UNIT 2 – LIVING THINGS

1. HOW DO WE CLASSIFY ORGANISMS

Scientists study many **characteristics** to **classify** organisms into groups. They look at the organism's shape, the number of cells (one or many), if the cells have nucleus and other cell parts, how it gets food, if it moves from place to place, how it grows and develops before it is born.

To describe organisms, scientists developed a classification system. This system divides the organisms into large groups called **kingdoms**.

Organisms in each kingdom share basic traits or characteristics. Organisms that belong to one kingdom are similar to others in that kingdom. They are different from organisms in other kingdoms.

2. THE NEED OF CLASSIFICATION (English class)

The science that studies all the diversity and the relationships between different organisms is called SYSTEMATIC. To become aware of the need and the characteristics of a classification here you have some questions to answer.

STUDY OF SYSTEMATIC

a) Imagine a supermarket where you can buy all these products:

Folders	Wine	Cheese
Ice-cream	Pens	Books
Thread	Jam	Ham
Milk	Detergent	Needles
Buttons	Fruit	Cleaning products
Notebooks	Fish	Frozen vegetables
Zippers	Frozen meat	Liqueur

What do you think is it necessary to make any product (such as a 50-cm-long red zipper) easier to find?

b) When is making a classification necessary?

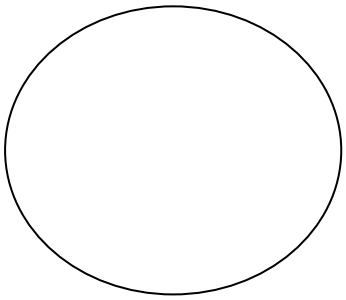
c) How is it made?

d) What is the difference between a group and a classification?

LABORATORY 1- EUGLENA, IS IT A PLANT OR AN ANIMAL?

1. Make a slide of pond water with Euglena in order to look at its characteristics. Make a drawing and a little description.
In case we cannot look directly into the microscope, we could begin this activity by watching a movie at:

http://www.microscopyu.com/moviegallery/pondscum/euglena/



2. Write a prediction, first individually and afterwards in a small group about what kind of organism you think the Euglena is.

3. You will be given the charts with the facts about the Euglena and a sheet of paper with a chart to place them. You will do this in small groups. You have to give your verdict about whether the Euglena is an animal or a plant or neither an animal nor a plant, using convincing arguments.

4. Every group will say their verdict and explain the evidence using convincing arguments. The others can assess and discuss it.

5. Finally the teacher will explain what scientists have decided about Euglena and why. The teacher will also explain that discussions like this are very frequent among scientists and that this is a way of controlling and advancing scientific knowledge.

UNIT 2 – LIVING THINGS

The following chart can help you organize information about the organisms in each kingdom:

Kingdom	Number of cells	Nucleus	Food	Move from place to place
Monera	one	no	Make or obtain	some
Protist	one or many	yes	Make or obtain	some
Fungi	one or many	yes	Obtain	no
Plant	many	yes	Make	no
Animal	many	yes	obtain	yes

Organisms that can make their own food are **autotrophic.**
Organisms that obtain food from others are **heterotrophic.**

Complete:

Fungi and Animals are …….
Plants are ……
Monera and Protists can be …….. or …….

➡ Can you name the five kingdoms?

UNIT 2 – LIVING THINGS

ACTIVITY 1

Now complete the following chart beginning with: It can be…

Does the organism …	If yes, …	If no, …
…have a nucleus?	It can be an animal, plant, fungus or protist.	
… have many cells?		
… obtain food?		
… move?		

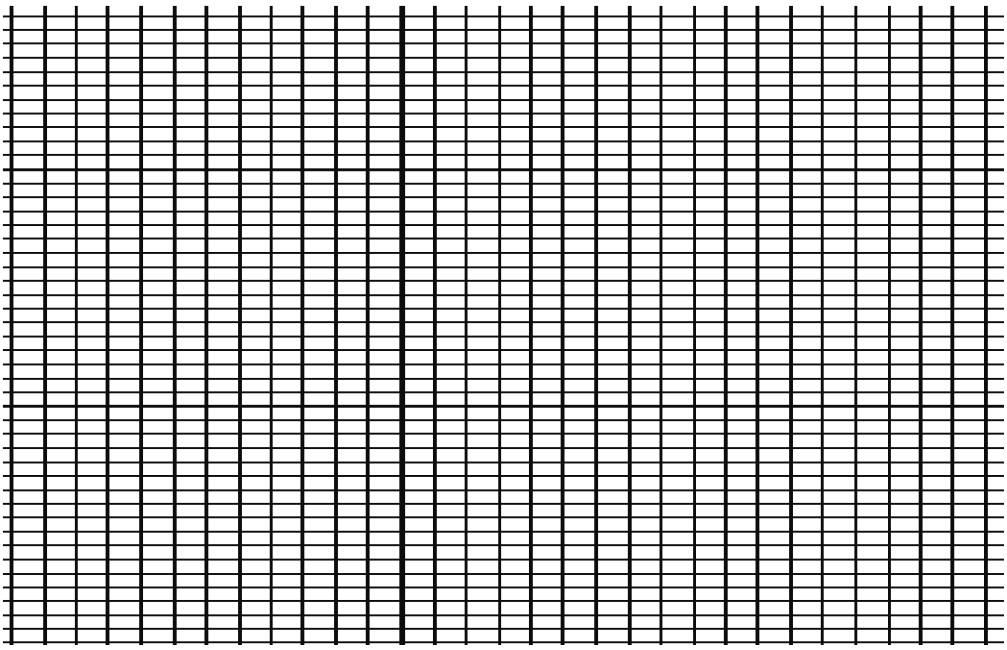
ACTIVITY 2

On the Earth there are two million described species of living things, and every year we discover new ones. In fact, we calculate that these two million species represent a low percentage of the total amount, maybe only 1%. In the table below you can observe the number of known species in each kingdom of eukaryotic organisms:

EUKARYOTIC KINGDOMS	NUMBER OF KNOWN SPECIES
PROTIST	22.500
PLANTS	270.000
FUNGI	100.000
ANIMALS	800.000

1. Which percentage of species corresponds to each of the four kingdoms of eukaryotic living things?

2. Make a bar graphic that represents the perceptual distribution of species in the four eukaryotic kingdoms.



3. Which is the kingdom that includes a bigger number of organisms?

Of all the known animals, only 45.000 are vertebrate animals. Which percentage corresponds to vertebrates in relation to the total number of animals?

And in relation to eukaryotic organisms?

And in realation to the total number of living things, if there are two million?

ACTIVITY 3

CONSTRUCT DYCHOTOMIC KEYS

Scientists visited an uninhabited island and discovered some previously unknown insects shown below. Construct a key which would enable a visitor to the island to identify them.

a) Begin by choosing one feature which sorts the insects into two groups.

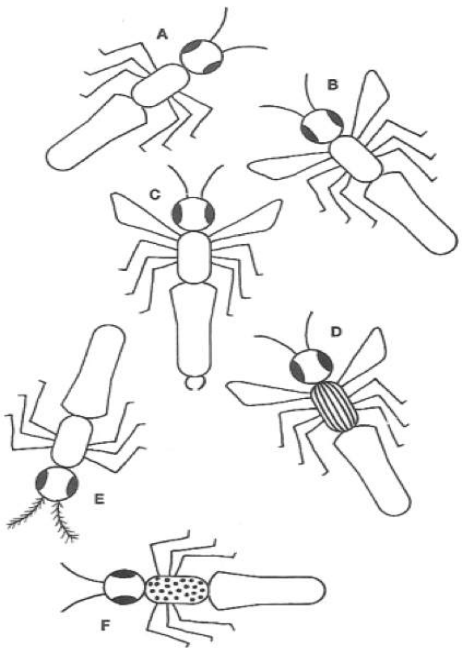
b) Sort the two groups into smaller groups by choosing other differences, then look for one feature which separates each insect from all the others.

c) Produce a key using the features you have chosen by arranging the features into numbered pairs.

d) The first pair of features should separate the insects into two groups, and subsequent pairs should either identify an insect or lead on to another pair of features.

These words will help you:

Thorax	Antennae	Legs
Wings	Sting/pincers	
Spots	Stripes	Hairs



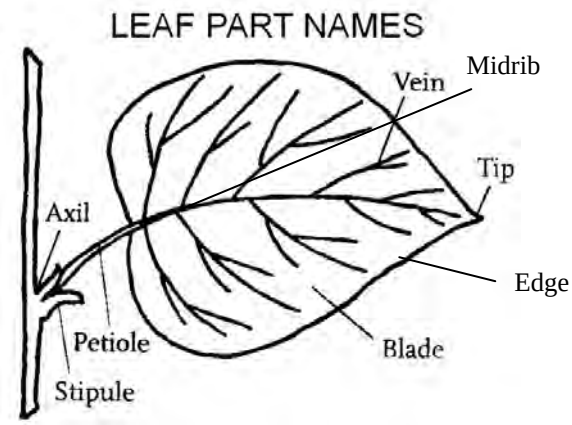
LABORATORY 2- OBSERVATION AND CLASSIFICATION OF LEAVES

Part One: Observation

The leaf is one of the most important parts of the plant because it is in charge of photosynthesis, respiration and transpiration.

Parts of the leaf:

There are different types of leaves, which allows us to distinguish the different kinds of plants, but essentially, each leaf is formed by the following parts:



The **blade** is the expanded part of the leaf. Inside the blade we can distinguish the following parts:
- The **veins** are like wrinkles or pipes running along the blade.
- The **midrib** is the main vein.
- The **edge** is the limit of the blade.

The **petiole** is the connection of the stem to the blade. The leaves having petiole are called **petiolated**, the leaves without petiole are called **stalkless** or **sessile**.

Part Two: Classification

There is an enormous variety in the shapes and sizes of leaves in the plant kingdom. In pairs, use the following steps to create your own classification system.

1. **Collect samples** from the garden:
Collect as many different samples of leaves as possible. Remember, pine needles are leaves!

2. **Establish criteria** for classifying the samples:
a. Separate the leaf samples into two different groups. You must use discriminating and objective criteria so everybody will decide on the two different groups, without personal opinions.
b. Now choose new criteria to separate these groups into two more groups.
c. Repeat this process again with the new groups, until all the leaf samples in a particular group have similar characteristics.

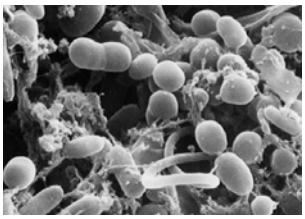
3. **Create a key** to explain the classification.
a. Write down your selection criteria.
For example: *Group A: leaves shaped like needles*.
b. Test your classification system and key. Ask a classmate to add new leaf samples to a group. If this is done correctly, you will know your classification works.

ACTIVITY 4: The Five kingdoms

Cut and paste the following organisms in the boxes below. Then, write the main characteristics of each kingdom.

PENICILLIUM MOLD

SNAIL



BACTERIA

EUGLENA

MUSHROOM

AMOEBA

TULIP

HUMAN

MOSS

TORTOISE

PARAMECIUM

SLIME MOLD

PENGUIN

BEE

GREEN ALGAE

ANT

PINE

MAGNOLIA

FERN

SEA CUCUMBER

KINGDOM MONERA Main characteristics

KINGDOM PROTISTS Main characteristics

UNIT 2 – LIVING THINGS

KINGDOM FUNGI Main characteristics

KINGDOM PLANTS Main characteristics

KINGDOM ANIMAL Main characteristics

3. MONERA, THE KINGDOM OF BACTERIA

Bacteria are **microbes**. Microbes are living things which are so small that can only be seen through a microscope. They are one-celled organisms. They do not have a cell nucleus. Bacteria have a cell wall. Most bacteria do not make their own food. They break down or decompose living or dead things. Some bacteria (*Cyanobacteria*) make their own food.

•They are grouped into two groups:

The **eubacteria**, or "true bacteria", a group that includes bacteria that cause diseases and decay matter in soil.

The **archaebacteria**, or "ancient bacteria", a group that includes bacteria that were found on Earth long ago. These bacteria are usually founding salt marshes, sulphur springs and volcanic vents on the ocean floor.

Bacteria come in three shapes. They can be shaped like a spiral, like a rod, or like a sphere.

Photos of different shapes of bacteria

ACTIVITY (internet searching)

There are bacteria that cause illnesses, but many of them are helpful. For example, some help us make foods such as cheese and buttermilk and other break down dead plants and animals.

* Find out three illnesses caused by bacteria and name three bacteria that are helpful.

* Describe what a virus is. Explain if a virus is living or nonliving and give some reasons why you think so.

LABORATORY 3- OBSERVATION OF DIFFERENT PROTISTS (SEAWEEDS) USING THE STEREOSCOPIC MICROSCOPE.

Part One: The Binocular lens

Description and function:
- You take the binocular lens out of the box.
- You turn the adjusting knob.
- You adjust the body tube.
- You tighten the knob to keep the ring in place.
- You place the material on the stage.
- You adjust the eyepiece lens as required.
- While you are looking, you focus with the focusing knob.
- For every observation, you must make a detailed drawing with a short explanation. Do not forget the magnification.

Questions

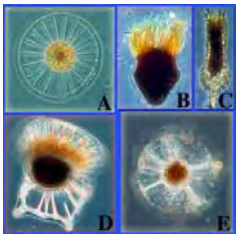
1- Write down the parts of the stereoscopic microscope.

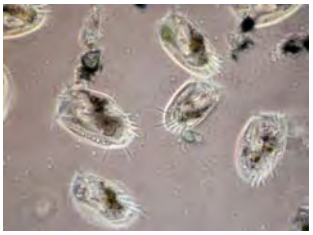
2- Say the differences between the microscope and the stereoscopic microscope.

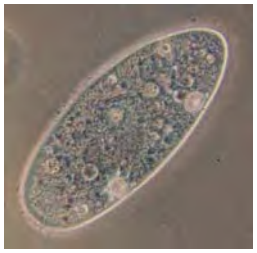
	Binocular lens	Microscope
Illumination		
Image (dimension)		
Image (sense)		
Magnification		
Slide		

Part Two: Observation of different protists

INTRODUCTION: Protists make up the most diverse of the kingdoms. This kingdom includes one-celled organisms like Euglena. It also includes larger organisms. So, we can find one-celled organisms and multi-celled organisms in this kingdom. There are also protists that can make their own food and others that take in food from their surroundings.







The **aim** of this laboratory class is to study the seaweeds. We will need samples of seaweeds and binocular lens.

A. View without lens(naked eye) and draw the algae you have in the Petri dish. Then, look through the binocular lens to see the differences. Draw what you can see.

Naked eye:	Binocular lens: magnification:.....

B. Answer the questions with a complete sentence (for example, Seaweeds belong to the kingdom...):

- Which kind of cells are protists made up of?

- Which kingdom do seaweeds belong to?

- How are the cells organized?

- How do they get their food? So, you can say that their nutrition is...

C. Take a book about different algae and have a look. Can you find the exact algae you are studying? If not, you can use the most similar one to complete the following description card:

- Common name:

- Scientific name:

- Living place:

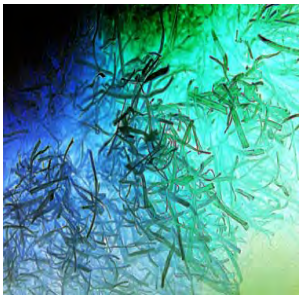
- Description and other characteristics:

4. PROTIST KINGDOM

Protozoa are animal-like protists. They move by a variety of methods:

- Some have **flagella** that look like whips. Euglena can move around using its flagellum.
- Other protozoa move by using tiny hairs called **cilia**. A Paramecium and several other protozoa move by using cilia.
- Other species move by extending **pseudopodia** or false feet. For example, amoeba.
-


Algae or seaweeds are protists that make their own food. They are classified according to the type of pigment, or colour. They are brown, green and red algae but they are not really plants because they have no proper roots, stems or leaves.
They can be small seaweeds to giant kelps. They all produce their own food as plants do.

5. KINGDOM FUNGI

Fungi (the plural of fungus) are mostly multi-celled organisms, but there are some one-celled organisms. Fungi cannot make their own food. They absorb and digest food out of the body. They are classified into different groups:

- Some are microbes, one-celled organisms called Yeasts. Some are parasites but others are useful for making bread, wine, and beer.
- There are moulds. You may know the blue-black moulds on bread, on other foods…but there are moulds useful to humans. In 1928, Alexander Fleming discovered that the mould *Penicillium notatum* killed bacteria. Scientists were able to make an antibiotic called penicillin. Today, people all over the world use penicillin.
- Mushrooms are another group of fungi. They are an important source of food.

Moulds

Mushrooms

LABORATORY 4- OBSERVATION OF DIFFERENT FUNGI.

Aim

Observation of different fungi.

Material

Bread, mould, mushroom and Binocular lens.

Observation

a) Bread mould

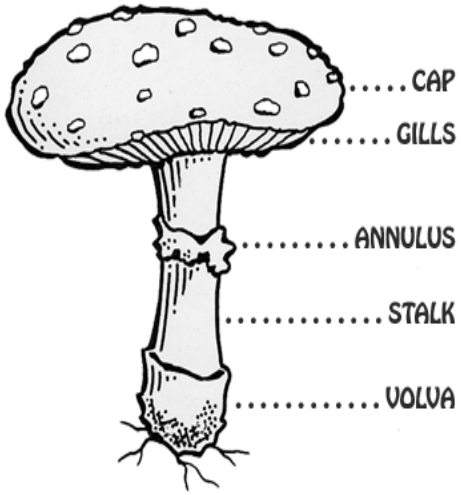
- View without the lens (naked eye) and draw the mould which you see. Draw what you can see and identify hyphae (threads) and spores (dots).

Naked eye:	**Binocular lens:** magnification:.....

- What kind of cells are fungi made up of?

b) Mushroom

- Draw the mushroom you have on the tray and identify its parts compared with the picture below:

Picture:	**Naked eye:** (Write down the scientific Catalan, Spanish and English names)
	

- Why do you think mushrooms were included in the plant kingdom?

- Why don't we consider moulds and mushrooms plants anymore?

Some moulds and mushrooms feed on dead things that are called saprophytes. Others feed on living things and cause diseases. They are called parasites. Ringworm in humans and mildew in plants are caused by parasitic fungi. Backet fungi kill trees, then digest the wood, so it is a ..... .

- Find out four mushrooms that you can eat and four that are poisonous. (In Catalan.)

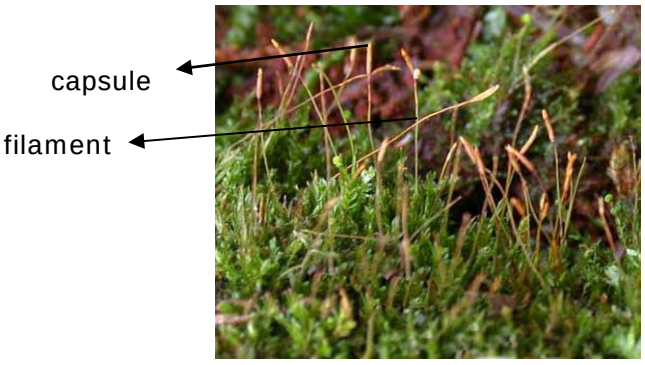
6. PLANT KINGDOM

The plant kingdom is made up of many cells, which form tissues, eukaryotic, autotrophic living things. They live attached to the soil but they are able to make some movements, for example, they grow towards the light.
Usually they have roots, stems and leaves.

Plants are classified in two groups: non-flowering and flowering.

- **Non-flowering plants** are simple plants without flowers or seeds.

  - **Mosses:** They are small and they have no conductor vessels. This means that they do not have conductor vessels to move water and minerals. They are **nonvascular** plants. They have to be low to the ground in wet places. Mosses do not have roots, but they have **rhizoids**, fibres that look like hairs that help them to stick to their surroundings.
    Mosses are **seedless.** They grow from **spores**. Spores are cells that become new organisms. They are tiny and they grow in a small container called a spore capsule.



Mosses

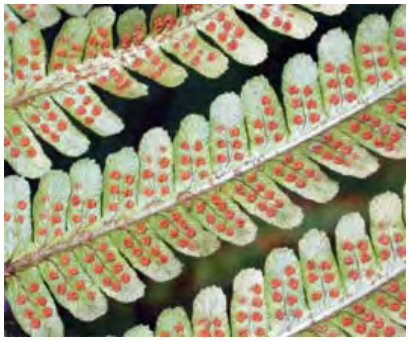
Liverworts

- **Ferns:** Like mosses, ferns are seedless plants, but they are **vascular.** This means that they have vascular tissue. Vascular tissue has cells that look like long tubes. These cells move water and minerals inside the plant. Vascular plants do not have to be low to the ground. This is why they can grow very tall.

Ferns

A long time ago, the Earth had huge forests of ferns. You can still find ferns in the woods. Maybe you grow ferns at home. Leaves of ferns are called **fronds**. On the bottom of a leaf you can find **spore cases.** The spore cases have millions of spores. Sometimes spore cases open. They spray spores on the ground. The spores can then grow into new ferns. Fronds are connected to a stem under the ground. This stem is called **rhizome. Roots** are also connected to the rhizome. The roots keep the plant in the ground or stuck to a tree.

Fronds with spore cases:



ACTIVITY 1 Internet searching

Find out the life cycle of a fern. Draw a diagram about it. Ferns, like mosses, have two steps in their life cycle. What does this mean?

LABORATORY 5- OBSERVATION OF MOSSES AND FERNS

Aim

Study of non-flowering plants.

Material

Moss, ferns, water.

Instruments

Microscope, binocular lens, slide, cover-slips, mounted-needle, dropper.

Observation

1) Identify the moss and the fern.

2) Write down the parts that you know.

3) Write a short description of each.

A

- Is this plant vascular or non-vascular? Why?

- How does it get water?

- Does this plant grow from seeds?

B

- Is this plant vascular?

- Does this plant grow from seeds?

On the bottom of a leaf you can find spore cases which have millions of spores. You can look at spores through a microscope. Just scrape the spore case with a toothpick and put the spores on a slide.

. Flowering plants: These plants are more complex, with **flowers** and **seeds**. They are also vascular. This means that they have tubes to move water and nutrients. They also have roots, stems, and leaves. Most of the plants you see everyday are seed plants. For example, trees, grass, bushes…

Flowering plants are divided into two groups related to reproduction:

- **Gymnosperms**: They have seeds inside a **false fruit**, like a pinecone.
- **Angiosperms**: They have seeds inside a **real fruit**.

Gymnosperms:

They are the oldest seed plants. They appeared on Earth 250 million years ago. The Earth was cold and dry. That is why they are adapted to cold and dry climates. For example, they do not have wide leaves. They have thin needles. A thick **cuticle** protects them in order to lose less water than flowering plants.

Most Gymnosperms are **evergreens**, like pine trees and sequoias.

Flowers of Gymnosperms are small. They group together into inflorescences or cones. These cones are male and female. Male cones have pollen grains with **sperm cells**. Female cells have **egg cells.** Pollen grains fall. The wind pushes them through the air and they can land on a female cone. That is how sperm cells can fertilize an egg cell. The fertilized cell becomes a seed inside the female cone. The seeds can germinate if they land in the right place.

Photo of a pine tree with male cones, which contain pollen and female cones, called pinecones, which contain seeds, called pine nuts.

Angiosperms:

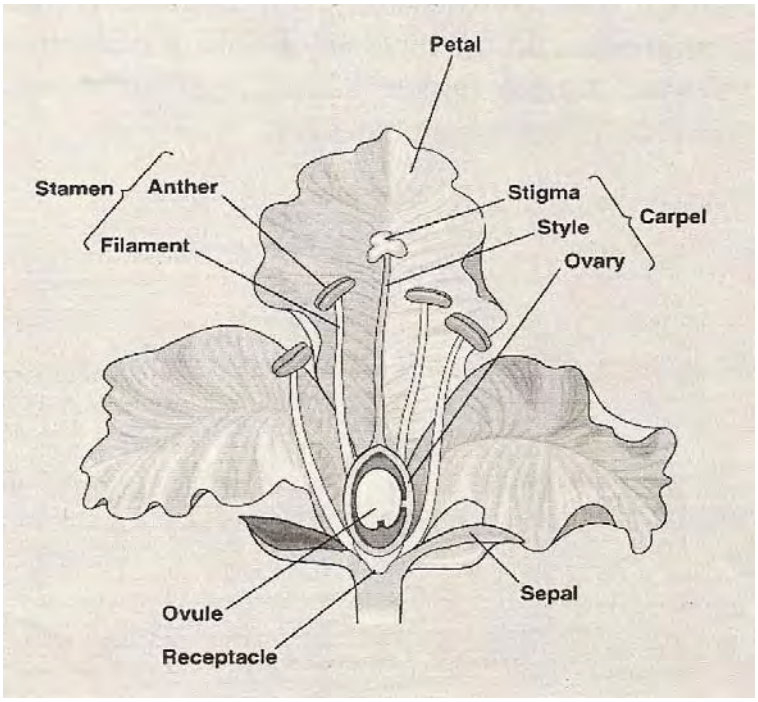
They appeared more recently than gymnosperms. This group is the largest division of the plant kingdom. There are many different kinds of angiosperms but all of them have flowers and seeds inside a **fruit**.
Flowers are for reproduction, we will study the parts in the lab.

They live in different climates. They can also be different sizes. Some of them cannot make their own food because they do not have chlorophyll. They are **parasitic**. They live on other organisms.
To classify angiosperms scientists use the number of **cotyledons**. A cotyledon is a tiny structure in the seeds. It looks like a leaf. Some angiosperms have one cotyledon. These are called **monocots**. Coconut palms, corn, rice, wheat, and grass are monocots.
Some angiosperms have two cotyledons. These are called **dicots.**
Bean plants, maple trees, rose plants, and cactuses are dicots.

LABORATORY 7- OBSERVATION OF A FLOWER

Part One

Observe the parts of a flower and complete the text below:



Humans have male and female sex organs, and so do flowering plants. If you slice a flower open you will see something like this:

The male sex organ is called.....

Its parts are: the ..... made up of pollen sacs, full of pollen grains that contain the male sex cells of the plant. The stalk or ..... of the stamen.

The female sex organ is called.....

The ..... is where pollen grains stick during pollination.

The ..... that protects the ovule. The ovule contains the female sex cells.

Some petals are coloured and scented to ..... insects.

Insects help plants to make seeds.

Sepals ..... the flower when it is in bud.

Part Two

Draw the flower you have brought. Identify all its parts and identify the function they carry out.

The flower

UNIT 2 – LIVING THINGS

ACTIVITY 2 ABC Dictation **"The life cycle of an Angiosperm"**

The class is divided into three groups: A, B, C. Each student will be given a piece of paper and will cut or tear it in four strips. You will be given a dictation of twelve sentences about "The life cycle of an Angiosperm". You only have to write down the information when the teacher says your letter. Use a different slip of paper each time, so you will have four sentences. Afterwards, you compare the sentences you have written with mates of the same letter groups. You have to check your sentences and send a messenger to the teacher if you have gaps or differences. Then, in groups with at least one A, one B, and one C you will have to put the slips of paper in the right order. The teacher will read out the text, this time in the correct order. You will write the sentences of the text.

ACTIVITY 3 MIND MAP (small groups)

The teacher will prepare a list of words connected to the topic "Plants". You will have to organize and categorize vocabulary by grouping words in similar categories. You will be given a skeleton of the mind map with blanks to fill in. If you want, you can add other words. We will correct the mind map.

PLANTS

7. ANIMAL KINGDOM

The animal kingdom is made up of multi-cellular, eukaryotic, heterotrophic organisms. They are sensitive to their environment.
Animals are classified in two groups:

. Invertebrates: Animals with no backbone. Some, like worms or jellyfish, have no skeleton. Others, like insects or spiders, have an external skeleton.
. Vertebrates: Animals with a backbone which is part of their internal skeleton.

INVERTEBRATES:

ACTIVITY 4 (English class): DICTOGLOSS (small groups)

You will be given some cards with key words about the main characteristics of invertebrates: Porifera or Sponges, Cnidaria, Worms, Molluscs, Arthropods and Echinoderms. Every group will have different cards. The teacher will select key words taken from the text she will read. As the teacher reads the text you have to place the key words in the order in which you hear them. Afterwards, every group will edit their texts from memory using the key words to help them. The text does not have to be word for word as the original. The teacher will read the text again and finally she will give the students a copy of the original text.

ACTIVITY 5 Which group of invertebrates does each animal belong to? Justify your answer.

jellyfish
starfish
crab
butterfly
urchin
snail
earthworm
sponge
coral
squid

ACTIVITY 6 **(at home)** Find out which invertebrates local sea food markets sell. Make a list.

VERTEBRATES:

All vertebrates have an endoskeleton with a backbone. The body is made up of a head, a trunk, and many have a tail. They have articulated limbs, a well-developed nervous system and bilateral symmetry.

Photos of different vertebrates

Fish:

They are aquatic: Some live in fresh water and some in salt water.
The body is wider in the middle than in the ends.
They have fins. Most have dorsal, pelvic and caudal fins.
They are covered with scales.
Their skeleton can be made of cartilage or bone.
They have a sensory organ that detects vibrations: the lateral line system.

They are cold-blooded. As a result, they cannot regulate their body temperature.
They use gills to obtain oxygen from water. The gills can be protected by a cover (flap), the operculum.
Most of them are carnivores.

Fertilisation takes place externally in the water and they are oviparous.

Photo of cartilaginous fish and bony fish

Bony fish are weightless in water because their bodies contain a swim bladder full of air.

LABORATORY 8- OBSERVATION OF A FISH

Scientific diagram of a fish:

1. Put the fish on a tray. Be sure you can see the parts you want to draw.
2. Observe the size and shape. Draw the outline and the main elements. The diagram must have the correct proportions.
3. Fill in the outline with the other parts of the fish.
4. Colour the drawing. You must use the correct colours. It must be realistic.
5. Label all the parts: eye, nostril, head, lateral line, scales, operculum, dorsal fin, caudal fin (tail), pectoral fin, and pelvic fin.

Scientific name:
English name:

Catalan/Spanish names:

Amphibians:

All amphibians begin life in water, and they always live in wet places. However, the adults live on land.
They have four limbs or legs.
Their skin is moist and has no covering.
They are the only vertebrates that undergo **metamorphosis**.
As a result, the adults do not look like the young.

ACTIVITY **The metamorphosis of a frog**

Put the following sentences in the correct order and draw four diagrams to show the life cycle of a frog.

- The tail and gills disappear. Legs develop.

- The female lays eggs in the water and the male fertilises them.

- The adult frog lives on land and has very strong back legs.

- A tadpole with gills and tail emerges from the egg and lives in the water.

ACTIVITY

Fill in the gaps using the following key words:

oviparous, lay, tadpoles, carnivorous, cold-blooded, lungs, limbs, moist, through (2).

Amphibians have four ……. and …….. skin. They can live on land or in water. On land they breathe using …… In water they breathe…… their skin.
Amphibians are ……, so they …… their eggs in water. These hatch into …….. , which swim using tails, and breathe ……. gills.
Most amphibian are ……., but young frogs are herbivores.
Amphibians do not usually live in cold places because they are ……

Reptiles:

Reptiles were the first animals to grow out of water. Reptiles breathe with lungs. Most have waterproof scales. The scales keep reptiles from drying out. Reptiles lay eggs (they are oviparous). The eggs have a hard covering which keeps them from drying out.
Most reptiles are carnivores. They have teeth to capture their prey. Turtles, however, have beaks. Many snakes have fangs connected to glands that produce poison.
Reptiles are cold or warm depending on the environment: they are cold-blooded.

ACTIVITY

Write down 4 questions about Reptiles using: What, Where, When, Which... Ask your classmates.
Example:

What do Reptiles/ use to/ keep moist?

-

-

-

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Birds:

The bird's body is adapted for flight (aerodynamic). The neck is sometimes very long. They have four limbs, the back ones are legs and the front ones are wings. Strong wing muscles are attached to the sternum or keel. The body is covered with feathers. Bird bones are hollow in order to make their body light to fly more easily.
Birds have a beak whose shape depends on the food they eat. They use lungs to breathe. Lungs are connected to air sacs.

Birds are oviparous. The eggs are incubated until the chicks hatch.
Birds are warm- blooded.

ACTIVITY

Associate each beak with how the birds feed:

Strong, curved	it filters water
Short	it feeds on grain
Long, pointed	it captures insects
Wide, flat	it catches its prey
Strong, short	it fishes in shallow water

Mammals:

Most mammals are terrestrial animals. They use lungs to breathe. Some are aquatic like dolphins, but only one, the bat, can fly.
Mammal bodies are covered with hair or fur which keeps them warm. They are warm blooded.
They have four articulated limbs (legs, fins or wings).
They have a head joined to the trunk by a neck. The spinal column finishes in a tail.
Mammals have teeth. Their shape depends on the food they eat.
The most important glands they have are the mammary glands. They produce milk. Young mammals drink milk from their mother.
Most mammals have larger brains than other vertebrates.

ACTIVITY (internet)

Part One: In groups find out information about the three groups of mammals: **Monotremes**, which are born from eggs and have a beak, **Marsupials** which finish their development inside the mother's pouch, and **Placentals**, which develop inside their mother's uterus.

Part Two: Find out information about mammals in danger of extinction that are at Barcelona's Zoo. Adopt one of them.

ACTIVITY

Complete the table:

	LIMBS	SKIN	BREATH	BLOOD	OTHERS
FISH					
AMPHI BIANS					
REPTILES					
BIRDS					
MAMMALS					