UNIT 1

Living beings: cells and functions

Work in your notebook

Track 1

What are living beings?

There are certain scientific conditions that differentiate a living being from a non-living being. Living beings are made up of cells and complete the three vital functions of nutrition, interaction and reproduction.

Cells

Cells are the smallest part of a living being and cells themselves are also alive. Cells are alive because they can complete the three vital functions.

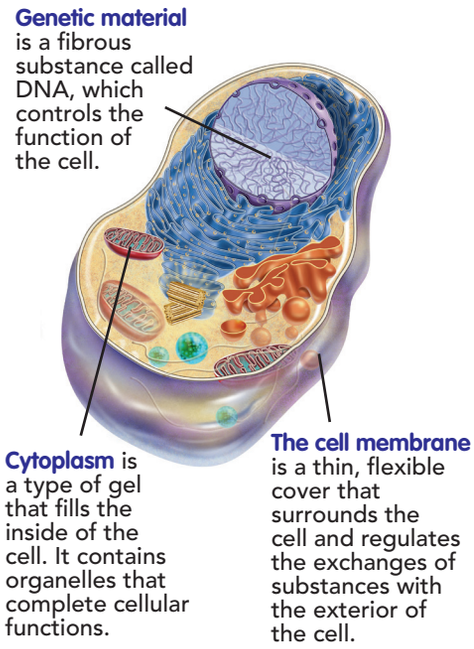
By looking at a variety of cells from different living beings under a microscope, we can see that they all have a similar structure. They all have three components: a cell membrane, cytoplasm and genetic material.

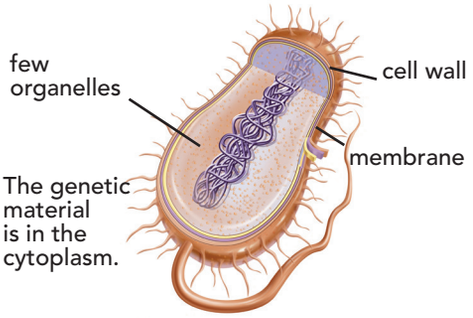
Types of cells

Although they have the same structure, different types of living beings have different types of cells. There are two main types of cells, which can then be divided into subtypes, depending on the job that they do.

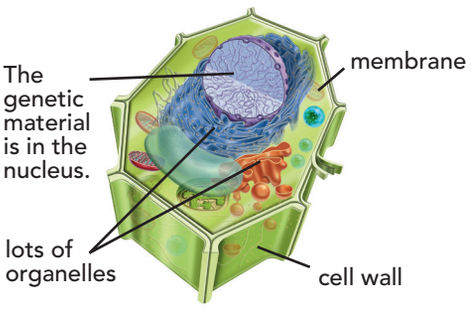
- **Prokaryotic cells.** The genetic material in prokaryotic cells is in the cytoplasm. They don't contain many different types of organelles and they have a rigid cell wall around the cell membrane.
- **Eukaryotic cells.** The genetic material in eukaryotic cells is enclosed inside a nucleus. They contain many different types of organelles. Some of these cells have a rigid wall around the cell membrane and others don't.

The basic structure of cells





Prokaryotic cell



Eukaryotic cell

1. How do scientists differentiate living beings from non-living beings?
2. What do all cells have in common?

Track 2

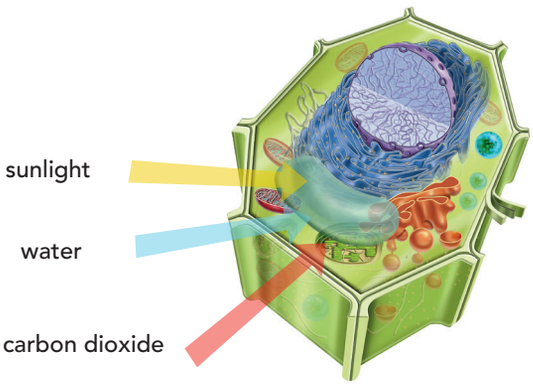
Cells and vital functions

Cells and the nutrition function

Cells can obtain and use nutrients, respire and release their waste.

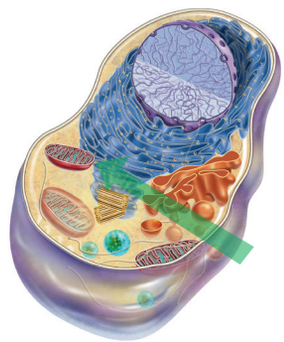
- Cells that use autotrophic nutrition make their own nutrients by combining water, carbon dioxide and solar energy. Cells that use heterotrophic nutrition take nutrients from other living beings.
- Most cells use oxygen from their environment to respire.
- Cells use nutrients and oxygen to obtain energy, to grow and to regenerate. While doing this, they produce waste material.
- Cells release waste material to the exterior of the cells through the cell membrane.

Cells that use autotrophic nutrition



These cells make their own nutrients.

Cells that use heterotrophic nutrition



These cells take nutrients from other living beings.

Cells and the interaction function

Cells react to internal changes. They do so by producing and releasing substances, by growing or by changing shape or position.

Cells and the reproduction function

Cells can divide themselves. They make a copy of their genetic material and divide the cytoplasm into two halves. This creates a new cell.

1. How do cells perform each vital function?
2. Find out if there are any cells that can be seen without a microscope.

Track 3

How cells are organised

Living beings have different levels of complexity. Their complexity depends on the number of cells they are made up of and how organised their cells are. There are unicellular living beings and multicellular living beings.

Unicellular living beings

Unicellular living beings are made up of just one cell. The three vital functions take place in that one cell. Some unicellular living beings live together in colonies, but they are not organised or coordinated in any way. In a colony, each cell is an independent living being.

Prokaryotic unicellular living beings

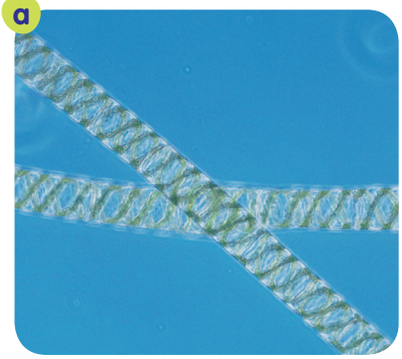
Unicellular living beings that are made up of a singular prokaryotic cell form the Monera Kingdom. This kingdom consists of bacteria and other similar beings.

Eukaryotic unicellular living beings

Living beings that are made up of one single eukaryotic cell can be found in the Protoctista Kingdom. These are protozoa and microscopic algae. There are also a few eukaryotic unicellular living beings that belong to the Fungi Kingdom.

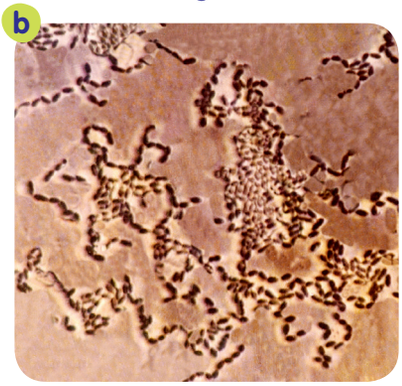
Unicellular living beings

a



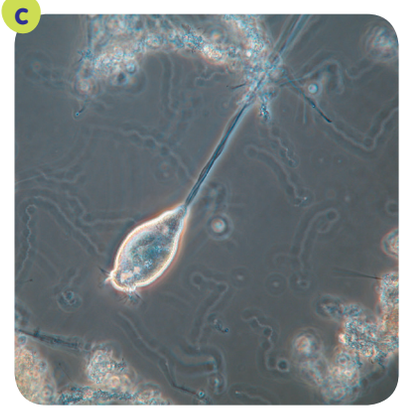
Algae

b



Bacteria

c



Protozoa

1 In your own words, explain how unicellular living beings are organised.

2 Look at pictures a-c. Are they *prokaryotic* or *eukaryotic*?

3 Match the kingdoms to the descriptions in your notebook.

1	Monera Kingdom	a)	prokaryotic unicellular living beings
2	Protoctista Kingdom	b)	eukaryotic unicellular living beings

Track 4

4 Listen to the audio and answer the questions.

1. Give three examples of cells that can be seen without a microscope.
2. What type of living being is the giant xenophyophore?
3. Why is it difficult to study them?

Sci-find

Do research on xenophyophore. Find a picture and describe it.

Track 5

Multicellular living beings...

... without tissues

There are multicellular living beings whose cells are joined together but aren't specialised. Some examples are:

- microscopic algae (Protoctista Kingdom)
- mould and mushrooms (Fungi Kingdom)
- sponges (Animalia Kingdom)

... with tissues but no organs

Tissues are groups of cells that work together to perform a specific activity. There are living beings that consist of tissues but not organs. Some examples are:

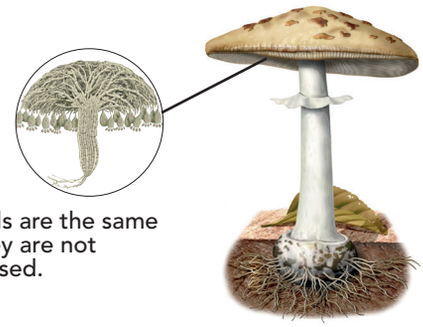
- mosses (Plantae Kingdom), which consist of tissues to perform photosynthesis
- cnidarians (Animalia Kingdom), which consist of muscular and reproductive tissues

... with organs

The most complex living beings consist of both tissues and organs. Organs are made up of tissues. They do very specialised tasks. Some examples are:

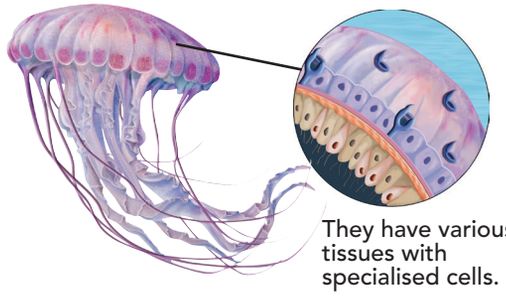
- most plants. Plants' organs are their roots, stem, leaves and flowers.
- most animals. Animals' organs are their digestive, respiratory and sense organs and their muscles. These organs are often part of a system, such as the digestive system, the respiratory system, etc.

Multicellular beings without tissues



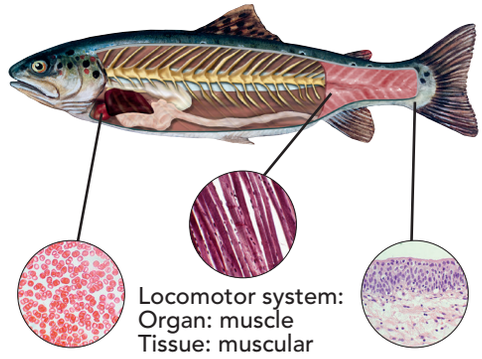
The cells are the same and they are not specialised.

Multicellular beings with tissues



They have various tissues with specialised cells.

Multicellular beings with organs



5 Look at the picture of the fish and answer the questions in your notebook.

1 What function do the arteries have?
2 What function do the muscles have?

6 What type of mulitcellular beings are humans?

Use your brain!

Did you know...?

The first multicellular animals were found in Australia. They looked like jellyfish and worms.

Track 6

The Monera Kingdom

The Monera Kingdom contains mainly bacteria. Bacteria are unicellular and they haven't got a nucleus.

Bacteria can be found on land, in water, air and inside other living organisms. There are about a million bacterial cells in just one millilitre of fresh water!

You need a microscope to see bacteria because they are so tiny.

Bacteria and humans

Bacteria are small and simple, but very powerful. They are adaptable and can survive in the most extreme conditions.

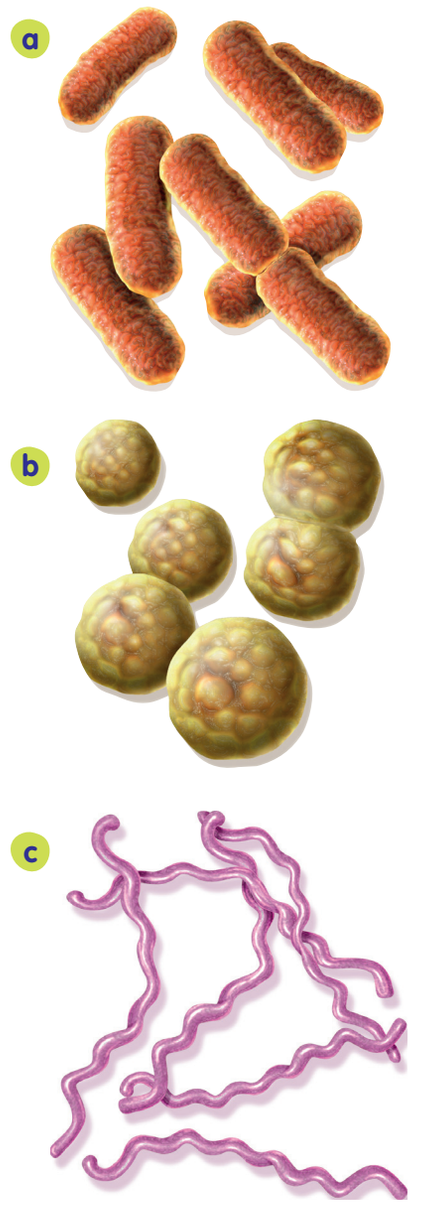
Diseases caused by bacteria

Bacteria are infectious agents. They can reproduce very quickly and they spread diseases They can also enter our food and contaminate it.

How we can use bacteria for our benefit

The majority of bacteria are actually good for humans. Antibiotics, used to cure some diseases, are made from bacteria!

Bacteria



Bacteria can be all different shapes.

1 What types of organisms belong to the Monera Kingdom?

2 Are the sentences *True* or *False*? Correct the false ones in your notebook.

1 Bacteria form part of the Monera Kingdom.
2 Bacteria have a nucleus.
3 Bacteria can be seen with the naked eye.
4 Bacteria are unicellular.

3 Are all forms of bacteria bad for us? Why?

Did you know...?

There are ten times more bacteria cells in your body than human cells!

Track 7

The Protoctista Kingdom

The Protoctista Kingdom contains unicellular and multicellular organisms that can live in water or in humid earth. They can also live inside other living beings. Protozoa belong to this kingdom and so do algae.

Protozoa

Protozoa are unicellular, have got a nucleus and are heterotrophic (they feed on other living beings). Some protozoa can cause serious diseases.

Track 8

Algae

There are unicellular algae and multicellular algae. Algae, like plants, are able to photosynthesize which means that they are autotrophic. They are normally found in water, but can also be found on some rocks and trees.

- **Unicellular algae** can be found in lakes and rivers.
- **Multicellular algae** form into kelp forests in the oceans.

When algae reproduce excessively, they can cause contamination. Some substances they produce are dangerous.

Algae, however, put oxygen into the Earth's atmosphere and oceans. They are used in medicines and food production. Animals and humans eat certain types of algae.

1 Where can you find organisms from the Protoctista Kingdom?

2 What type of protozoa are used to treat sewage and why?

3 Write definitions for the words in the box.

algae multicellular protozoa unicellular

Protozoa

a

Paramecium

b

Trypanosoma

c

Amoeba

Algae

Green algae live in both fresh and salt water.

Track 9

The Fungi Kingdom

Fungi cannot make their own food like plants. They are heterotrophic and feed on the remains of other living beings. There are unicellular fungi and multicellular fungi. Some fungi, such as yeast, are microscopic. Others, such as mushrooms, are larger.

Unicellular fungi

Yeast is a unicellular fungus. It grows where sugar can be found, such as in very ripe or decaying fruit and flowers. It also lives in the mouths, skin, intestines and mucous membranes of some animals.

Mould

Mould is multicellular and has the appearance of cotton wool. It grows on damp floors or walls and on fruit and bread.

Mushrooms

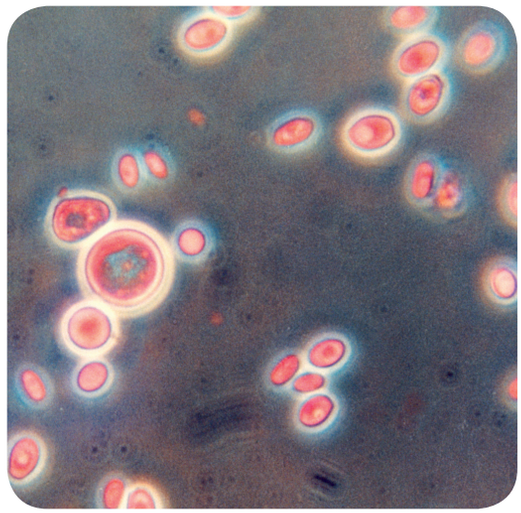
Mushrooms are multicellular. They grow in damp, shady places. Mushrooms decompose the remains of other living beings. Decomposition is an essential part of the food chain, as it puts nutrients back into the soil, which the plants need.

1 Write a short paragraph about fungi and their characteristics.

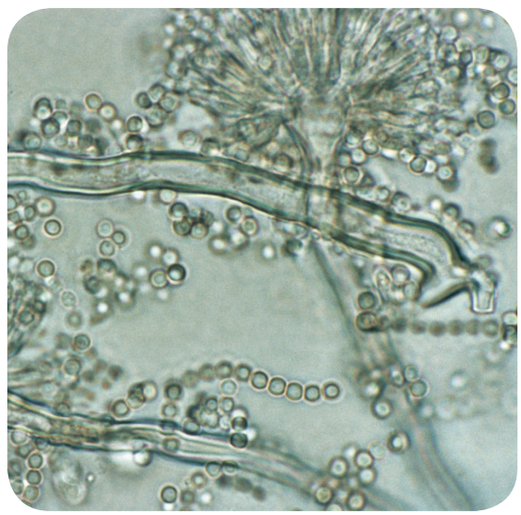
2 Which of the following are unicellular?

a) yeast
b) mould
c) mushrooms

Types of fungi



yeast



mould

mushrooms

Track 10

Fungi and people

- Yeast is used to make bread and alcoholic drinks.
- Antibiotics and other medicines are also obtained from mould. Some types of mould are dangerous and cause illnesses.
- Some mushrooms are poisonous but others we can eat. It is very important to know the difference. Others are parasitic, which means that they attack trees, causing deadly diseases.

Fungi and people

We make bread using yeast.

People obtain antibiotics from mould.

Some mushrooms are edible.

3 List three ways that fungi are beneficial to us.

Use your brain! **4** Why is it important to be an expert in mushrooms when picking them?

Geometric shapes 2 1 3

Track 11

A category of its own...

Lichens

Lichens are a partnership of heterotrophic fungi and algae. This partnership is very beneficial for lichens because they can grow where an alga or fungus could not grow separately. In fact, they can grow in some of the most extreme temperatures on the planet.

Lichens

Lichens can live on rocks, wood, soil, leaves...

1 In your own words, explain why the partnership between fungi and algae is beneficial.

2 Give two examples of places lichens can grow in.

Use your brain! **3** What can scientists determine if an area has lots of lichen growing in it? Find out!

Sci-find

Investigate some of the diverse habitats where lichens grow.

Apply your skills!

Project Are viruses living beings?

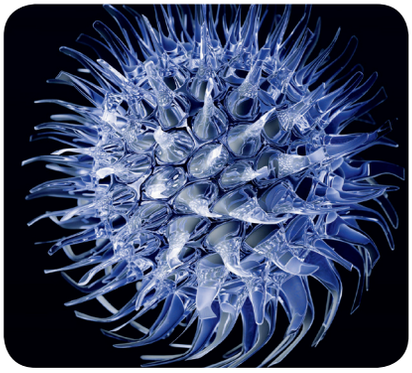
Viruses are considered to be somewhere between living and non-living material. This is because they cannot perform vital functions on their own.

When they invade (or enter) the cell of a living being, they begin to multiply and produce more viruses. This destroys the healthy cell.

Because of this process, viruses cause many illnesses such as the flu, measles, polio and hepatitis.

Viruses are tiny and were only discovered long after the illnesses they caused. They can only be seen though a powerful electronic microscope.

On examination, it was found that they were not made up of cells, but are composed of a capsule, which contains geometric forms and genetic material with the information necessary for viruses to reproduce.



1. What is the difference between a bacteria and a virus?
2. Create a hypothesis explaining why viruses are always harmful to the cells they invade.
3. Some scientists call viruses ‘obligate parasites’. Why do think they are called this?
4. To compare sizes, read the following:

   If you were as big as Europe, a unicellular fungus would be as big as a football field, bacteria as a coach and a virus like a football.

   What are the advantages of making comparisons?

Check what you know!

Work in your notebook

1. Cells can divide themselves into two. They do this by making a copy of their genetic material and dividing the cytoplasm into two halves. This is part of the cell's…
   a) … reproduction function.
   b) … interaction function.
   c) … nutrition function.

2. Give an example of a multicellular living being that hasn't got tissues.

3. Choose the correct sentence in your notebook.
   a) Algae are unicellular.
   b) Algae are multicellular.
   c) Algae can be unicellular or multicellular.

4. Which is the odd one out? Explain your answer.
   a) yeast
   b) algae
   c) mould
   d) mushrooms

5. Describe what you can see in the picture below.

My Word list

Cells
cytoplasm
genetic material
membrane
nucleus
organelles

Living beings
multicellular
unicellular

Kingdoms
Fungi:
- mould
- mushroom
- yeast

Lichens
Monera:
- antibiotics
- bacteria
- infectious agents

Protoctista:
- algae
- protozoa

Vital functions
interaction
nutrition:
- autotrophic
- heterotrophic

reproduction