Contents

Pearson Science 2nd edition Activity Book

An intuitive, self-paced approach to science education, which ensures every student has opportunities to practise, apply and extend their learning through a range of supportive and challenging activities.

Pearson Science 2nd edition has been updated to fully address all strands of the new Australian Curriculum: Science, which has been adopted throughout the nation. This edition also captures the coverage of Science curricula in states such as Victoria, which have tailored the Australian Curriculum slightly for their students.

The *Pearson Science 2nd edition* features a more explicit coverage of the curriculum. The activities enable flexibility in the approach to teaching and learning. There are opportunities for extension as well as reinforcement of key concepts and knowledge. Students are also guided in self-reflection at the end of each topic.

Explicit scaffolding makes learning objectives clear and includes regular opportunities for reflection and self-evaluation.

In this edition, we provide a structured approach that integrates a seamless, intuitive and research-based learning hence **differentiating** the course for every student.

The Activity Book also provides richer application opportunities to take the Student Book content further with explicit coverage of Inquiry Skills, Science as a Human Endeavour and Science Understanding.

The diverse offering of worksheets allows students to be challenged at their level. Students have the flexibility to be self-paced and this new edition comes with the advantage of each worksheet being self-contained.

Be guided

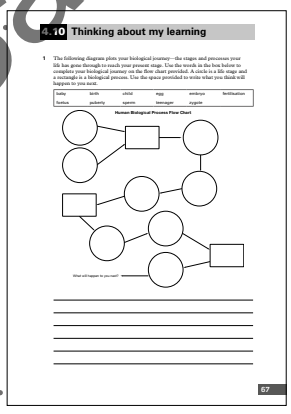
A new handy **Toolkit** at the beginning of the Activity Book has been created to build skills in the key areas of practical investigations, research, thinking, organising, collecting and presenting. Each skill developed in the toolkit is directly relevant to applications in questions, investigations and research activities throughout the student and activity books. A toolkit spread provides guides and checklists alongside models and exemplars.

Be supported

Vocabulary boxes provide definitions for key terms within the relevant context of the task. **Hints** help students get started on a worksheet and provide support in overcoming a barrier.

Be reflective

The **Thinking about my learning** feature provides the opportunity for self-reflection and self-assessment. It encourages students to look ahead to how they can continue to improve and assists in highlighting focus areas for skill and knowledge development.


4.10 Thinking about my learning

1 The following diagram plots your biological journey—the stages and processes your life has gone through to reach your present stage. Use the words in the box below to complete your biological journey on the flow chart provided. A circle is a life stage and a rectangle is a biological process. Use the space provided to write what you think will happen to you next.

baby · birth · child · egg · embryo · fertilisation · foetus · puberty · sperm · teenager · zygote

Human Biological Process Flow Chart

What will happen to you next?

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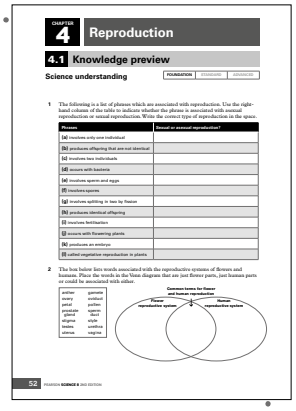
Be ready

A **knowledge preview** at the beginning of every chapter, activates prior knowledge relevant to the topic, providing an opportunity for students to show what they currently know. This handy tool supports teachers in assessing students' prior knowledge.


CHAPTER 4 Reproduction

4.1 Knowledge preview

Science understanding

FOUNDATION · STANDARD · ADVANCED

1 The following is a list of phrases which are associated with reproduction. Use the right-hand column of the table to indicate whether the phrase is associated with asexual reproduction or sexual reproduction. Write the correct type of reproduction in the space.

Process	Sexual or asexual reproduction?
(a) involves only one individual	
(b) produces offspring that are not identical	
(c) involves two individuals	
(d) occurs with bacteria	
(e) involves sperm and eggs	
(f) involves spores	
(g) involves splitting in two by fission	
(h) produces identical offspring	
(i) involves fertilisation	
(j) occurs with flowering plants	
(k) produces an embryo	
(l) called vegetative reproduction in plants	

2 The box below lists words associated with the reproductive systems of flowers and humans. Place the words in the Venn diagram that are just flower parts, just human parts or could be associated with either.

anther · gamete · ovary · ovules · petal · pollen · pistil/style · sperm · stamen · testes · stigma · vagina · uterus · vulva

Common terms for flower and human reproductive system

Flower reproductive system · Human reproductive system

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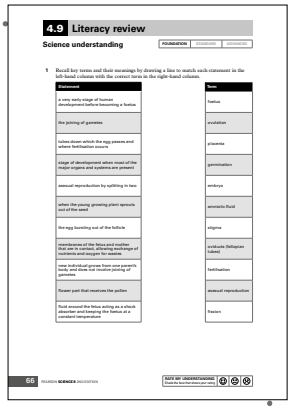
Be literate

Newly improved **literacy reviews**, in consultation with our Literacy Consultant Dr Trish Weekes, provide a deeper and broader range of language building tasks. Every chapter concludes with a literacy review which focuses on building a deeper understanding of key terms supporting students to correctly apply key terms from the topic.


4.9 Literacy review

Science understanding

FOUNDATION · STANDARD · ADVANCED

1 Recall key terms and their meanings by drawing a line to match each statement in the left-hand column with the correct term in the right-hand column.

Statement	Term
a very early stage of human development before becoming a foetus	
the joining of gametes	
tubes down which the egg passes and where fertilisation occurs	
stage of development when most of the major organs and systems are present	
asexual reproduction by splitting in two	
when the young growing plant sprouts out of the seed	
the egg bursting out of the follicle	
membranes of the fetus and mother that allow the exchange of a wide range of nutrients and oxygen for wastes	
new individual grows from one parent's cells and does not involve joining of gametes	
flower part that receives the pollen	
fluid around the fetus acting as a shock absorber and keeping the foetus at a constant temperature	

Term
fission
ovulation
placenta
gametogenesis
embryo
amniotic fluid
stigma
ovulation (fallopian tubes)
fertilisation
asexual reproduction
fission

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RATE MY UNDERSTANDING

Be set

Visit www.pearsonplaces.com.au to enjoy the benefits of the following digital assets and interactive resources to support your learning and teaching:

- Interactive activities and lessons
- Untamed Science videos
- Student investigation templates and teacher support
- Answers for questions in Student and Activity Book
- Chapter tests with answers
- SPARKlabs
- Weblinks
- Risk assessments
- Teaching programs and curriculum mapping audits

Worksheets

Each worksheet is classified according to the degree with which it deals with curriculum understandings.

- **Foundation** indicates the focus is on the basics like terminology.
- **Standard** indicates a focus on the core ideas, understandings and skills.
- **Advanced** indicates transfer and extension of core science understanding and skills to new or more sophisticated situations.

Teachers may use this tool to **differentiate** the worksheets allocated to students. They may select worksheets for students based on whether basic, core or extension exercises are required. The categories do not indicate the degree of difficulty of tasks on the worksheet. A worksheet labelled advanced may have tasks ranging from lower level through to higher-level thinking.

The main science **strand** is identified for each worksheet: Science Inquiry Skills, Science Understanding, Science as a Human Endeavour.

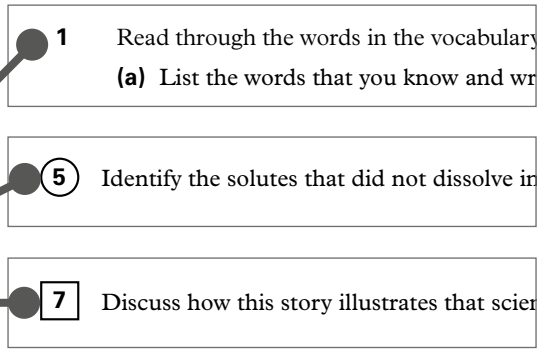
Science Inquiry Skills relevant to the worksheet are identified: Questioning and Predicting, Planning and Conducting, Processing and Analysing, Evaluating, Communicating.

Each question in a worksheet is identified according to the degree of difficulty. Bloom's taxonomy is used as the basis for question classification. The classification is intentionally subtle and unobtrusive. This tool may be used to differentiate between students, matching questions to their levels of ability.

Questions with a straight number indicate a remembering or understanding lower-order question.

Questions with a circle around the question number indicate an analysing or applying middle-order question.

Questions with a square around the question number indicate a creating or evaluating higher-order question.



An innovative tool for students to quickly and easily reflect on their understanding of each worksheet. The teacher may use the student responses as a formative assessment tool. At a glance, teachers may assess which topics and which students need intervention for improvement.

CHAPTER 2

Cells

2.1 Knowledge preview

Science understanding

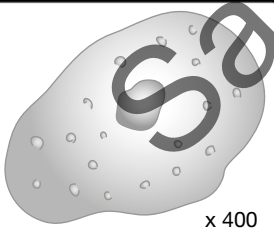
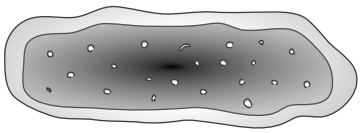
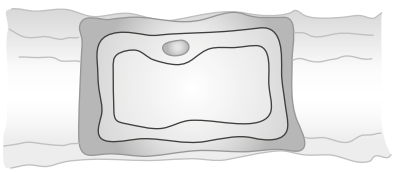
FOUNDATION | STANDARD | ADVANCED

Check what you know about cells and complete the following:

1 Write True or False for the following statements:

Statement	True or False	Statement	True or False
Microscopes and magnifying glasses both enhance your sense of sight.		Cells are the building blocks of living things.	
Animals are unicellular organisms.		A lung is an example of an organ system.	
The human body is made up of just one type of cell.		The brain is composed of nerve tissue.	
Most cells are composed of organelles.		Fungi are not made up of cells.	
All plant cells can make their own food.		Bacterial cells are smaller than plant and animal cells.	

2 A scientist investigated three different specimens and sketched pictures of them after observing them under a microscope. The scientist also included the magnification for each specimen. State whether each specimen is a plant cell, animal cell or bacterial cell and give a reason for your choice.

Specimen	Type of cell	Reason
 x 400		
 x 1000		
 x 100		

3 Select the best answer to complete each statement from the choices provided.

(a) A micrometre is:

- **i** larger than a millimetre
- **ii** smaller than an atom
- **iii** a used to measure the size of cells.

(b) The heart is:

- **i** a tissue made up of blood
- **ii** an organ
- **iii** a muscle tissue.

(c) When a cell divides:

- **i** the number of cells increases
- **ii** the number of cells decreases
- **iii** the organism dies.

(d) Objects viewed through a microscope appear:

- **i** smaller and upside down
- **ii** larger and upside down
- **iii** the same size but back-to-front.

(e) When considering organelles, we know that:

- **i** cells are made up of only one type of organelle
- **ii** organelles have specialised functions
- **iii** organelles are only found in the cells of multicellular organisms.

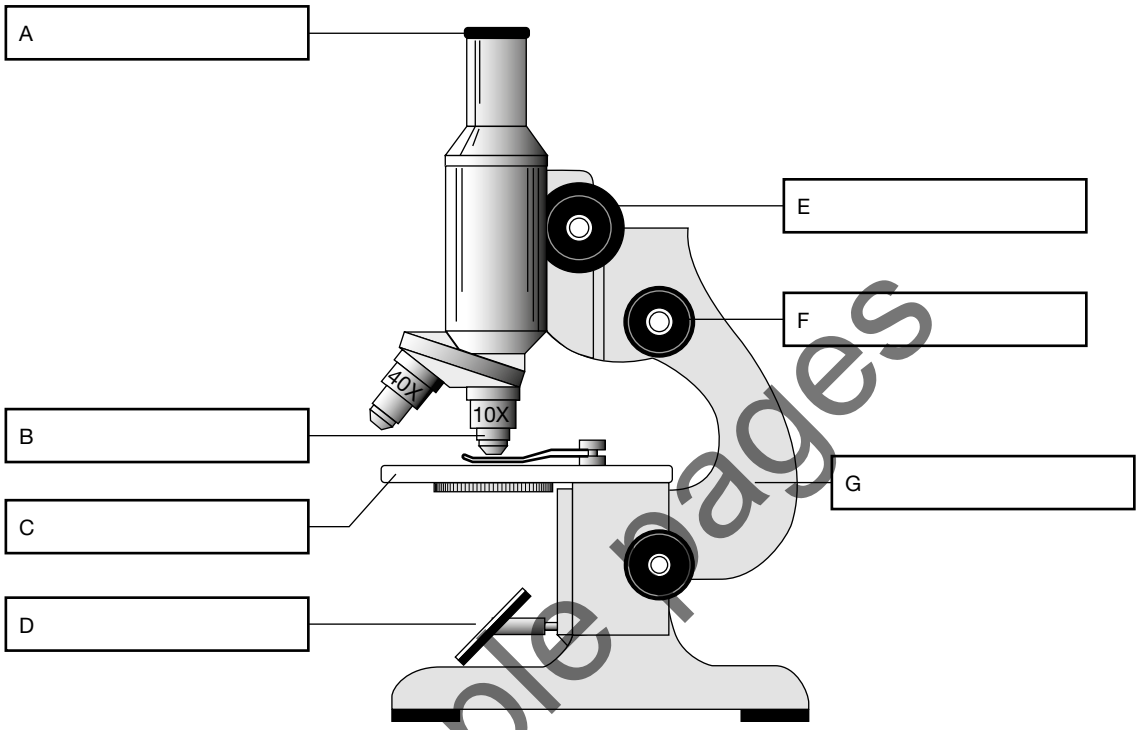
2.2 Getting to know your microscope

Science understanding

FOUNDATION	STANDARD	ADVANCED

1 Name the parts labelled A to G on the diagram using terms from the box below.

coarse focus knob	eyepiece	fine focus knob	handle	light source	objective lens	stage



2 Identify the description of each of the following parts of the microscope to the correct term by joining them with a line.

(a) eyepiece	part of the microscope on which the specimen is placed
(b) coarse focus knob	sharpens the focus on high power
(c) stage	unit used to measure microscopic objects
(d) objective lens	equipment used to make a wet mount
(e) micrometre (μm)	the object being studied using the microscope
(f) specimen	the lens of the microscope closest to the specimen
(g) light source	the part of the microscope you look through
(h) fine focus knob	used to light the specimen
(i) slide and coverslip	used to focus the microscope on low power

2.3 Plant and animal cells

Science understanding

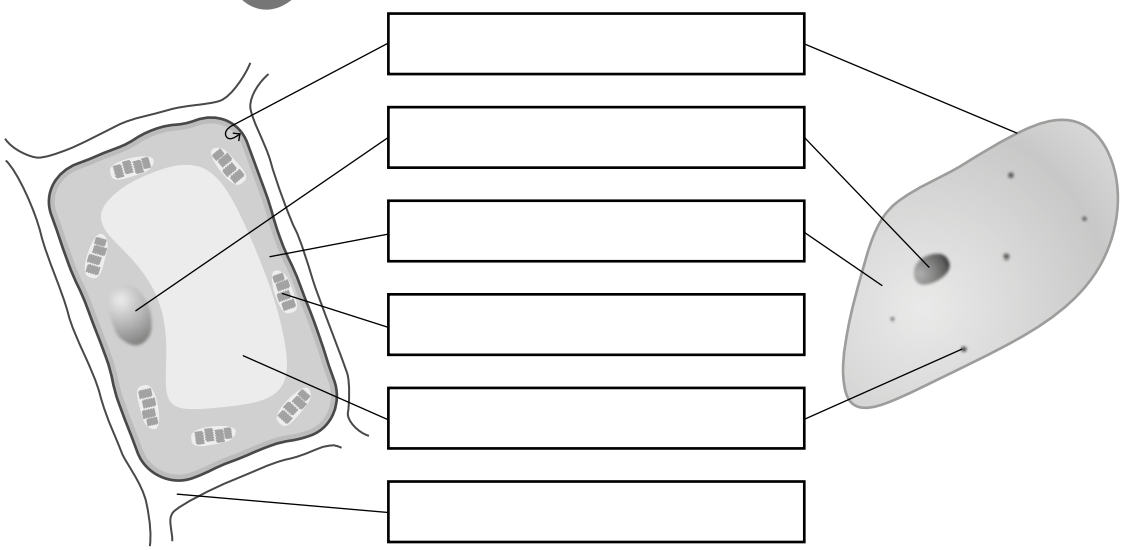
FOUNDATION | **STANDARD** | ADVANCED

1 Plant and animal cells have a number of different features. Match the cell structure (on the left-hand side) with the job it does (on the right-hand side) by joining them with a line. One has been done for you.

(a) cell wall	the 'skin' that holds the cell together
(b) cell membrane	a watery, jelly-like mixture inside cells
(c) nucleus	the powerhouses of the cell where energy is released
(d) cytoplasm	supports and gives a plant its shape
(e) vacuole	the garbage disposal units that get rid of wastes from the cell
(f) mitochondria	where photosynthesis takes place in some plant cells
(g) ribosome	control centre of the cell
(h) lysosome	microscopic factories that produce proteins
(i) chloroplast	contains wastes or chemicals that are being moved around the cell

2 Some features are found only in plant cells, and others are common to both plant and animal cells. Identify the structures of the plant and animal cells by selecting the correct term from the box.

cell membrane	cell wall	chloroplast	cytoplasm	nucleus	vacuole



RATE MY UNDERSTANDING
Shade the face that shows your rating

2.4 Microscopic field of view

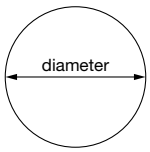
Science inquiry skills

FOUNDATION | STANDARD | **ADVANCED**

Processing & Analysing **Communicating**

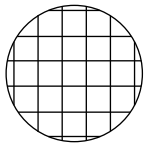
When you look at an organism or part of an organism through a microscope, you can estimate the size by knowing the diameter of the microscope's field of view. The field of view is the circle you see when you look through a microscope. The diameter of the field of view can be calculated by using a mini-grid. A mini-grid is a plastic grid divided into millimetre squares. It is like clear plastic graph paper.

diameter (*n*) a straight line passing from one side of a figure to the other side through the centre

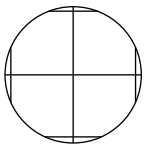


A diagram of a circle showing the diameter

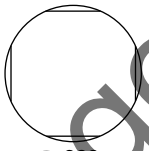
1 The following diagrams show the field of view for three different magnifications of the same microscope. Work out the diameter of the field of view for each of the magnifications to the nearest whole millimetre (mm) and micrometre (µm). Remember that 1 mm = 1000 µm



x 40



x 100



x 200

_____ mm _____ mm _____ mm

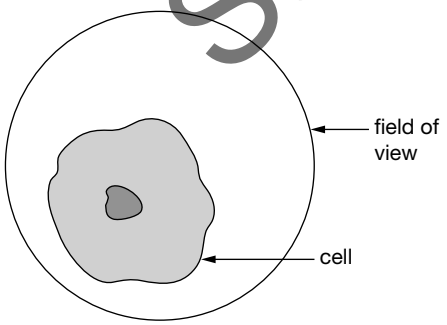
_____ µm _____ µm _____ µm

Use the diagrams and information, to answer the following questions.

2 Explain what happens to the diameter of the field of view as the magnification increases?

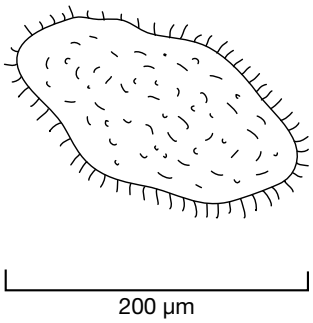
_____

3 Estimate how large the cell in the diagram below is in millimetres. This cell was observed at a magnification of × 40 on the same microscope as for question 1.



Estimate _____

4 Paramecium are small unicellular freshwater organisms that look like this:



They are about 200 µm long and swim through the water using fine hairs (cilia) on the outside of their bodies. Draw a picture of a paramecium as it would appear at a magnification × 200 in the circle below using the same microscope as in Question 1.

5 Paramecium swim so rapidly they can be difficult to observe because they move out of the field of view. Propose a way to slow them down so they are easier to examine.

RATE MY UNDERSTANDING
Shade the face that shows your rating

2.5 Size of cells

Science inquiry skills

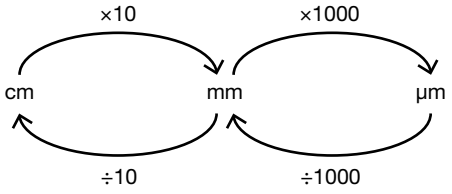
FOUNDATION | **STANDARD** | ADVANCED

Processing & Analysing **Communicating**

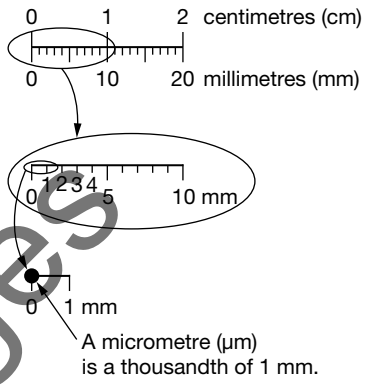
Cells are generally microscopic and many are only fractions of a millimetre. It is not possible to measure the size of cells using millimetres. The unit used is the micrometre. A micrometre is a thousandth of a millimetre and has the symbol μm.

1 Calculate the missing values in the table below by converting to the units shown. To convert from centimetres to millimetres, multiply by 10. To convert millimetres to micrometres, multiply by 1000. To reverse each of these, divide by these factors of 10 and 1000. The first one has been done for you.

Centimentres to millimetres to micrometres conversion table



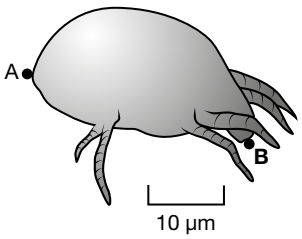
cm	mm	μm
0.03	0.03 × 10 = 0.3	0.03 × 1000 = 300
0.7		
	2	
		45 × 1000 = 45
0.03		
		130
	0.04	
		78



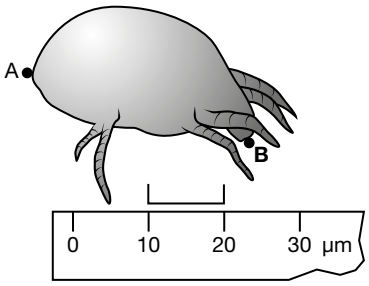
Using scales

2 When scientists draw diagrams of very small objects, they enlarge them. A scale is then added to the diagram to give an idea of the real size. Below is an enlarged drawing of a dust mite and its scale. Dust mites are found everywhere but they are too small for us to see easily. Follow the steps below to work out how big the dust mite really is.

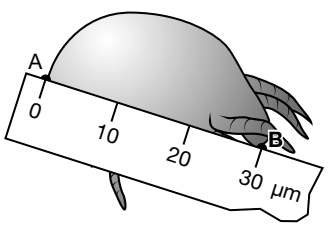
Step 1 Take a piece of paper and place it along the scale next to the drawing



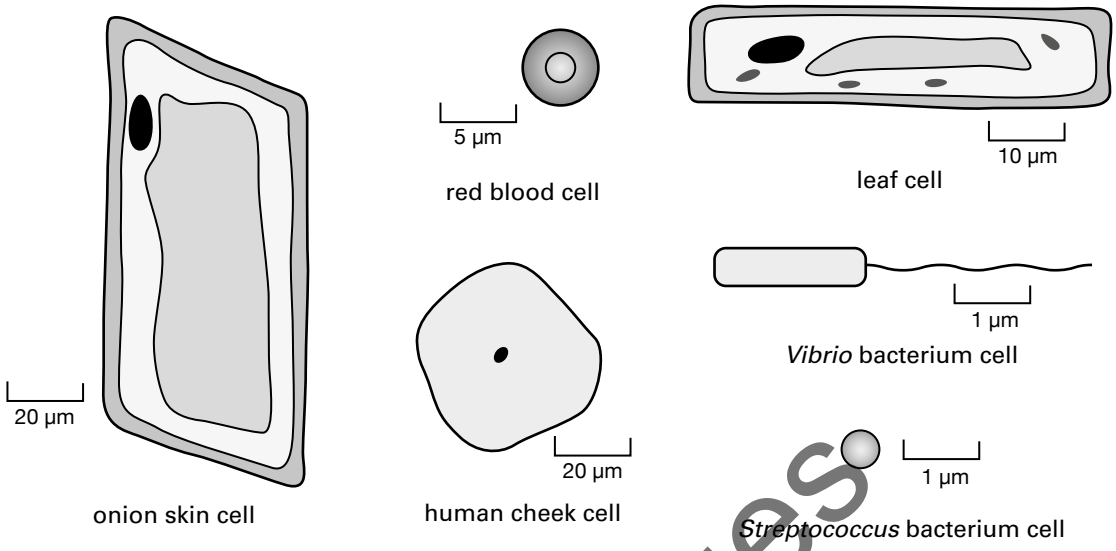
Step 2 Mark off sections along the paper that are exactly the same distance apart as the scale. Number the sections to make a ruler.



Step 3 Use your paper ruler to measure the length of the body from point A to point B. This measurement is 30 micrometres (μm). The actual length of the dust mite is 30 micrometres.



(a) Use these enlarged drawings to calculate how big the cells really are then complete the table below.



Question	Actual size (µm)
What is the diameter of the red blood cell?	
What is the diameter of the human cheek cell?	
What is the length of the leaf cell?	
What is the width of the leaf cell?	
What is the length of the onion skin cell?	
What is the width of the onion skin cell?	
What is the length of the body of the *Vibrio* bacterium cell?	
What is the width of the body of the *Vibrio* bacterium cell?	
What is the length of the tail of the *Vibrio* bacterium cell?	
What is the diameter of the *Streptococcus* bacterium cell?	

(b) Calculate the number of *Streptococcus* bacterial cells placed side by side that would fit across the diameter of a human cheek cell.

_____

(c) Calculate the number of red blood cells placed side by side that would fit along the length of a leaf cell.

_____

2.6 Electron microscope images

Science inquiry skills

FOUNDATION | STANDARD | **ADVANCED**

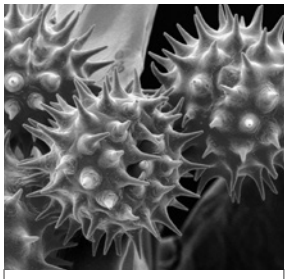
Processing & Analysing **Evaluating**

When scientists first used electron microscopes many familiar structures looked very different to how they appeared under a light microscope. They also saw things that had never been seen before. They had to try to make sense of the images.

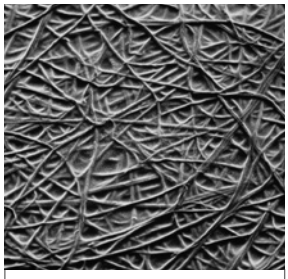
The following pictures are electron micrographs of familiar objects.

1 **(a)** Match photographs **A** to **D** with the correct name from the box. Write your answers on the labels underneath the images.

eye of a fly	salt crystals	sun flower pollen	paper



A



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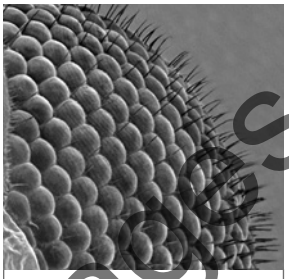
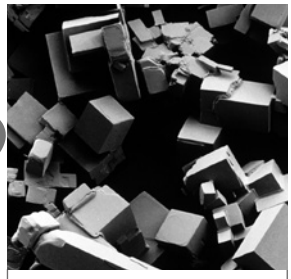


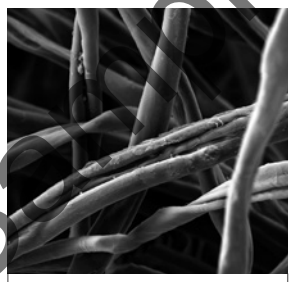
C



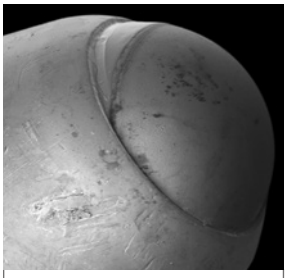
D

(b) Suggest what photographs **E** to **H** represent. Write your ideas under each image.

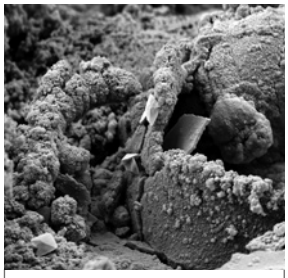
E



F



G



H

2 How did you try to work out what each was? What type of things did you look for?

2.7 The shape and structure of cells

Science inquiry skills

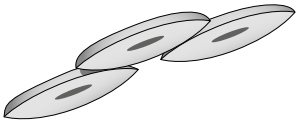
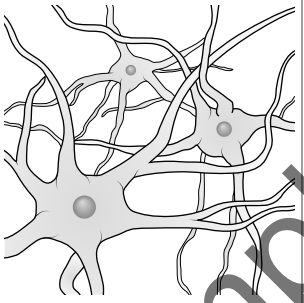
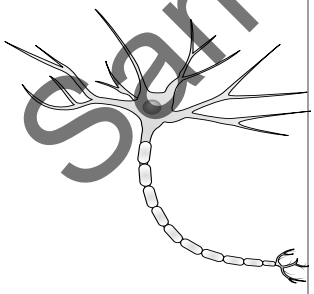
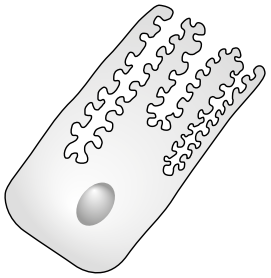
FOUNDATION | **STANDARD** | ADVANCED

Processing & Analysing

The cells found in plants and animals are of different shapes and sizes depending on what they do.

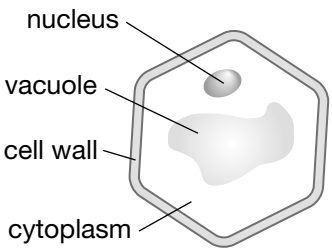
1. Think about where these cells are found and the jobs they have to do. Explain why their shape means that the cells are well suited to their jobs.

Cell type and function suitability

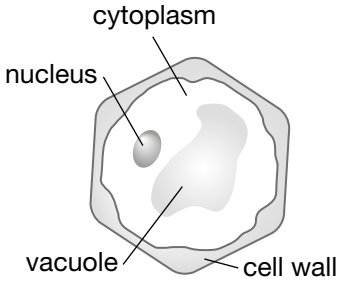
Cell type	Diagram of cell	Function	Why the shape makes the cell suited to its job
(a) human skin cells		provides a complete covering for the body	
(b) nerve cells in brain		sends information to and receives information from different parts of the brain	
(c) nerve cell in body		sends information from all parts of the body to the brain	
(d) cell from small intestine		passes digested food from space inside the intestine into the circulatory system of the body	

digested (*v*) food broken down in the stomach

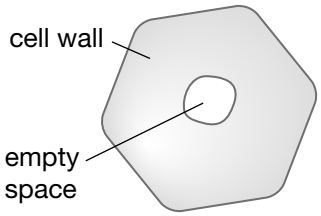
2 Some plant cells change as they get older. These three diagrams represent a cell from the stem of a tree.



Cell in the stem of a seedling at 10 days old



Same cell at 3–4 months old



Same cell in mature tree at 5 years old

(a) Describe the changes that have occurred.

(b) How do these changes help the plant survive?

3 The following table contains a list of features of particular cells. Suggest how each feature helps the cell carry out its job.

Cell features and functions	
Feature of cell	**How the feature helps the cell do its job**
(a) Cells in the upper layers of leaves have large numbers of chloroplasts.	
(b) Muscle cells in the human leg have large numbers of mitochondria.	
(c) Cells in plant stems that carry water from the roots are joined end to end so they form a continuous tube.	
(d) Bone cells make a structure which can store minerals. This makes a hard substance that surrounds the bone cells.	

2.8 Surface area

Science inquiry skills

FOUNDATION | STANDARD | **ADVANCED**

Processing & Analysing **Questioning & Predicting** **Evaluating**

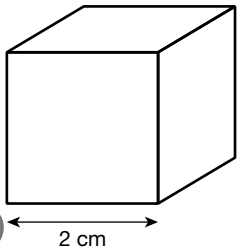
Cells come in many different shapes. This activity explores the possible advantages of cells of different sizes and shapes.

The cell membrane acts as a barrier between the outside and the inside of the cell. Anything that the cell requires or needs to get rid of has to move out through the membrane. The cell will function best if there is an efficient exchange of materials across the membrane.

exchange (*n*) a swap or transfer of something

membrane (*n*) a thin layer that acts like a skin

1 Imagine a cell as being like a cube.



The surface of this cube is made up of the faces of the cube. The surface area of the cube is the area of all six sides of the cube added together. This cube has sides that are each 2 cm long.

To calculate the surface area of the cube:

Work out the surface area of one side of cube.

Area = Length × Width

Area = 2 × 2

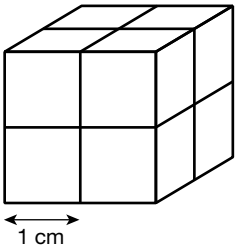
Area = 4 cm^2

Multiply the surface area of one side (4 cm^2) by the number of sides the cube has (6)

Total surface area = 4 × 6

Total surface are = 24 cm^2

(a) Imagine the cube now being cut into eight smaller cubes.



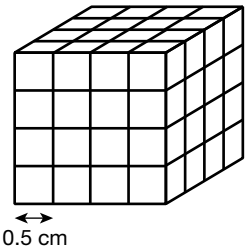
Calculate the surface area of one of the smaller cubes and then the total surface area of all eight cubes combined.

_____ _____

_____ _____

_____ _____

(b) Now cut each small cube into eight smaller cubes again.



Calculate the surface area of one of the smaller cubes and then the total surface area of all the cubes.

_____ _____

_____ _____

_____ _____

(c) Record your results for (a) and (b) in rows 2 and 3 of this table.

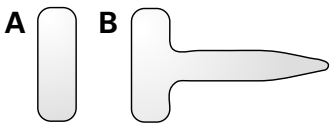
Length of side (cm)	Surface area of 1 cube (cm^2)	Number of cubes	Total surface area (cm^2)
2	4	1	24
1		8	
0.5			
0.25			
0.125			

(d) Describe the pattern of change in the surface area by looking at the results in the table.

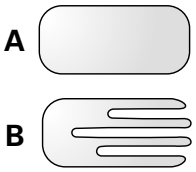
(e) Use this pattern to predict the values that will complete the last two rows of the table. At each stage, each cube is cut into eight. Write your predictions in the table.

(f) Calculate how much faster water would move into 64 cube-shaped cells with sides of 0.5 cm than into one cell with sides of 2 cm. (Hint: compare the total surface area of each.)

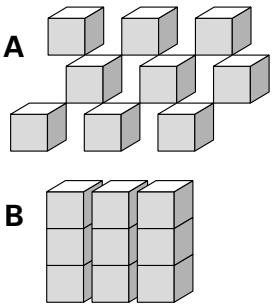
2 The cells covering the surface of a plant root are mostly like those shown in diagram A to the right. However, in the area where most water enters the root, the cells are shaped like those of diagram B. Explain why these root cells would be an advantage to the plant.



3 Diagram A to the right shows the typical shape of the cells lining your gut. In a part of the gut called the small intestine the cells are more like those of diagram B. Suggest what the purpose of the small intestine might be.



4 During the night, leaf cells take in oxygen gas from the atmosphere. They also release carbon dioxide gas. Compare the two arrangements of cells shown in diagrams A and B to the right and decide which one would exchange gas more efficiently. Explain your answer.



2.9 Functioning plant

Science inquiry skills

FOUNDATION | **STANDARD** | ADVANCED

Processing & Analysing | Evaluating

1 Use words from the box below to complete the sentences.

carbon dioxide	chlorophyll	glucose	oxygen
phloem	root hairs	sunlight	water
xylem			

chloroplasts (*n*) organelles in green plants that contain chlorophyll and where photosynthesis takes place

distributed (*v*) spread out

efficiency (*n*) ability to do a job effectively

raw materials (*n*) basic elements/ingredients, not processed

waste product (*n*) unwanted material or substance

(a) The raw materials for photosynthesis are _____ and _____ .

(b) Photosynthesis also needs the green chemical called _____ found in chloroplasts together with energy from _____ .

(c) _____ is produced by photosynthesis.

(d) A waste product from photosynthesis is _____ .

(e) Water is taken into the plant through _____ and travels up the _____ to the leaves of the plant.

(f) Glucose is distributed throughout the plant in the _____ .

2 Why is it an advantage for plants to have cells with large numbers of chloroplasts near the upper surface of the leaf?

_____

_____

_____

3 Glucose is carried in the phloem from the cells where it is made, up the plant towards the tips of branches and down towards the roots. Explain why glucose is needed in:

(a) the tips of branches

_____

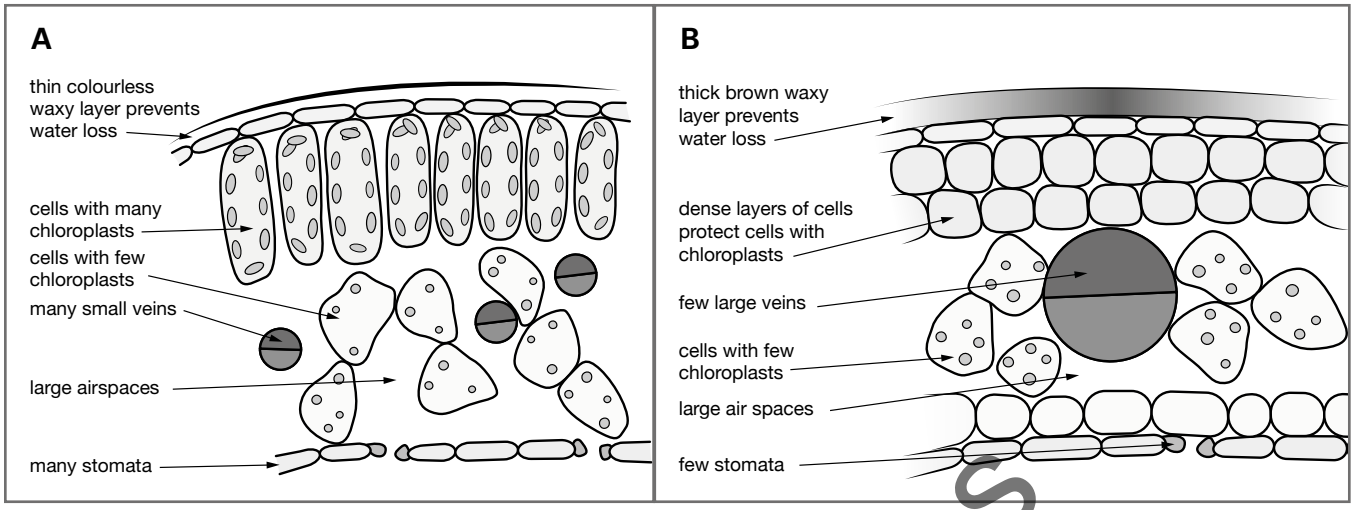
_____

(b) in the roots.

_____

_____

4 **(a)** Contrast the organisation of the tissues in the two leaves shown in diagrams A and B. Write these differences in the first column of the table below in question 4(b).



(b) What effect would the differences between the two leaves, A and B, have on the leaves' ability to carry out photosynthesis efficiently? Write your answers in the second column of the table.

Leaf organisation differences	
Difference	**Effect on photosynthesis**

2.10 Growing cells

Science as a human endeavour

FOUNDATION | **STANDARD** | ADVANCED

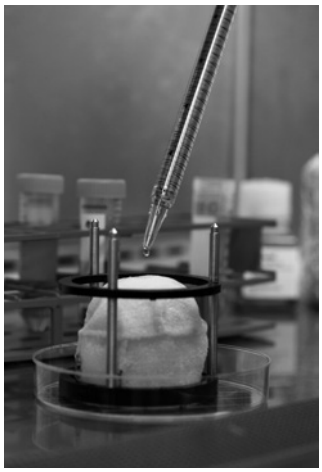
1 Define the term *cell culture*.

2 List some of the uses of cultured cells.

3 Explain how stem cells are different from other cells.

4 Below is a jumbled set of steps for growing a bladder for transplant to a human. Read each step and arrange the steps in the order the process occurs by numbering the steps 1 to 5.

- ☐ Make a scaffold that cell culture can grow on in the shape of a bladder.
- ☐ Grow the cells taken from the patient in a cultured solution.
- ☐ Transplant the cell culture back into the body of the patient where they continue to grow.
- ☐ Take cells from the bladder lining and from muscle of the patient.
- ☐ When enough cultured cells have grown, place them on a shell-shaped scaffold to grow more cells in a cultured solution.



A bladder grown using cultured cells.

5 Why is a shell-shaped scaffold necessary when growing a new organ like a bladder but is not used when growing skin?

6 What are two types of cells that were cultured to grow the new bladder?

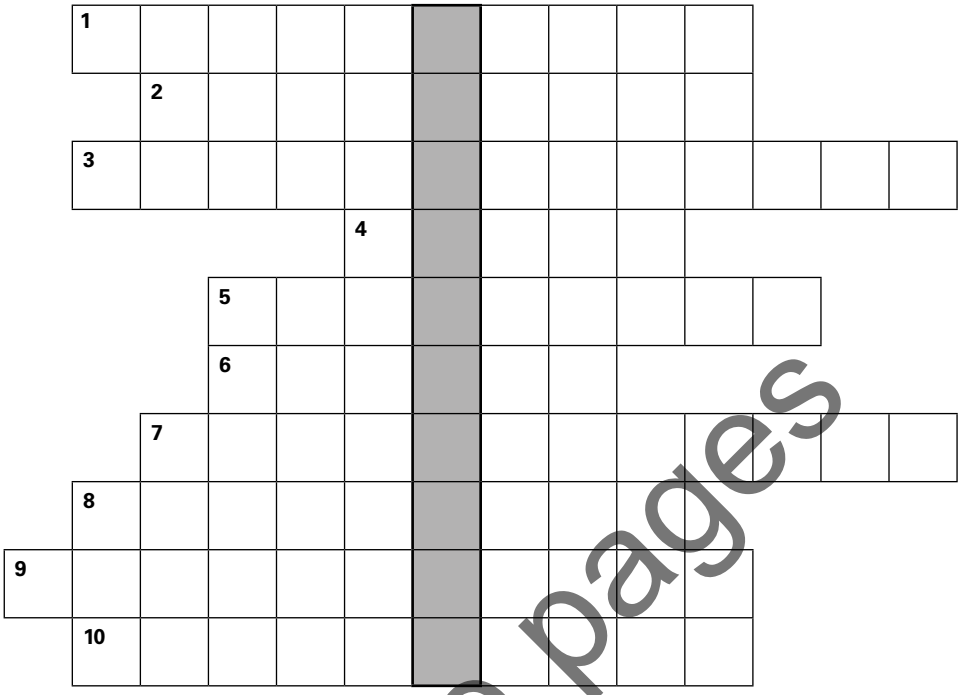
RATE MY UNDERSTANDING
Shade the face that shows your rating ☺ 😐 ☹

2.11 Literacy review

Science understanding

FOUNDATION | STANDARD | ADVANCED

1 **(a)** Use the clues to complete the crossword. All words are written across the crossword.



1 Unit used to measure microscopic things
2 When small things are made to look bigger than they are
3 Describes an organism made up of many cells
4 Group of different tissues that work together
5 Watery, jelly-like substance found inside cells
6 Groups of cells of the same type
7 Powerhouses of the cell
8 Organelles that produce proteins
9 The organelle that makes plants green and where they make their food
10 Small parts found within cells

(b) Read the letters in the shaded column. State the word they spell.

_____

(c) Define this word.

_____

_____

2.12 Thinking about my learning

Consider the statements in the table below and rate your confidence in your knowledge, understanding or skills for each statement by placing a tick (✔) in one of the columns.

Statements	I am not sure.	I understood some things.	I understood most things.	I understand this really well.
I can label the parts of a microscope				
I can operate a microscope correctly				
I can prepare a wet mount to observe a specimen				
I can calculate the magnification on a microscope				
I can correctly identify the difference between a plant and animal cell				
I can identify the different organelles in a cell				
I understand the function of a cell membrane				
I understand the function of the nucleus				
I can convert millimetres to micrometres				
I understand the function of a chloroplast				
I am confident I know the difference between a unicellular and multicellular organism				
I am confident I can name a variety of specialised cells				
I can name a variety of different tissues in animals				
I can identify different organs in the human body				
I understand the purpose of mitosis				
I can analyse data in a table or graph				