **Risk Assessment Template** 40 minutes	As a class, review answers to **3.3 Check-in: Cells under the microscope** As a class, recall the structures that plants have but animals do not and predict how plant and animal cells may therefore look different under a microscope	Students revise scientific drawing rules and then observe plant and animal slides under the microscope. They record a diagram of what they see and compare this with the sample x to identify if it is a plant or animal cell	Ask students to reflect on their learning using the *Connect, Extend, Challenge* thinking routine	Stile X app: Flashcards

Lesson Planning Guide

Week 1 · Week 2 · Week 3 · Week 4 · **Week 5**

	Lesson name	Learning goals	Preparation required	Ice breaker	Core of lesson	To close	Revision and mastery
Session 17	**3.5 Make a cell model** MATERIALS REQUIRED *Please note this can be substituted for* **4.2 Putting cells to work**	1. Describe the advantages and limitations of scientific models	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode 20 minutes	As a class, revise the importance and limitations of scientific models	Students build a scientific model to represent a plant or animal cell As an extension, students can create a cell analogy to support their model	Ask students to reflect on how well they feel they have done with their model and what they could improve next time	Stile X app: Flashcards
Session 18	**4.1 Specialised cells**	1. Describe what specialised cells are 2. Explain how the structure of a specialised cell helps with its function	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode 30 minutes	As a class, ask students to select options from a poll about what is most important for human survival and then discuss the results	Students explore cell specialisation and how these different cells function to meet the needs of the human body Direct students to the corresponding Stile X revision notes to complete the question: Describe how the structure of the following specialised cells helps with its function	Ask students to reflect on their learning using the *Headlines* thinking routine Assign **4.1 Check-in: Specialised cells** as homework to be completed before the next lesson	Stile X app: Flash Quiz 3 Stile X app: Specialised cells video Stile X Revision notes: Specialised cells Glossary terms: fat cell, intestinal lining cell, red blood cell, specialised cell Extension lesson: **4.3 Mythbusters – Cell division** Glossary term: cell division
Session 19	**Socratic seminar: Feeding the future with cultured meat** MATERIALS REQUIRED	1. Describe some of the risks and benefits of cultured meat, as viewed from different perspectives	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode and **watch this video** of a Socratic seminar in action Download and print the **stakeholder name tags** 40 minutes	As a class, review answers to **4.1 Check-in: Specialised cells**	Students participate in a Socratic seminar to explore the issues around cultured meat, they then self-assess using the rubric	Ask students to reflect on the issue of cultured meat from multiple perspectives using *De Bono's Six Thinking Hats* Encourage students to complete the practice test section of Stile X and explain how it will help them prepare for the test	Stile X app: Flash Quiz 1–3 Study Stile X Revision notes in preparation for **Test: Cells**
Session 20	**Test: Cells**		Ensure each student has access to a device	Seat students appropriately for the test	Supervise students as they complete the test	Fast finishers can complete mindful colouring activities in Stile X	Stile X: Reflection

Lab Guide

< Back to Contents

Complete unit material list

Sourcing all of the materials you need can be hard. To make it easier, we've compiled the list below to show you where we purchased the materials we used in our development and testing of the unit.

Easily accessible items

These items can be bought at your local grocery, stationery and hardware stores. They can typically be purchased with 1–2 days notice.

Equipment	Quantity required per group	Labs this equipment is used in
onion	1 per class	**3.4 Observing plant and animal cells**
paper towel	1 sheet per group	**3.4 Observing plant and animal cells**
ruler, 30 cm	1 ruler	**2.3 Measuring with microscopes**
salt	1 pinch for group observations, 0.9 g for a saline solution	**2.2 Using a microscope** **3.4 Observing plant and animal cells**
seeds (various)	Sample seeds of various sizes to look at under the microscope	**2.2 Using a microscope** **2.3 Measuring with microscopes**
sugar	1 pinch	**2.2 Using a microscope**
tape, clear	1 roll for the class	**2.2 Using a microscope**
teaspoon	1 teaspoon	**2.2 Using a microscope**
toothpick	1 toothpick	**3.4 Observing plant and animal cells**
tweezers	1 pair of tweezers	**2.3 Measuring with microscopes** **3.4 Observing plant and animal cells**

Complete unit material list (cont.)

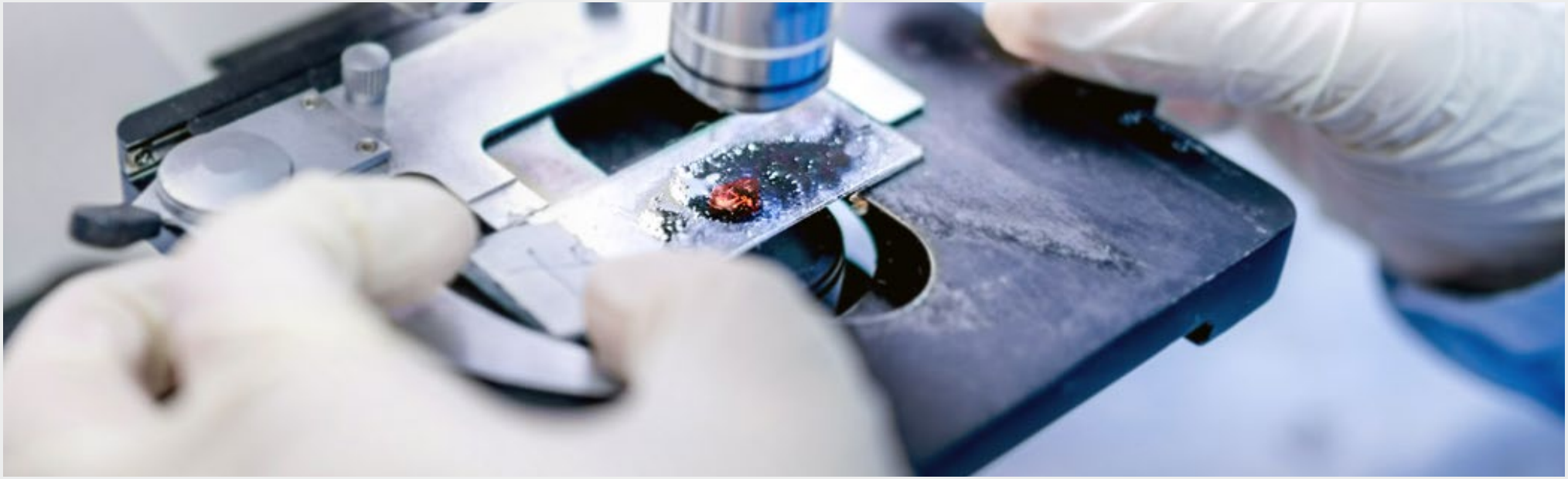
Specialised items

These items can be bought at educational retailers or more specialised locations. We suggest ordering these in advance as they may take longer to arrive.

Equipment	Quantity required per group	Labs this equipment is used in
compound light microscope	1 microscope	2.2 Using a microscope 2.3 Measuring with microscopes 3.4 Observing plant and animal cells
methylene blue	1–2 mL	3.4 Observing plant and animal cells
microscope slide coverslip	2 coverslips	3.4 Observing plant and animal cells
microscope slide, concave	4 slides	2.2 Using a microscope 2.3 Measuring with microscopes
microscope slide, flat	4 flat slides	2.2 Using a microscope 3.4 Observing plant and animal cells
plastic pipette	2 pipettes	3.4 Observing plant and animal cells

PRACTICAL ACTIVITY

Using a microscope



Watch the demo video

stileapp.com/go/usingmicroscopevideo

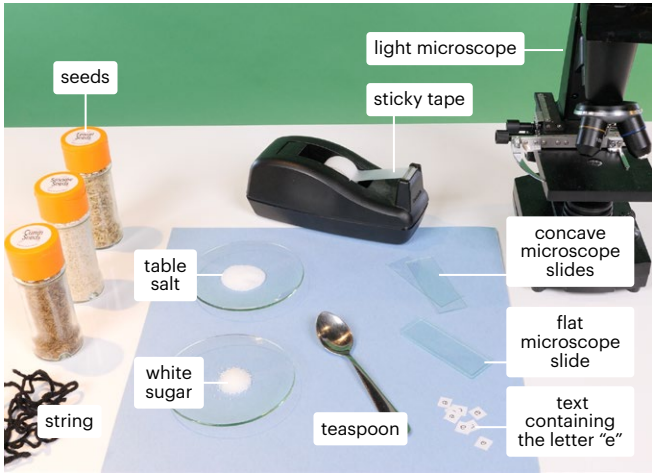
Activity purpose: Teach basic microscope skills, including how to prepare, view and draw dry mount slides.

45 minutes	Lesson: **stileapp.com/go/UsingMicroscope**
2–4 students per group	RiskAssess: **stileapp.com/go/rausingmicroscope**

Materials

Each group of students will need:
- light microscope
- flat microscope slide (for newspaper, wool, string, etc.)
- 2 concave microscope slides (for sugar, salt, seeds, etc.)
- 1 cm^2 square of printed text containing the letter “e”
- sticky tape
- teaspoon
- table salt
- white sugar

Alternative materials:
- *Having a range of small objects for students to observe is recommended. Some interesting alternatives include: sand, glitter, different fabric swatches, wool, string, pipe cleaners, tiny seeds or insect wings.*



Before class preparation

10 min: Prepare 1 cm^2 squares of printed text containing the letter “e” for each group.

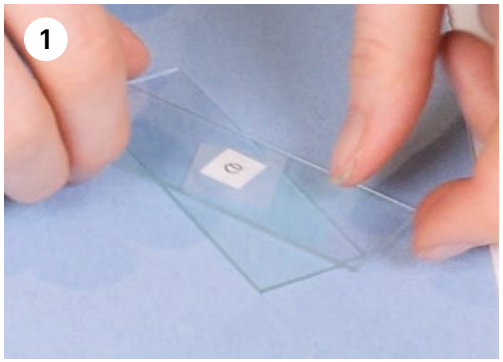
Tips and tricks

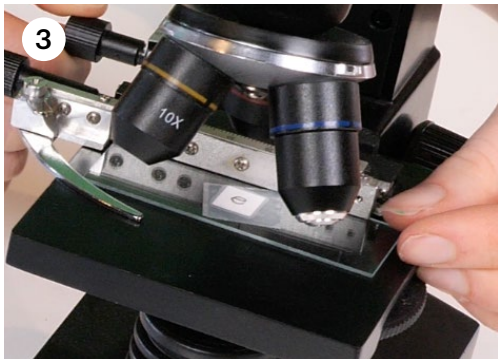
Things we learned from testing the lab ourselves
The smaller the amount of salt, sugar and other objects, the easier it is to observe under the microscope. We encourage you to remind students that less is more when magnifying objects.

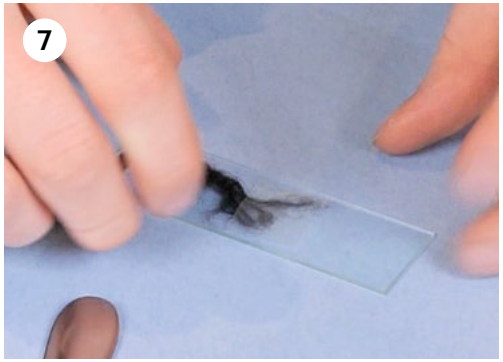
If your microscopes have a photograph function, you might also ask students to record their observations that way.

Method

1. Use sticky tape to attach the square of printed text to the flat microscope slide.
2. Locate a letter “e” and place it over the centre of the light on the microscope stage.
3. Rotate the slide so the “e” is the right way up when you look at it without the microscope (as shown in the photo below).
4. With the lowest power objective lens, locate the “e”. Move it to the centre of the field of view and adjust the focus.
5. Zoom in to the next power objective lens and re-adjust the focus if necessary.
6. Place a few grains of salt and sugar on to concave microscope slides. Take careful note of which one is salt and which one is sugar. Observe the salt and sugar with the microscope.
7. Choose up to two other specimens to observe under the microscope. Examples you might find in the classroom are: hair, millimetre markings on a clear plastic ruler, dust, carpet fibre, T-shirt fibre, dead insect, etc.



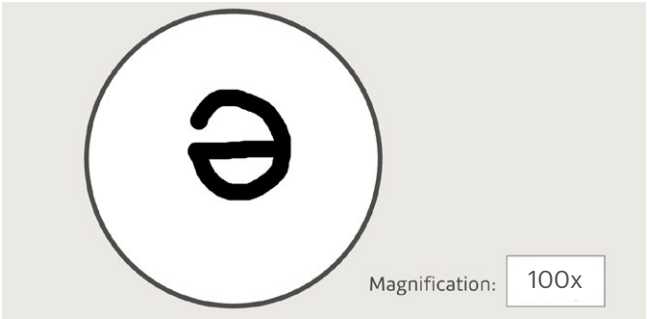


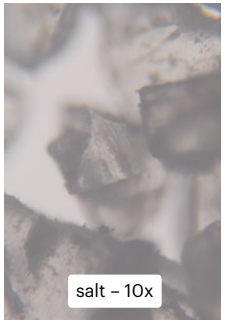


Final outcome

What you can expect to see at the end
The “e” will be both reversed and inverted. The magnification students use will vary depending on the size of the letter they are focusing on.

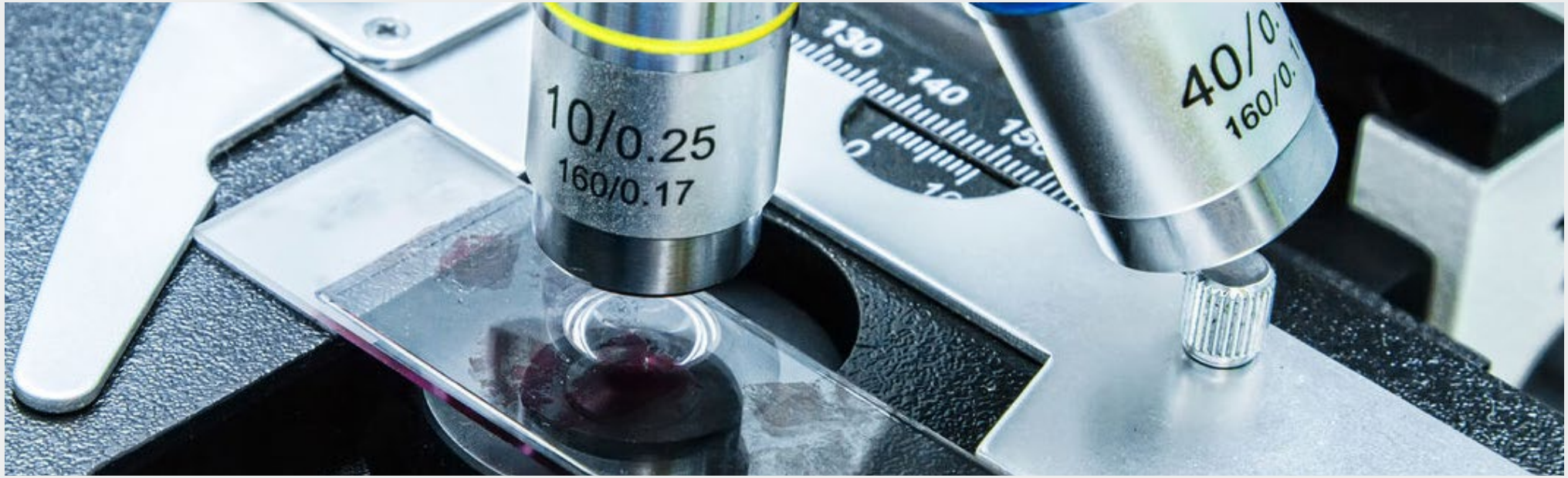
Students’ drawings are not expected to meet all of the conventions of scientific drawings, as these techniques have not yet been covered.





PRACTICAL ACTIVITY

Measuring with microscopes



Watch the demo video

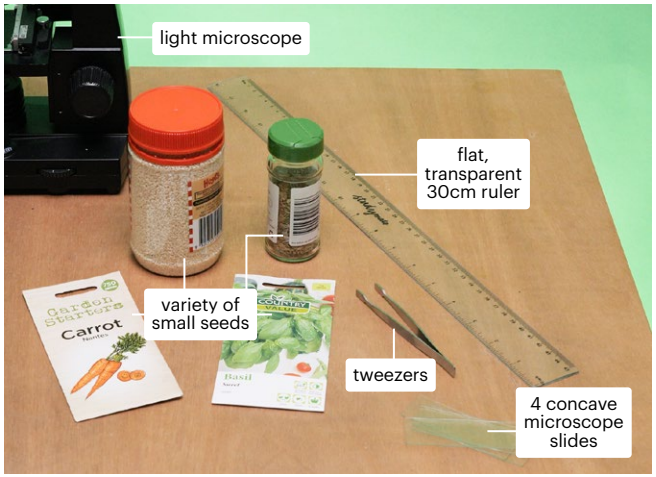
stileapp.com/go/measuringwithmicroscopesvideo

Activity purpose: Explain how to use a microscope's field of view to measure the size of a specimen.

45 minutes	Lesson: **stileapp.com/go/MeasureMicroscope**
2–4 students per group	RiskAssess: **stileapp.com/go/rameasuremicroscope**

Materials

Each group of students will need:
- light microscope
- 4 concave microscope slides
- variety of small seeds
- tweezers
- 30 cm ruler



Before class preparation

Other than collecting materials, no additional preparation is required.

Tips and tricks

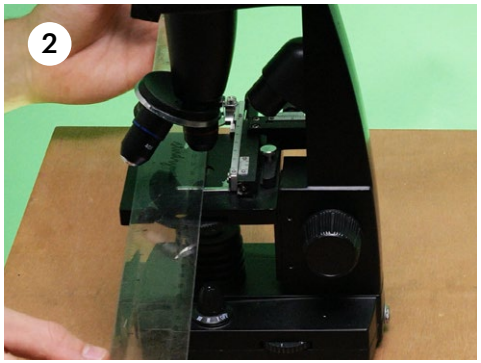
Things we learned from testing the lab ourselves
We recommend poppy, sesame, fennel and mustard seeds as these are commonly found in supermarkets. You may also like to use flower or vegetable seeds from gardening stores, such as celery, basil or carrot seeds. Note that seeds like dandelion, radish and coriander are too big to measure with a microscope. You may also need to consider if any students have seed allergies. You can find more background information and a size reference chart **here** (pp. 45–46).

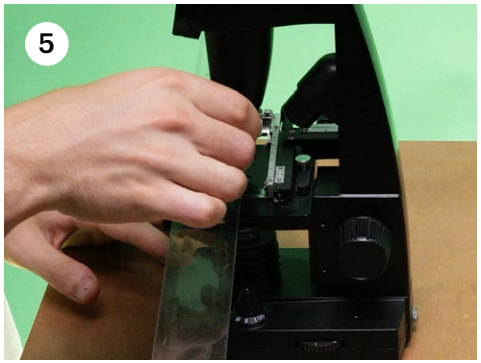
This activity requires students to have been introduced to micrometres and how to convert between different units of length (as covered in the **Sizes of cells** lesson).

Method

Part 1: Measuring the field of view

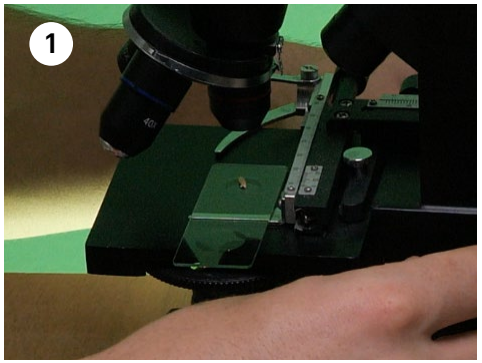
1. Set up the microscope with the lowest power objective lens. Calculate the total magnification and enter it into the first row of the results table below.
2. Place the ruler on the stage and focus the microscope on the ruler markings.
3. Line up the ruler so that it crosses the full diameter of the field of view, as shown in the diagram. Check that the left-hand marking is on the edge of the field of view.
4. Starting from the left-hand marking (zero), count the markings on the ruler. This is the diameter. Record the measurement (in mm) in the results table.
   Note: If you can, use decimals to improve accuracy. e.g. 3.2 mm if there is an extra 0.2 mm in view.
5. Repeat steps 1–4 using the other objective lenses.
6. Convert the measurements to µm and complete the results table.





Part 2: Calculating the sizes of specimens

1. Use the lowest power objective lens to focus on one poppy seed.
2. If appropriate, select a higher-powered objective lens. If the seed takes up the whole field of view after zooming in, zoom back out until the whole seed is in view.
3. Estimate the number of seeds that would fit across the diameter by imagining a row of them. Record this number and the total magnification in the results table below.
4. Repeat steps 1–3 for the other types of seeds.



Final outcome

What you can expect to see at the end
Students will have variations in their measurements. The answers included in the table use seeds easily found in a grocery store. Please note that the measurements shown in the table are approximations only.

Specimen	Number of specimens that fit in field of view	Total magnification	Field of view diameter (µm)	Length of specimen (µm)
poppy seed	4	40x	4000	4000 ÷ 4 = 1000
celery seed	3	40x	4000	4000 ÷ 3 = 1330
sesame seed	1.5	40x	4000	4000 ÷ 1.5 = 2670

PRACTICAL ACTIVITY

Observing plant and animal cells

Watch the demo video

stileapp.com/go/observingplantanimalcellsvideo

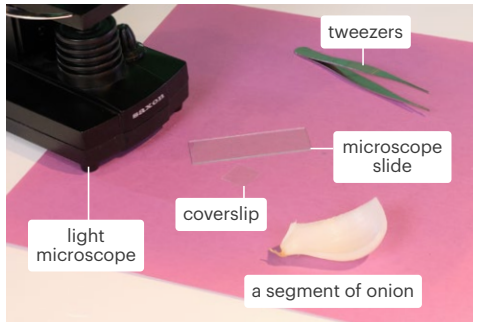
Activity purpose: To compare and contrast plant and animal cells using a microscope.

45 minutes	Lesson: stileapp.com/go/PlantAnimalCells
2–4 students per group	RiskAssess: stileapp.com/go/raplantanimalcells

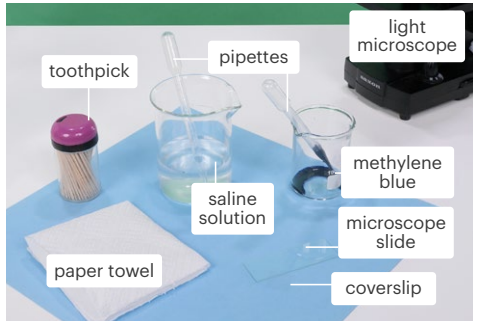
Materials

Each group of students will need:
– light microscope

Part 1: Observing plant cells
– microscope slide
– coverslip
– tweezers
– a segment of onion, with the thin membrane between layers attached



Part 2: Observing animal cells
– microscope slide
– coverslip
– 1 drop of saline solution
– 1 drop of methylene blue
– 2 pipettes
– toothpick
– paper towel



Part 3: Impossible Burger sample
– a prepared slide labelled “Sample X”

Alternative materials:
– *The materials in Part 2 can be replaced with prepared animal slides. Alternatively, see the tips and tricks section to see how the demonstration video can be used in place of Part 2.*

Before class preparation

5 min: Cut an onion into a number of wedged segments. Ensure that there is one wedged segment for each group. Check the segments to make sure they all have the thin membrane between layers attached.

5 min: Prepare a 0.9% NaCl solution by dissolving 0.9 g of NaCl in 100 mL of deionised water. Set the solution aside for use later in class.

10 min: Prepare slides of Sample X by following the student instructions for Part 1. Trim the membrane to create 5 mm x 5 mm squares. This will avoid it being obvious that it’s an onion membrane when the students see it without a microscope. Prepare enough slides so that multiple groups of students can observe them at the same time.

Tips and tricks

Things we learned from testing the lab ourselves
Part 1 and **Part 3**
Onion cells should look a little like a brick wall of connected, layered cells. Sometimes the individual cells can be difficult to observe where there is an air pocket in the sample or where the onion skin has folded over itself. Encourage students to move their slide around until they can see the individual cells clearly.

After conducting Part 1, it may be worth discussing with students why the onion cells don't have any chloroplasts. As these cells spend their entire life underground they have no need to photosynthesise and therefore lack chloroplasts.

Part 2
This activity uses students' cheek cells as animal cell samples. Some school authorities don't allow human fluids and tissues to be used in experiments. Check your school policy before conducting this practical activity. If this is the case for your school, you can show the demonstration video for Part 2 to the class. This includes footage of cheek cells under the microscope. You can show this to the class and pause the video on the footage of the cells down the microscope. Students can use this to draw their scientific drawings and answer the questions.

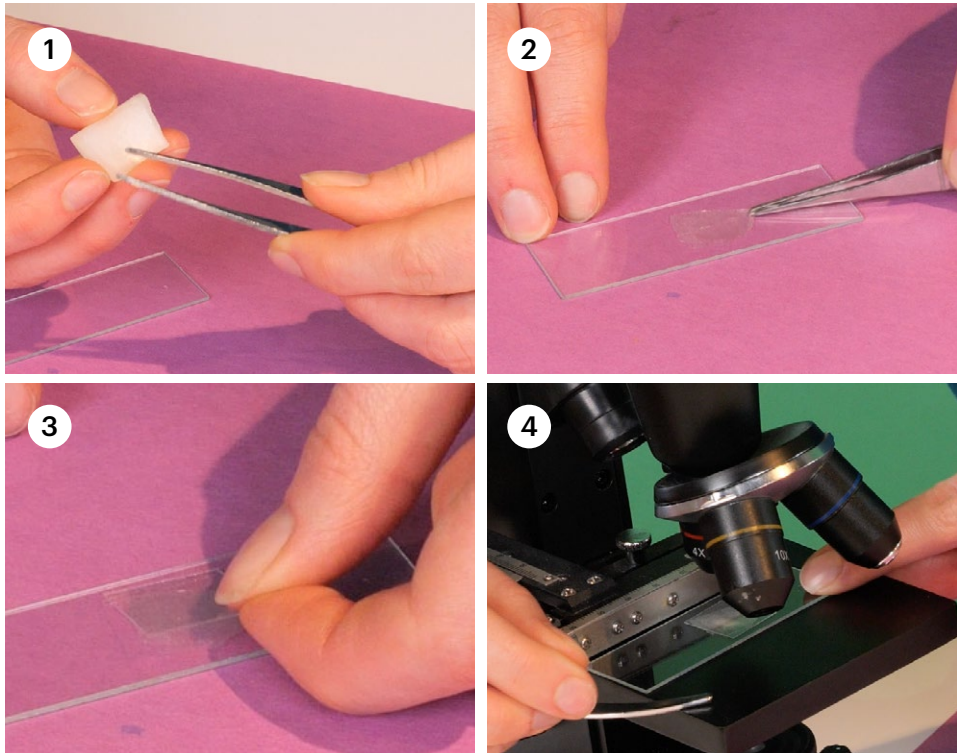
Locating a nice clear cheek cell on the slide can be tricky. The process of scraping the cells from the cheek and onto the slide can often damage the cells. Encourage students to find the most intact cells to observe. Make sure students use the lowest magnification to take a good look around the slide before increasing the magnification.

Note that the toothpick, slide and coverslip that students use in Part 2 will need to be disposed of in a biohazard waste bin. Ensure there is a bin accessible to all students during this practical activity.

Method

Part 1: Observing plant cells

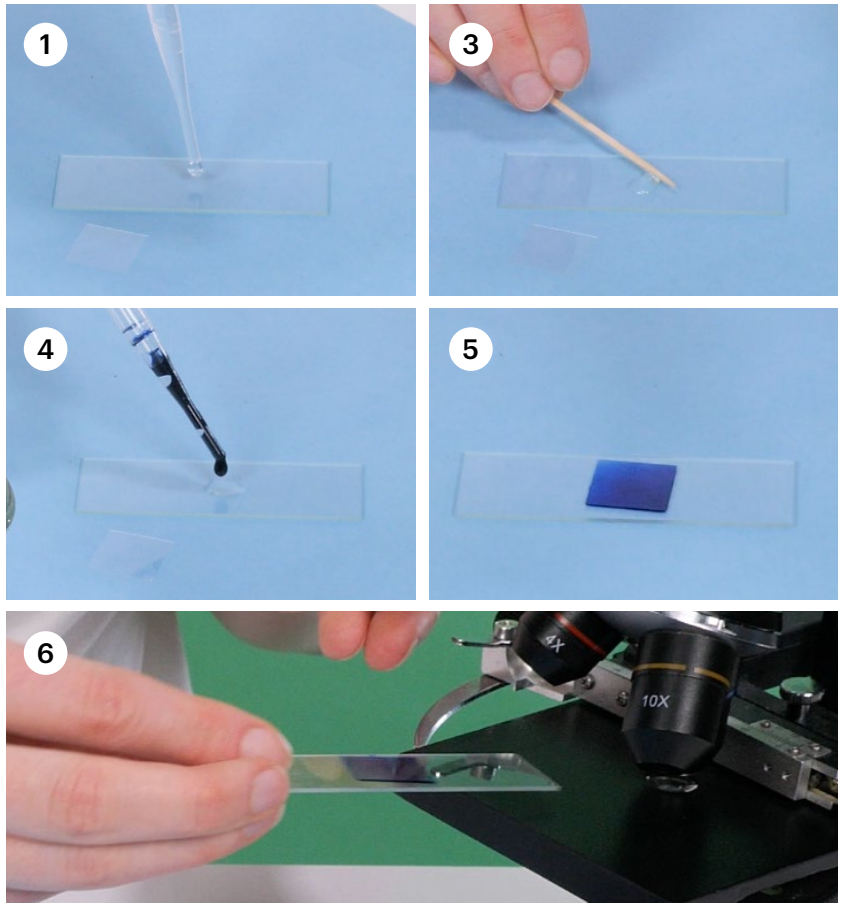
1. Using tweezers, carefully remove the thin membrane from the onion segment. The membrane piece doesn't need to be larger than 1 cm x 1 cm.
2. Place the onion membrane flat onto a glass slide.
3. Place the glass coverslip carefully on top of the onion membrane. Note: Remember to handle the coverslip carefully and not press too hard, as it can easily break.
4. Place the sample securely onto the stage of the microscope. Increase the microscope's magnification until you can clearly see the structure of individual cells.
5. Draw a diagram of one or more cells, following the rules of scientific drawing. Write a detailed description of what you observe.



Method (cont.)

Part 2: Observing animal cells

1. Use a pipette to place one drop of saline solution on a slide.
2. Gently scrape the inside of your cheek with the flat edge of a toothpick.
3. Slowly swirl the toothpick in the drop of saline solution. Dispose of the toothpick into a biohazard waste bin.
4. Add one drop of methylene blue to the saline solution and cheek cells.
5. Place the glass coverslip carefully on top of the solution and cheek cells. Use a paper towel to soak up excess liquid from the slide if needed. Note: Removing too much liquid will make it difficult to see the cells. Only dab the paper towel once or twice lightly to absorb excess liquid if required.
6. Place the sample securely onto the stage of the microscope. Increase the microscope's magnification until you can clearly see the structure of individual cells.
7. Draw a diagram of one or more cells, following the rules of scientific drawing. Write a detailed description of what you observe.
8. When finished, dispose of the cells, slide and coverslip into a biohazard waste bin.



Part 3: Impossible Burger sample

1. Place the slide labelled "Sample X" securely onto the stage of the microscope. Increase the microscope's magnification until you can clearly see the structure of individual cells.
2. Draw a diagram of one or more cells, following the rules of scientific drawing. Write a detailed description of what you observe.

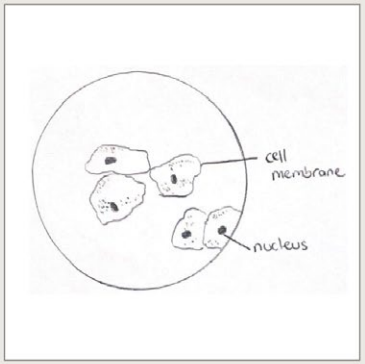
Final outcome

What you can expect to see at the end

Only a few of the main organelles for each cell type will be visible to students using these techniques. They are:

	Cell membrane	Cell wall	Nucleus	Cytosol	Chloroplast
Onion cell sample	✓	✓	✗	✓ (maybe not clear)	✗
Cheek cell sample	✓	✗	✓	✓ (stained a light blue)	✗

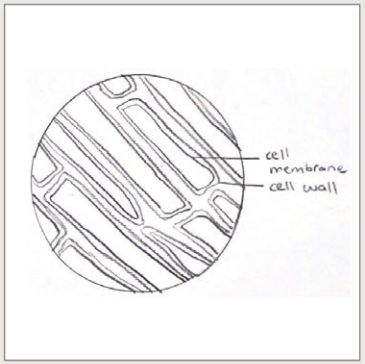
Animal sample



Magnification: 400x

Description: Individual cells are visible. The cell membrane and nucleus can be seen for each cell.

Plant sample



Magnification: 400x

Description: Individual cells are visible. They are arranged in rows, side by side. The cell wall and cell membrane can be seen for each cell.

Students should be able to determine that Sample X is a plant cell by identifying the cell walls. These are only present in the plant cell sample.

Call us on 1300 918 292

Email us at community@stileeducation.com

Swing by the office to say hi!
Level 5, 128 Exhibition Street, Melbourne, Victoria

Stile HQ is located on the traditional lands of the Boon Wurrung and Woiwurrung (Wurundjeri) peoples of the Kulin Nation. We acknowledge that sovereignty was never ceded and pay our respects to Elders past, present and future.