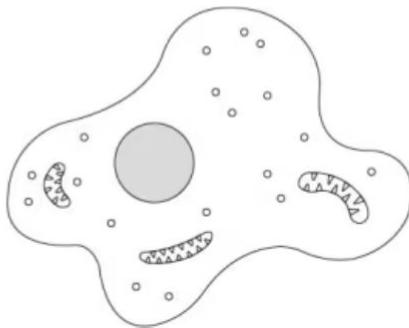


LESSON 4

Animal cell structures and their functions

Animal cells: common structures and specialised cells

1 What does this picture show? Tick 1 correct answer



- plant leaf
- blood vessel
- animal cell
- DNA

2 Which of the following is not a sub-cellular structure? Tick 1 correct answer

- nucleus
- cell membrane
- mitochondria
- organ

3 Name the gas that is transported around the body inside the red blood cells? Fill in the blank

4 What is the name of the genetic material found inside the nucleus? Tick **1** correct answer

cytoplasm

DNA

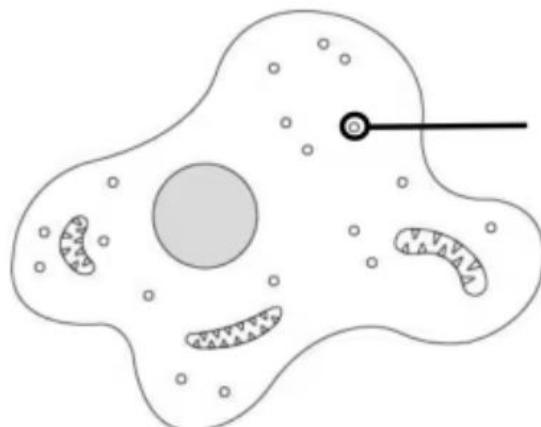
ribosomes

mitochondria

5 Which cellular process takes place inside the mitochondria? Tick **1** correct answer

- photosynthesis
- protein synthesis
- aerobic respiration
- fertilisation

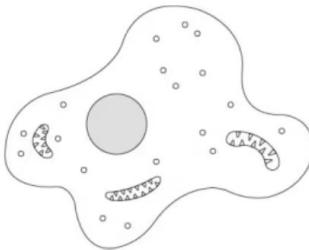
6 Which structure is labelled below? Tick **1** correct answer



- ribosome
- nucleus
- cell membrane
- mitochondrion
- chloroplast

Animal cells: common structures and specialised cells

1 What does this picture show? Tick 1 correct answer



- plant leaf
- blood vessel
- animal cell
- DNA

2 Which of the following is not a sub-cellular structure? Tick 1 correct answer

- nucleus
- cell membrane
- mitochondria
- organ

3 Name the gas that is transported around the body inside the red blood cells? Fill in the blank

oxygen

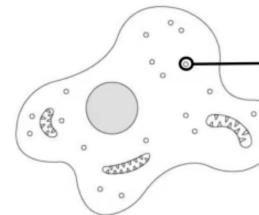
4 What is the name of the genetic material found inside the nucleus? Tick 1 correct answer

- cytoplasm
- DNA
- ribosomes
- mitochondria

5 Which cellular process takes place inside the mitochondria? Tick 1 correct answer

- photosynthesis
- protein synthesis
- aerobic respiration
- fertilisation

6 Which structure is labelled below? Tick 1 correct answer



- ribosome
- nucleus
- cell membrane
- mitochondrion
- chloroplast

Outcome

- I can identify common structures of animal cells and describe what these structures do.
- I can identify common structures of animal cells and describe how some specialised cells in animals are adapted for the jobs the cells do.

Keywords

cell membrane

DNA

cytoplasm

nucleus

mitochondria

model

Keywords

The **cell membrane** surrounds the cell and controls what substances enter and leave the cell.

The **cytoplasm** is the jelly-like substance inside a cell where the chemical reactions of the cell take place.

The **nucleus** contains DNA, which stores information that controls the activities of the cell.

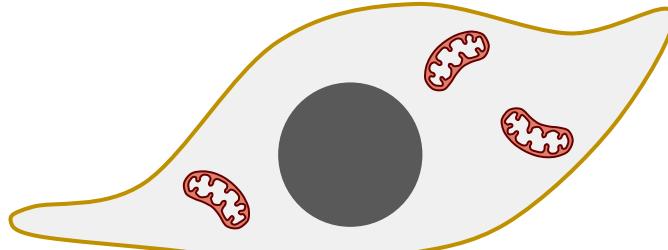
Mitochondria use food and oxygen as fuel to provide energy for the cell in a process called cellular respiration.

Scientists use **models** as simpler representations of complex things and ideas.

DNA is a molecule found in the nucleus of cells and contains the genetic code for making proteins.

Cells are the living building blocks that all living organisms are made of.

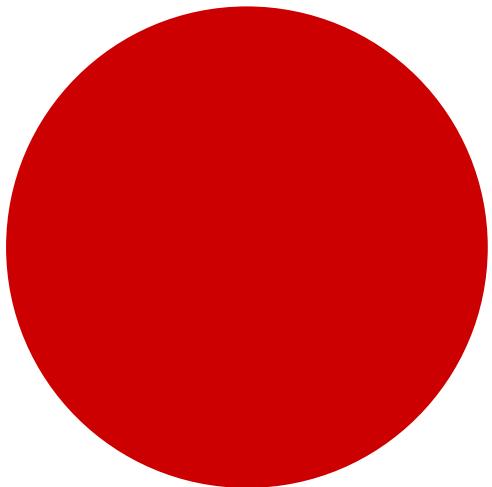
Cells are often drawn in two dimensions (2D).



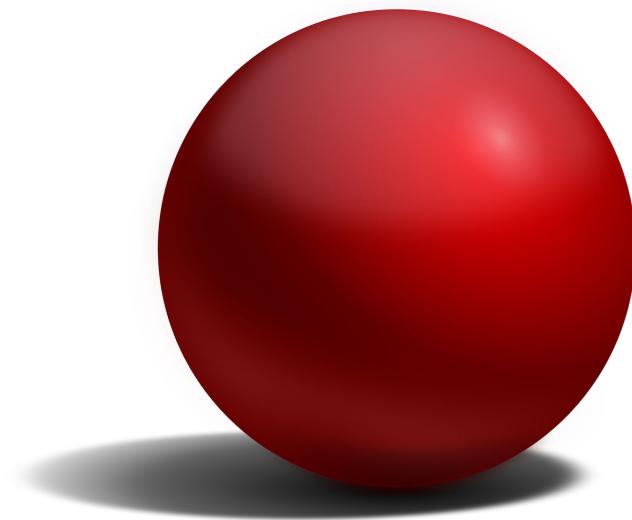
An animal cell drawn in 2D

Cells are actually three dimensional (3D) and they come in lots of shapes and sizes.

This is a drawing of a ball in 2D.



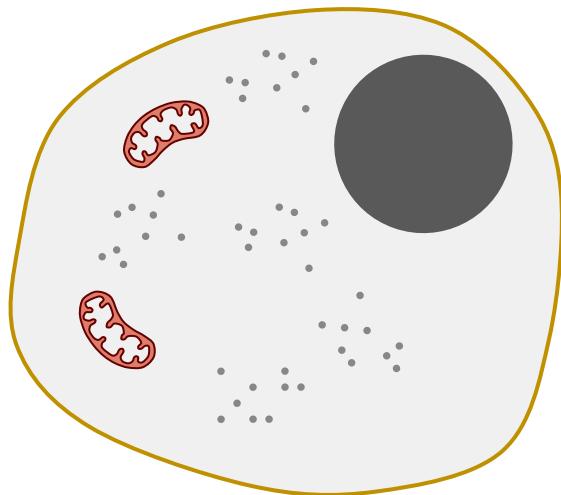
This is a drawing of a ball in 3D.



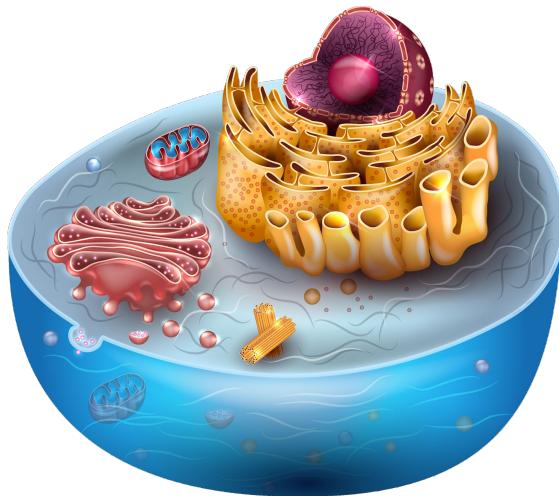
Cells are 3D



This is a drawing of an animal cell in 2D.



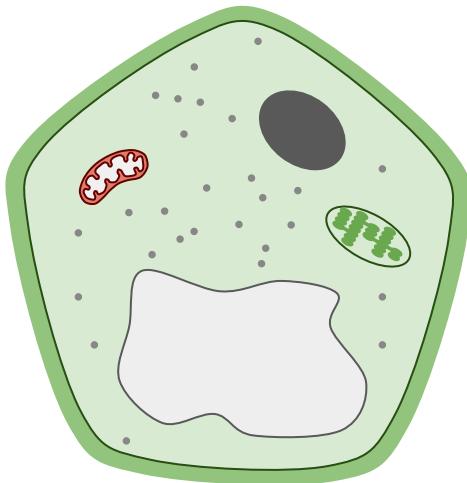
This is a drawing of an animal cell in 3D.



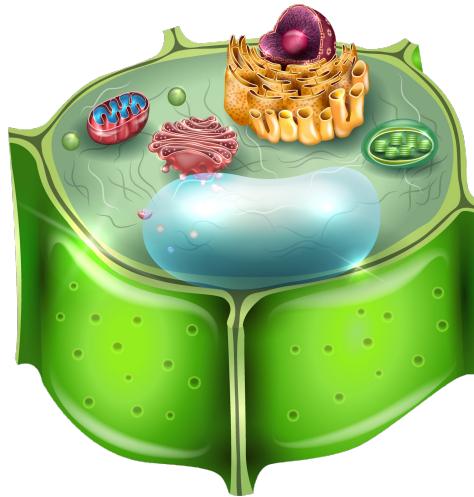
Cells are 3D



This is a drawing of a plant cell in 2D.



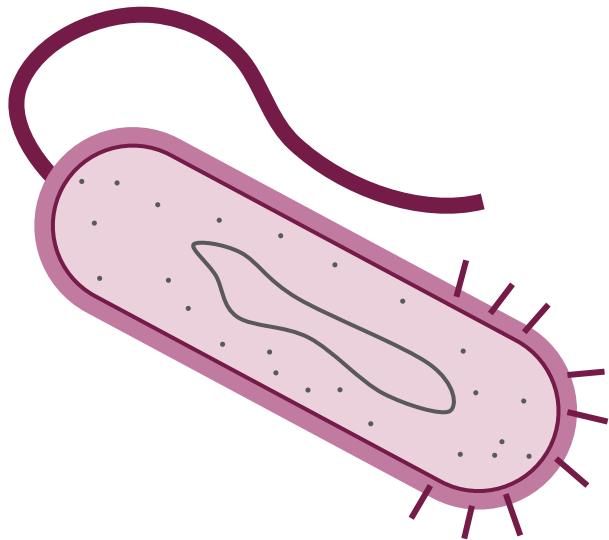
This is a drawing of a plant cell in 3D.



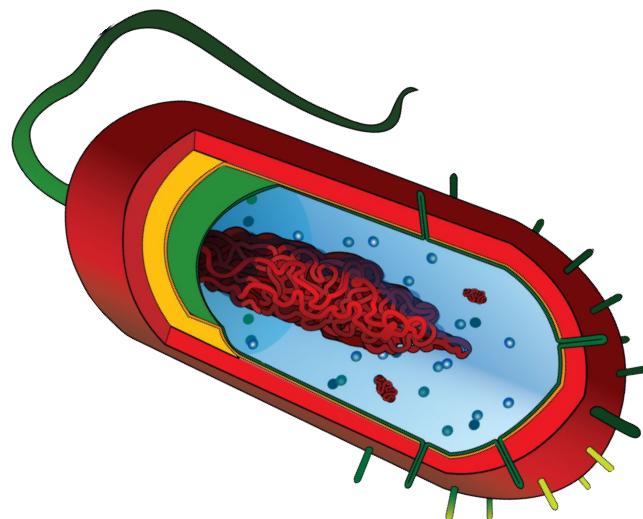
Cells are 3D



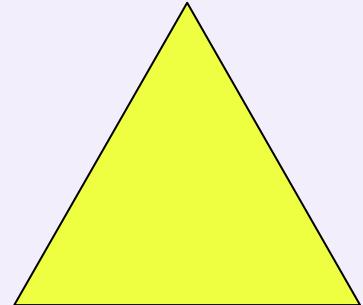
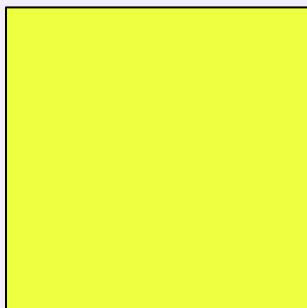
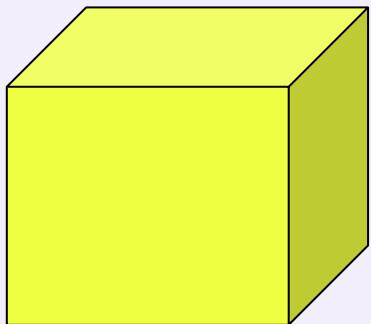
This is a drawing of a bacteria cell in 2D.



This is a drawing of a bacteria cell in 3D.



Which is the best drawing of a 3D shape?



a ✓

b

c

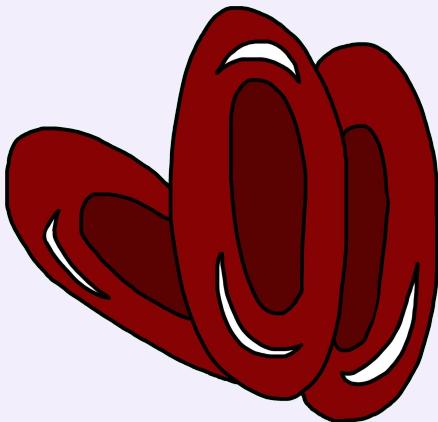
Cells are 3D



Check

Our blood contain red blood cells.

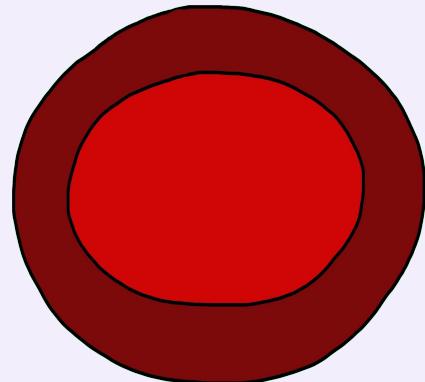
Which image shows red blood cells in 3D?



a



b ✓

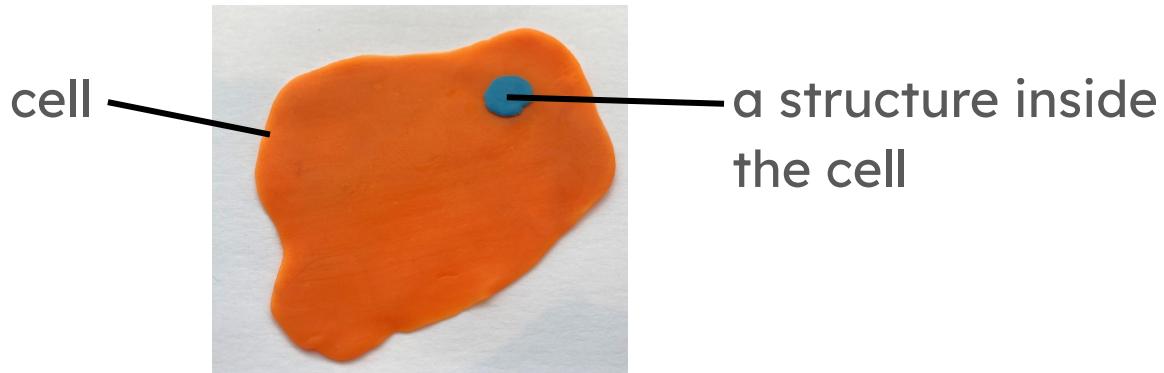


c

Task A Cells are 3D



The photograph shows a simple 2D animal cell made out of plasticine.



Use some plasticine to make a 3D version

or describe how you would make a 3D version.

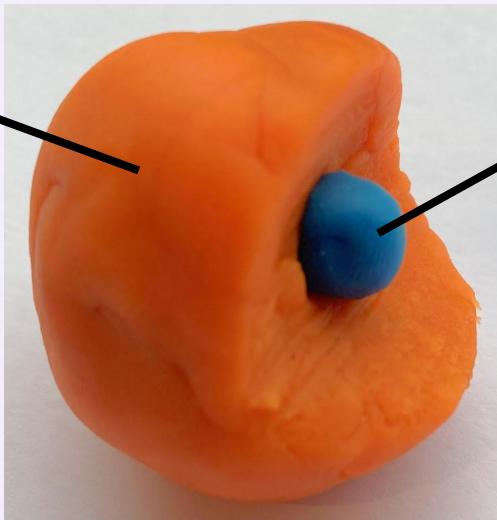
Task A Cells are 3D



Feedback

Use some plasticine to make a 3D version

or describe how you would make a 3D version.



The plasticine has
been rolled into a
ball to make the
cell 3D

The plasticine has been
rolled into a ball to
make the structure
inside the cell 3D

Common structures of animal cells



Most cells are too small to see with the naked eye.

A light microscope can be used to magnify cells so that some of their structures can be seen.

To identify some smaller structures inside cells, we need to use an even more powerful microscope.



Animal skin cells viewed through a light microscope

True or false?

Animal cells can be seen with the naked eye.

T

True

F

False ✓

Justify your answer

a

Animal cells are big enough to see with just our eyes.

b

Animal cells are too small to be seen without a microscope. ✓

Common structures of animal cells



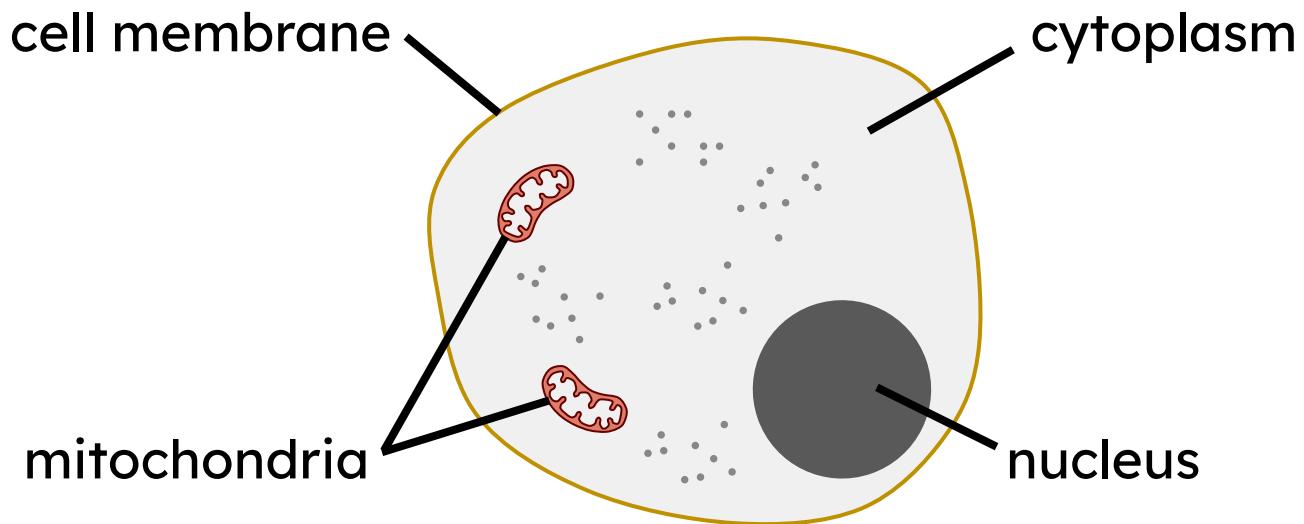
Humans and all other animals are made up of cells.



Even though animals can look very different, they are all made up of cells.

Their cells have some common structures.

Common parts of animal cells are:



Common structures of animal cells



Which one of these structures is **not** part of an animal cell?

a nucleus

b cell membrane

c brain ✓

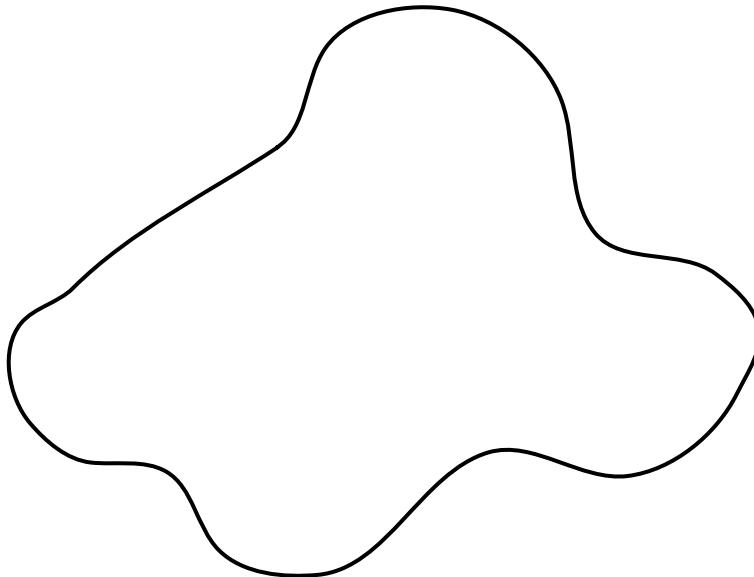
d mitochondria

Task B Common structures of animal cells



Starting with the basic structure below, draw a diagram to show the common structure of animal cells.

Add labels.

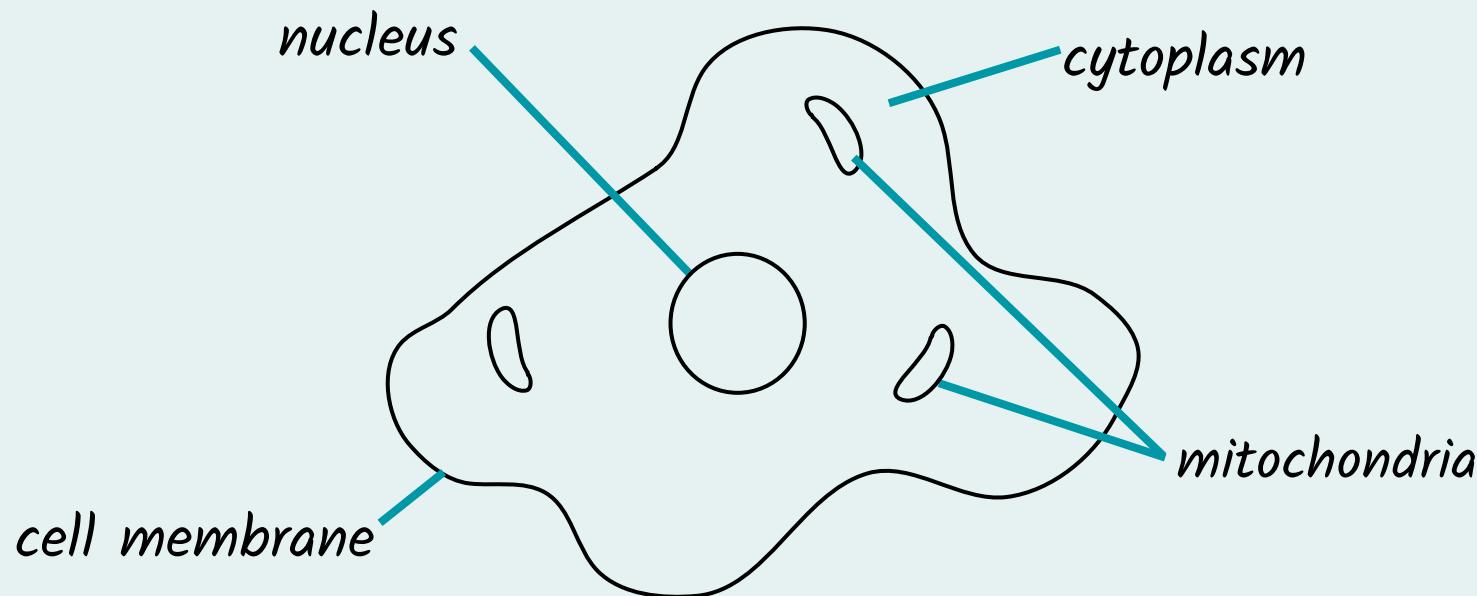


Task B Common structures of animal cells



Feedback

Starting with the basic structure below, draw a diagram to show the common structure of animal cells. Add labels.



Functions of animal cell structures



Match the part of the cell to the correct description of its role

cytoplasm

Where the chemical reactions of the cell take place

cell membrane

Contains DNA and controls activities in the cell

nucleus

Provide energy for the cell's activities by respiration

mitochondria

Controls which substances enter and leave the cell

Task C Functions of animal cell structures



Izzy is trying to help her friends understand what a cell is, and what the structures inside do. She explains a cell with an analogy.

If your body was a town, a cell is like one house in the town. It contains smaller structures that have their own jobs.



Izzy

Write an analogy, like Izzy, that compares the job of each cell structure to something in your house.

Task C Functions of animal cell structures



Feedback

Write an analogy, like Izzy, that compares the job of each cell structure to something in your house.

Here are some examples of analogies you could have used:

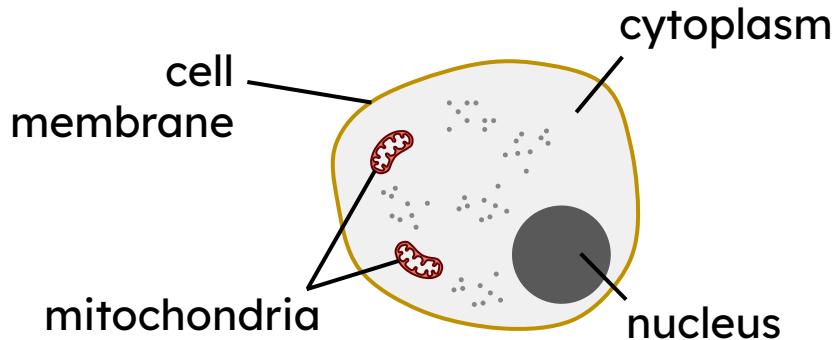
- A cell membrane is like the walls, windows and doors of the house that control what things can come in and out of the house.
- The cell cytoplasm is like the rooms in the house, where all the activities take place.
- The cell nucleus is like a computer or bookcase where information is stored.
- The mitochondria are like batteries or plug sockets that provide energy for activities in the house.

Modelling animal cells

Models are used in science to explain things that are difficult to see or understand.

Animal cells can be modelled in 2D...

...and in 3D.



An analogy, as you used in the last practice activity, is also a type of **model**.

A **model** represents something in the real world.

It's a simpler version of the real thing.



A real car



A simple model of
the car



A more detailed model of
the car

Different models of the same thing can include different amounts of detail.

A **model**...

a

...includes every part and detail of the real thing.

b

...is a simpler version of the real thing. ✓

c

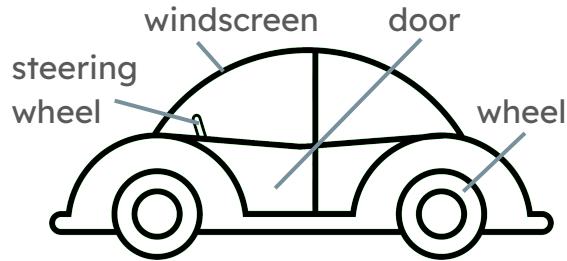
...is the real thing.

A **model** can be:



A physical model

...a 3D model that we can touch.



A description

...using words and diagrams.

$$\text{speed} = \frac{\text{distance (m)}}{\text{time (s)}}$$

A mathematical model

...showing how measurements of things are related.

Modelling animal cells

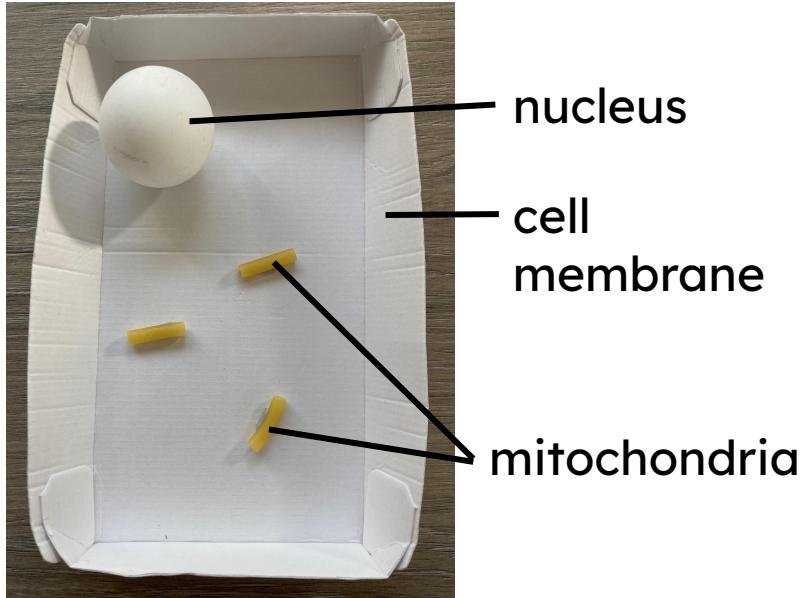


Some models are better than others.

We can use our understanding of science to evaluate a **model**.

To evaluate a cell **model**, identify and explain:

- ways the **model** is similar to a cell
- ways it is different
- ways it could be improved.



A 3D model of an animal cell

Modelling animal cells

Evaluate this model of an animal cell:



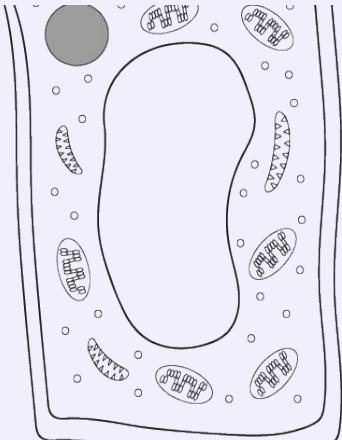
- It has a bag like the cell membrane.
- It is filled with a fluid like cytoplasm.
- It has a 3D nucleus and mitochondria.
- The bag does not let substances in and out like a cell membrane does.

Evaluate this model of an animal cell:

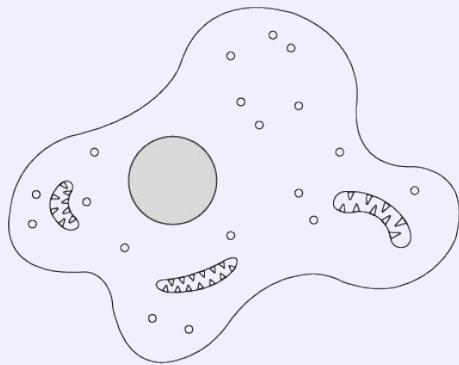


- It has a 3D nucleus.
- It has a sponge to show the 3D cytoplasm.
- The mitochondria are not 3D.
- There is no cell membrane.

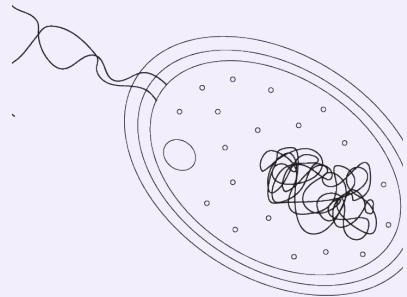
Which image represents the model for an animal cell?



a



b



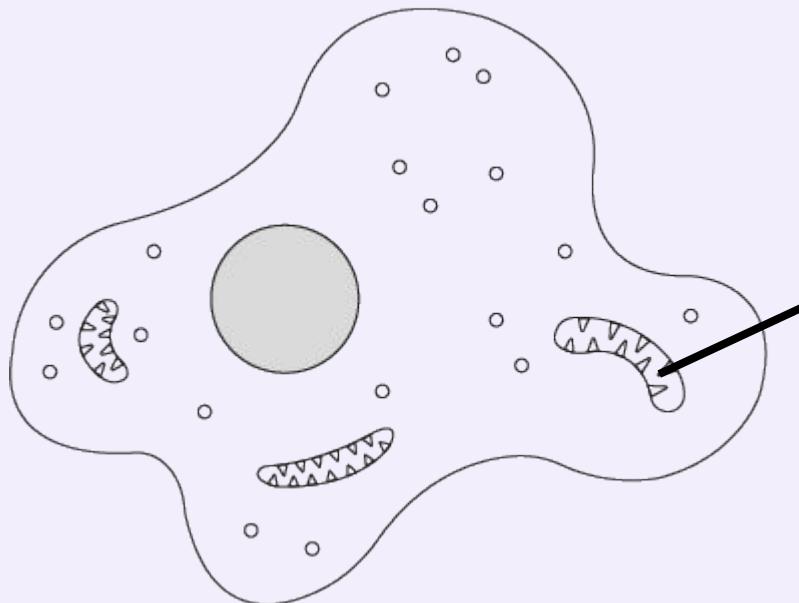
c

Which sub-cellular structure is the line pointing towards?

a cell membrane

b mitochondrion ✓

c nucleus



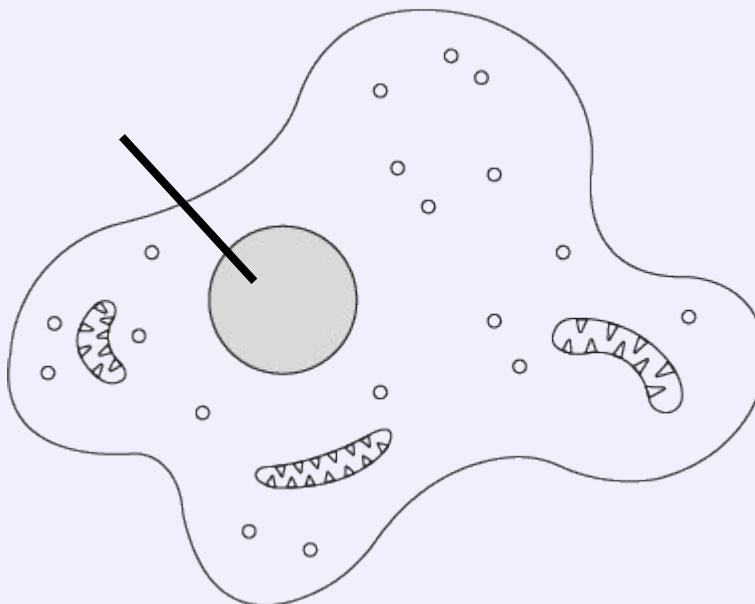
Which sub-cellular structure is the line pointing towards?

a nucleus



b ribosome

c cytoplasm



Which of these statements is true for the cytoplasm?

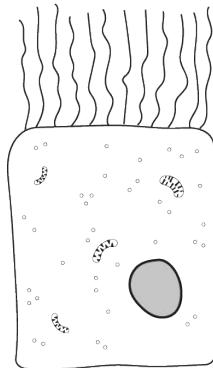
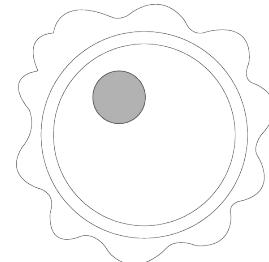
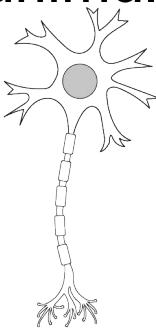
- a it is where protein synthesis takes place
- b it contains DNA; the molecule of inheritance
- c it is where many chemical reactions take place ✓

Where are proteins synthesised in animal cells?

- a mitochondria
- b ribosomes ✓
- c nucleus

Specialised cells

Specialised cells are cells that have a specific structure and function. Here are some examples of specialised animal cells.



nerve
cell

red blood
cell

sperm
cell

egg
cell

ciliated
cell

muscle
cells

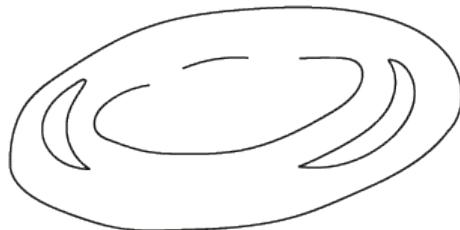
Why do you think we need specialised cells?

Specialised cells

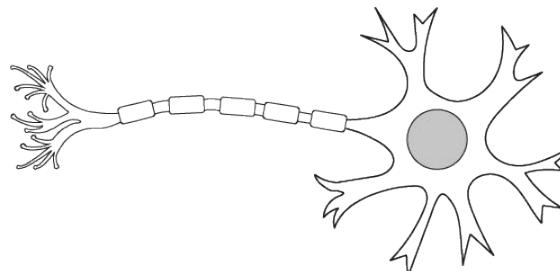


Specialised cells look very different due to their specific shapes and sub-cellular structures.

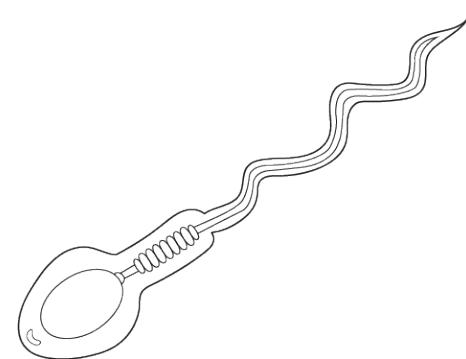
Specialised cells are adapted to be able to carry out their specific function.



red blood cell



nerve cell

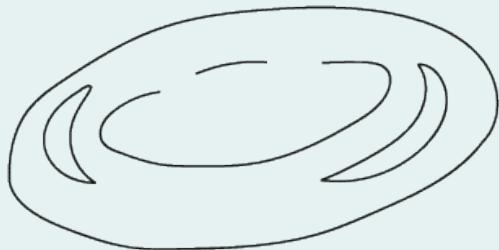


sperm cell

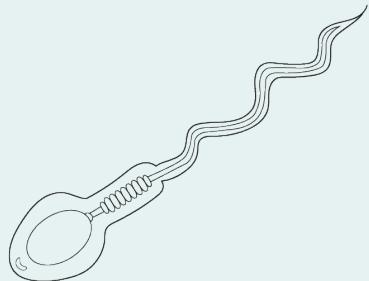
Specialised cells



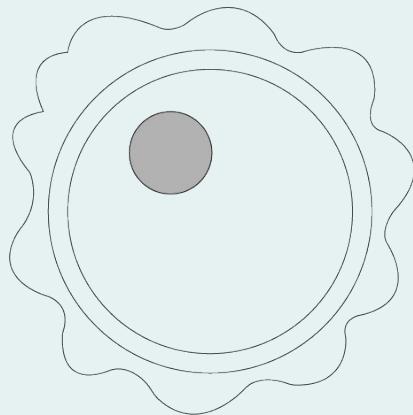
Which image below shows an egg cell?



a



b



c ✓

Specialised cells



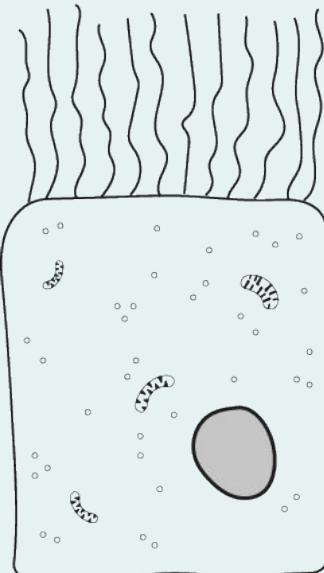
Check

What is this specialised cell?

a nerve cell

b muscle cell

c ciliated cell



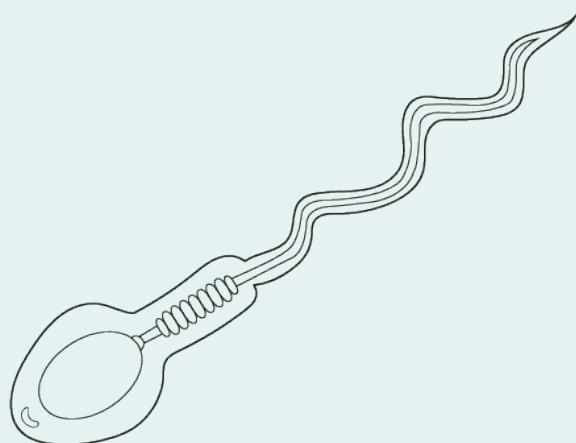
What is this specialised cell?

a sperm cell



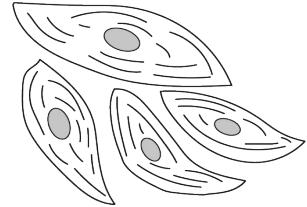
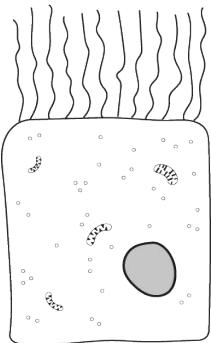
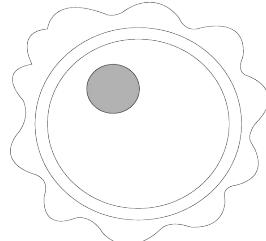
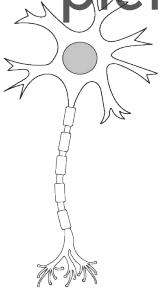
b egg cell

c red blood cell



Task B Specialised cells

1) Write the name of each specialised cell below the picture.



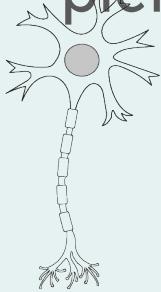
2) What are specialised cells?

Task B Specialised cells



Feedback

1) Write the name of each specialised cell below the picture.



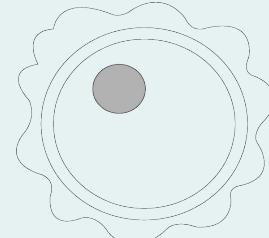
nerve
cell



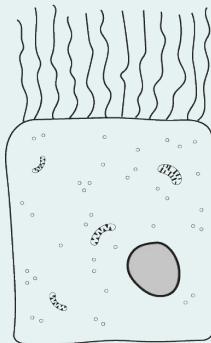
red blood
cell



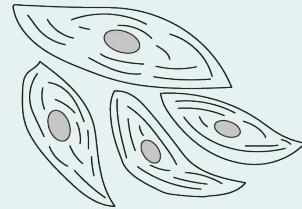
sperm
cell



egg
cell



ciliated cell



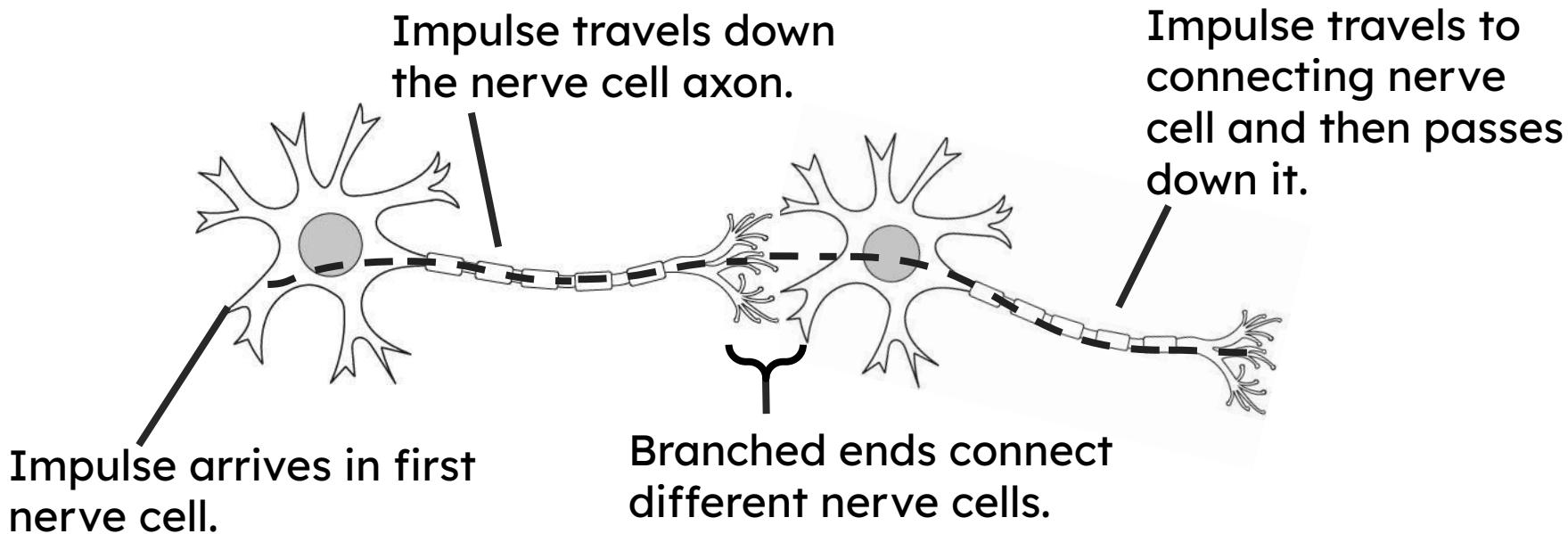
muscle
cells

2) What are specialised cells?

Specialised cells are adapted to have a specific function. They have different shapes and sub-cellular structures.

What is this specialised cell?

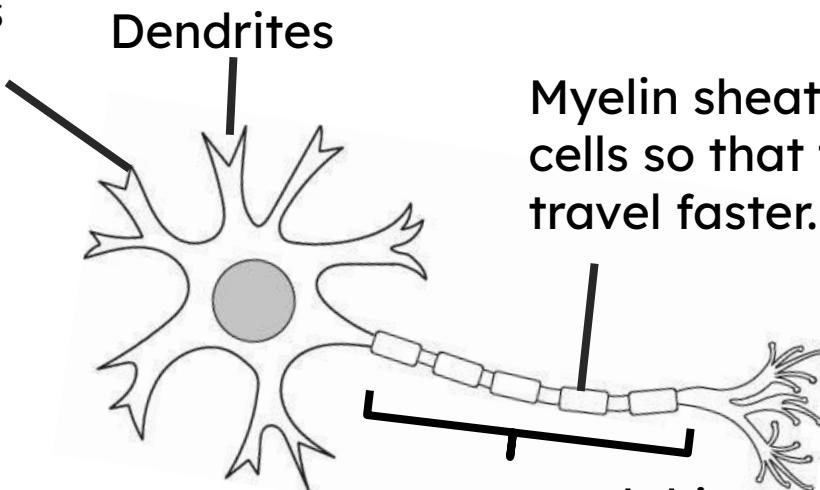
Nerve cells transmit electrical impulses throughout the body. They form part of the nervous system.



Specialised animal cells

Nerve cells are adapted to their function in the following ways:

Branched connections called dendrites at each end so that they can connect to other nerve cells and transmit impulses quickly.



Myelin sheath surrounds nerve cells so that the impulse can travel faster.

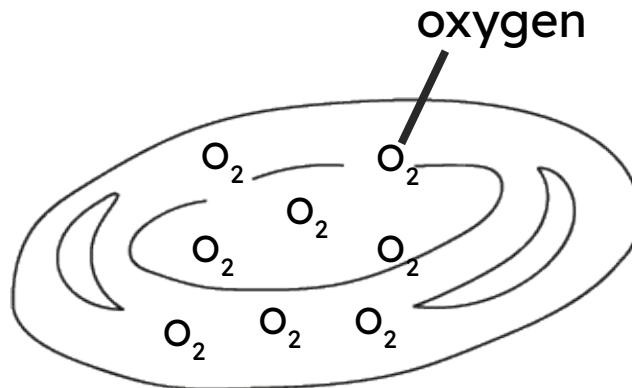
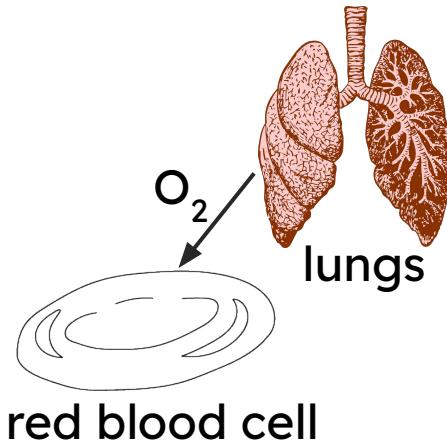
Long and thin axon so that they can carry impulses over long distances quickly.

Specialised animal cells



What is this specialised cell?

Red blood cells carry oxygen around the body for aerobic respiration.

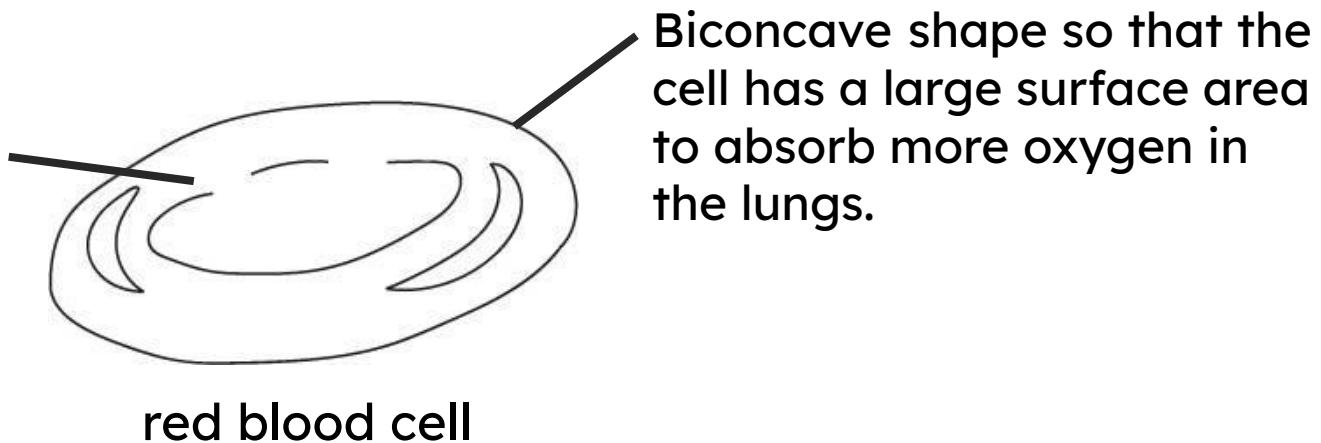


In the lungs, oxygen diffuses through the alveoli into the red blood cells.

Oxygen binds to haemoglobin in the red blood cells and is delivered to most body cells for respiration.

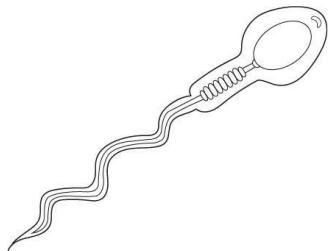
Red blood cells are adapted to their function in the following ways:

No nucleus so that there is more space inside the cell to carry oxygen.

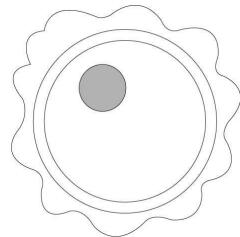


What is this specialised cell?

Sperm cells are the male sex cells. They have to swim to meet the egg cell before fertilisation can occur.



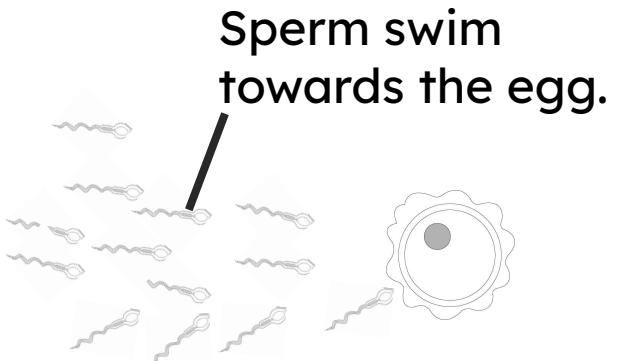
sperm cell



egg cell

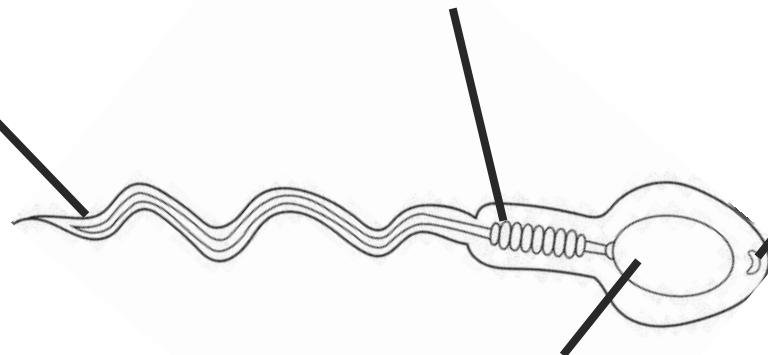
The sperm cells have to swim through the cervix and uterus to find the egg cell.

Millions of sperm are released, but usually only one can fertilise the egg.



Sperm cells are adapted to their function in the following ways:

Tail so that they can swim towards the egg cell.



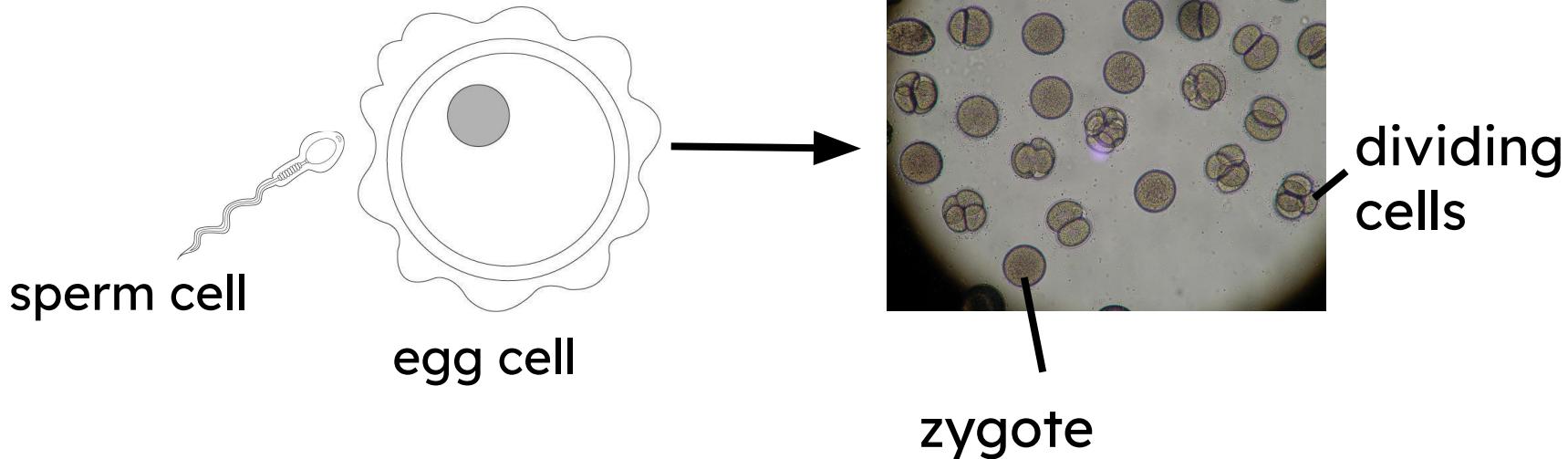
Many mitochondria so that lots of energy is released for movement.

Nucleus contains half the number of chromosomes (haploid).

Head contains an acrosome which contains enzymes so that the egg cell membrane can be broken down.

What is this specialised cell?

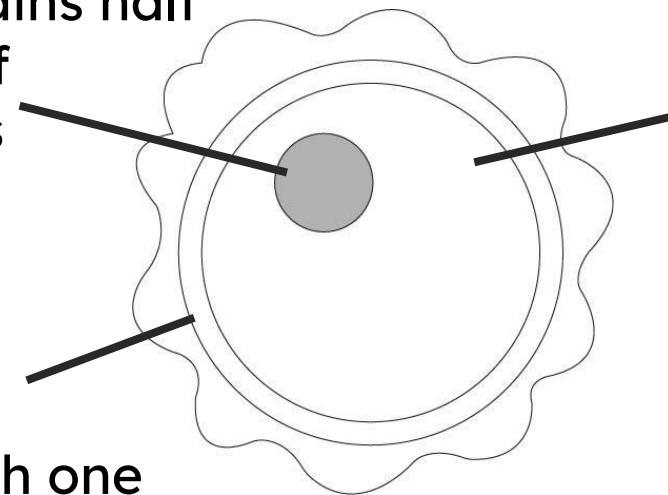
The egg cell is the female sex cell and it is fertilised by the sperm cell, forming a zygote.



Egg cells are adapted to their function in the following ways:

Nucleus contains half the number of chromosomes (haploid).

Cell membrane changes after fertilisation with one sperm; this usually means no more sperm can enter.

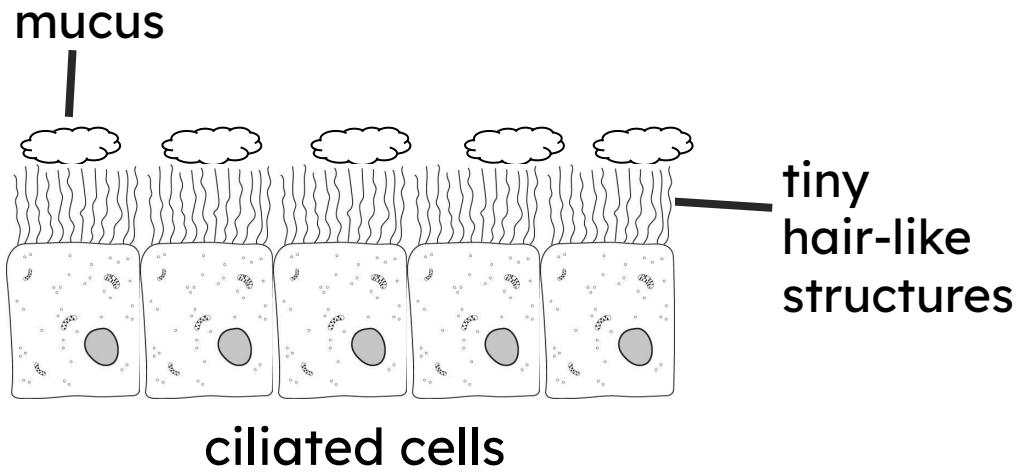


Cytoplasm contains lots of nutrients to sustain the early growing embryo.

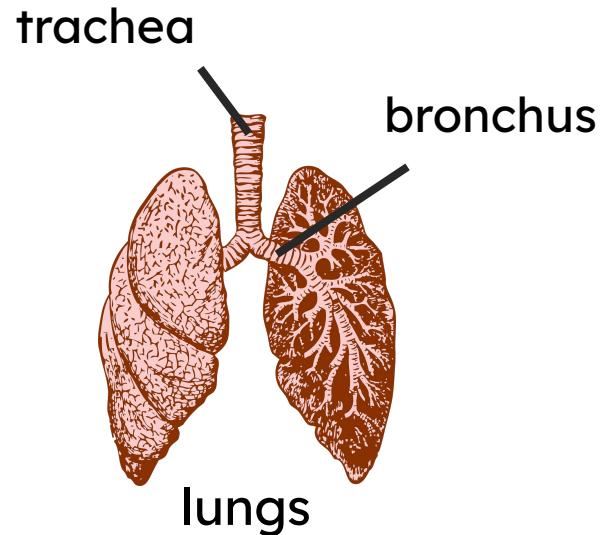
Specialised animal cells



What is this specialised cell?



Ciliated cells line the airways. Their job is to move mucus up and out of the lungs.



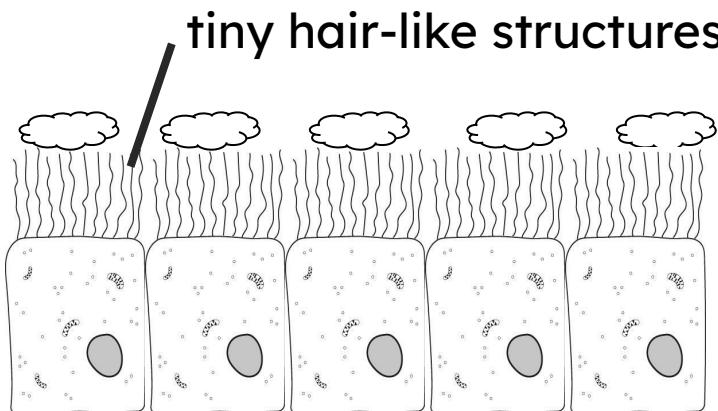
Ciliated cells line the bronchi and trachea which form part of the respiratory system.

Specialised animal cells

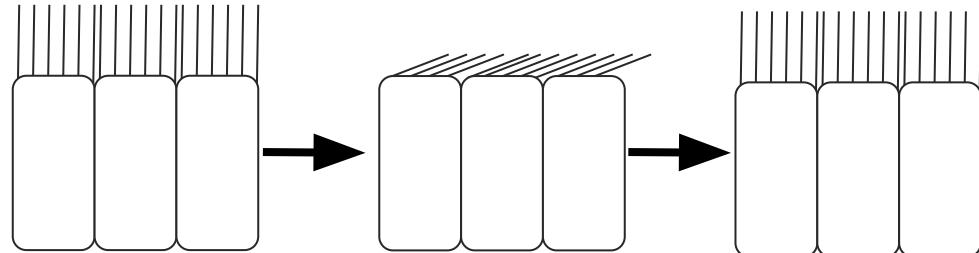


Ciliated cells are adapted to their function in the following way:

Their surfaces are covered in tiny hair-like structures called cilia that move together to sweep the mucus up and out of the lungs.



ciliated cells



ciliated cells

Specialised animal cells



What are these specialised cells?

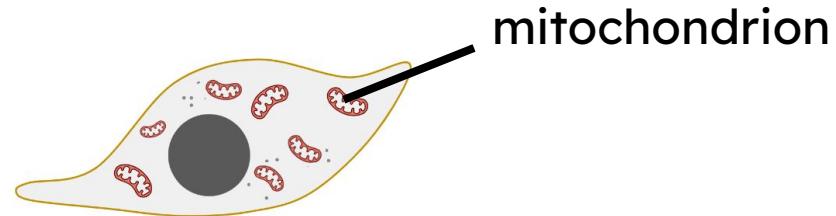
Muscle cells contract in order to allow the body to move.

Muscle cells are adapted to their function in the following ways:



muscle cells

Muscle cells contain filaments of protein that can slide to cause muscle contraction.



muscle cell

Muscle cells contain lots of mitochondria to release energy for muscle contraction.

Which of the following is true for ciliated cells?

- a have a tail so that they can swim
- b have tiny hair-like structures called cilia to sweep mucus
- c have branched ends to send impulses quickly



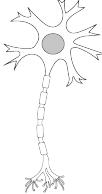
Which of the following is true for muscle cells?

- a contain nutrients to sustain muscle contraction
- b have a biconcave shape to increase their surface area
- c contain lots of mitochondria to release energy ✓

Task C Specialised animal cells

1) Match the specialised cell to its function.

A



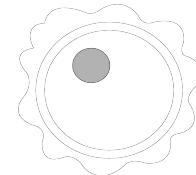
B



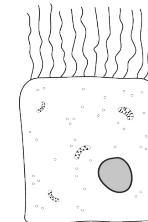
C



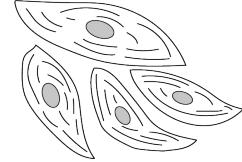
D



E



F



Swims to the egg before fertilisation can occur.

Carries oxygen around the body for respiration.

Lines the airways to move mucus up and out of the lungs.

Transmits electrical impulses around the body.

Contains filaments that slide over each other to cause contraction.

Fuses with the sperm during fertilisation.

Task C Specialised animal cells



Feedback

1) Match the specialised cell to its function.

A



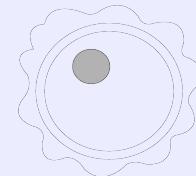
B



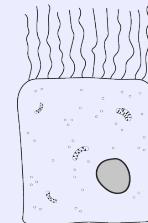
C



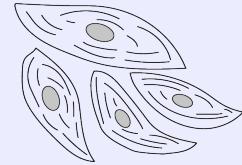
D



E



F



Swims to the egg before fertilisation can occur

C

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B

Lines the airways to move mucus up and out of the lungs

E

Transmits electrical impulses around the body

A

Contains filaments that slide over each other to cause contraction

F

Fuses with the sperm during fertilisation

D

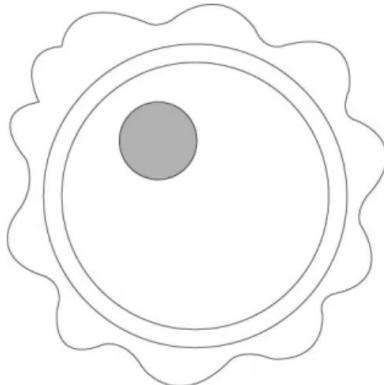
Summary Animal cells: common structures and specialised cells

- Animal cells have common features called sub-cellular structures that each have a function.
- The common sub-cellular structures found in animal cells are cell membrane, cytoplasm, nucleus, mitochondria and ribosomes.
- Specialised cells are adapted to carry out a specific function.
- Specialised cells have different shapes they also contain different sub-cellular structures that enable them to carry out these functions.
- Some examples of specialised animal cells are nerve cell, sperm cell, egg cell, red blood cell, muscle cell and ciliated cells.

Exit Quiz

Animal cells: common structures and specialised cells

1 What is this specialised cell? Fill in the blank



2 Match the sub-cellular structure to their function. Write the correct letter in each box

a	cytoplasm
b	ribosomes
c	mitochondrion
d	cell membrane
e	nucleus

	where protein synthesis takes place
	controls cell activities; contains DNA
	semi-permeable; controls what enters and exits the cell
	jelly-like liquid where many chemical reactions take place
	where aerobic respiration takes place to release energy

3 Which of the following are true for a ciliated cell? Tick 2 correct answers

- they have a biconcave shape
- they have tiny hair-like structures called cilia
- their job is to transmit electrical impulses
- their job is to sweep mucus up and out of the airways

4 Which are adaptions of a nerve cell? Tick 2 correct answers

- biconcave shape to speed up nerve impulses
- dendrites to help connect nerve cells
- long and thin axon to transmit nerve impulses
- half the amount of DNA (haploid)

5 Match each specialised cell to their correct features. Write the correct letter in each box

a	egg cell
b	sperm cell
c	red blood cell
d	muscle cell

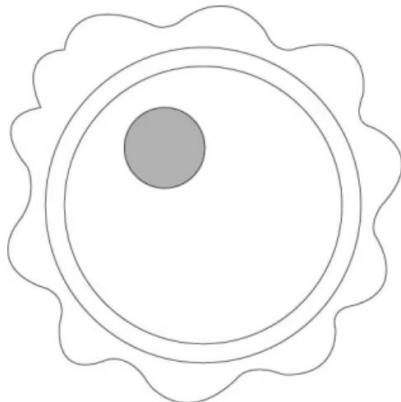
	tail to help it swim, half the amount of DNA, acrosome in head
	cytoplasm contains nutrients, half the amount of DNA
	filaments of protein, lots of mitochondria
	biconcave shape, no nucleus

6 Which of the following are true? Tick 2 correct answers

- the axon of nerve cells have a myelin sheath to transmit impulses faster
- egg cells have an acrosome to break down the sperm cell membrane
- ciliated cells have dendrites to sweep mucus up and out of the lungs
- red blood cells have a biconcave shape to increase their surface area

Animal cells: common structures and specialised cells

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