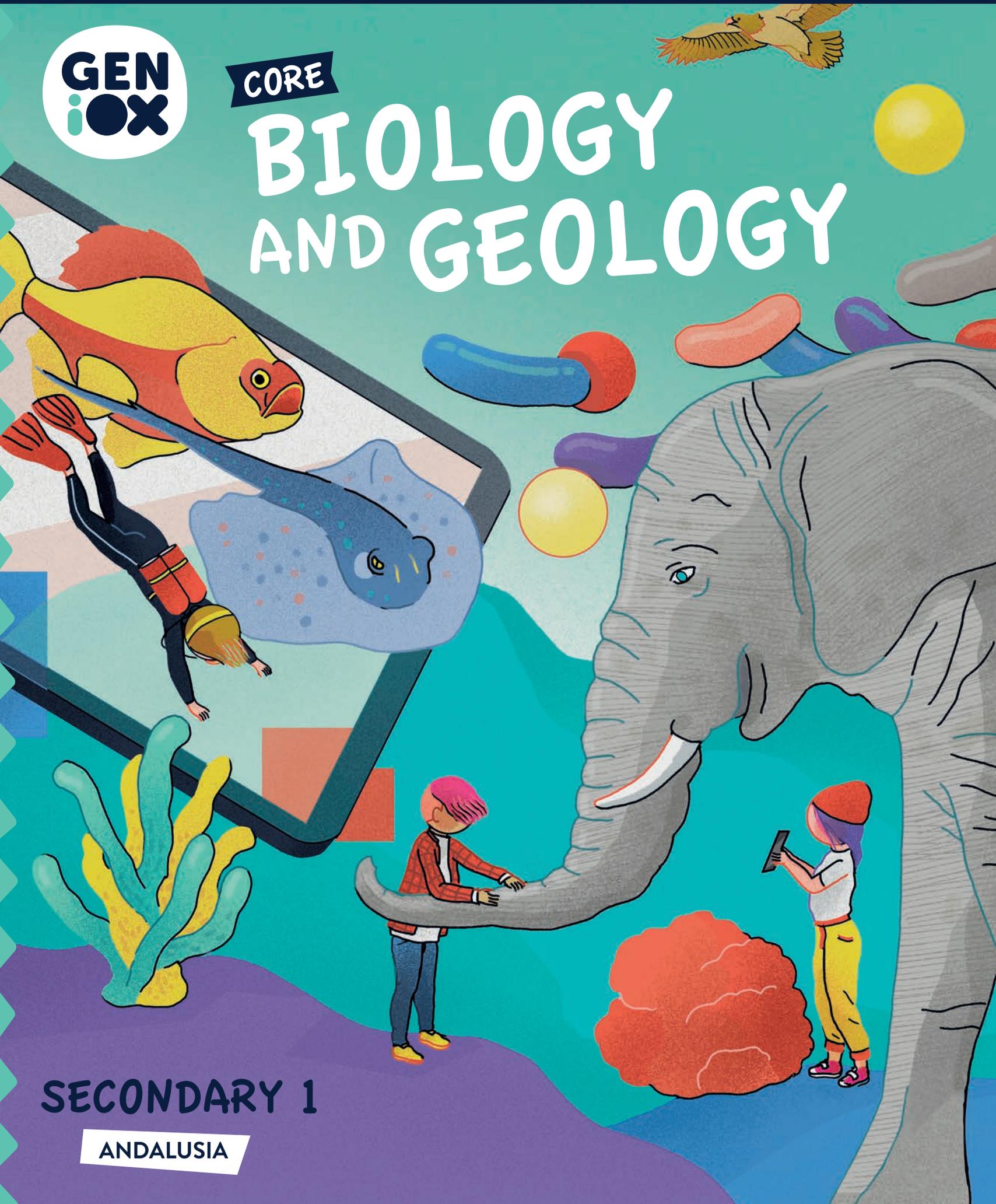




CORE

BIOLOGY AND GEOLOGY



SECONDARY 1

ANDALUSIA

1 Characteristics of the Earth - the planet of life

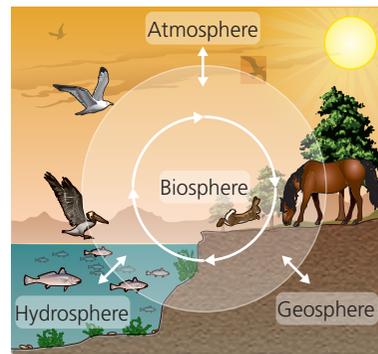
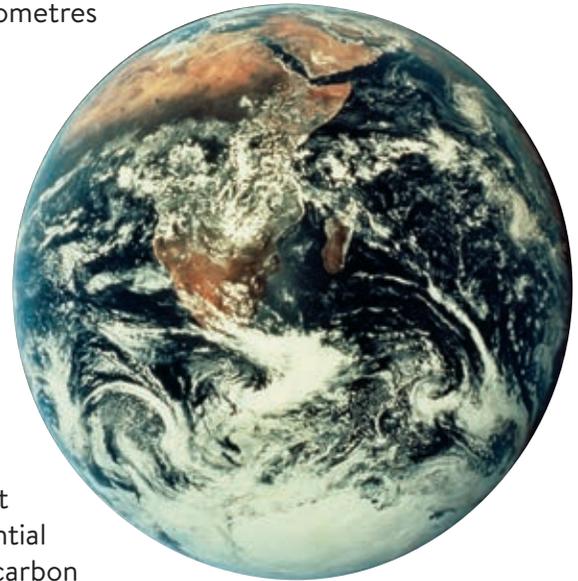
¹**mild:** not severe or strong.

²**life processes:** essential activities performed by living things.

³**atmosphere:** mixture of gases that surrounds the Earth.

Planet Earth has special characteristics that make it **habitable** for living things:

- The Earth is 149.6 million kilometres from the Sun. Unlike other planets in our Solar System, the surface of the Earth has **mild**¹ temperatures, which allow it to have liquid water. Living things need liquid water to carry out **life processes**².
- The Earth has an **atmosphere**³ that protects living things from **ultraviolet radiation** and keeps temperatures stable. It contains gases that are essential for life, such as oxygen and carbon dioxide.
- The presence of **liquid water**, essential for living things to perform cellular processes, and **sunlight** that plants need to perform photosynthesis.
- There are basic **chemical elements**, such as hydrogen, carbon, nitrogen and oxygen. These elements are able to combine and make up the molecules found in living matter.



1.1. Characteristics of the biosphere

The **biosphere** consists of all living things and the places where they live. This includes part of the **atmosphere** (the troposphere), the **hydrosphere** and the surface layer of the **geosphere**.

CLIL activities

1 Explain these words in your notebook:

- element
- molecule
- hydrosphere
- geosphere

2 Listen to the four statements and write *true* or *false*. Correct the false statements.

3 In groups of four, prepare a short presentation about the Earth's special characteristics.

4 Look at the image below. Why is the green area sometimes called the 'Goldilocks zone'?



2 Differences between living and non-living things

All matter in the Universe, including all living things on Earth, is made up of tiny particles called **atoms**. Atoms of the same type group together to form **chemical elements**. Chemical elements group together to form **molecules**.

All living things...

- contain chemical elements that are different from the chemical elements in non-living things.
- are made up of **cells**.
- carry out **life processes**: nutrition, interaction and reproduction.

2.1. Important elements and chemicals for living things

Living things are made up of **bioelements**. Primary bioelements are the most **abundant**¹. Examples are: carbon (C), hydrogen (H), oxygen (O), nitrogen (N), phosphorus (P) and sulphur (S).

Other bioelements, such as calcium (Ca), sodium (Na), potassium (K) and iron (Fe) are less abundant, but they are still essential for living things. Bioelements combine to create biomolecules. Living things are made up two types of biomolecules:

- **Organic**. They are only found in living things and their main element is carbon.

Biomolecule	Functions	Examples
Carbohydrates	They give immediate energy to organisms.	Glucose, lactose, sucrose
Lipids	They can store ² energy for possible future needs.	Fats, waxes, cholesterol
Proteins	They form structures such as skin, hair and muscle.	Haemoglobin, collagen, keratin
Nucleic acids	They contain an organism's ³ genetic information. They are responsible for the functioning of the cell.	DNA, RNA

- **Inorganic**. They are also found in non-living things. Water is the most abundant inorganic biomolecule in living things.

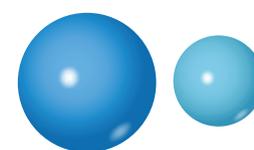
Biomolecule	Functions	Examples
Water	Important for many vital processes such as the transportation of substances and thermal regulation.	Water
Mineral salts	They form rigid structures in the organism, such as bones, and are important for cellular processes.	Calcium carbonate, calcium phosphate

CLIL activities

- 5  In your notebook, write two true and one false sentence about living and non-living things. Then test a classmate.

- 6  Listen and write *organic* or *inorganic*.

- 7 Draw a mind map about biomolecules. Include small images.



Atoms



Molecules



¹**abundant**: existing in large quantities.

²**store**: keep or contain something when it is not in use.

³**organism**: living thing.



What are vitamins?

Vitamins are organic biomolecules. They help the regulatory functions of an organism, such as obtaining energy, calcification of bones and the formation of red blood cells.

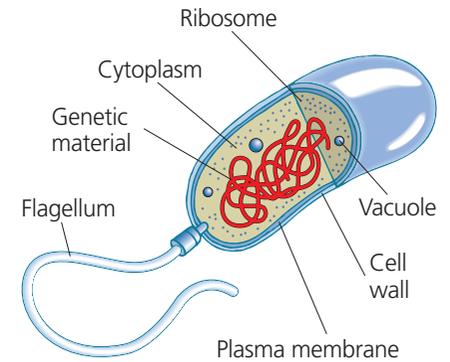


3.2. Cell types

There are two cell types:

Prokaryotic cells

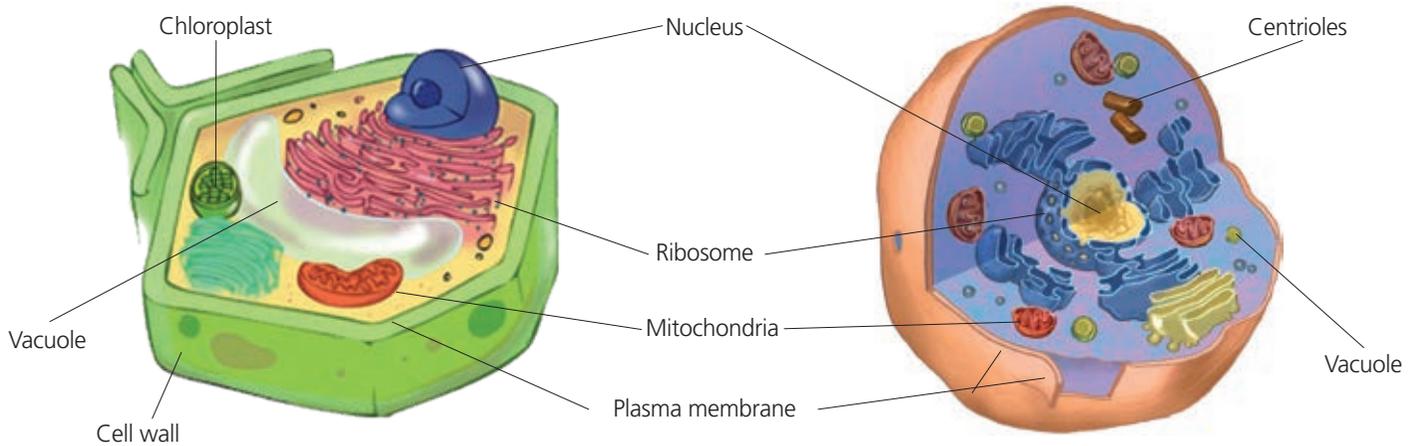
- Size: between 0.5 and 10 μm .
- They carry genetic material (DNA) in the cytoplasm.
- A cell wall surrounds the plasma membrane.
- They don't have many organelles. They have ribosomes to create proteins, and vacuoles to store substances.
- Some have additional structures, such as a flagellum, to help them move.



Eukaryotic cells

- Size: between 10 and 150 μm .
- The cell's nucleus contains the genetic material.
- Some have a cell wall around the plasma membrane.
- They have a variety of organelles.

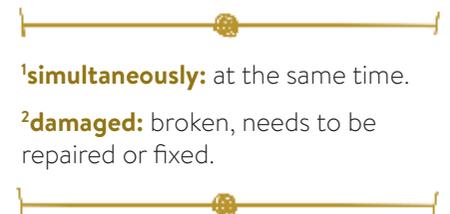
There are two main types of eukaryotic cells: **plant cells** and **animal cells**.



Plant cells	Animal cells
They have a cell wall.	They don't have a cell wall.
They have chloroplasts , organelles essential for photosynthesis.	They don't have chloroplasts.
They don't have centrioles.	They have centrioles, which are essential for cell division.

Multicellular eukaryotic organisms contain **specialised cells** that do different jobs. Each cell uses different **DNA** information to carry out its function. Specialised cells can perform different functions **simultaneously**¹.

Multicellular eukaryotic organisms also carry out another important function: the substitution of **damaged**² cells.



CLIL activities

11 Listen to the podcast. Copy and complete the table to compare eukaryotic and prokaryotic cells in your notebook.

	Eukaryotic cells	Prokaryotic cells
Similarities
Differences

12 Identify which part of a eukaryotic cell carries out these functions:

- controlling what goes in and out of the cell
- storing genetic material
- containing cell organelles.

13 In pairs, make a Venn diagram to compare and contrast a bacterium cell and a white blood cell. Which is more complex?

4 The life processes of living things

Life processes are the activities that all living things carry out. These activities are **nutrition**, **interaction** and **reproduction**.

4.1. Nutrition

Nutrition is the process of **getting energy and nutrients from matter** to grow and be healthy. There are two types of nutrition:

- **Autotrophic nutrition.** Plants, algae and certain bacteria **feed on¹** inorganic matter and transform it into organic matter.
- **Heterotrophic nutrition.** Animals, fungi, protozoa and certain bacteria feed on organic matter.

4.2. Interaction

Living things need to **sense changes** in their environment and their bodies so they can **respond**. This process is called interaction.



4.3. Reproduction

Reproduction is the creation of **offspring²**. There are three types of reproduction: asexual, sexual and a combination of both.

In **asexual reproduction**, a single individual produces multiple offspring that are identical to the parent. All unicellular organisms and some multicellular organisms carry out this type of reproduction.

In **sexual reproduction**, specialised reproductive cells (gametes) from two individuals, male and female, combine. This type of reproduction is slower and produces offspring that aren't identical to the parents.

Some species can reproduce **both sexually and asexually** during their life cycles. Examples of these organisms are ferns, jellyfish and mosses.

¹**feed on:** eat something as food regularly.

²**offspring:** young of an animal or plant.

³**split:** divide into separate parts.



What is asexual reproduction?

There are three types:

Bipartition. One cell **splits³** into two cells of a similar size.



Gemmatation. One cell splits into two cells of different sizes.



Sporulation. The nucleus of a cell divides multiple times, creating lots of cells.



GLIL activities

- 14 Write two sentences about nutrition in a sunflower and an eagle in your notebook.

Sunflowers carry out ... nutrition because...

- 15 Listen to the reporter. Summarise the difference between sense organs and effector organs in one sentence.

Sense organs..., whereas effector organs...

- 16 Find two main differences between sexual and asexual reproduction. Discuss the differences with a classmate.

- 17 In groups of three, choose a living thing and give a short presentation about its life processes.

5 Classification of living things

The criteria to classify living things must be...

Natural. They must be based on functional or **anatomical**¹ aspects, not on random criteria.

Objective. They cannot depend on the likes and dislikes of an individual.

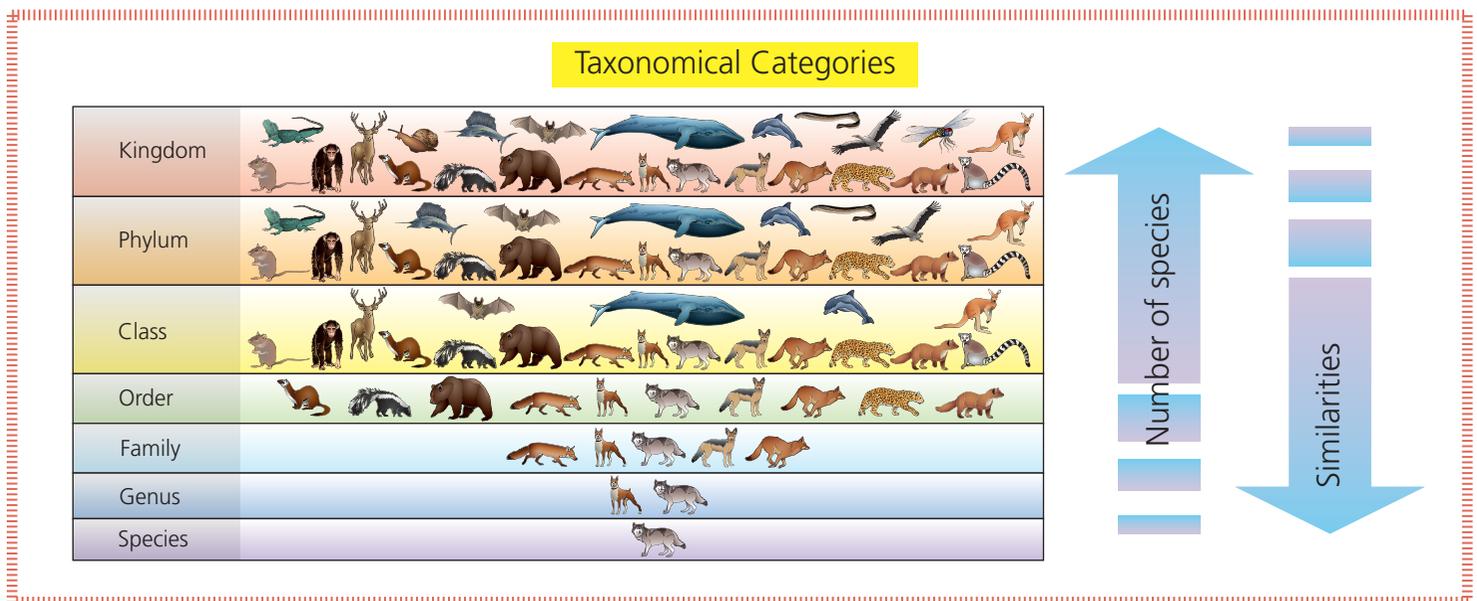
Discriminatory. Characteristics must be shared by some of the living things.

¹**anatomical:** related to the physical structure of the body.

²**fertile:** able to reproduce.

Taxonomy is the science which **classifies** living things according to **natural criteria**. Each group of living things is called a **taxonomical category** or a **taxon**. The most basic taxon is the species.

A **species** is a group of individuals that have **common characteristics** and can reproduce to make **fertile**² offspring.



Binomial nomenclature, invented by **Carl Linnaeus** in 1753, is how we name species. Each name has two Latin words written in italics: the first word is the genus. The second word describes a specific characteristic of the species. For example, the binomial nomenclature of a cork oak is:

Quercus suber

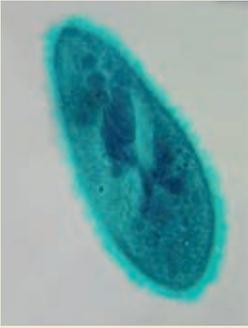
Quercus name of the genus

suber means 'cork' in Latin

CLIL activities

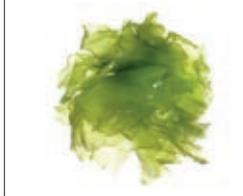
- 18 Listen and explain the meaning of *classification* in your notebook. Then identify the phylum and class of a ladybird.
- 19 In groups, write a series of questions using the taxonomic categories table. Then do a class quiz.
- 20 Research and classify a dog and a holm oak. Start with the kingdom and finish with the species.

6 The five kingdoms

		<p>Think like a biologist. What are the biggest differences between these two pairs of living things?</p>		
protozoa	mushroom		olive tree	lemur

In 1969, **Robert H. Whittaker** proposed **five kingdoms** based on three criteria: type of cell, number of cells and type of nutrition.

Then in 1985, **Lynn Margulis** perfected the system and gave names to the five kingdoms.

	Monera	Protocistas	Fungi	Plants	Animals
					
Kingdom	Monera, Protocista, Fungi, Plantae, Animalia				
Type of cell	Prokaryote, Eukaryote, Eukaryote, Eukaryote, Eukaryote				
Number of cells	Unicellular, Unicellular or multicellular, Unicellular or multicellular, Multicellular, Multicellular				
Tissue	Not present, Not present, Not present, Present, Present				
Type of nutrition	Autotrophic or heterotrophic, Autotrophic or heterotrophic, Heterotrophic, Autotrophic, Heterotrophic				
Living things	Bacteria, Protozoa and algae, Yeasts, moulds and fungi, Hepaticae, mosses, ferns and spermatophytes, Invertebrates and vertebrates				

In 1990, **Carl Woese** suggested a new category to go above kingdom: the **domain**. There are three domains: **Archaea**, **Bacteria** and **Eukaryota**. Archaea and bacteria are prokaryotic organisms.

CLIL activities

-  Listen to the students make statements about the five kingdoms and write *true* or *false* in your notebook. Correct the false statements.
- Which kingdoms have both tissue and eukaryotic cells?
- Identify the kingdoms for these living things: porcupine, oak, shitake mushroom, streptococcus, green algae, opalinid.

7 Biodiversity

Today we know of approximately 1.75 million different species. However, it's estimated that there are around 50 million.

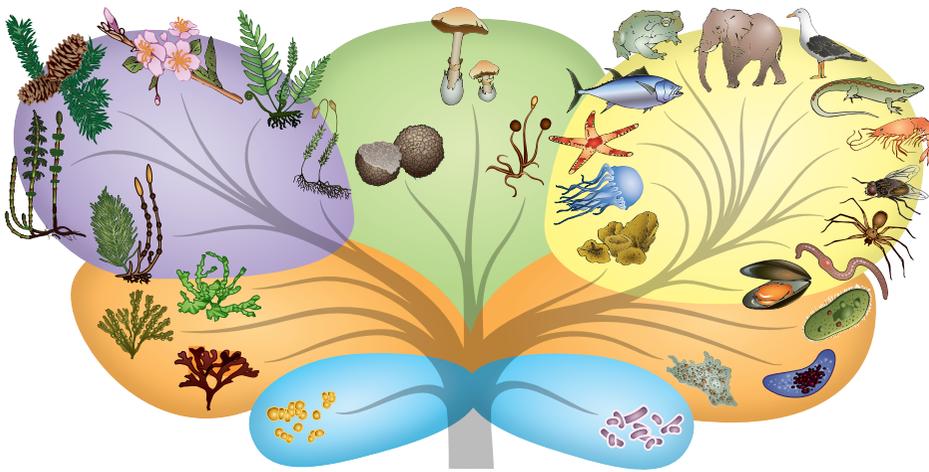
All living things are the resulting offspring of one initial cell. This first cell is the base of the 'Tree of Life' and its offspring form the tree's branches.

As each living thing has multiplied itself over millions of years, changes have allowed some living things to **adapt to their environment** and to survive. This process is called **biological evolution** and it continues to this day.

Evolution explains the immense variety of living things on the Earth.



preserve: protect; keep something in its original state.



The 'Tree of Life'. Where are we?

Biodiversity is the variety of living species in a habitat. It includes the variety of individuals within a species, as well as the variety of species and the variety of ecosystems.

Preserving¹ biodiversity is essential for several reasons:

- Living things provide us with a great variety of materials, food and medicines. They also maintain the quality of soil and water.
- If habitats are damaged or destroyed, the living things that live there are affected negatively. The extinction of one species affects all the other species that interact with it.

CLIL activities

- 24 Why is it important to preserve biodiversity? In your notebook, give examples of the effects of the disappearance of a species.

If ... disappear, then ..., ... and ... are affected.

- 25 Write four sentences to explain the meaning of the statement: 'Biodiversity is the result of a long evolutionary process.' Use the following words:

varied, adapt, change, survive, millions of years.

- 26 In groups, discuss how humans can have a negative effect on biodiversity. Give examples and share your ideas with the class.

- 27 **STEAM** Our planet's current deforestation rate is equal to the size of 20 football fields disappearing every minute. One football field is 5 000 m². Calculate how many square metres of forest disappear...

- in one day.
- in one week.