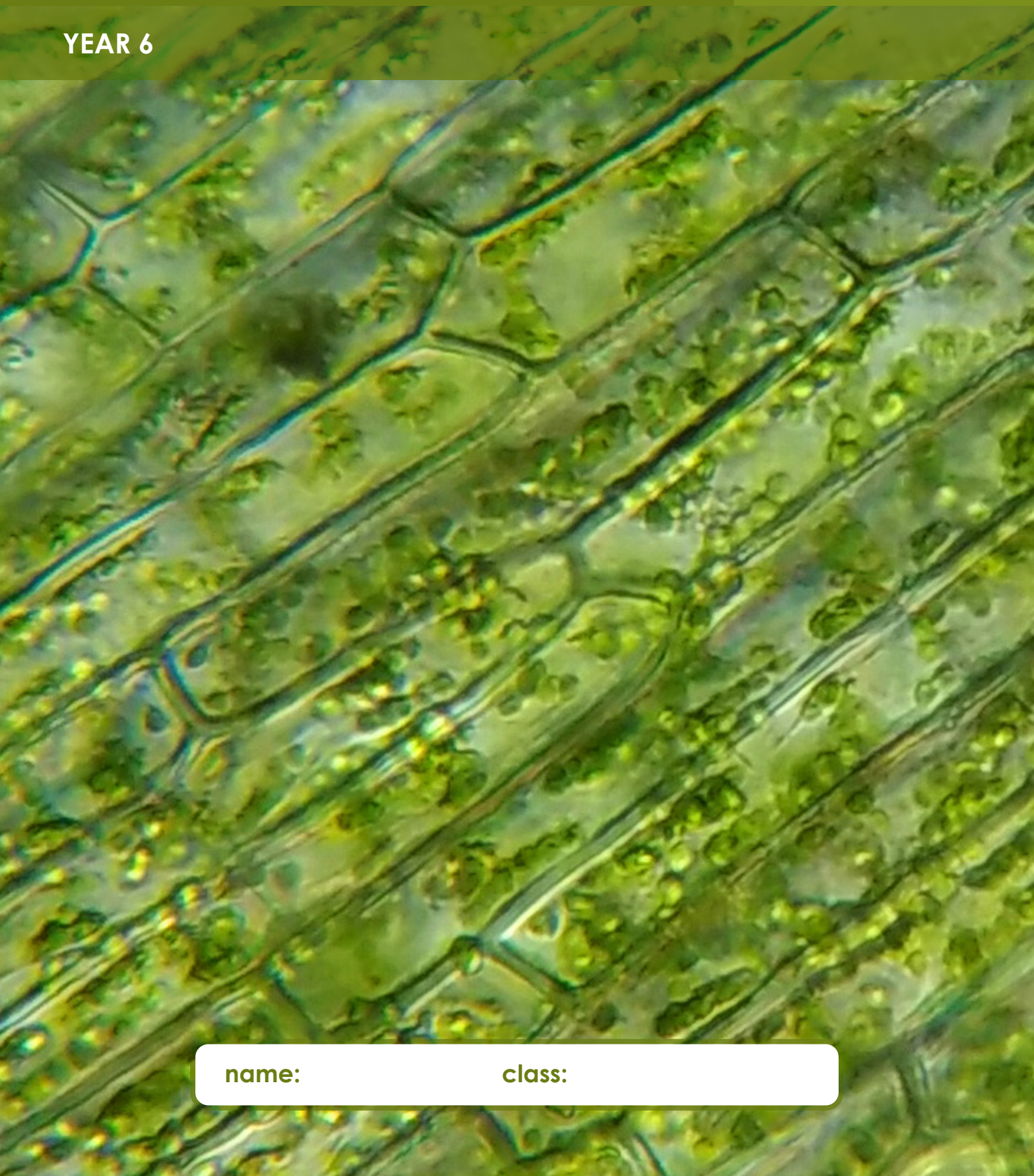
CELLS

REACH OUT

YEAR 6



name: class:

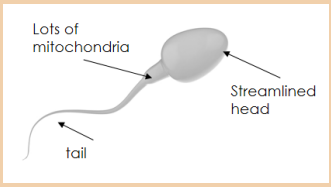
Knowledge Organiser • Cells • Year 6

Vocabulary

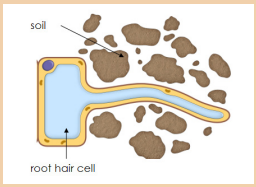
Organism	Any living thing
MRS NERG (acronym)	7 processes all living things carry out: Move, respire, sense, nutrients, excrete, reproduce, grow
Organ system	A group of organs working together e.g. circulatory system
Organ	A group of tissues working together e.g. heart, leaf
Tissue	A group of cells working together e.g. muscle
Cell	The smallest functional unit of an organism
Mitochondria	Releases energy for the cell
Photosynthesis	Chemical reaction that makes food for plants

Specialised cells

Sperm Cell



Root hair cell

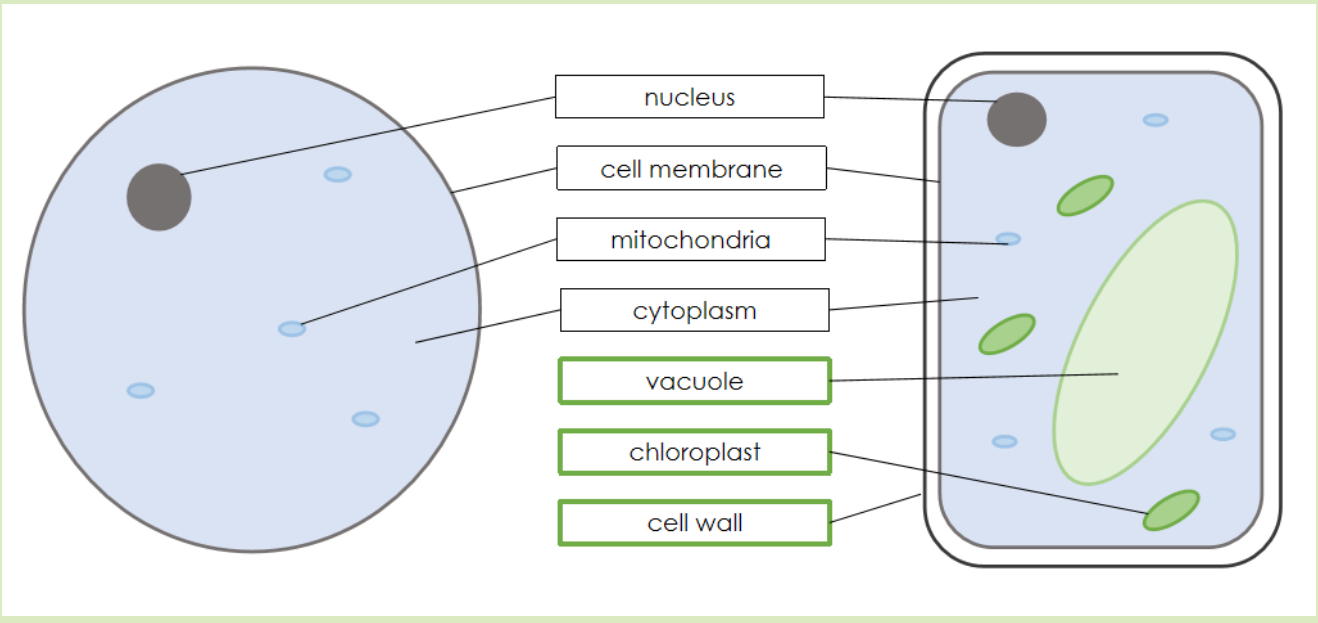


Organ System	Function
Digestive system	Breaks down food and absorbs nutrients
Circulatory system	Transports substances like oxygen around the body
Muscular system	Works with bones to help you move
Skeletal system	Works with muscles to help you move
Respiratory system	Takes in oxygen and gives our carbon dioxide

Cell Structure	Function
Nucleus	Controls the activities of the cell
Cytoplasm	Jelly like substance where chemical reaction take place
Cell membrane	Controls what gets in and out of the cell
Respiration	Chemical reaction that releases energy
Cell wall	Supports the cell
Vacuole	Contains sap and keeps cell rigid
Chloroplast	Absorbs sunlight for photosynthesis

Animal cell

Plant cell



Lesson Question	You will learn	Learning Review
What is the difference between living and non-living things?	• Name the seven factors all living things carry out • Identify things as living or non-living • Explain the history of classification of living things.	
What are the main organ systems of the body?	• Describe what an organ system • Give examples of organ systems in animals • Give examples of organ systems in plants	
What are organ systems, organs, tissues and cells?	• Describe how organ systems are made from organs • Explain how organs are made from tissues which are made from cells • Describe how cells can together build tissues	
What are animal cells?	• Name the parts of an animal cell • Label the parts of an animal cell on a diagram • Describe what each part of an animal cell does	
What are plant cells?	• Name the parts of an plant cell • Label the parts of an plant cell on a diagram • Describe what each part of an plant cell does	
What are specialised cells?	• Describe what a specialised cell is • Give examples of specialised cells are • Explain how root cells and sperm cells are specially adapted	

Lesson
01

What is the difference between animals and plants?

Retrieval practice

1. Animals are:
   a. Not living
   b. Sometimes living
   c. Living things
   d. It depends on the animal

2. Which one of the following do plants NOT need?
   a. Water
   b. Sunshine
   c. Nutrients
   d. Things to eat

3. Name three living things.

Retrieval from previous units:

4. Match up the words below with the right definition:

Independent variable	the thing you observe to see how it is affected
Dependent variable	the things you have to keep the same to make sure it is a fair test
Control variables	the one thing that you change

1. Watch the video of a plant. How does this prove that a plant is a living thing?

2. Can you remember the 7 life processes in the acronym MRS NERG?

3. Read the following passage about classifying organisms.

There are seven processes that all living things can be recognised to do. These seven processes form an acronymn to help us remember them: MRS NERG.

The first process is movement, for example animals can move using muscles, plants can move towards sunlight. Respiration is the second process. Respiration is a chemical reaction that all living things can do to release energy.

All organisms are able to sense changes in their environment and will respond to these changes we call this sensitivity. For example, barnacles will close their shells during low tide to prevent themselves from drying out and you will blink if something flies towards you.

In order for organisms to survive they require food for energy and nutrients. Energy and nutrients are essential for growth, survival and reproduction we call this nutrition. Excretion is an essential living process so that organisms can remove waste products. In order for a species to continue they must be able to reproduce which means they can create new organisms from an existing organism. Finally, all organisms are also able to grow.

4. Find the answers in the text above.

1. What does MRS NERG stand for?

M_____ N_____

R_____ E_____

S_____ R_____

G_____

2. Explain why you are classified as a living thing.

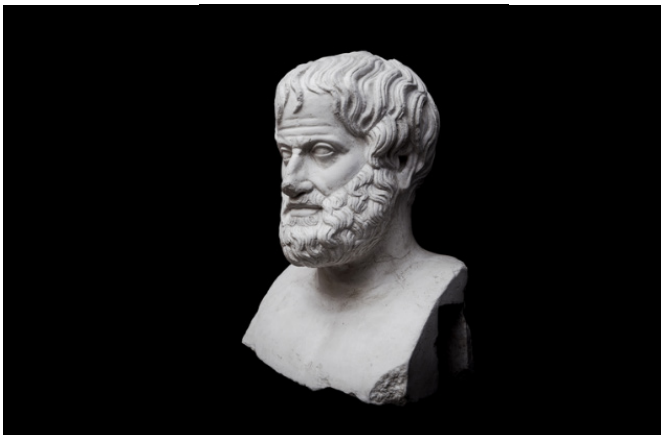
3. Explain why rocks are not classified as living things.

5. Can think of an action to help you remember each part of MRS NERG?

6. Read the following passage about the history of classifying organisms.

Aristotle was an ancient Greek philosopher, born in 384 BCE and is recognised as the originator of the scientific study of life. He was the first person to write about the study of Biology in the history of science and he came up with a system of studying life by making observation and collecting data.

He recognised that living things (such as plants and animals) were different to non-living things (such as rocks) because of core processes they can do. Today we use technology to classify organisms using MRS GREN.



7. Find the answers in the text above.

1. Which scientist developed the science of studying living things?

_____

2. When did this scientist live?

_____

3. Give an example of a living thing.

_____

4. Give an example of a non-living thing.

_____

8. Look at the examples below. Are they living or non-living. Explain your answer. The first one has been done for you.

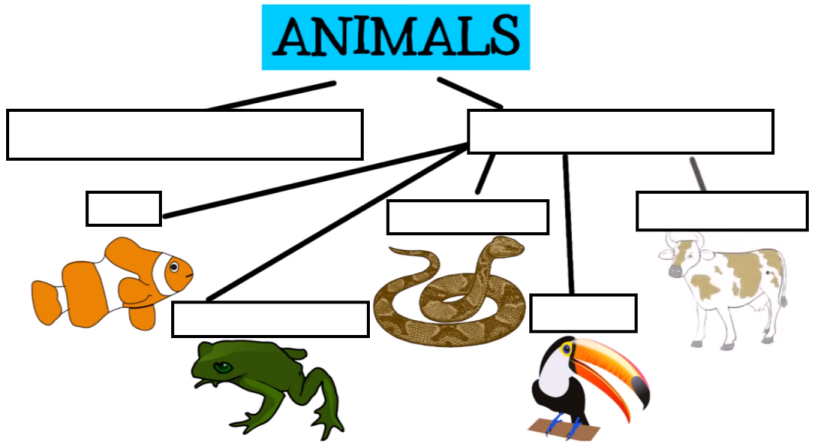
	Living or non-living	Explanation
Tree	Living	Trees move e.g. towards light, respire, sense e.g. light and garvity, grow, reproduce e.g. produce acorns, excrete e.g. oxygen is a waste product, nutrients e.g. absorb mineral in the soil.
Cat		
Sand		
Cactus		

9. When else have we learnt about classification? Can you remember other ways to classify living things?

10. Can you match the 5 Kingdoms to the characteristic that we observe in each kingdom?

Prokaryotes and Protoctista	Grow from the remains of other organisms
Animalia	Organisms that eat other organisms.
Plantae	Micro-organism (so small that we can't see them)
Fungi	Organisms that create their own food using sunlight

11. Can you fill in the diagram below to show how we commonly classify the animal kingdom?



• amphibians • birds • vertebrates • mammals • fish • `invertebrates • reptiles

12. How could we design an experiment to test whether cress will move towards light? What would the variables be?

13. Write a method and draw a diagram for your proposed experiment below.

14. How could we test cress to see if it performs a different life process from MRS NERG?

Lesson
02

What are the main organ systems of the body?

Retrieval practice

1. What seven processes do all living things carry out?

M_____ N_____

R_____ E_____

S_____ R_____

G_____

2. Name the scientist who is the originator of the study of living things?

3. What is the word we use to describe all living things? Circle the correct answer.

MRS NERG organism classification cell

4. Explain how you know a parrot is a living thing.

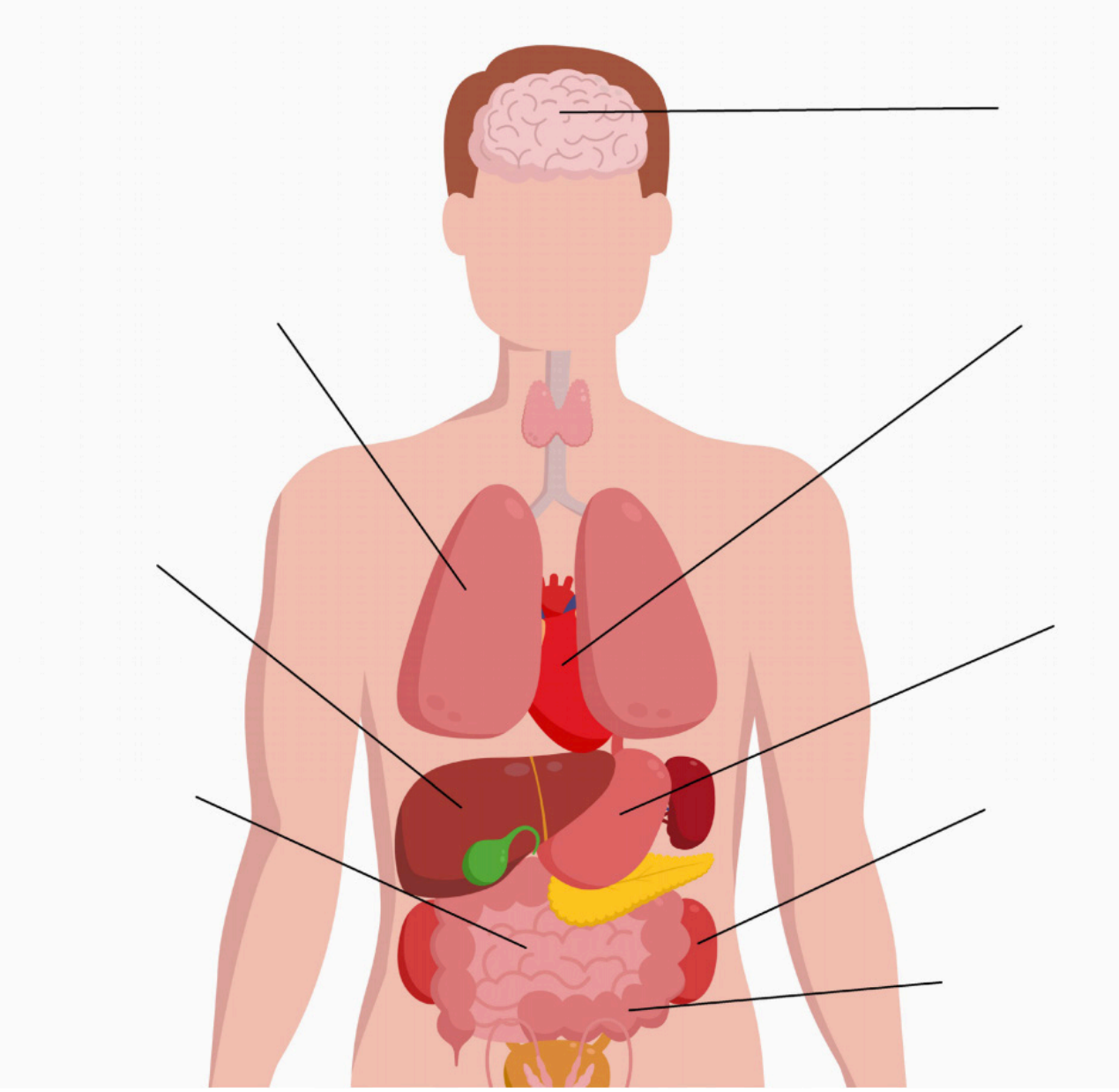
Retrieval from previous units:

5. Does this particle diagram represent a solid, a liquid or a gas?

6. Are the following physical properties of a solid, liquid or gas?

Can flow and fill the bottom of a container	
Can be compressed	
Cannot change shape	

1. How much can you remember about organs? Label the diagram below with the name of each organ. See if you can also add notes about function.



2. Discuss with a partner. If you were going to build a house what types of people would you need to help you? I would need a plumber to connect my toilets!

3. Read the following passage about organ systems.

Your body has lots of important organs that keep you alive such as your brain, your heart and your lungs. An organ system is when lots of organs work together to do a job. This is important because most organisms are so big and complex that one organ cannot work alone.

For example your stomach cannot break down food without the help of other organs like your mouth and small intestine.

4. Find the answers in the text.

1. What is an organ system?

2. Why do organisms have organ systems?

5. Read the following passage about organ systems in humans.

The skeletal system includes all the bones in your body. Your skeletal systems job is to support your body and protect your organs.

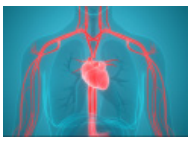
The respiratory system includes the nose and the lungs. It takes in oxygen and removes carbon dioxide allowing you to release energy from your food to stay alive.

The muscular system which includes all the muscles in your body, allows you to move by working with your skeletal system.

The circulatory system includes the heart and blood vessels. Its function is to transport substances, like oxygen, around the body.

The digestive system includes the stomach and intestines. It breaks down food and absorbs nutrients.

6. Complete the table using the information above.

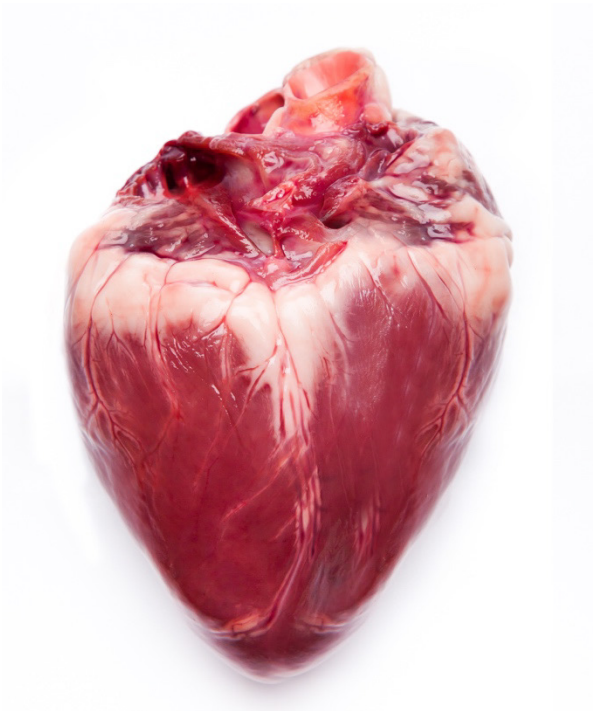
Organ system	Job of the system	Organs within the system
Digestive system 		
Circulatory system 		
Skeletal system 		
Muscular system 		
Respiratory system 		

7. What do we need to remember when drawing a scientific diagram?

8. Can you draw a scientific diagram of a heart based on the picture below?

Include the labels: thick muscular wall, aorta

Hint: the aorta is the artery at the top of the heart through which blood leaves.

Picture	Diagram
	

Phenomenal fact

Did you know that octopuses have 3 hearts? Worms have 5!

9. Read the following passage about organ systems in plants.

Plants also have lots of organs working together to different jobs.

The shoot system of a plant includes the stem and the leaf. The job the leaf system is make food by absorbing sunlight.

The root system of a plant is underground and has a very important job to absorb water and nutrients of the soil. The root system contains all the different sized roots.

The reproductive system of a plants includes all the different parts of the flower. The flower exists so that plants can make seeds that grow into new plants.

10. Complete the table using the information above.

Organ system	Job of the system	Organs within the system
Shoot system 		
Reproductive system 		
Root system 		

11. Can you draw a scientific diagram of plant roots based on the picture below?

Include the label: root hairs

Picture	Diagram
	

12. Would life improve for humans if they had two hearts?

Lesson
03 What are organ systems, organs, tissues and cells?

Retrieval practice

1. Match the organ system to its function.

Circulatory system	Absorb water for the plant
Root system	Break down food and absorb nutrients
Respiratory system	Work with bones to move
Muscular system	Absorb sunlight to make food
Shoot system	Take in oxygen and release carbon dioxide
Digestive system	Transport oxygen around the body

2. Name two organs in the digestive system of humans.

3. Explain why organisms have organ systems.

Retrieval from previous units:

4. Add arrows and labels to this food chain.

_____

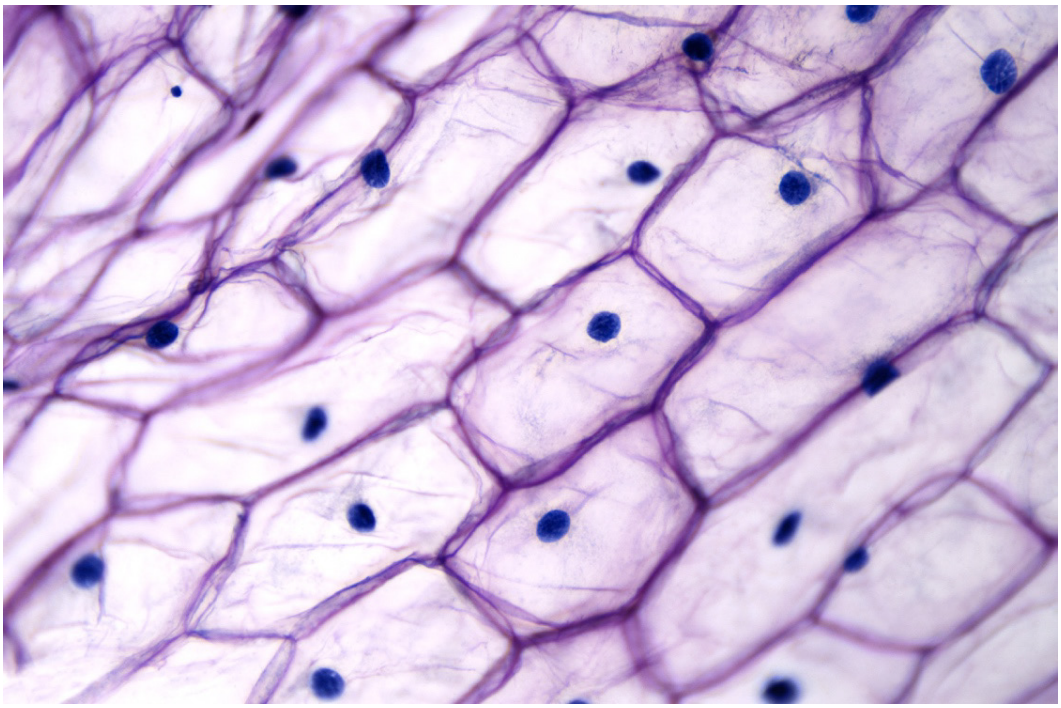
_____

_____

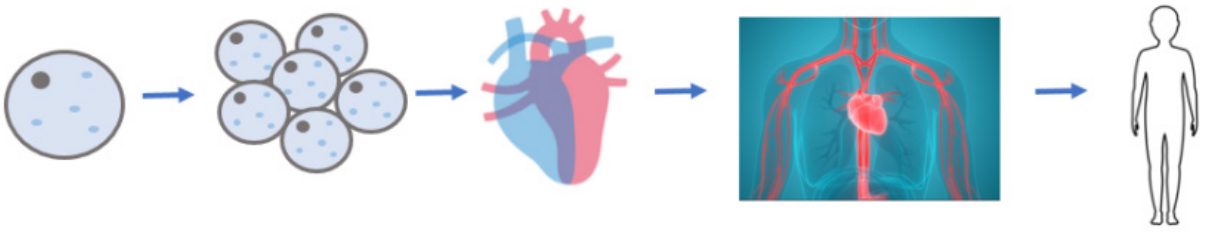
_____

- secondary consumer
- primary consumer
- tertiary consumer
- producer
- energy transfer

1. Do you know what this is a picture of?



2. Watch your teacher explain the levels of organisation.



3. Read the following passage about organisation.

The human body is made up of many cells, so it is an example of a multicellular organism. A multicellular organism has five layers of organisation. Cells are the basic unit of all living organisms. Tissues are groups of similar cells that work together to perform a specific function for example muscle tissue. Organs are different tissues working together to carry out a particular function, for example the heart. Organ systems are groups of organs that work together to do a job for example the circulatory system. Every organism has lots of organ systems working together.

4. Find answers to the questions below in the text above

1. What is the name for an organism made up many cells?

_____

2. What is the smallest unit of an organism?

_____

3. What is a tissue, give an example.

_____

4. What is an organ, give an example.

_____

5. Define an organ system and give an example.

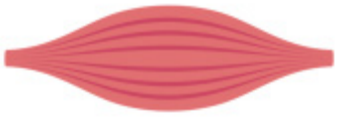
_____

6. Place these key words in order from smallest to largest:
   - tissue
   - organ system
   - organ
   - cell
   - organism.

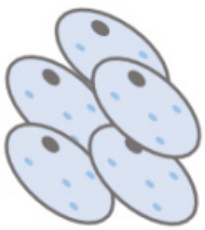
Phenomenal fact

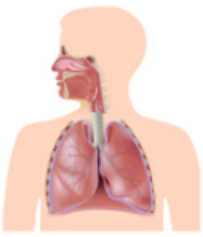
Did you know that It's estimated the human brain alone contains 80 billion cells?

5. Complete the table below. The first has been done for you

Example	Level of organisation	Reason
Muscle cell 	Cell	A muscle cell is the basic unit of a muscle
Stomach 		
Digestive system 		
Muscle 		

6. Label the tissue, organ system, organ, cell, and organism.

Sensational scientist: Robert Hooke 1653 - 1703

- Best known for coining the term 'cell'.
- When studying a sliver of cork through his microscope he saw structure which we now call cells.
- He thought that these cells existed only in plants.

7. How did Robert Hooke's discovery of cells change our understanding of organisms? How did it pave the way for further discoveries?

8. Read the passage below about how our undertanding of human anatomy has changed over time.

In modern times, we know lots about human anatomy, which is the strudy of structures (such as cells, tissues, organs and organ systems) in the human body. This hasn't always been the case though. One of the first people to study anatomy was a Greek medical scientist named Galen, who lived in the Roman times in 160 AD. Galen learnt lots about antamomy by treating Roman gladiators and performing dissections on animals. He treated many Roman emperors and publsihed lots of books about his work. His ideas about human anatmy remained the main ideas that people followed for 1500 years.

The next 'big thinker' to come along was Vesalius in the 16th Century. He compared what his human dissections revealed with what he read in the textbooks of the day (based on Galen's work). He found many differences. For example, Vesalius pointed out that Galen erred in asserting that the human jaw consists of two bones. The introduction of the microscope, in the 17th Century, opened up a world of cells which meant we could study the human body in more minute detail. In 1895 the X-ray was invented which meant we could now study bones and the skeleton more easily. the invention of CT and MRI scanners, in 1977, has made it possible to inspect the interior of the human form in life and without the use of a scalpel.

9. Using the text in the previous page, fill in the event that happened in each time period. Can you add some notes into the impact column. The first one has been done for you.

Date	Event	Impact
160 AD	Learnt lots about anatomy, using animal anatomy to make guesses about human anatomy.	What Galen learnt was used to influence doctors and medical scientists for 1500 years.
1977		
17th Century		
1895		
16th Century		

10. Draw a timeline showing how our understanding of human anatomy has changed over time.

11. Why is it important that we study human anatomy and understand how our bodies work?

Lesson
04 What are animal cells?

Retrieval practice

1. Place in order from smallest to largest:

• organism • cell • organ • tissue • organs system

2. Match up the words below with the right definition:

organism	Lots of tissues working together
Organ system	Lots of similar cells working together
Organ	Any living thing
Tissue	Lots of organs working together
Cell	Basic unit of an organism

3. What is the function of the shoot system in plants? Name two organs in the shoot system.

Retrieval from previous units:

4. What does this symbol stand for?

5. What is meant by sustainability?

Sustainability is_____

6. What material are these bottles made from? Is it natural or synthetic?

1. Discuss with a partner. What is the smallest thing you can see with your eyes?

2. Read the following passage about microscopes.

Scientists discovered what cells were made of using microscopes. The word microscope comes from two Latin words: Micro meaning small and scope meaning to view or see. Microscopes use glass to bend light to make things look bigger.

3. Find answers to the questions below in the text above

1. What language does the word microscope come from?

_____

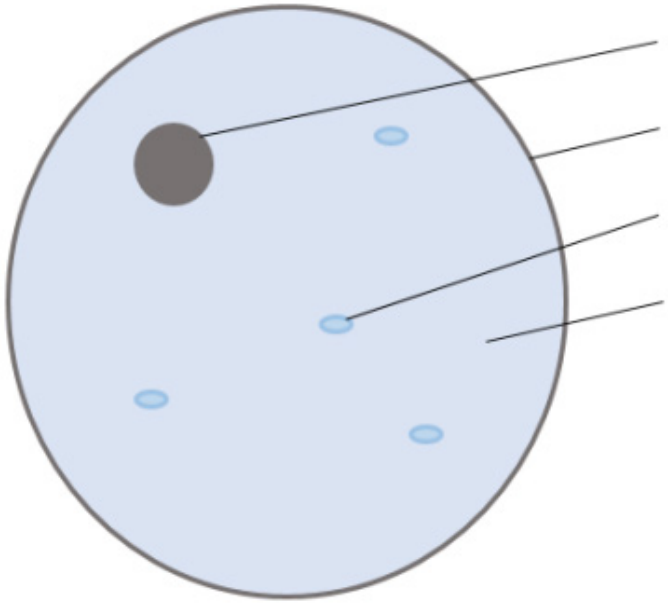
2. How do microscopes work?

_____

_____

4. Watch the video of cheek cells under a microscope.

5. Use the information from your teacher and your knowledge organiser to label the animal cell.



6. Read the following passage about animal cells

All living organisms are made of cells and all animal cells have common features. The cell membrane surrounds the cell and controls what enters and exits the cell. The nucleus contains genetic information and controls the activities of the cell. The mitochondria release energy from food in a chemical reaction called respiration. Each of these organelles is surrounded by a jelly like substance called the cytoplasm which is where chemical reactions take place.

7. When have we learnt about energy before? Can you remember the definition?

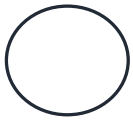
8. Find answers to the questions below in the text above.

1. What are all living things made of?

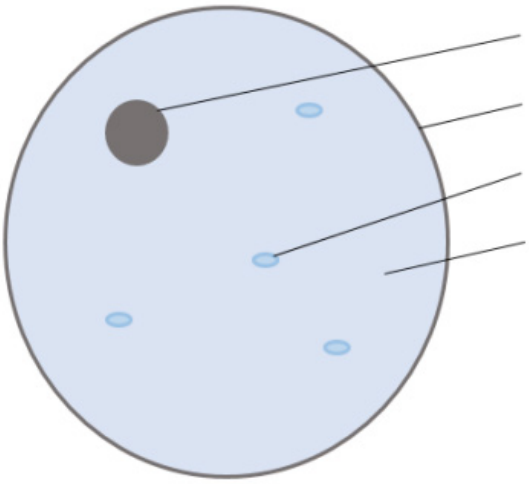
2. What part of cell controls the activities of the cell?

3. Which part of the cell releases energy from food?

4. Which part of the cell surrounds the cell and controls what goes in and out.

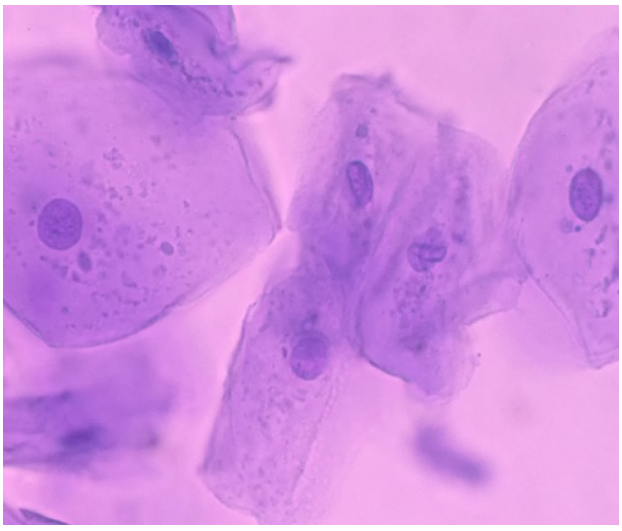
Cell structure name	Function
Nucleus 	
Cell membrane 	
Cytoplasm	
Mitochondria 	

9. Without using your notes label the cell below.



10. Draw scientific diagram of an animal cell based on the picture below.

Include the labels: cytoplasm, cell membrane, nucleus, mitochondria

Picture	Diagram
	

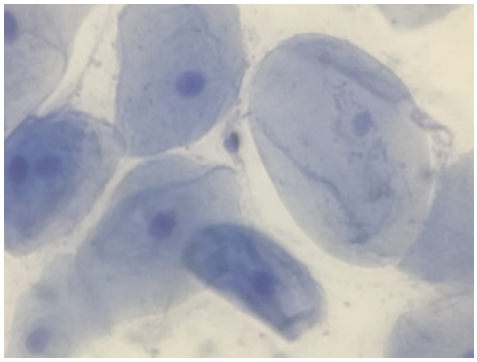
11. Look at the table below that shows the number of mitochondria in different types of animal cell.

Type of animal cell	Approximate number of mitochodria
Red blood cell	0
Liver cell	1000
Sperm cell	75
Heart muscle cell	5000

1. Which cell type has the most mitochondria?
2. Which cell type has the least mitochondria?

12. What conclusions can you draw from this table and your knowledge of mitochondria about which types of cell need the most energy?

13. Light micropscopes can not see all parts of the cell. How many parts cn you label in the picture of a cheek cell?



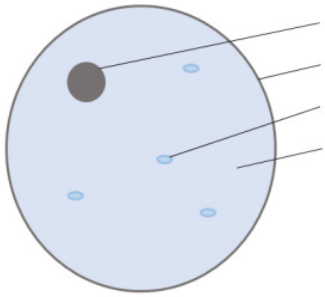
Phenomenal fact

Did you know that approximately 50 billion to 70 billion cells in human body die every single day?

Lesson
05 What are plant cells?

Retrieval practice

1. Label the animal cell shown below:



2. Match the organ systems to their function:

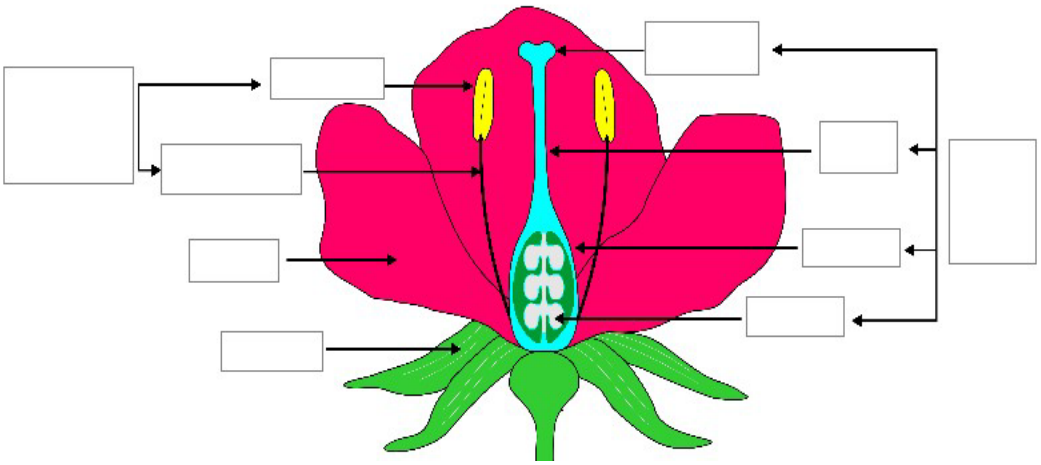
Circulatory system	Take in oxygen and release carbon dioxide
Reproductive system	Break down food and absorb nutrients
Respiratory system	Work with muscles to move
Skeletal system	Transport oxygen around the body
Shoot system	Allows the organism to produce offspring (babies)
Digestive system	Absorb sunlight to make food

3. What is the job of the mitochondria in the cell?

Retrieval from previous units:

4. Add label to the diagram of a flower below:

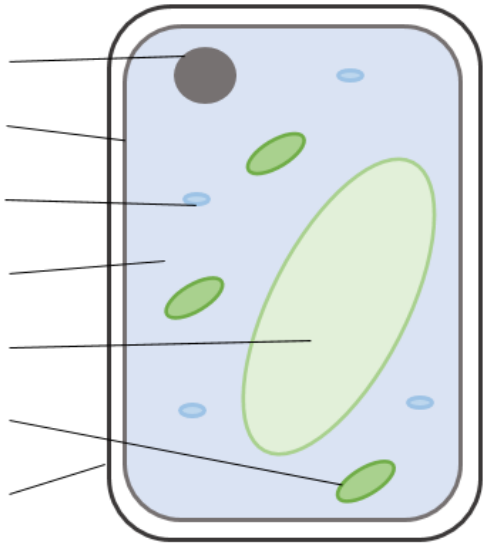
- Petal
- sepal
- anther
- style
- filament
- pistil
- ovary
- ovules
- stigma
- stamen



1. Can you remember how plants get their energy?

2. Watch the video of onion cells under a microscope.

3. Use the information from your teacher and your knowledge organiser to label the plant cell.



4. Read the following passage about plant cells

Plants have all the structures animals have and some extra structures. Plants can make their own food using energy from the sun in a chemical reaction called photosynthesis. In order to do this plant cells contain chloroplasts which are filled with a green pigment which absorbs sunlight for photosynthesis. Plants also have a cell wall surrounding the cell which gives extra support to the cell. The vacuole of a plant cell contains cell sap and supports the cell structure.

5. Find answers to the questions below in the text above.

1. What is the chemical reaction plants carry out to make their food?

2. Which part of the cell absorbs sunlight?

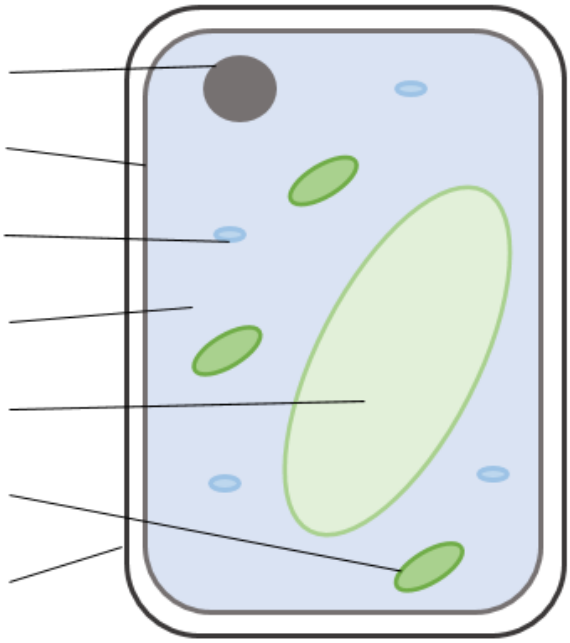
3. Which part of the cell surrounds the cell to give extra support?

4. Which part of the cell contains cell sap to support the cell?

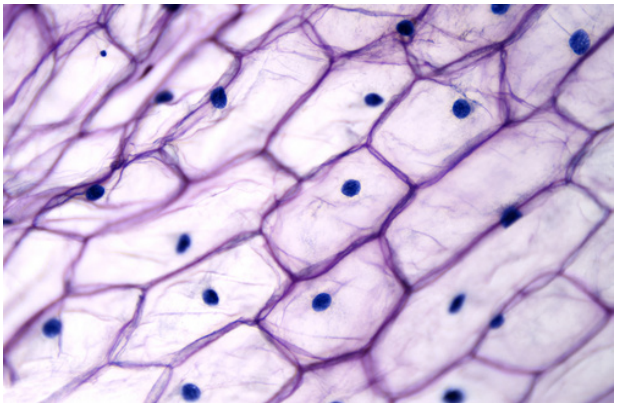
6. Find answers to the questions below in the text on previous page

Cell structure name	Function
Chloroplast 	
Cell wall 	
Vacuole 	

7. Without using your notes label the cell below.

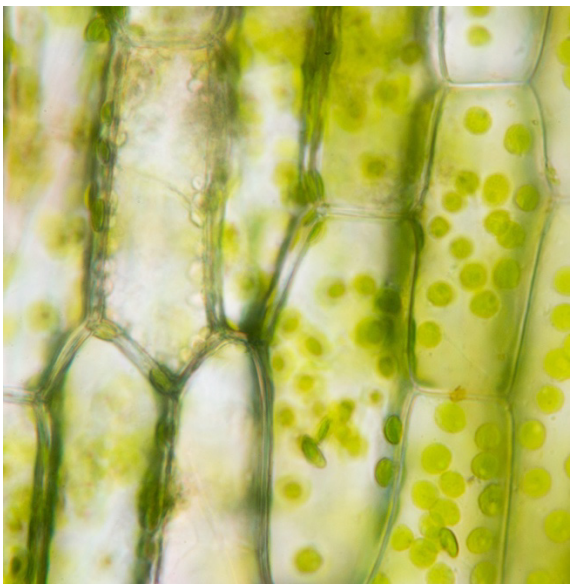


8. Label the picture of an onion cell under a microscope.



9. Draw scientific diagram of a plant cell based on the picture below.

Include the labels: chloroplast and cell wall.

Picture	Diagram
	

10. Compare plant and animal cell components by drawing a Venn diagram in the space below:

11. Think about the differences between plant and animal cells. For each difference why do you think it exists? Use the table below to structure your thoughts and write down your ideas with your partner.

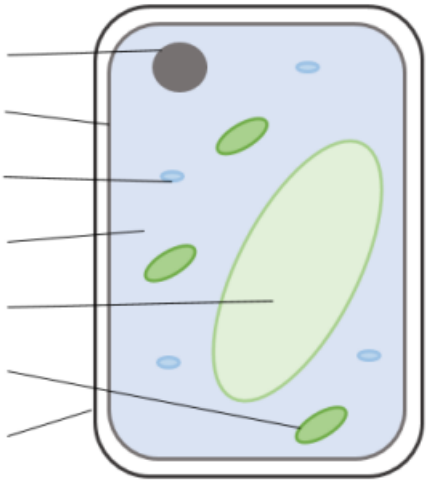
Difference	Why does a plant cell need this structure?
Plants cells have a vacuole, animal cells do not.	
Plant cells have a cell wall, animal cells do not	
Plant cells have chloroplasts, animal cells do not	

12. Using your ideas above answer the question: What are the main differences between plant and animal cells?

Lesson
06 What are specialised cells?

Retrieval practice

1. Label the plant cell below:



2. Match up the cell structure to its function:

Nucleus	Jelly like substance where chemical reactions happen
Cytoplasm	Controls the activities of the cell
Cell membrane	Surrounds and supports the cell
Cell wall	Contains sap and controls the cell
Vacuole	Absorbs sunlight for photosynthesis
Chloroplast	Controls what gets in and out of the cell

3. Name the five levels of organisation from smallest to largest.

Cell,_____

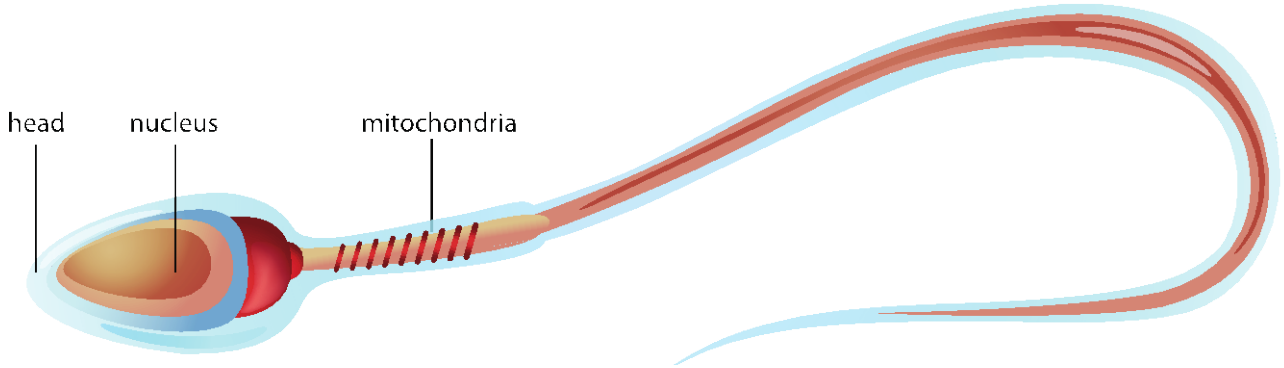
Retrieval from previous units:

4. Can you put the planets in the correct order?

• Uranus • Jupiter • Earth • Mercury • Venus • Mars • Neptune • Saturn

1. _____ 5. _____
2. _____ 6. _____
3. _____ 7. _____
4. _____ 8. _____

1. What differences do you notice about the animal cells below, compared to the basic animal cell structure we have already learnt about? Label or circle any additional features or differences.



2. Read the following passage about specialised cells

New cells are made from a special type of cell called a 'stem cell'. A stem cell is an unspecialised cell that can become any other type of cell. Once a cell becomes specialised, it has features that make it look different to a typical cell and help it do its function (job).

Red blood cells, muscle cells and sperm cells are all examples of specialised animal cells. Root hair cells are examples of specialised cells in plants.

Phenomenal fact

The longest cells in the human body are the motor neurons. They can be up to 1.37 meters long and run from the lower spinal cord to the big toe!

3. Find answers to the questions below in the text in the previous page.

1. What is a stem cell?

_____

_____

2. What is a specialised cell?

_____

_____

3. Name three specialised animal cells.

1. _____
2. _____
3. _____

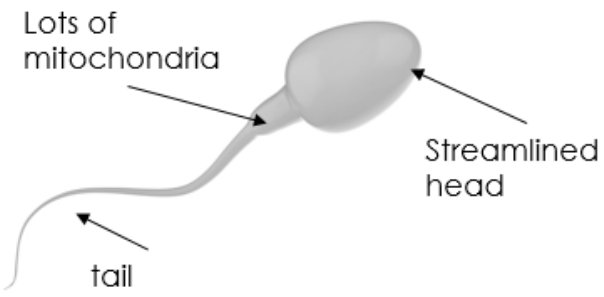
4. Name a specialised plant cell.

_____

4. Watch this video of sperm cells. Why do you think they contain lots of mitochondria?

5. Read the following passage about Sperm cells

Sperm cells function to carry genetic information from the male to the female egg. Sperm cells contain lots of mitochondria to release energy for movement. Sperm cells also have a streamlined head and long tail to help them reach the egg.



6. Find answers to the questions below in the previous page.

1. What is the function of a sperm cell.

2. Complete the table.

Feature of a sperm cell	How the feature helps carry out the function
Streamlined head	
Tail	
Lots of mitochondria	

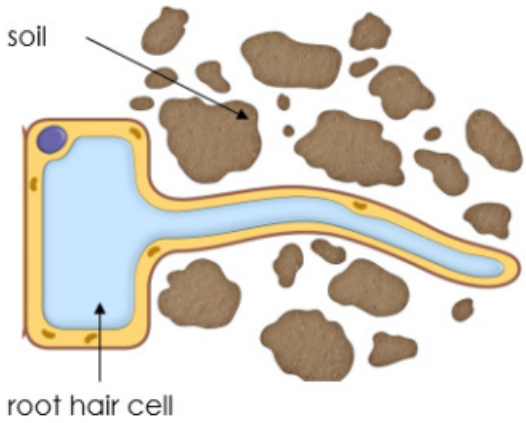
Sensational scientist: Ernest Everett Just 1883 - 1941

- Famous for his discoveries about specialised cells!
- When studying fertilisation, he made many discoveries about how the cell membrane of the egg cell can change in different ways to aid fertilisation. For example, pulling the sperm into the egg.
- His work also disproved some theories at the time that egg cells could be initiated to develop without fertilization by sperm.

7. How did Ernest Everett Just change scientific views?

8. Read the following passage about root hair cells

An example of a specialised cell plant cell is a root hair cell. The function of a root hair cell is to absorb water and nutrients from the soil. It has an unusual shape so that it has a high surface area for absorbing water. Root hair cells have no chloroplasts as there is no sunlight underground. Instead they have lots of mitochondria to release energy to help move essential nutrients from the soil into the roots.



9. Find answers to the questions below in the text above.

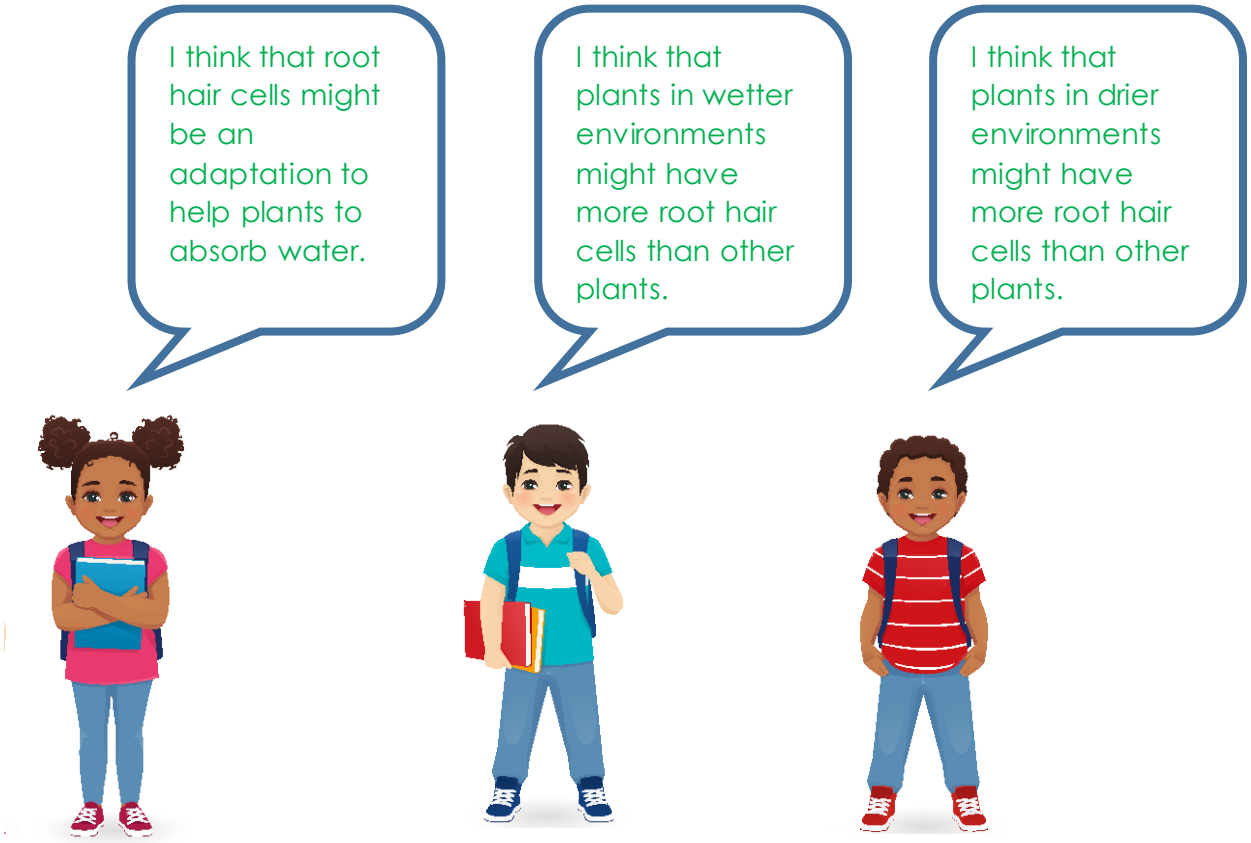
1. What is the function of a root hair cell.

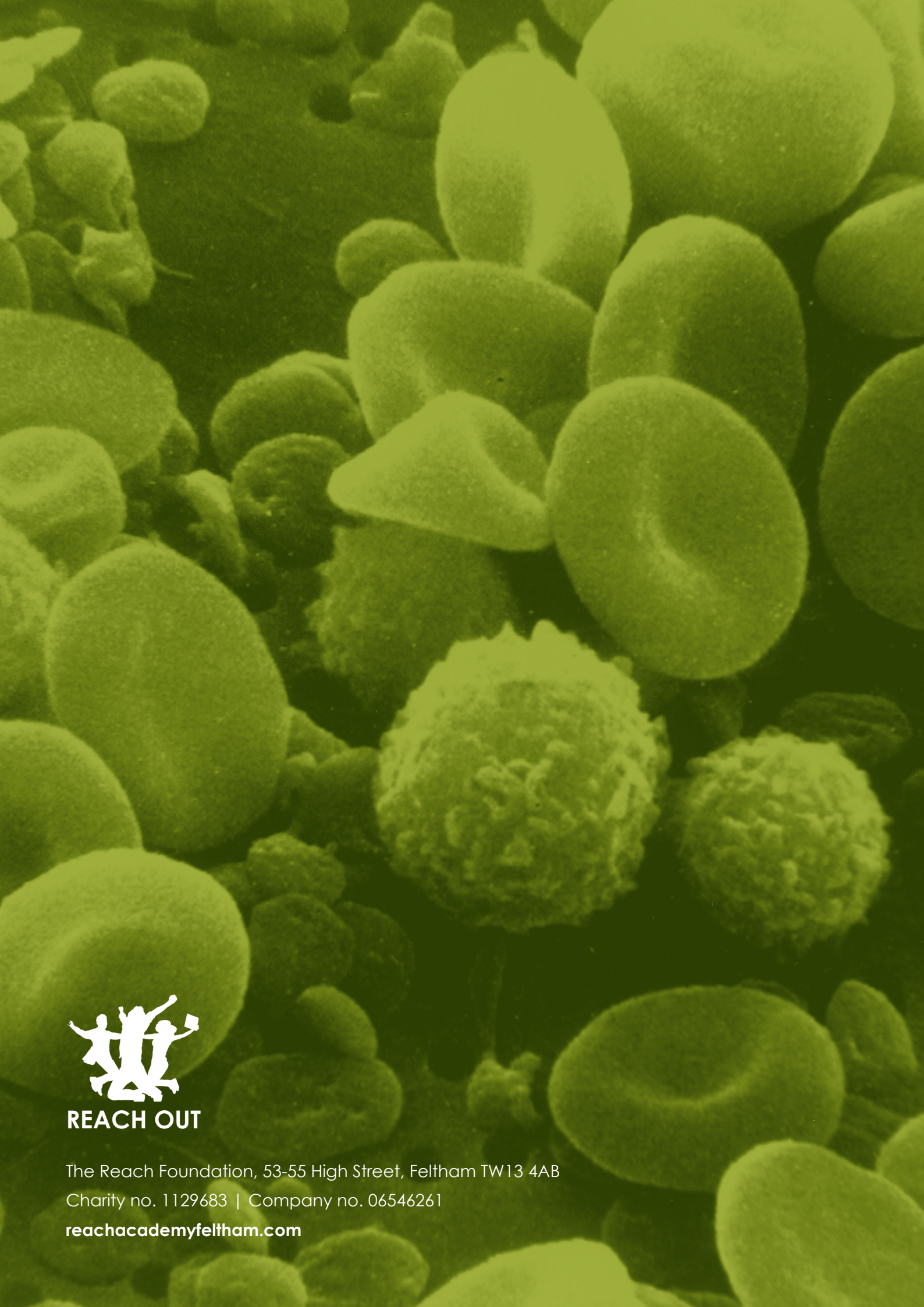
2. Complete the table.

Feature of a root hair cell	How the feature helps carry out the function
High surface area	
No chloroplasts	
Lots of mitochondria	

10. Can you remember what an adaptation is?

11. What do you think about the ideas of the pupils in the cartoon below?





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