María del Mar Vera Sánchez

Biology and Geology

Teoría, actividades y prácticas de laboratorio

1º ESO - Programa SELE

Región de Murcia

María del Mar Vera Sánchez (Almería, 1978): es Licenciada y Doctora en Biología por la Universidad de Murcia y Máster en Nutrición y Seguridad Alimentaria por la Universidad Católica San Antonio de Murcia. Ha desarrollado su labor profesional en el ámbito hospitalario, el CEBAS-CSIC y la empresa privada, pero desde 2009 se dedica a la docencia, su verdadera vocación. Actualmente ejerce como profesora en el IES D. Antonio Hellín Costa (Puerto de Mazarrón), centro en el que lleva impartiendo el programa SELE desde 2018.

Biology and Geology

Teoría, actividades y prácticas de laboratorio

Material para el desarrollo del programa SELE (inglés) en la asignatura de Biología y Geología de 1º ESO

María del Mar Vera Sánchez

Región de Murcia
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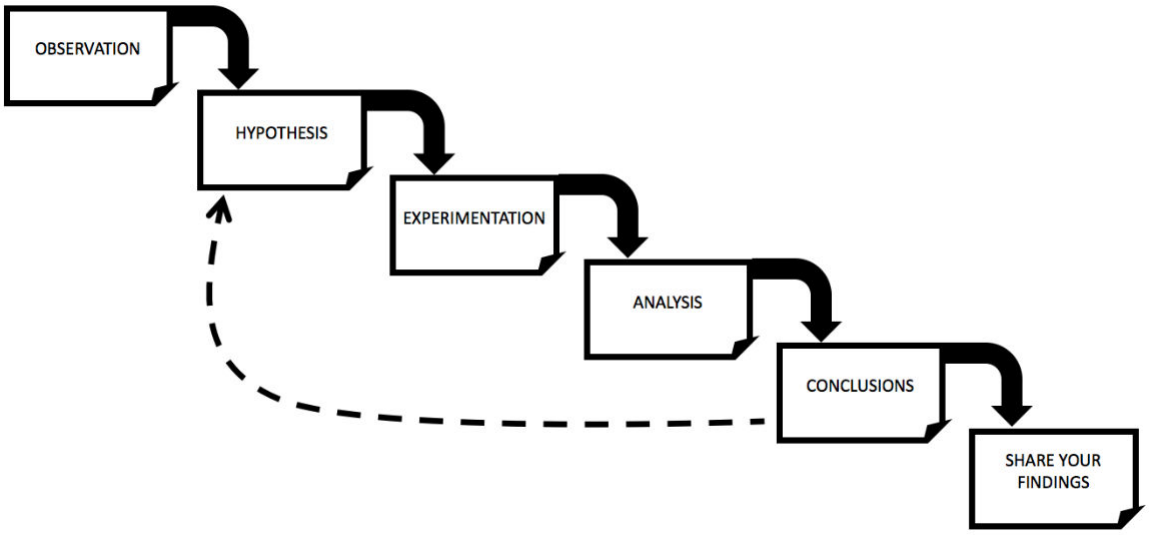
CONTENTS AND ACTIVITIES

UNIT 1
SCIENTIFIC ACTIVITY

1.1. THE SCIENTIFIC METHOD

YouTube: *Clowntifics, ciencia que conecta "El Método Científico explicado para niños | ¿Por qué LLORAMOS al cortar CEBOLLA?"*



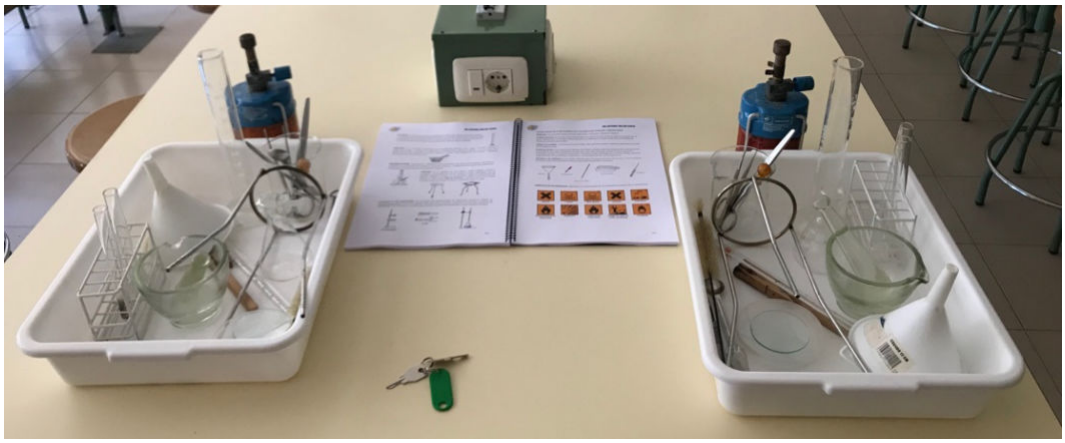
STEPS OF THE SCIENTIFIC METHOD _____

- **Observation**
  It consists of examining a phenomenon.

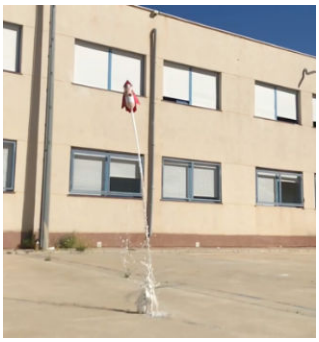
- **Hypothesis**
  It is an explanation for something that is based on known facts but has not yet been proved.

- **Experimentation**
  It is a procedure that allows us to test if the hypothesis is true or false.
  It can be necessary to make a table with data and graph.

  PRÁCTICA DE LABORATORIO Nº 1: *Normas de funcionamiento y material de laboratorio.*



- **Analysis**
  It consists of analyzing the results of the experiments.
  The results of the experiments can support the hypothesis as true, or disprove as false.



- **Conclusions**
  It consists of drawing conclusions after examining the data from the experiment. Maybe, you need a new hypothesis.

- **Share your findings**
  Write a report and make a presentation.

Unit 2
THE EARTH IN THE UNIVERSE

2.1. THE UNIVERSE

PRÁCTICA DE LABORATORIO Nº 2: *Un cohete para explorar el universo.*

ORIGIN OF THE UNIVERSE _____

YouTube*: National Geographic "Origins of the Universe 101"*
YouTube*: QuantumFracture "¿Dónde está la Tierra en el Universo?"*

The most accepted theory of the origin of the Universe and its expansion is the **Big Bang Theory**:

1) EVERYTHING was concentrated in a little point that exploded 13,700,000,000 years ago.
2) The name of that explosion is Big Bang and it is called time zero.
3) At first, the temperature of the universe was very high.
4) Gradually it cooled down, which made it possible for stars and planets to form.

COMPONENTS OF THE UNIVERSE _____

The Universe contains all matter, energy and space that exist.

- The Universe is made up of galaxies (galaxies are grouped in galaxy clusters).
- Galaxies are made up of stars.
- Some stars are alone. Others have planets orbiting them: planetary systems.
- Some planets have satellites.

Universe **>** Galaxies **>** Stars **>** Planetary systems

Definitions

- Galaxy: organization of thousands of millions of stars, interstellar dust and gases.
- Star: celestial body made of hydrogen (H) and helium (He) which emits their own light.
- Planet: body which orbits a star.
- Satellite: rocky body which orbits a planet.

HUMANS	Our galaxy: the Milky Way Our planet: the Earth	Our star: the Sun Our satellite: the Moon

How to express huge distances:

- Astronomical unit (AU): 150 million km (this is the distance from the Earth to the Sun).
- Lightyear (it is NOT a time unit): 9.5 trillion km.

2.2. THE SOLAR SYSTEM

COMPONENTS OF THE SOLAR SYSTEM (AGE: 4,500 million years) _____

YouTube: *Paxi ESA Kids "Solar system"*

1 STAR

- **The Sun**
  YouTube*: National Geographic "Sun 101"*
  It is a yellowish medium-sized star.
  Nuclear reactions take place in its interior and they produce huge amounts of energy: the temperature of the surface is about 6000 ºC and emits light and heat.

8 PLANETS (number of satellites in brackets)

- **Rocky planets**: Mercury (0), Venus (0), the Earth (1: the Moon) and Mars (2).
  They are located between the Sun and the asteroid belt.
  Their surface is solid and they have 3 layers:
  - Crust: the outermost layer; made of rocks.
  - Mantle: the layer under the crust; made of rocks.
  - Core: metallic.

  YouTube: *National Geographic "Mercury 101"*
  YouTube: *National Geographic "Venus 101"*
  YouTube: *National Geographic "Earth 101"*
  YouTube: *National Geographic "Mars 101"*

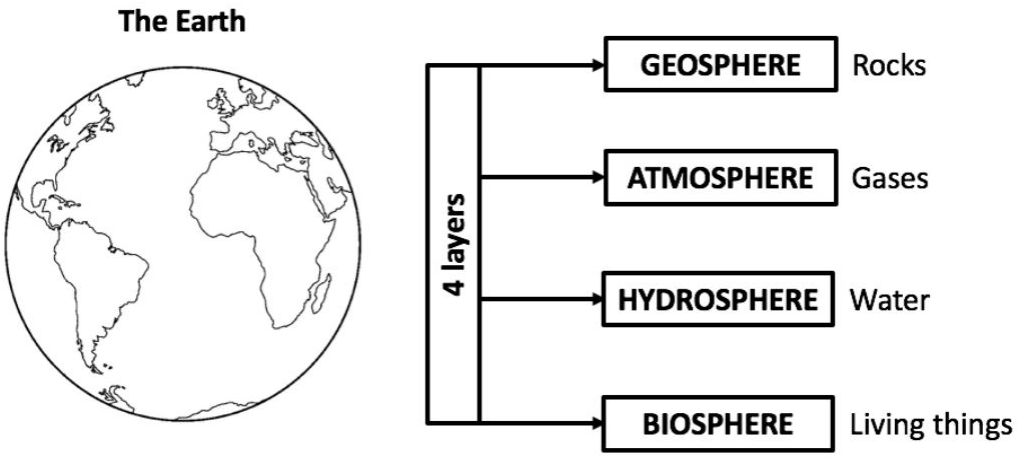
- **Giant planets**: Jupiter (63), Saturn (61), Uranus (27) and Neptune (14)
  They are located beyond the asteroid belt.
  Their surface and composition are gases, mainly H and He.
  They have solid cores.
  YouTube: *National Geographic "Jupiter 101"*
  YouTube: *National Geographic "Saturn 101"*
  YouTube: *National Geographic "Uranus 101"*
  YouTube: *National Geographic "Neptune 101"*

CELESTIAL BODIES

- **Satellites**
  They can be very large or very small and their shape can be spherical or irregular.
- **Dwarf planets**
  Their orbit around the Sun is not clear (Pluto, Ceres...).
- **Asteroids**
  They are rocky and irregular shaped bodies of different sizes. There is an asteroid belt between the orbits of Mars and Jupiter. There is a Kuiper belt beyond the orbit of Neptune.
- **Comets**
  They are small and irregular bodies which travel around the sun in highly elliptical orbits and have a nucleus of ice, dust and gas.
  They are formed in a very far region of the Solar System (the Oort cloud) and when they travel close to the Sun, the ice starts to evaporate creating a long and bright tail.

2.3. THE EARTH

YouTube: *OpenMind "Why is there life on Earth?"*
YouTube: *CNN "NASA discovers Earth-like planet in habitable zone"*



YouTube*: Happy Learning English "The Earth and its layers | Educational Video for Kids" (till 1')*

SPECIAL CHARACTERISTICS OF THE EARTH _____

The Earth is the 3rd planet closest to the Sun. The Earth has different characteristics that make it a unique planet. The following characteristics together don´ t exist in the other planets. These characteristics are:

- **TEMPERATURE**
  Due to its distance from the Sun, its average surface temperature is about 15 ºC. The temperatures around it make it possible for water to exist as ice, liquid and water vapor. These changes of state result in the water cycle.
- **ATMOSPHERE**
  It contains very important gases for living things: oxygen (O_2) and carbon dioxide (CO_2) are essential gases of respiration and photosynthesis.
- **MAGNETIC FIELD**
  It protects living things from solar radiation.
- **SATELLITE**
  The Moon causes ocean tides.
- **GEOLOGICAL ACTIVITY**
  Erosion, volcanoes or earthquakes.

MOVEMENTS OF THE EARTH

YouTube: *European Space Agency, ESA "Paxi - Day, night, and the seasons"*

The Earth moves into two different ways:

- **ROTATION** on its axis:
    - It takes 24 hours (1 day) to complete one rotation.
    - The consequence of rotation is the cycle of the day (sunlight) and the night (darkness).
    - The tilt of the axis varies throughout the year, so the length of the day and the night also varies.

- **REVOLUTION** around the Sun:
    - It takes 365 days (1 year) to complete one revolution.
    - The distance between the Earth and the Sun is almost the same.
    - The orbit of the Earth is an ellipse (almost a circle) and it is contained within the ecliptic plane.
    - The consequence of the revolution and the tilt of the axis of rotation is the annual cycle of seasons (spring, summer, autumn and winter). There is a different amount of sunlight in every season. According to the length of days and nights, there are:
        - Equinoxes (September equinox and March equinox): when the day and night are equal length (12 hours).
        - Solstices (December solstice and June solstice): when the difference in length between day and night is the greatest.

2.4. THE MOON

YouTube: *National Geographic "Moon 101"*

MOVEMENTS OF THE MOON

The Moon moves into two different ways:

- **ROTATION** on its axis:

  It takes 28 days to complete one rotation.

- **REVOLUTION** around the Earth:

  It takes 28 days to complete one revolution. As a consequence, from the Earth, we see the same side of the Moon every day.

LUNAR PHASES

YouTube: *European Space Agency, ESA "Paxi and Our Moon: Phases and Eclipses"*

The Moon is illuminated by the Sun from different angles. Its aspect varies due to rotation and revolution. There are eight phases that always occur in the same order. The following four phases are the most well-known:

New Moon	**First quarter**	**Full Moon**	**Last quarter**
The Sun illuminates the side of the Moon we don´ t see.	We see the right half of the Moon illuminated.	The Sun illuminates the side of the Moon we see.	We see the left half of the Moon illuminated.
			

TIDES

YouTube: *Atomic School "Ocean's Tides Explained"*
YouTube: *MooMoo Math and Science "Tides Explained-Spring and Neap Tides"*

The Earth and the Moon attract each other due to the gravitational attraction. The effect of this force can be seen in the oceans:

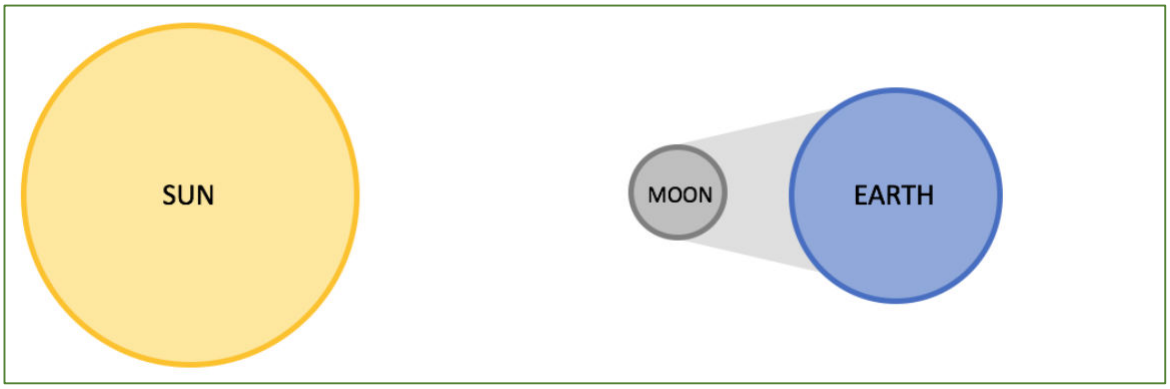
- High tide: it occurs when the water level rises on the side of the Earth closest to the Moon and also on the opposite side.
- Low tide: it occurs in areas where the water level becomes lower.

ECLIPSES

YouTube: *National Geographic "Solar eclipse 101".*
YouTube: *National Geographic "Lunar eclipse 101".*

It takes place when one celestial body totally or partially obscures another.

A **solar eclipse** occurs when the Moon passes directly between the Earth and the Sun.



A **lunar eclipse** occurs when the Moon passes through the shadow produced by the Earth.

ACTIVITIES

ACTIVITY 1. The origin of the Universe.

a. The name of the most accepted theory of the origin of the Universe is (choose the correct one):

a) The Wing Van Theory

b) The Origin of the Universe Theory

c) The Big Bang Theory

b. Put the following sentences in the right order:

1. At first, the temperature of the universe was very high.
2. The name of that explosion is Big Bang and it is called time zero.
3. EVERYTHING was concentrated in a little point that exploded 13,700,000,000 years ago.
4. Gradually it cooled down, which made it possible for stars and planets to form.

1st	2nd	3rd	4th

ACTIVITY 2. Which ones are components of the solar system? Circle them.

The Sun	Jupiter	The Big Bang	The Earth	The Moon
Mars	A galaxy	The Milky Way	The Kuiper belt	Rocky planets

ACTIVITY 3. About planets.

a. Match.

Rocky planet	Nuclear reactions take place in its interior.
Satellite	It has a lot of satellites.
The Sun	The core is metallic.
Jupiter	It orbits a planet.

b. Answer about giant planets:

- Which are their names? (from the one closest to the Sun to the furthest)
- Where are they located?
- What substances are they made of?
- Which state is their core in?

c. True or false? Justify your answer. "The Earth is the closest planet to the Sun."

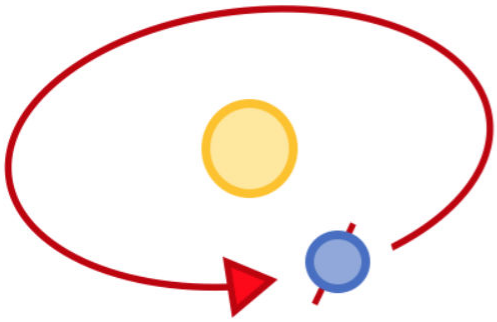
ACTIVITY 4. Enumerate the characteristics that make life possible on our planet.

ACTIVITY 5. About the Earth.

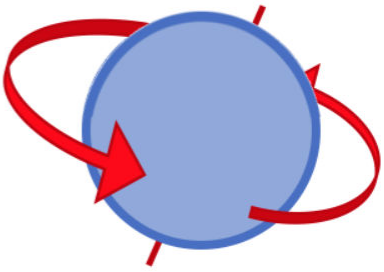
a. Which movement is it: rotation or revolution?

- The cycle of the day and the night is the consequence.
- The cycle of seasons is a consequence of that movement and the tilt of the axis of rotation.
- The distance between the Earth and the Sun is almost the same.
- The length of the day and the night varies.

b. Movement which each picture represents:



MOVEMENT:



MOVEMENT:

ACTIVITY 6. About the Moon.

a. How long does the Moon take to complete one rotation? And one revolution?

b. Identify which phase of the Moon is each picture or sentence according to:

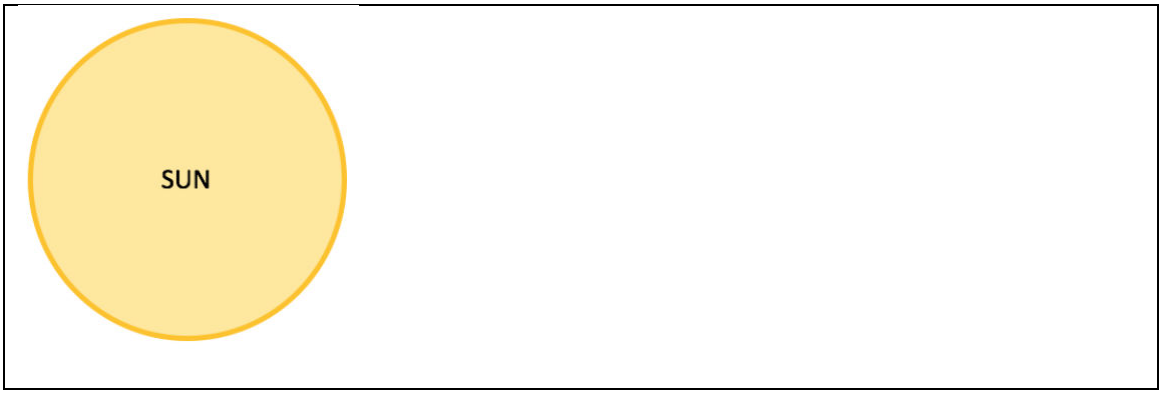
- The Sun illuminates the side of the Moon we don't see.
- We see the left half of the Moon illuminated.
- We see the right half of the Moon illuminated.
- The Sun illuminates the side of the Moon we see.

ACTIVITY 7. About eclipses.

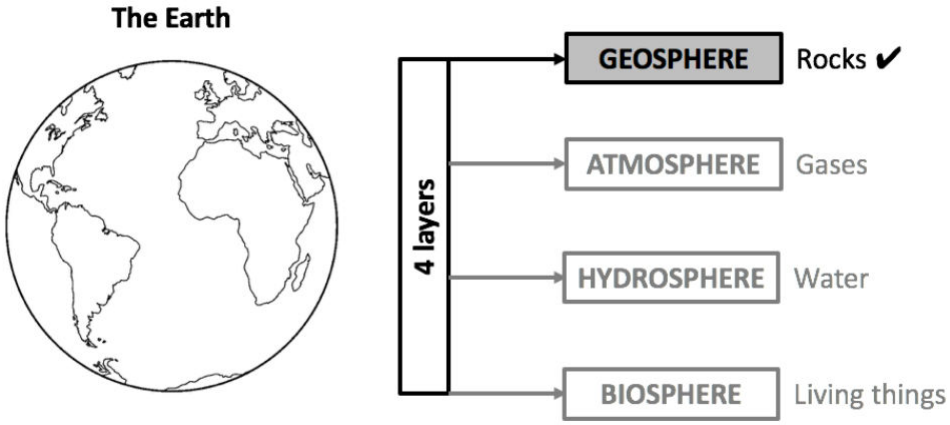
a. Match:

It occurs when the Moon passes through the shadow produced by the Earth.	ECLIPSE
It takes place when one celestial body totally or partially obscures another.	SOLAR ECLIPSE
It occurs when the Moon passes directly between the Earth and the Sun.	LUNAR ECLIPSE

b. Draw a lunar eclipse (identify each body):



Unit 3
THE GEOSPHERE

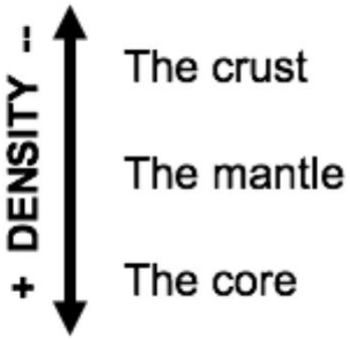


GEOSPHERE: it is the **rocky** layer of the Earth.

3.1. COMPOSITION

PRÁCTICA DE LABORATORIO Nº 3: *Estructura de la geosfera.*

The geosphere is made up of rocks, minerals and landforms. As a rocky planet, the Earth's geosphere is divided into 3 layers. They are, in order of density:



1.The crust:
   a. Continental crust
   b. Ocean crust

2.The mantle:
   a. Upper mantle
   b. Lower mantle

3.The core:
   a. Outer core
   b. Inner core

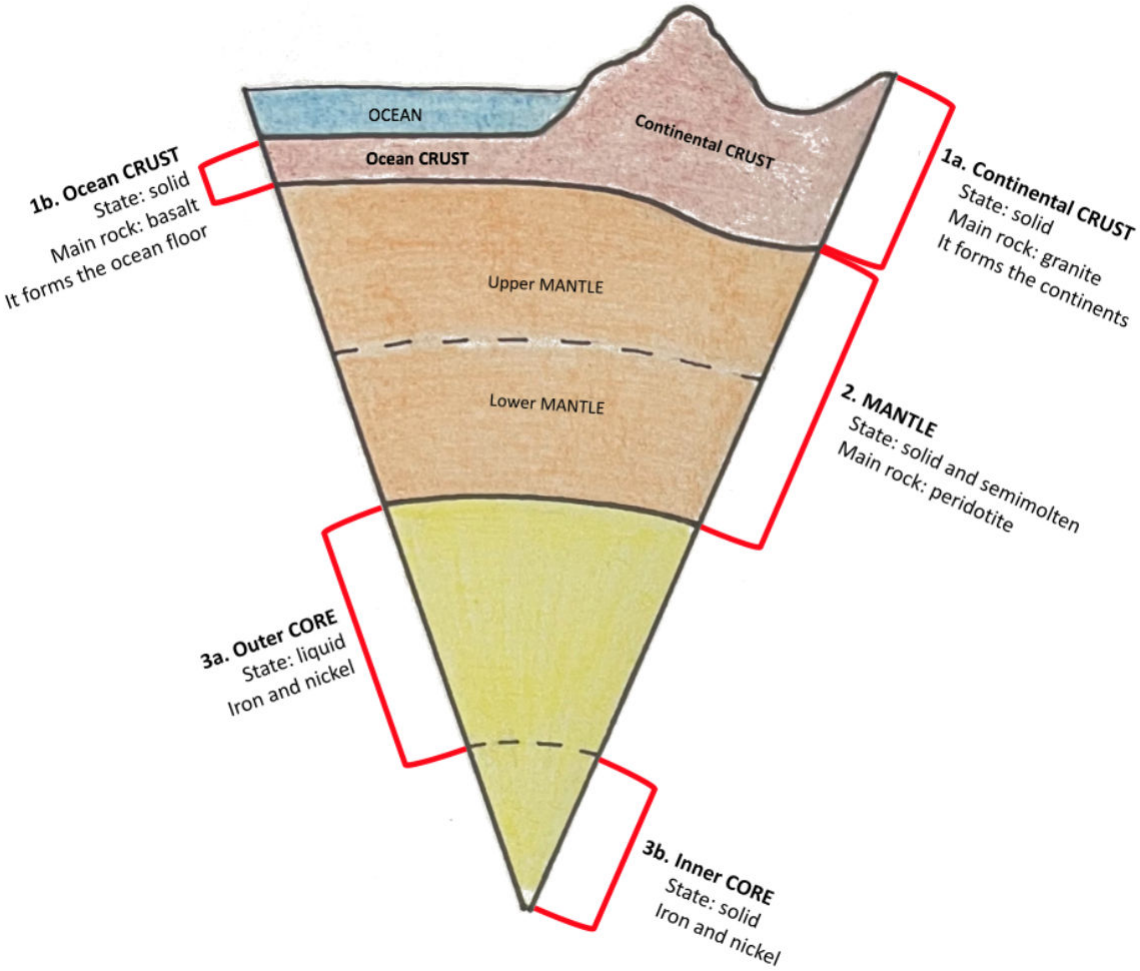
Remember: the **crust** is **very thin** (in proportion to an egg, similar to the shell).

YouTube*: Happy Learning English "The Earth and its layers | Educational Video for Kids" (till 1'12'')*

Relative density of the main rocks and the layers of the geosphere (*Iron and nickel are not rocks):

DENSITY	LAYERS	ROCKS
2.7 g/cm^3	continental crust	**GRANITE**
	ocean crust	**BASALT**
5 g/cm^3	mantle	**PERIDOTITE**
13 g/cm^3	core	*iron-nickel**

***YouTube**: Ter "LA ÚLTIMA MODA EN COSMÉTICA: columnas de basalto de 20 metros RIHANNA colección Fenty" (from 23'' till 5'05'').*



3.2. USES OF MINERALS AND ROCKS

***PRÁCTICA DE LABORATORIO Nº 4:** Reconocimiento de minerales y rocas.*

The crust of the Earth consists essentially of rocks and minerals:

- **Minerals** are solids composed of one or more chemical elements.
- **Rocks** are unique combinations of minerals.

MINERALS	USES	
Different minerals	Chemical, pharmaceutical and food industries.	INDUSTRIAL PROCESSES
Metals	Iron and lead.	
Quartz	To make glass and electrical components.	
Calcite	To make lime and cement.	
Clay minerals	To make ceramics.	
Gypsum	To make plaster.	

GEMS Diamonds, rubies and emeralds.	JEWELLERY
SEMI-PRECIOUS STONES Onyx, amber and turquoise.	
NATIVE METALS Gold, platinum and silver.	

***YouTube**: Ter "3 MATERIALES que cambiaron el mundo: Acero, Vidrio y Papel" (from 7'30'' till 9'52'').*

ROCKS	USES
Limestone	To make cement.
Clay	To make bricks, ceramics and tiles.
Stones, sand, gravel, marble and granite.	Construction.
Coal and oil	For fuel.
Oil	To make fertilizers, plastics, solvents and synthetic fibers.

3.3. EXTRACTION OF MINERAL AND ROCKS

Places where minerals and rocks are extracted are called mines. There are two types of mines: underground mines and above ground mines. Mining causes an environmental impact and there are different measures to manage it:

- Preventive measures: they try to avoid the damage (e.g. rating and storing sludge)
- Mitigation measures: they try to reduce the damage (e.g. controlling noise emission)
- Corrective measures: they try to restore the land (e.g. replacing topsoil).

***YouTube**: EL PAÍS "Bahía de Portmán: Condenada a la suciedad" (till 35'').*
***YouTube**: RTVE "¿Te acuerdas? – Historia de un desastre".*
***YouTube**: El País "20 años del desastre de Aznalcóllar | España".*

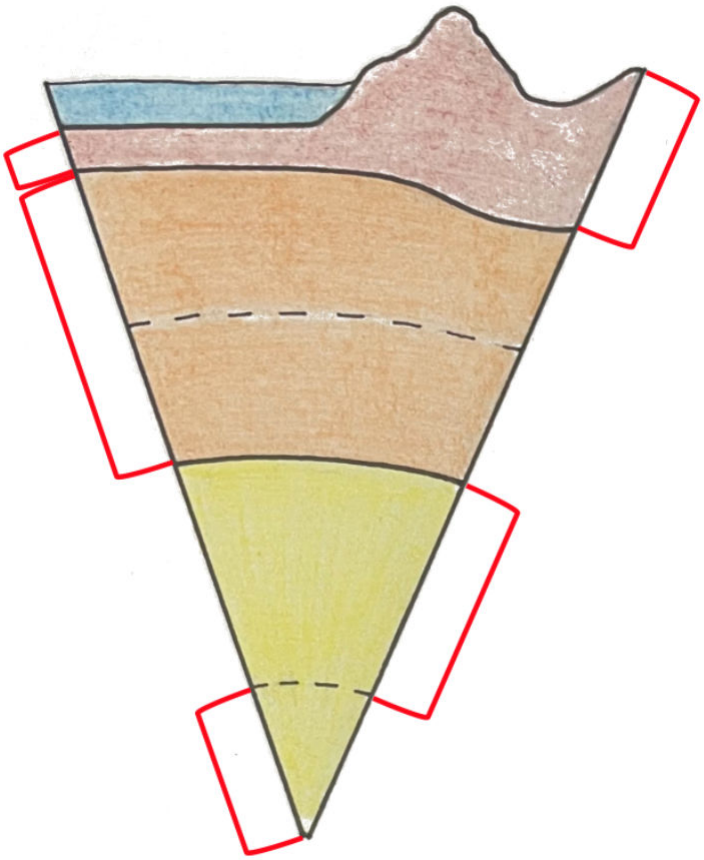
ACTIVITIES

ACTIVITY 8. Order the layers of the geosphere by density (from the highest to the lowest).

ACTIVITY 9. Circle rock (R) or mineral (M) and match the use:

Quartz (R – M)	Jewellery
Limestone (R – M)	Construction
Sand (R – M)	To make glass and electrical components
Gold (R – M)	To make cement

ACTIVITY 10. Complete:

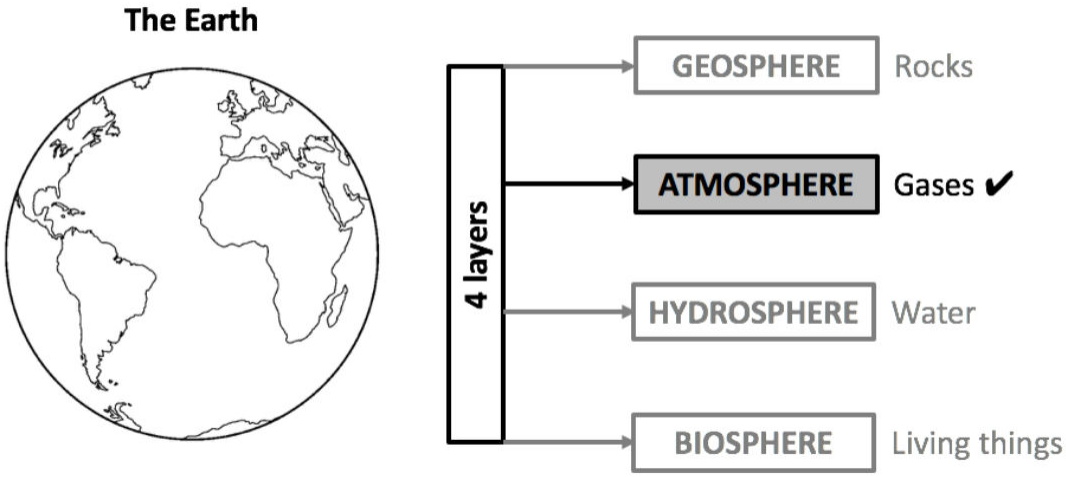


ACTIVITY 11. Measures to manage the environmental impact of mining:

- _____ measures try to reduce the damage.
- _____ measures try to avoid the damage.
- _____ measures try to restore the land.

Aznalcóllar and Portman bay need _____ measures to restore the land.

Unit 4
THE ATMOSPHERE



ATMOSPHERE: it is the layer of **gases** that surrounds the Earth.

4.1. COMPOSITION

HISTORICAL COMPOSITION

Composition of the atmosphere has changed throughout the time:

1) H and He (when the Earth began to form)

2) Volcanic gases (primitive atmosphere)

3) About 3.5 billion years ago (3,500,000,000 years), some bacteria began to produce oxygen through photosynthesis.

CURRENT COMPOSITION

The atmosphere is made up of a mixture of gases called **air**:

- 78% nitrogen (N_2)
- 21% oxygen (O_2)
  ***YouTube**: Frank Gregorio "Introduction to Photosynthesis"*
- 1% trace gases: argon, carbon dioxide (CO_2), others (methane or ozone (O_3)).

4.2. ATMOSPHERE AND LIVING THINGS

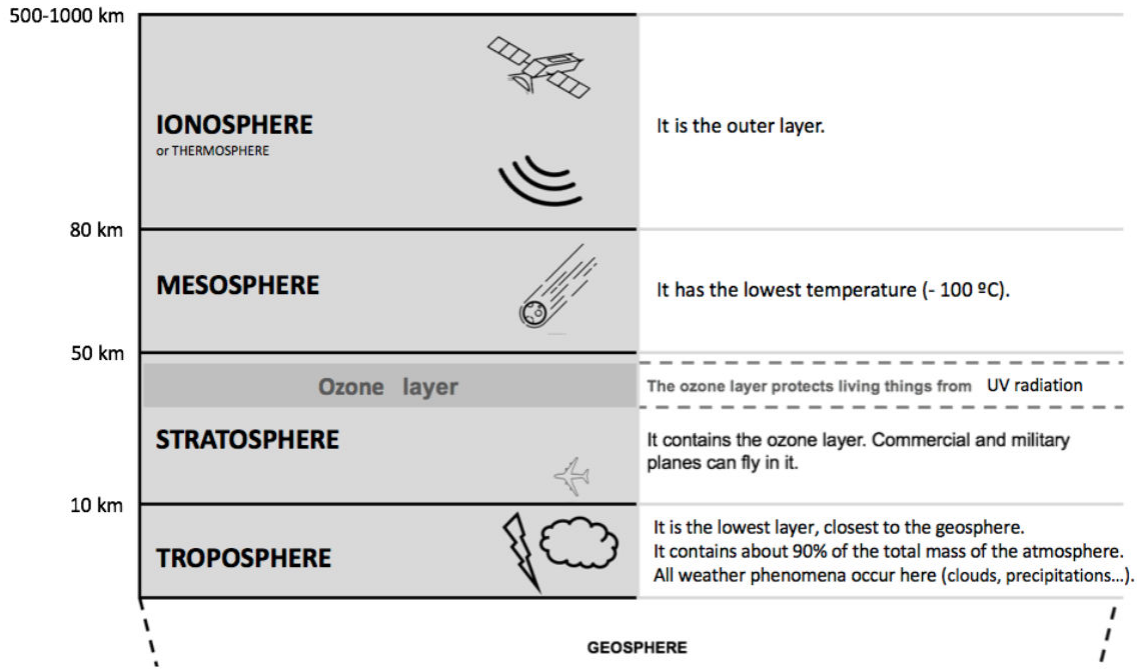
The atmosphere is essential for living things. It provides:

- A **protective filter** against solar radiation.
  - X-rays and gamma rays are absorbed in the ionosphere.
  - Ultraviolet rays (UV) are absorbed in the stratosphere by the ozone layer.
- Regulation of global temperature due to the **greenhouse effect**.
  ***YouTube**: European Space Agency, ESA "Paxi Greenhouse effect".*
  Some of the visible light that arrives at the surface of our planet is absorbed by the ground and warms it.
  The warm ground emits infrared radiation, which heats the atmosphere.
  This phenomenon is the greenhouse effect and it keeps the Earth warm.
- The oxygen (O_2) we need to **breathe**.
- The carbon dioxide (CO_2) used in **photosynthesis**.
- The nitrogen (N_2) used by some bacteria as a nutrient.

4.3. STRUCTURE OF THE ATMOSPHERE

***YouTube**: Met Office – Learn About Weather "What are the layers of the atmosphere?"*
***YouTube:** National Geographic "Thunderstorms 101"*
***YouTube:** National Geographic "Climate 101: Ozone depletion"*

The atmosphere has got 4 layers:



4.4. AIR POLLUTION

YouTube: *National Geographic "Air pollution 101"*

Quality of air is often deteriorated by substances called **air pollutants** that affect the health of living things.

AIR POLLUTANTS	SOURCE	CONSEQUENCES IN LIVING THINGS
Carbon monoxide (CO)	Fumes from burning fuels.	It reduces the ability of red blood cells to carry oxygen.
Sulphur and nitrogen oxides	Burning of coal and oil.	They produce acid rain when react with water, what damages living beings and monuments.
Bad ozone or smog or ground level O_3	Industry and motor vehicles (secondary pollutant).	It causes respiratory problems, more severe in people with lung diseases.
Soot	Burning fossil fuels, mostly coal.	As they are tiny particles, they can reach the lungs and even pass into the blood.

PRÁCTICA DE LABORATORIO Nº 5: *Composición de la atmósfera y contaminantes atmosféricos.*

HOW TO CARE FOR THE ATMOSPHERE _____

- **Filters** are capable of trapping soot and sulfur oxides, so their installation in power plants and factories reduces emissions.
- Use **renewable energy** (wind, solar…) to gradually replace the use of coal and oil for electricity production.
- Choose responsible **energy consumption**. Most of the power stations pollute. Reducing energy consumption is another way to reduce pollution.
- **Recycle**. Using used materials (paper, plastic, glass…) in manufacturing processes causes less pollution than using raw materials.

ACTIVITIES

ACTIVITY 12. Composition nowadays of the atmosphere:

ACTIVITY 13. The atmosphere is essential for living things. Give two reasons.

ACTIVITY 14. Which layer of the atmosphere is each sentence related to?

- Troposphere is under it:
- Ionosphere isanother name for this layer:
- Ozone layeris in this layer:
- It contains about 90% of the total mass of the atmosphere:
- It is the outer layer:

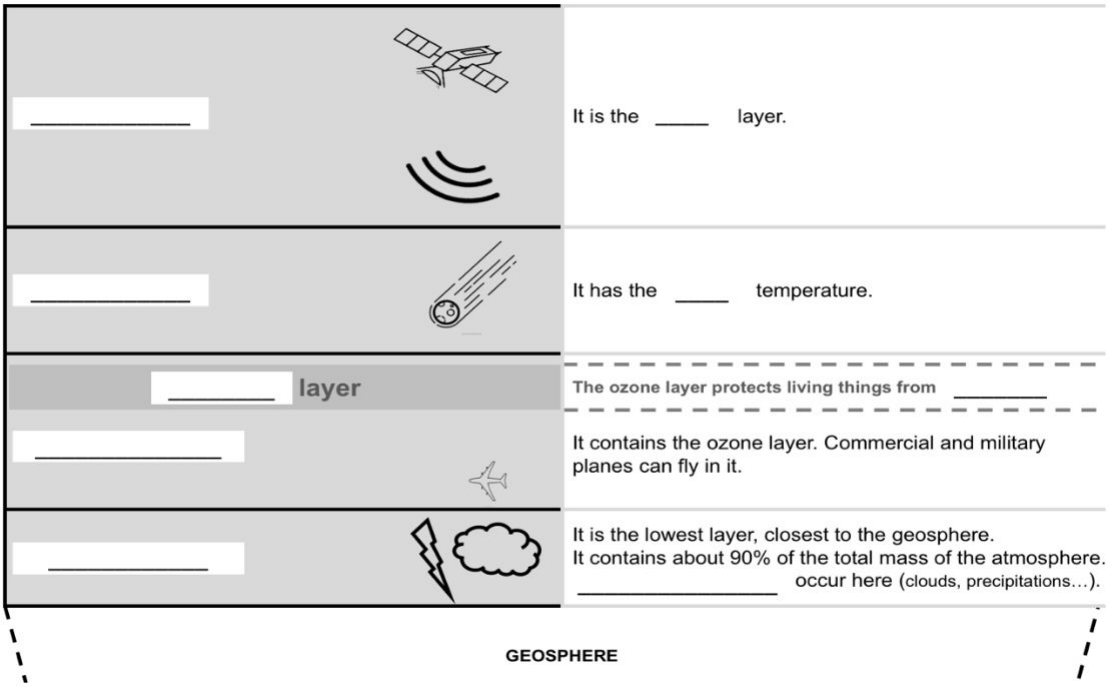
- It is between mesosphere and troposphere:

- Commercial and military planes can fly in it:

- Artificial satellites orbitin it:

- Its temperature is -100 ºC:

- All weather phenomena occur in this layer:



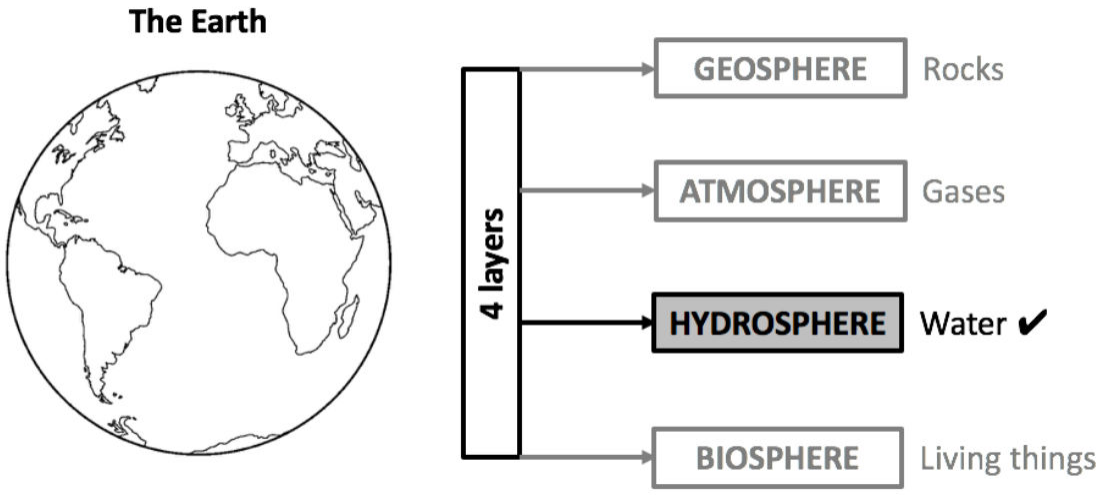
ACTIVITY 15. Which air pollutant is it?

- It creates a grey cloud, smog, over cities.
- Source: industry, coal heating systems, diesel engines.
- Source: burning fuels, specially coal
- Tiny particles can pass into the lungs
- Source: motor vehicles
- It decreases the ability of the blood to transport oxygen.
- They produce acid rain.

True or false?

- *Nitrogen oxide and water form acid rain.*
- *CFCs destroy O_3, what causes ozone layer depletion.*

Unit 5
THE HYDROSPHERE



HYDROSPHERE: it is all the **water** that exists on the Earth (in its 3 states: solid, liquid and gas).

YouTube: *APPUSERIES "Learn About Planet Earth - Hydrosphere"*

5.1. PROPERTIES OF WATER

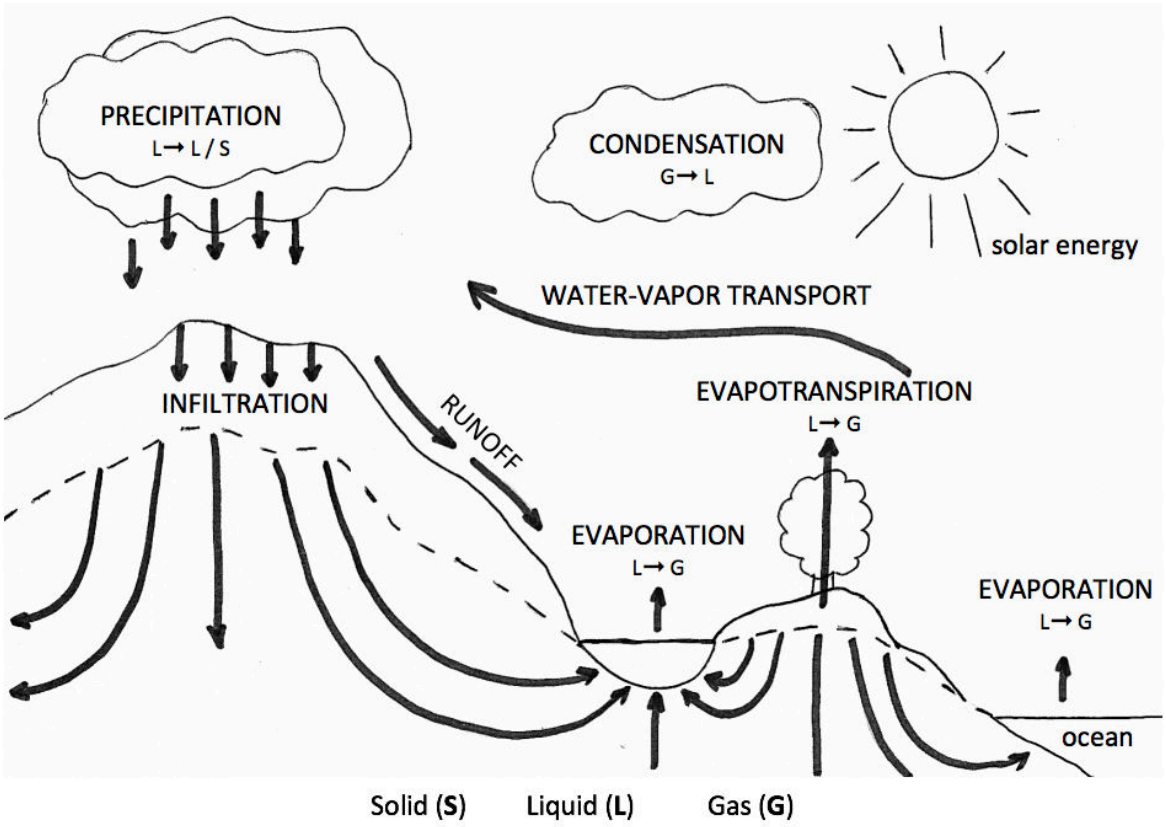
Water is a substance with unique **PROPERTIES** that takes part in many processes on our planet's surface and it is essential for living things.

PROPERTIES	PROCESSES ON THE SURFACE	PROCESSES IN LIVING THINGS
Excellent solvent	It dissolves substances of the Earth's crust that can be washed into the ocean.	Many substances are carried by water inside organisms. It is the main component of blood,urine, sweat…
Heat capacity	Coastal places enjoy milder temperatures than inland places.	Homeothermic animals maintain their body temperature.
Anomalous expansion	It expands when it freezes, so rocks are broken when liquid water in a crack becomes solid.	Ice is less dense than liquid water. The layer of ice acts as a barrier that allows the survival of the living things that live under it.
Cohesion/ adhesion	Water molecules attract each other and they are also able to adhere to most surfaces and wet them.	Due to the process of capillary action, water rises through the conducting vessels in plants.

5.2. THE WATER CYCLE

The energy from the Sun is the motor that powers the water cycle.

- **Evaporation and evapotranspiration.**
  Liquid water from oceans, rivers or lakes (evaporation) or from living things (evapotranspiration) changes to water vapor (gas).
- **Condensation.**
  Water vapor (gas) changes to liquid water forming clouds, dew and fog.
- **Precipitation.**
  Liquid water in the clouds falls to the ground as rain (also liquid), snow (solid water) or hail (solid water).
- **Surface run-off.**
  Surface water forms rivers and streams when it moves across the land.
- **Infiltration.**
  Water filters into the ground and flows underground through soil and rocks.



5.3. USES OF WATER AND WATER MANAGEMENT

Water has a lot of uses:

- **Domestic**. Personal hygiene or drinking water.
- **Agriculture and ranching industry**. Irrigation of crops and water for livestock.
- **Industrial**. Different manufacturing processes and hydroelectric power stations.
- **Commercial**. Hotels, restaurants, shops, etc.
- **Municipal**. Cleaning public areas, watering parks and fountains.

It is important to use water responsibly. At home, we can **save water** in different ways:

- Take a short shower, not a bath.
- Turn off the tap when you brush your teeth.
- Use full loads in the washing machine and dishwasher.

Potable water (or drinking water) is water that is safe to drink. It must meet acceptable standards after being treated by the *potable water treatment process*. Water treatment should remove harmful microorganisms and other contaminants, and leave the water clean and clear.

5.4. ENVIRONMENTAL IMPACTS ON THE HYDROSPHERE

One of the main negative impacts on water is water pollution, that reduces water quality and makes it less suitable for use.

Types of water pollutants

- **Suspended matter**: plastic, sand, organic matter or soot.
- **Dissolved solids**: nutrients (eutrophication), metals, etc.
- **Liquids**: oils, industrial liquid waste, etc.
- **Gases**: CO_2, CH_4 and N_2O (rivers); CO_2 (ocean acidification).
- **Microbiological contaminants**: viruses, bacteria and protozoa.
- **Energy**: heat, sound, radioactivity, etc.

The hydrosphere can be significantly deteriorated by the following negative impacts:

- Fresh water:
    - Overexploitation of groundwater and surface waters (it reduces the reserves).
    - Alteration of river regimes.
    - Salinization of aquifers.
- Seawater: spills (Mar Menor and Portman).

YouTube: *Microplásticos TED-Ed "What really happens to the plastic you throw away - Emma Bryce"*
YouTube: *National Geographic "How we can keep plastics out of our ocean"*

PRÁCTICA DE LABORATORIO Nº 6: *Depuradora casera.*

ACTIVITIES

ACTIVITY 16. Complete about properties of water.

	PROPERTY	ON SURFACE OR IN LIVING THINGS
It dissolves minerals of the crust.		
It is the main component of blood, lymph, saliva…		
It expands when it freezes.		
Aquatic organisms can survive in the layer of water created under the ice.		
Oceans absorb heat in summer and release it slowly in winter.		
It carries a lot of substances inside organisms.		
Water molecules are attracted to each other.		
If water fills a crack in a rock and freezes, it can break the rock.		
Due to the process of capillary action, water rises through the conducting vessels in plants.		
It prevents large variations of temperature.		

ACTIVITY 17. Underline mistakes about the water cycle and correct them.

a) Water vapor (gas) from oceans, rivers or lakes (evaporation) or from living things (evapotranspiration) changes to liquid water.

b) Water vapor (gas) changes to ice (solid water) forming clouds and dew.

c) Water vapor (gas) in the clouds falls to the ground as rain (solid water), snow (liquid water) or hail (solid water).

d) Surface water moves across the land and forms rivers and streams.

e) Water filters into the ground and flows underground through soil and rocks.

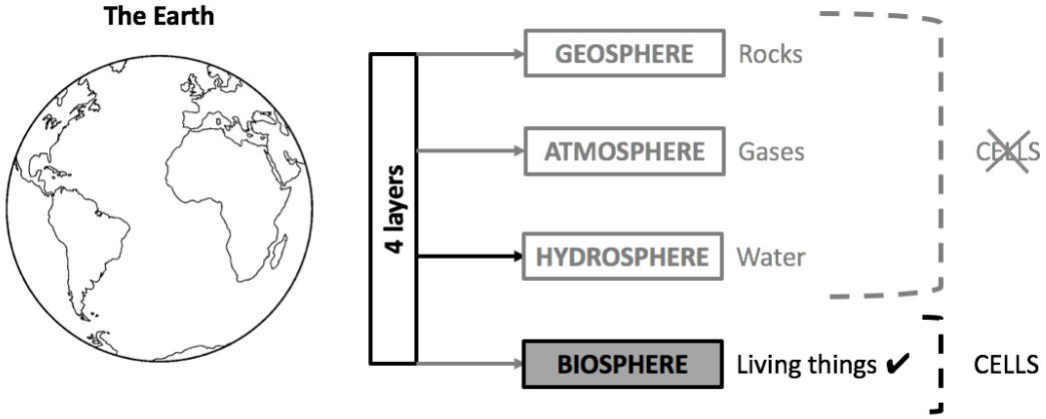
ACTIVITY 18. At home, you can **save water** in different ways. Write three ways.

ACTIVITY 19. Which type of water pollutants are the following?

Sound: Oils: CO_2:

Bacteria: Soot: Phosphates:

Unit 6
THE BIOSPHERE



BIOSPHERE: it is the sum of all **living things** (or living beings) on the Earth.

6.1.CHARACTERISTICS OF LIVING THINGS

All living things have the following characteristics:

- A similar **CHEMICAL COMPOSITION:**
  - **Chemical elements (bioelements)**
    95%→C: carbon; H: hydrogen; O: oxygen; N: nitrogen.
  - **Molecules (biomolecules)**
    - INORGANIC BIOMOLECULES: water and mineral salts.
    - ORGANIC BIOMOLECULES: carbohydrates, lipids, proteins and nucleic acids.
- They are made up of **1 CELL** (unicellular) or **MANY CELLS** (multicellular).
- They carry out the **LIFE FUNCTIONS**:

  -**NUTRITION** is an essential life function because it involves al lthe processes to obtain ENERGY and MATTER that living things need to stay alive.

  - **Autotrophs** combine inorganic matter (water, mineral salts and CO_2) with energy from the Sun (photosynthesis) or from chemical reactions (chemosynthesis) to produce their own organic compounds. Plants, algae and some bacteria are autotrophs.
  - **Heterotrophs** take organic matter made by other living things. Animals, fungi, protozoa and some bacteria are heterotrophs. According to the type of food they eat, the heterotrophic organisms are classified into: herbivores, carnivores, omnivores, saprophytes.

- **INTERACTION** enables living things to interact with other living things and with the environment. Interaction is an essential life function because it makes it possible for living things to react to and respond to changes in their environment. In addition, it enables them to maintain stable internal conditions even though external conditions may change.

- **REPRODUCTION** allows living things to produce new individuals. The variety in new individuals depends on the type of reproduction: there is morevariety with sexual reproduction than with asexual one.

6.2. STRUCTURE OF CELLS

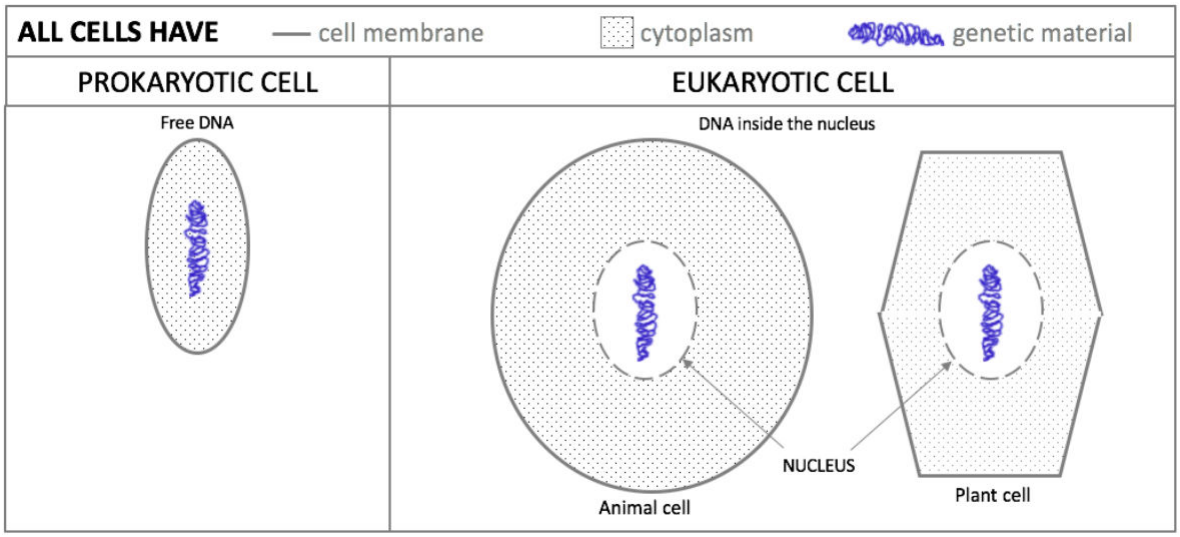
Cells are the smallest unit of life, so they have the characteristics of living things.

Although there are various types of cells, all of them have three main parts:

- **Cell membrane**: it covers the whole cell; it is a thin layer made up of lipids and proteins.
- **Cytoplasm**: it is a jelly-like substance.
- **Genetic material**: it consists primarily of DNA which contains the hereditary information.

There are two types of cells:

- Prokaryotic cells: DNA is free in the cytoplasm.
- Eukaryotic cells: DNA is inside the nucleus, so DNA is separated from the cytoplasm; the nucleus is a membrane with pores.

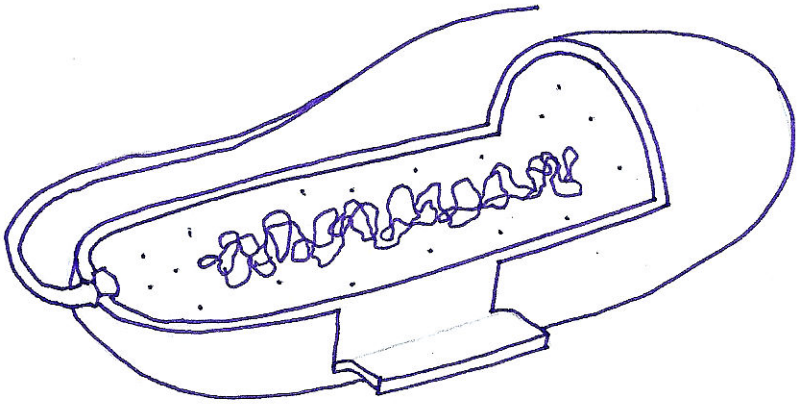


RIBOSOMES (·) are represented as small points inside the cytoplasm. They are in prokaryotic and eukaryotic cells but prokaryotic ribosomes are smaller than eukaryotic ribosomes. They make proteins (one type of organic biomolecule).

YouTube: *RicochetScience "Prokaryotic Vs. Eukaryotic Cells"*
YouTube: *Nucleus Medical Media "Biología: estructura celular"*

6.3. PROKARYOTIC CELLS

- They are simple.
- They are much smaller than eukaryotic cells.
- Their genetic material is not separated from the cytoplasm.
- They have a cell wall that covers the cell membrane.
- They only form unicellular organisms.
- They have prokaryotic ribosomes.
- They belong to Monera Kingdom (bacteria).



6.4. EUKARYOTIC CELLS

- They are complex.
- They are bigger than prokaryotic cells.
- Their genetic material is separated from the cytoplasm into the nucleus.
- They have many types of **ORGANELLES** that do different metabolic jobs.
- They form unicellular and multicellular organisms.
- They have eukaryotic ribosomes.
- They belong to Protoctist, Fungi, Plant and Animal Kingdom.

Some organelles of EUKARYOTIC cells:

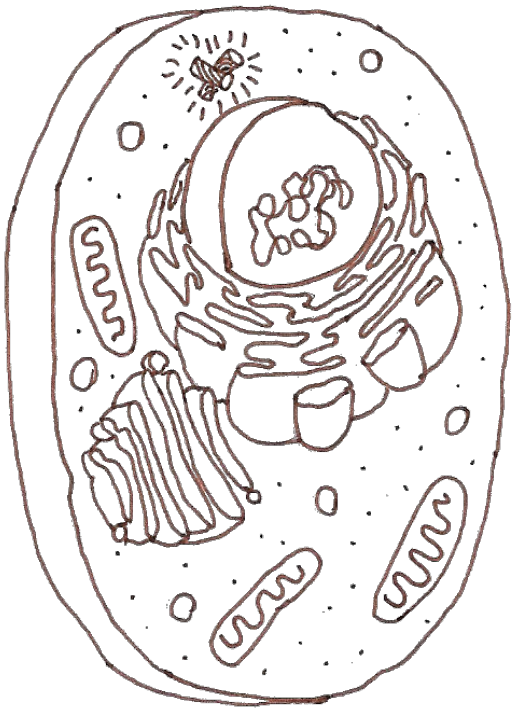
MITOCHONDRIA (): do <u>cellular respiration</u> to produce energy; they need oxygen (O_2) and glucose (one type of carbohydrate); all eukaryotic cells have mitochondria.

CHLOROPLASTS (): do <u>photosynthesis</u> to make organic compounds (glucose); they need carbon dioxide (CO_2), water and sunlight; plants and algae (Protoctist) have chloroplasts to do photosynthesis.

Animal cell

Irregular shape

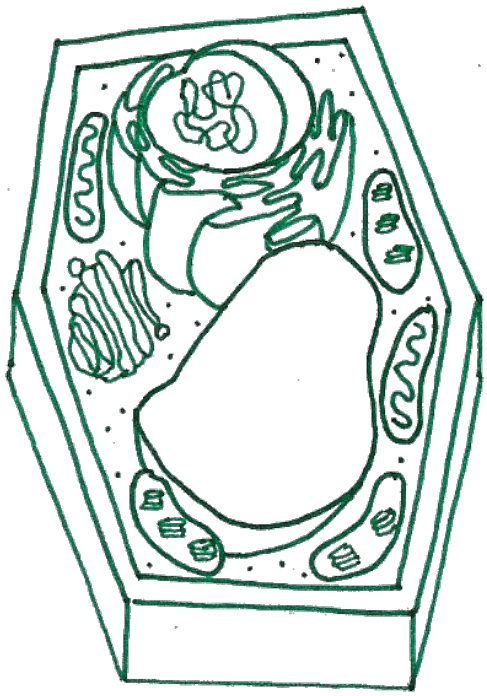
Centrosome



Plant cell

Regular shape Nucleus on one side

Cell wall Chloroplast Large vacuole



6.5. CLASSIFICATION OF LIVING THINGS

There are two principal systems of classification:

- **Artificial system**: based on physical characteristics (shape, size and color) and habitat.
- **Natural system** (scientific classification): based on natural relationships (internal and external characteristics and evolutionary (genetic) relationships).

Taxonomy is the science of classifying living things. There are different taxonomic categories and species is one of these categories. Every living thing belongs to one species.

Controversy exists in the definition of **species**, but one accepted definition is:

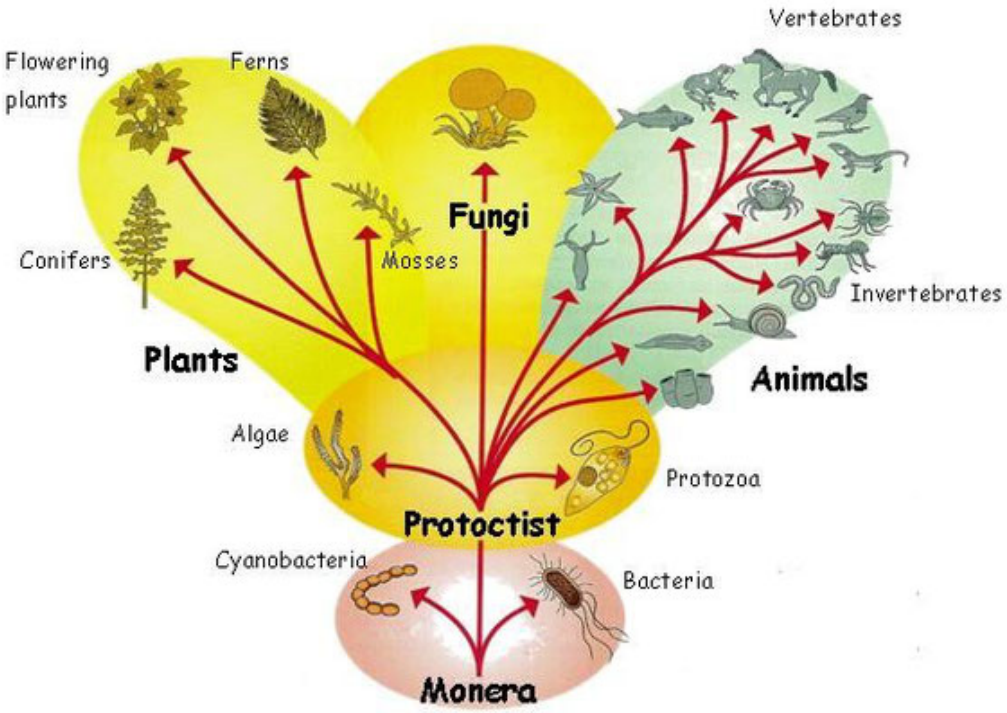
"A species is a group of living things that are physically similar and can produce fertile descendants".

How are species named?

The scientific system that is used to name living things is called binomial nomenclature. This system uses two Latin words (an example of each kingdom is in the table below).

5 KINGDOMS	CELL TYPE	ORGANIZATION	NUTRITION	TISSUES
ANIMALS *(e.g. Homo sapiens)*	Eukaryotic	Multicellular	Heterotrophs	Yes
PLANTS *(e.g. Chamaerops humilis)*	Eukaryotic	Multicellular	Autotrophs	Yes
FUNGI *(e.g. Saccharomyces cerevisiae)*	Eukaryotic	Unicellular Multicellular	Heterotrophs	No
PROTOCTISTS *(e.g. Plasmodium falciparum)*	Eukaryotic	Unicellular Multicellular	Autotrophs Heterotrophs	No
MONERA *(e.g. Escherichia coli)*	Prokaryotic	Unicellular	Autotrophs Heterotrophs	No

YouTube: *WillDiv "5 bacterias sensacionales"*



https://evaprofebio.jimdofree.com/biology-and-geology-1st-eso/ud-6-la-diversidad-de-la-vida/2-los-cinco-reinos/

PRÁCTICA DE LABORATORIO Nº 7: *Cultivo de microorganismos.*
PRÁCTICA DE LABORATORIO Nº 8: *Microscopio óptico y observación de protozoos.*
PRÁCTICA DE LABORATORIO Nº 9: *Lupa binocular y observación de moho.*

6.6. THE FIVE KINGDOMS

ANIMAL KINGDOM

- **Vertebrates**
  - **Fish**
    - Bony
    - Cartilaginous
  - **Amphibians**
    - Without tail
    - With tail
  - **Reptiles**
    - Sauria
    - Testudines
    - Crocodilia
    - Ophidia
  - **Birds**
    - Flying
    - Flightless
  - **Mammals**
    - Placentals
    - Marsupials
    - Monotremes
- **Invertebrates**
  - **Porifera**
  - **Cnidarians**
  - **Platyhelminthes**
  - **Nematodes**
  - **Annelids**
  - **Molluscs**
    - Gastropods
    - Bivalves
    - Cephalopods
  - **Arthropods**
    - Myriapods
    - Arachnids
    - Crustaceans
    - Insects
  - **Echinoderms**

PLANT KINGDOM

- **Non-flowering**
  - Mosses
  - Ferns
- **Flowering**
  - Gymnosperms
  - Angiosperms

FUNGI KINGDOM

Yeasts Moulds Mushrooms

PROTOCTIST KINGDOM

- **Protozoa**
  - Flagellates
  - Ciliates
  - Rhizopods
  - Sporozoa
- **Algae**
  - Green
  - Red
  - Brown

MONERA KINGDOM (bacteria)

ACTIVITIES

ACTIVITY 20. Look at the following chemical elements and circle the most abundant ones in living things:

C (carbon) - Ca (calcium) - H (hydrogen) - Na (sodium) - O (oxygen) - Fe (iron) - N (nitrogen)

ACTIVITY 21. Match each biomolecule with its function. Ask your teacher for help:

WATER	Are reserve and insulating substances.
MINERAL SALT	Regulate chemical reactions and build skeletal structures.
CARBOHYDRATES	Contain the inheritance information.
LIPIDS	Give energy to the organism.
PROTEINS	Transport other substances through the body.
NUCLEIC ACIDS	Build structures, transport substances, etc.

ACTIVITY 22. Define cell.

ACTIVITY 23. Complete. *All cells have* _____.

ACTIVITY 24. Prokaryotic, eukaryotic or both types?

- They belong to Protoctist, Fungi, Plant and Animal Kingdom:
- They form unicellular and multicellular organisms:
- They belong to Monera kingdom:
- They don't have a nucleus:
- They are much smaller than eukaryotic cells:
- Their genetic material is not separated from the cytoplasm:
- Cell membrane is made up of lipids and proteins:
- They only form unicellular organisms:

ACTIVITY 25. Which life function is it?

Through this function, organisms can find food, flee from their predators and respond to changes in heat, light, sound, and chemical or mechanical contact.

ACTIVITY 26. Put a cross in the right column.

	Prokaryotic cell	**Eukaryotic cell**	**Animal cell**	**Plant cell**
CELL MEMBRANE				
CHLOROPLAST				
NUCLEUS				
DNA				
MITOCHONDRIA				
RIBOSOMES				

ACTIVITY 27. Match.

Interaction	**a.** It involves all the processes to obtain ENERGY and MATTER that living things need to stay alive.
Reproduction	**b.** It allows living things to produce new individuals.
Nutrition	**c.** It makes it possible for living things to react to and respond to changes in their environment.

ACTIVITY 28. Match:

They haven't got nucleus.	
They have ribosomes, little organelles that make proteins.	EUKARYOTIC CELLS
Their genetic material is not separated from the cytoplasm.	PROKARYIOTIC CELLS
They have cellular wall, a rigid structure located outside.	PLANT CELLS
They have mitochondria, organelles which produce energy.	ANIMAL CELLS
They have a big vacuole that occupies the most part of the cytoplasm.	

ACTIVITY 29. Answer these questions and justify your answer.

- Is there any multicellular organism made up of prokaryotic cells?
- What organelles are exclusive to plant cells?

ACTIVITY 30. Complete about nutrition.

_____ combine inorganic matter (water, _____ _____ and CO_2) with energy from the Sun (_____) or from chemical reactions (chemosynthesis) to produce their own organic compounds. Plants, _____ and some bacteria are autotrophs.

Heterotrophs take _____ matter made by other living things. Animals, _____, protozoa and some bacteria are heterotrophs. According to the type of food they eat, the _____ organisms are classified into:

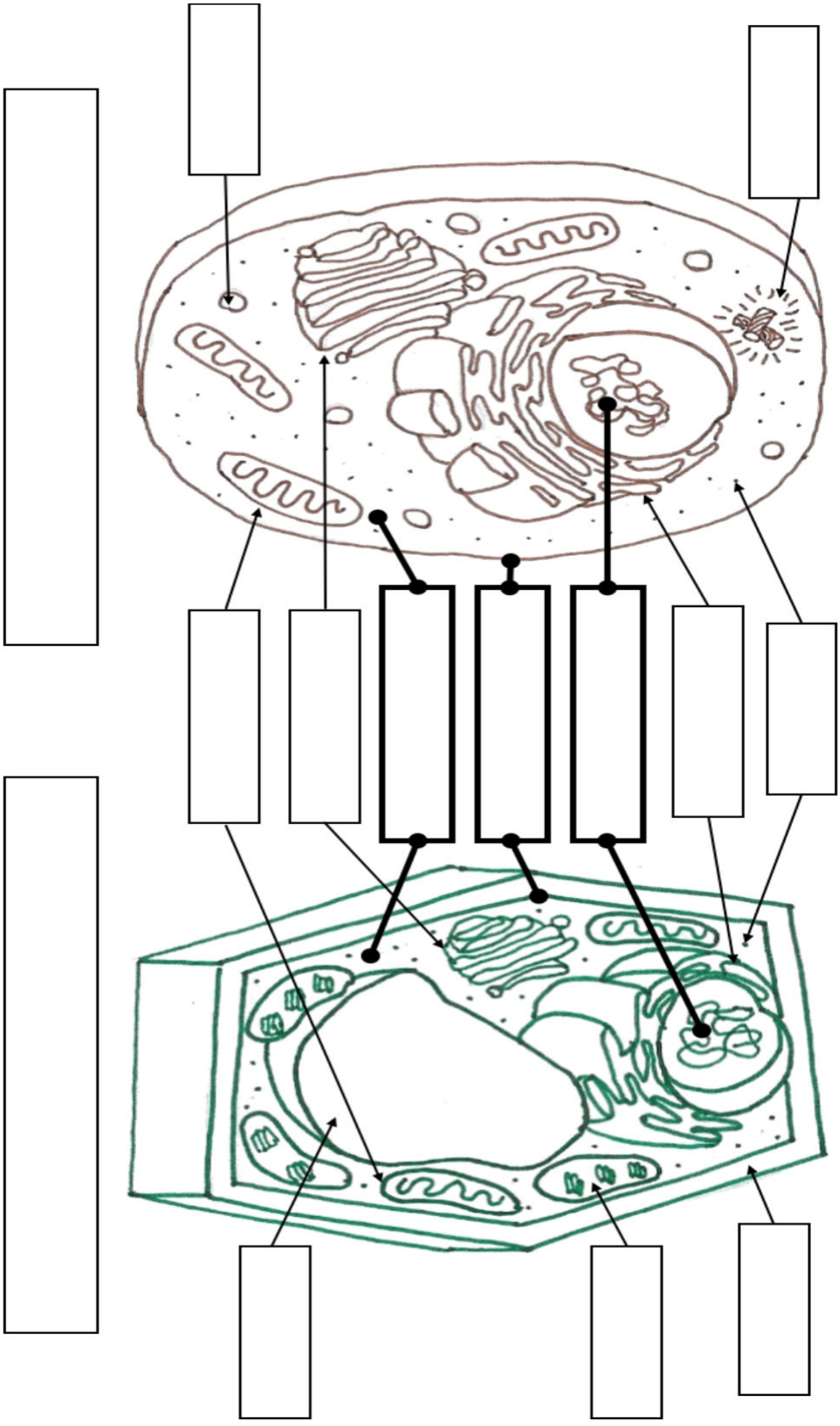
- Herbivores: they eat _____ (e.g. cows)
- _____: they eat meat (e.g. lions)
- _____: they eat meat and plants (e.g. humans)
- Saprophytes: they eat _____ _____ _____ (e.g. fungi)

ACTIVITY 31. Complete the table:

	Kingdom	**Nutrition**	**Tissues**	**Type of cell**
Algae				
Butterfly				
Cypress				
Fungi				
Starfish				
Moss				

- Which organisms are autotrophs?
- Which organisms have prokaryotic cells?
- Which organisms are multicellular?
- Which organisms do belong to animal kingdom?

ACTIVITY 32. Look at the picture and fill in the gaps.



UNIT 7
THE ANIMAL KINGDOM

7.1. VERTEBRATE ANIMALS

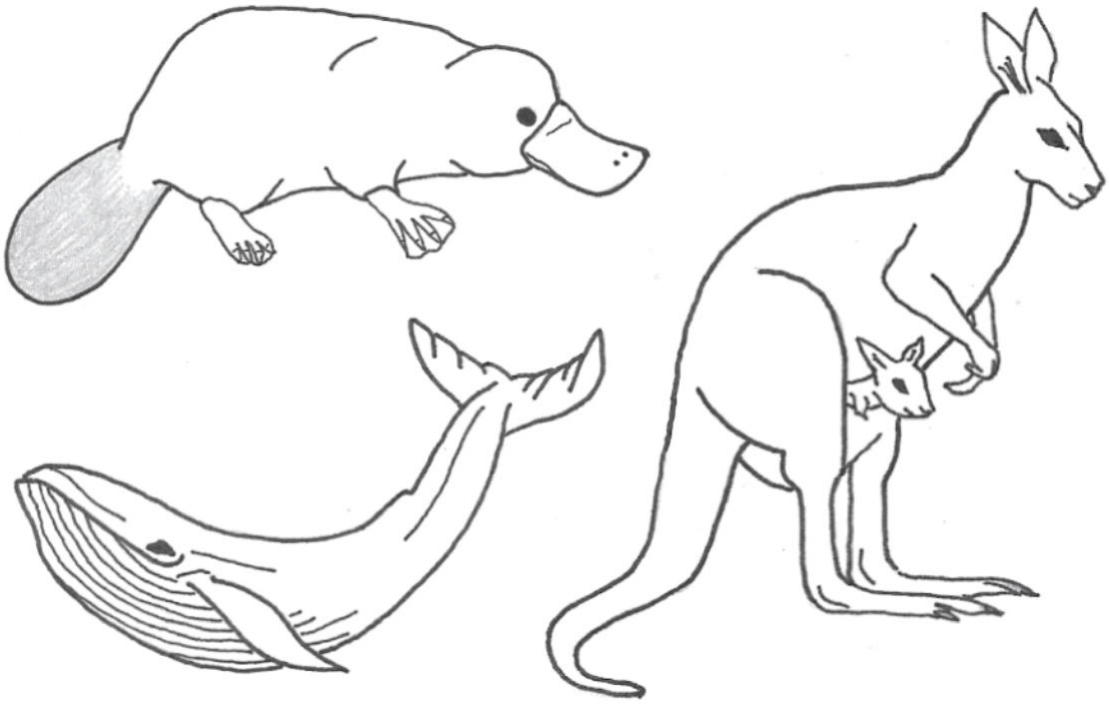
General characteristics of vertebrates:

- Internal skeleton made of bones. The main axis is the spinal column.
- Bilateral symmetry.
- Body: head, trunk and tail; articulated limbs.
- Nervous system: brain, spinal cord and nerves.
- Sexual reproduction.
- Fiveclasses: mammals, birds, reptiles, amphibians and fish.

MAMMALS

Habitat: terrestrial (most of them)
Carnivores, herbivores and omnivores
Many glands: sweat, sebaceous and mammary
Skin: hair or fur

Four limbs
Lips and teeth
External ears
Homeothermic

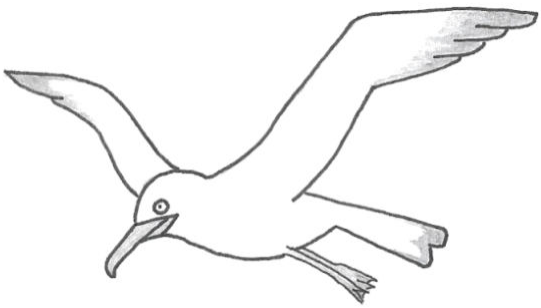


YouTube: *TED-Ed "Las tres formas en que los mamíferos dan a luz"*

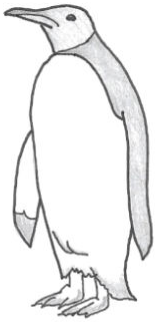
BIRDS

Habitat: terrestrial
Carnivores and/or herbivores
Fusiform body shape
Skin: feathers

Four limbs, beak and wings
Light skeletons
Homeothermic
Oviparous



FLYING



FLIGHTLESS

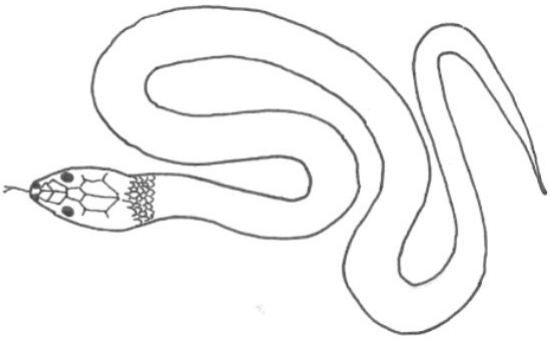
REPTILES

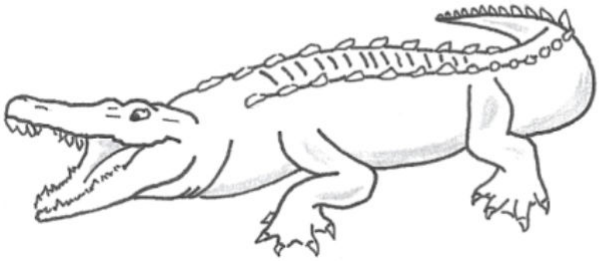
Habitat: terrestrial
Carnivores (testudines: herbivores)
Skin: hard scales (testudines: carapace)

Four limbs (except ophidia)
Poikilothermic
Oviparous

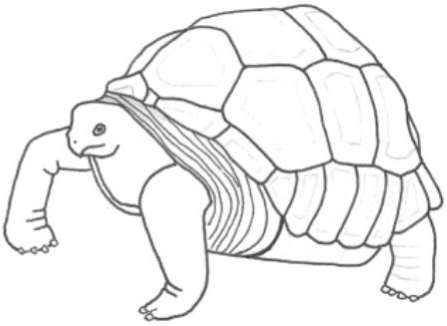
SAURIA

OPHIDIA





CROCODILIA

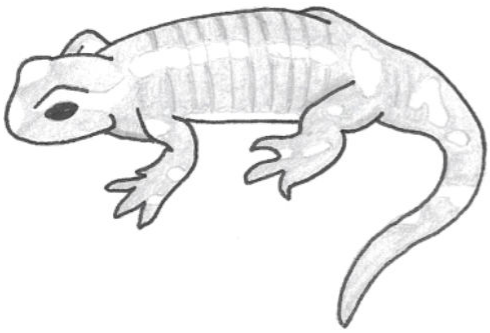


TESTUDINES

AMPHIBIANS

Habitat: terrestrial (wet)
Carnivores
Skin with no covering

Four limbs or legs
Poikilothermic
Oviparous



WITH TAIL

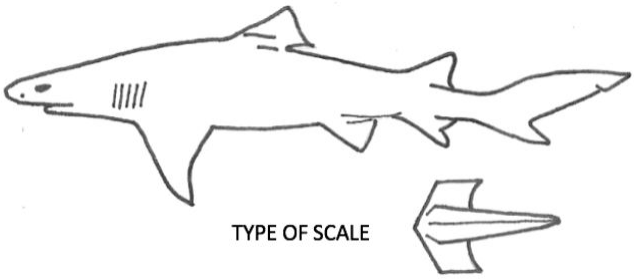
WITHOUT TAIL

YouTube: *National Geographic "Amphibians face mass extinction"*
YouTube: *National Geographic "See a Salamander Grow From a Sigle Cell in this Incredible Time-lapse"*

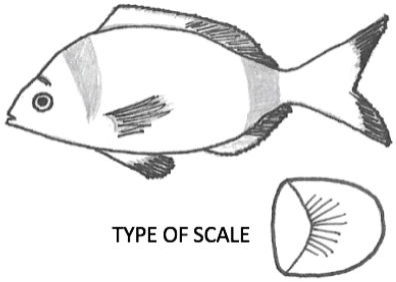
FISH

Habitat: aquatic (gills to breath)
Carnivores and/or herbivores
Fusiform body shape; fins to swim

Lateral line (detects vibrations)
Poikilothermic
Oviparous



CARTILAGINOUS



BONY

YouTube: *National Geographic "Tiny fish use bacteria"*
PRÁCTICA DE LABORATORIO Nº 10: *Disección de un pez óseo.*

YouTube: *National Geographic "See a Meat-eating hare caught in the act"*
YouTube: *WillDiv lista de reproducción Animales Fantásticos*

7.2. INVERTEBRATE ANIMALS

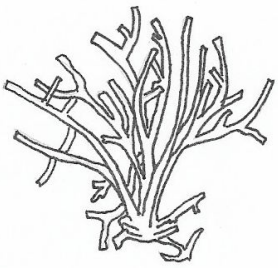
General characteristics of invertebrates:

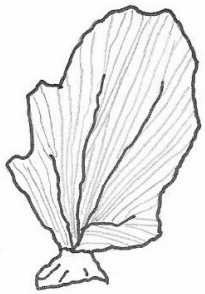
- Skeleton: invertebrates have not spinal column, but they can present an external skeleton (exoskeleton), an internal skeleton or no skeleton.
- Movement: some can movearound; othersare sessile.
- Eight groups: porifera, cnidarians, platyhelminthes, nematodes, annelids, molluscs, arthropods and echinoderms.

PORIFERA (sponges)

Habitat: marine
Nutrition: filter feeders
Motion: sessile (stationary)

Body: no symmetry; full of pores
Skeleton: internal hard structures



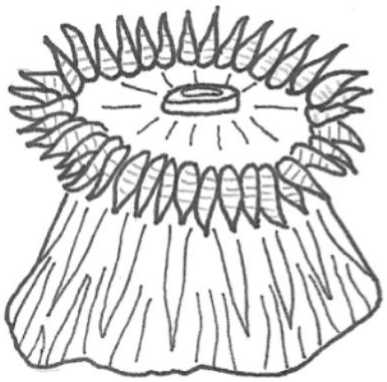


CNIDARIANS

Habitat: marine
Nutrition: carnivorous

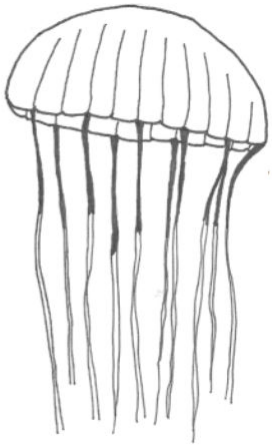
Body: radial symmetry

Motion: sessile and motile
Skeleton: no skeleton



Polyp

Coral

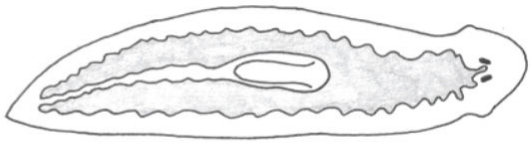


Jellyfish

PLATYHELMINTHES

Habitat: aquatic and damp soils
Body: bilateral symmetry
Nutrition: carnivores and parasites
Motion: cilia and muscle contraction
Skeleton: no skeleton
Reproduction: asexual (fragmentation) and sexual (hermaphrodites: ovaries and testis)

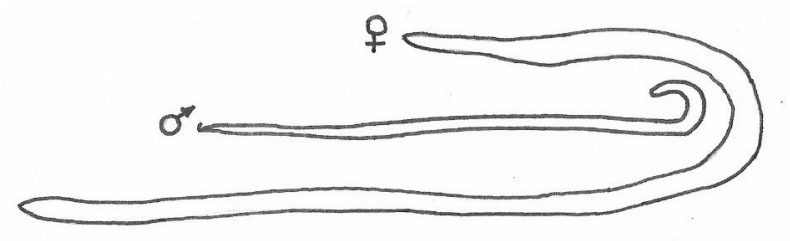
Tapeworm



Planaria

NEMATODES

Habitat: aquatic, damp soils and parasites
Skeleton: no skeleton
Reproduction: sexual
Body: bilateral symmetry; thin and cylindrical
Nutrition: free-living (some parasites)
Motion: muscle contractions
Size: small or microscopic

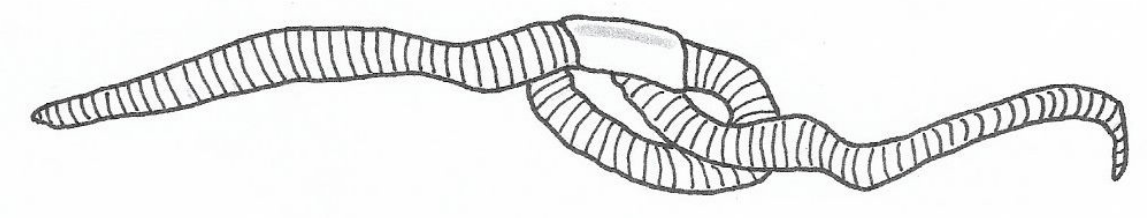


Ascaris (intestinal parasite)

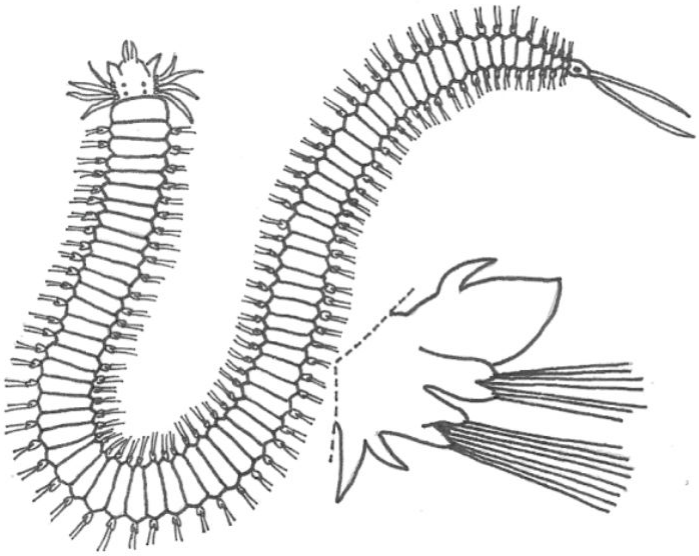
ANNELIDS

Skeleton: no skeleton
Motion: setae
Reproduction: sexual
Habitat: sea, fresh water and damp soils
Body: bilateral symmetry; metameres (segmented worms)
Nutrition: free-living and parasites

Earthworm



Marineworms



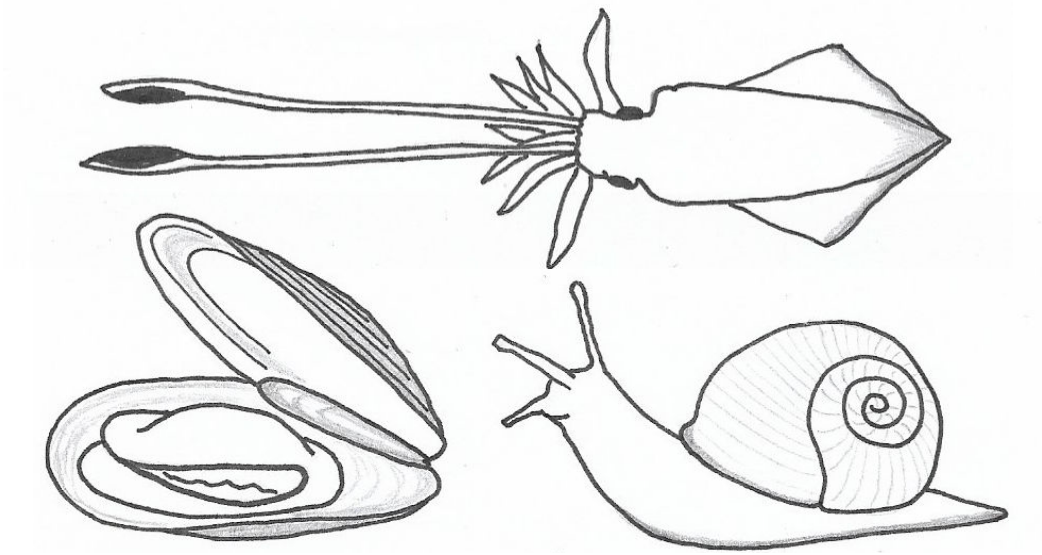
Leeches

setae for motion

MOLLUSCS

Habitat: aquatic or damp soils **Body**: bilateral symmetry; head, visceral mass and foot	CEPHALOPDS: internal shell; beak BIVALVES: external shell (2 valves) GASTROPODS: external shell (spiral shaped)

CEPHALOPDS (octopus, squid and cuttlefish; tentacles; gills)



BIVALVES (clam, oyster, mussel and scallops)
No head; filter feeders; gills.

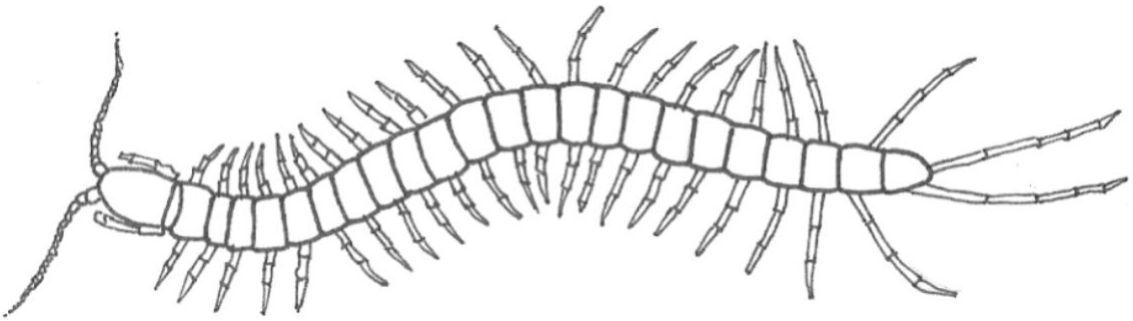
GASTROPODS (snails and slugs)
Gills or lungs

PRÁCTICA DE LABORATORIO Nº 11: *Disección de un mejillón.*

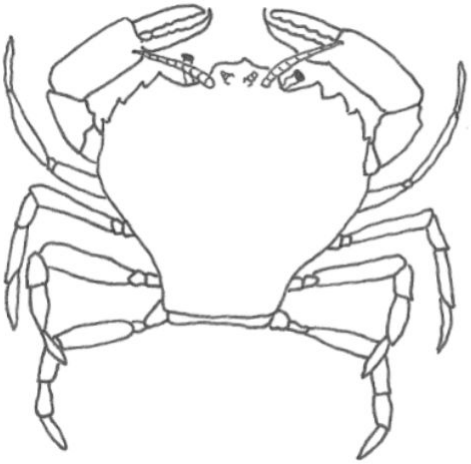
ARTHROPODS

Habitat: ocean, damp and dry soils
Nutrition: carnivorous
Motion: legs (jointed appendages)

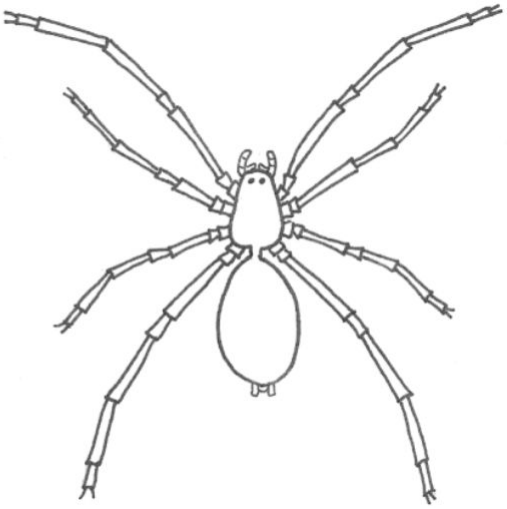
Body: bilateral symmetry; head, thorax and abdomen; cephalothorax (head+thorax) in crustaceans and arachnids
Skeleton: external



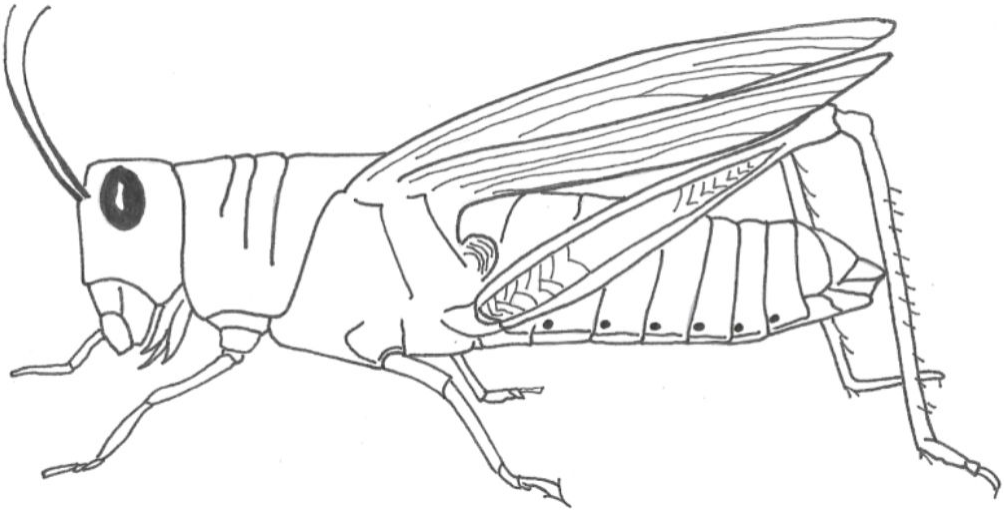
MYRIAPODS (a lot of legs)



CRUSTACEANS (10 legs)



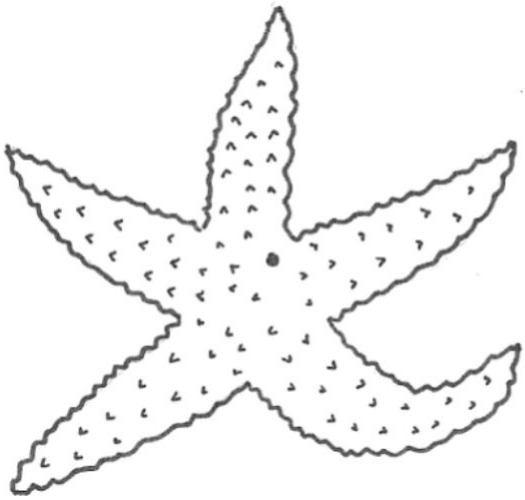
ARACHNIDS (8 legs)



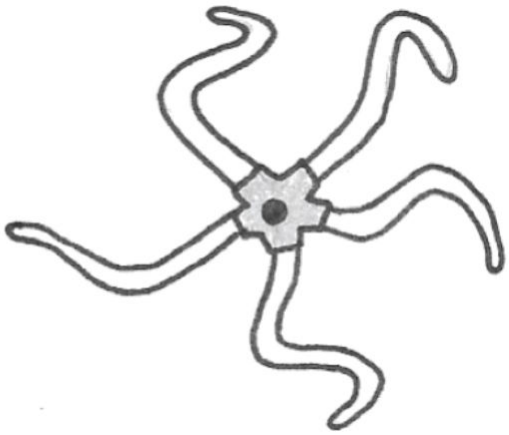
INSECTS (6 legs)

ECHINODERMS

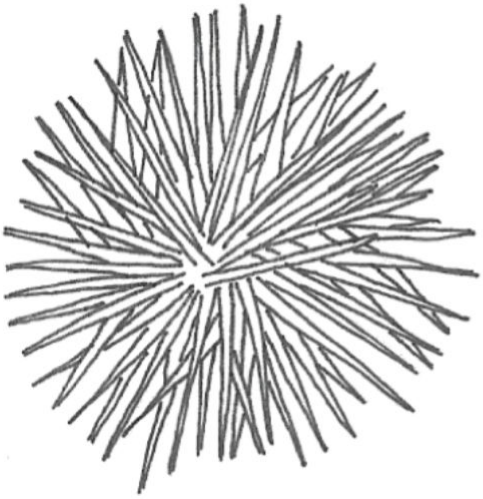
Habitat: ocean
Nutrition: carnivorous
Skeleton: internal skeleton
Body: radial symmetry; mouth on the underside
Movement: water vascular system
Reproduction: asexual (fragmentation) and sexual



STAR FISH



BRITTLE STAR



SEA URCHIN

SEA CUCUMBER

SEA LILY

YouTube: *Jonathan birds's blue world "Sponges!"*
YouTube: *National Geographic "Corals collaborating to eat jellyfish"*
YouTube: *BBC Earth "Jellyfish sunbathing"*
YouTube: *BBC Earth "Fluorescent corals"*
YouTube: *WillDiv serie Animales Fantásticos*
YouTube: *TED-Ed "La vida secreta del plancton"*

ACTIVITIES

ACTIVITY 33. About the Animal Kingdom.

a. Circle true (T) or false (F) and justify your answer.

- All animals have bilateral symmetry.T / F
  Justification:
- Nematodes move with cilia and muscle contractions.T / F
  Justification:
- Birds have two limbs and fusiform body shape.T / F
  Justification:
- Monotremes have feathers and placentals have fur.T / F
  Justification:
- Invertebrates have head, trunk and tail.T / F
  Justification:
- Reptiles and birds are poikilothermic.T / F
  Justification:
- Mammals are oviparous.T / F
  Justification:
- Echinoderms and cnidarians have radial symmetry.T / F
  Justification:
- Cephalopods haveanexternal shell (two valves).T / F
  Justification:
- Whales have not got mammary glands.T / F
  Justification:
- Cephalopods are a type of Arthropods.T / F
  Justification:
- Crustaceans have six legs.T / F
  Justification:
- Vertebrates have head, trunk and limbs.T / F
  Justification:
- Scorpions are arachnids, so they have 10 legs.T / F
  Justification:

b. General characteristics of vertebrate animals.

c. Compare fish vs. aquatic mammals:

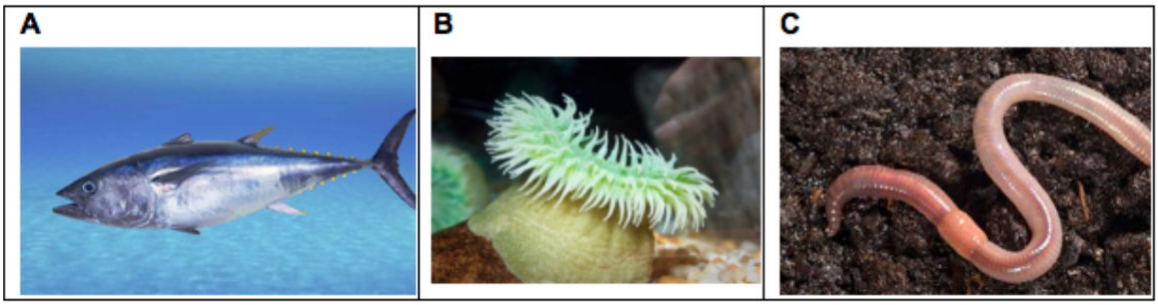
	FISH	AQUATIC MAMMALS
Body shape		
Skin		
Nutrition		
Skeleton		
How they breath		

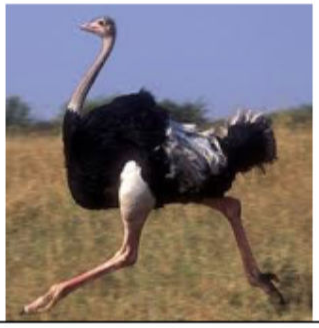
d. General characteristics of invertebrate animals.

e. Draw, classify and explain characteristics of a ladybug.

ACTIVITY 34. Complete the table and classify the pictures from "Google images" writing the letters close to the correct group of animals.

ANIMAL KINGDOM	
VERTEBRATES	**INVERTEBRATES**
Fish	**Porifera**
–	
– Cartilaginous	**Plathyhelmintes**
– Without tail	**Annelids**
– With tail	**Molluscs**
Reptile	– Gastropods
– Sauria	–
–	– Cephalopds
– Crocodilia	**Arthropods**
– Ophidia	– Myriapods
Birds	–
–	– Crustaceans
– Flightless	–
	Echinoderms
– Placentals	**NO ANIMAL KINGDOM**
– Marsupials	
– Monotremes	



D 	E 	F 
G 	H 	I 
J 	K 	L 
M 	N 	Ñ 
O 	P 	Q 

Unit 8
THE PLANT KINGDOM

General characteristics of plants:

- Multicellular (eukaryoticcells); plant cells have chloroplasts and cell wall.
- Autotrophic nutrition:photosynthesis(go to page 24).
- They usually live fixed to the soil.
- Reproduction: sexual and asexual.
- Groups: non-flowering (mossesand ferns) and flowering (gymnosperms and angiosperms).

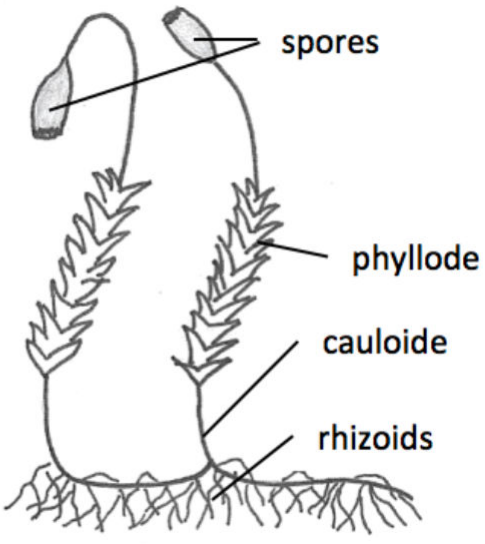
8.1. CLASSIFICATION

PRÁCTICA DE LABORATORIO Nº 12: *Herbario.*

YouTube: *WillDiv "Plantas que imitan a animales"*
YouTube: *National Geographic "How trees secretly talk to each other"*
YouTube: *Knowledge Platform "Types of reproduction in plants"*
YouTube: *Neil Bromhall "Pear flower opening to fruit swelling time lapse filmed over 8 weeks"*

NON – FLOWERING
MOSSES

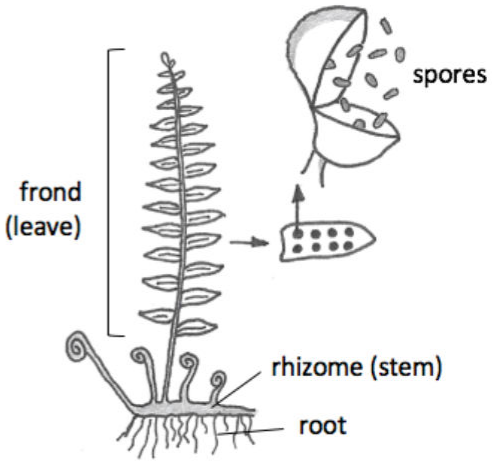
No vessels are present	Rhizoids–phyllodes–cauloides (false roots-stems-leaves)
Small size, simple structure	Humid environment



NON – FLOWERING
FERNS

Conducting vessels
Larger than mosses

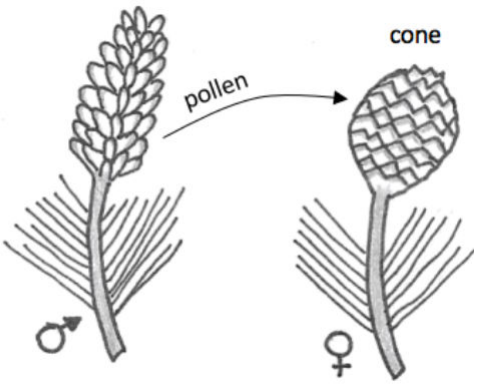
More complex than mosses
Roots – stems – leaves



FLOWERING
GYMNOSPERMS

Conducting vessels
3 groups: Conifers (the largest), cycads and ginkgos

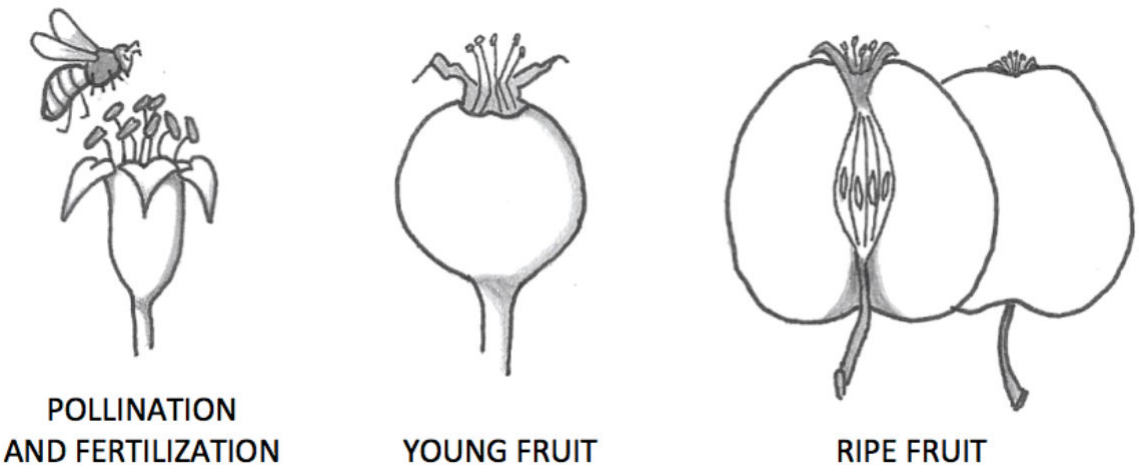
Male and female flowers
Seeds are found in cones



FLOWERING
ANGIOSPERMS

Conducting vessels
Seeds inside a fruit

Different sizes and habitats
Pollination occurs by wind or animals



POLLINATION
AND FERTILIZATION

YOUNG FRUIT

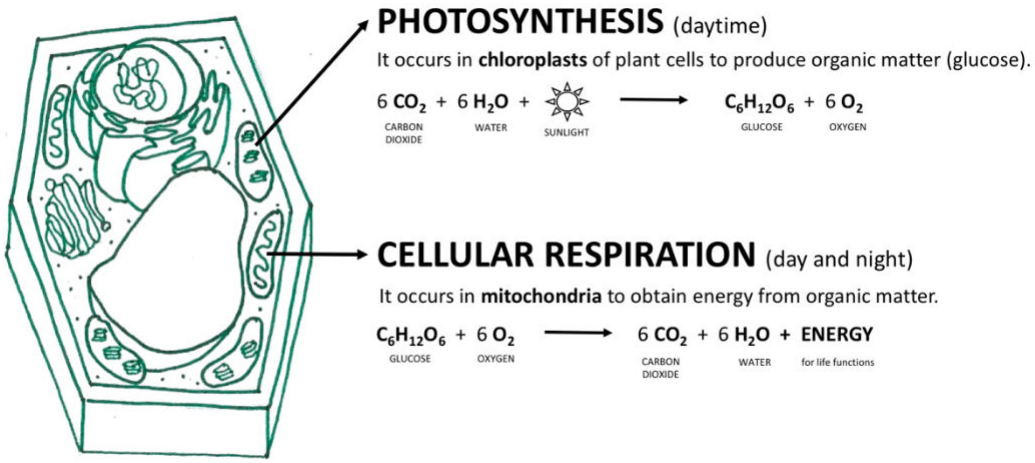
RIPE FRUIT

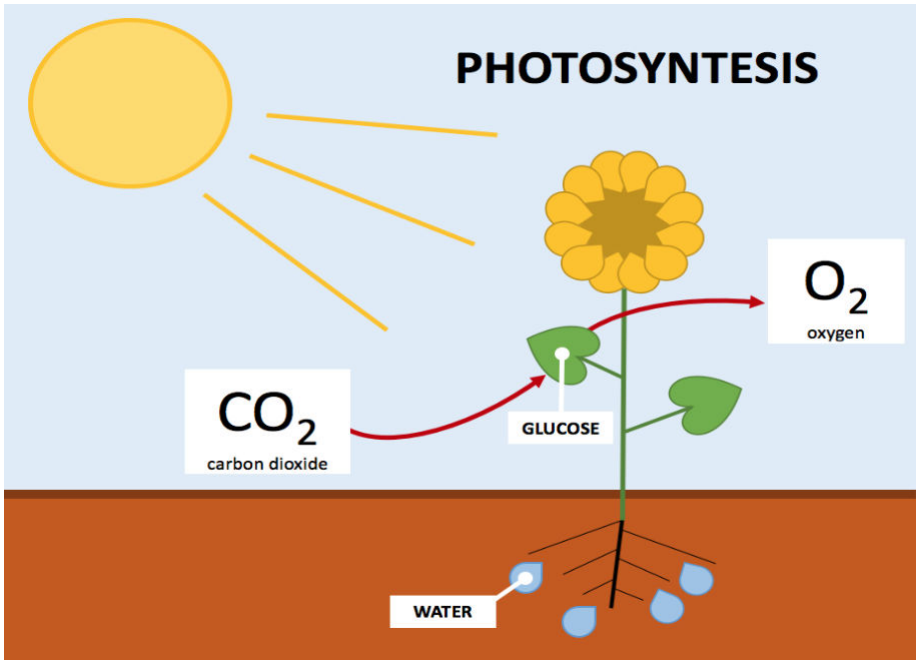
8.2. NUTRITION OF PLANTS

Plants are autotrophs (photosynthesis), so they combine inorganic matter (water, mineral salts and CO_2) with energy from the sun to produce their own organic compounds (glucose).

Plant nutrition involves several processes:

- Absorption of water and mineral salts
- Transport and distribution of fluids by vessels
- **Photosynthesis**
  YouTube: *Designmate Pvt. Ltd. … "Science – Amazing Process Of Photosynthesis" (till 3')*
- **Cellular respiration**
- Gas exchange.





8.3. IMPORTANCE OF PLANTS IN THE BIOSPHERE

Plants are very important because:

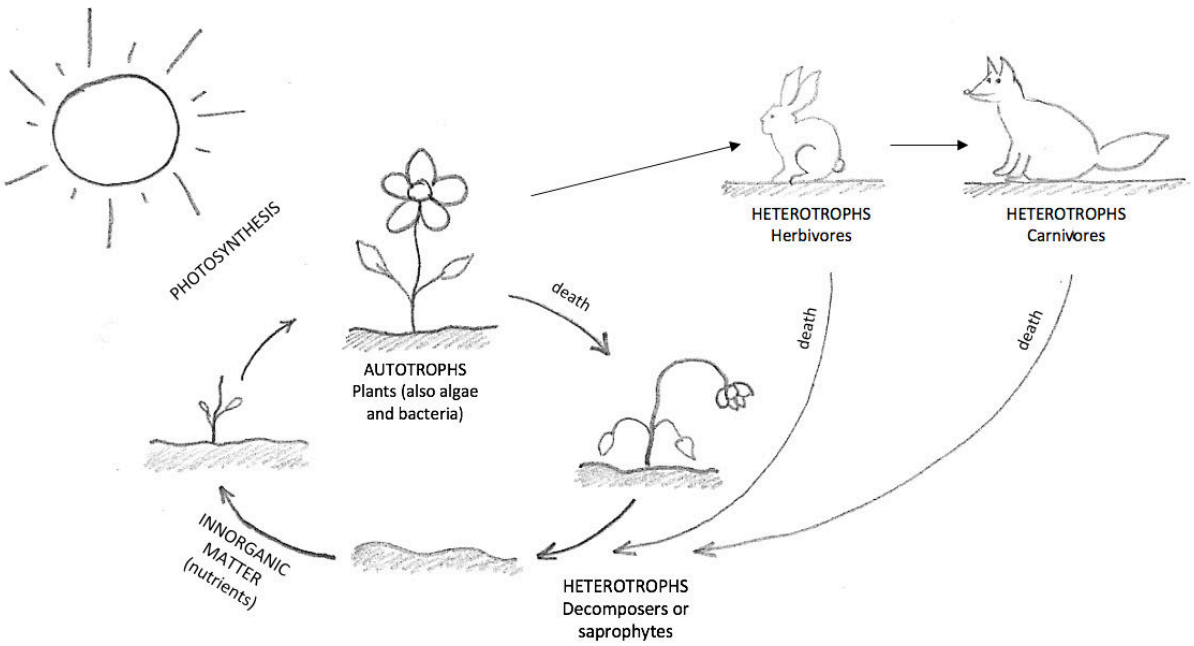
- They are the principal producers of the O_2 we breath.
- They help to regulate the amount of CO_2 in the atmosphere because they absorb CO_2 during the process of photosynthesis.
- Their roots prevent soil erosion.
- Plants are a fundamental part of the food chains in ecosystems.

8.4. RELATIONSHIP BETWEEN AUTOTROPHS AND HETEROTROPHS

YouTube: *DesertUSA "Desert food chain"*

Remember:

- **Autotrophs** combine inorganic matter (water, mineral salts and CO_2) with energy from the Sun (photosynthesis) or from chemical reactions (chemosynthesis) to produce their own organic compounds. Plants, algae and some bacteria are autotrophs.
- **Heterotrophs** take organic matter made by other living things. Animals, fungi, protozoa and some bacteriaare heterotrophs. According to the type of food they eat, the heterotrophic organisms are classified into:
    - Herbivores: they eat plants (e.g. cows)
    - Carnivores: they eat meat (e.g. lions)
    - Omnivores: they eat meat and plants (e.g. humans)
    - Saprophytes: they eat decaying organic matter (e.g. fungi).



ACTIVITIES

ACTIVITY 35. Circle true (T) or false (F) and justify your answer.

- Autotrophs combine organic matter (water, mineral salts and CO_2) with energy from the Sun to produce their own inorganic compounds. T / F

  Justification:

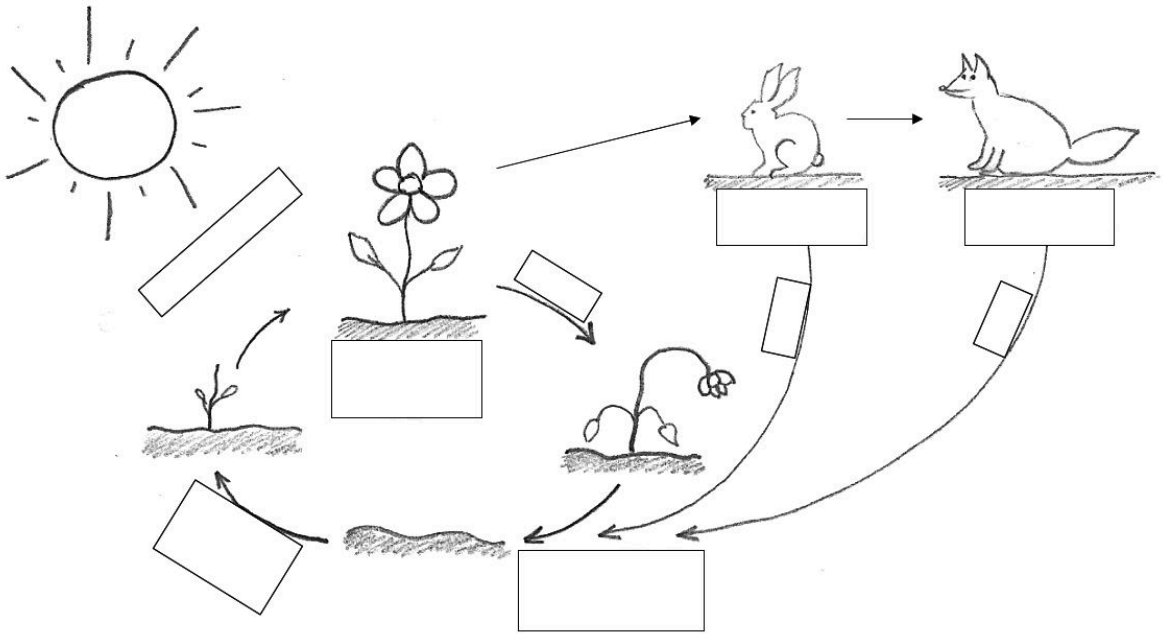
- Some fungi are autotrophs. T / F

  Justification:

- Herbivores take organic matter made by other living things. T / F

  Justification:

ACTIVITY 36. Complete the picture to describe the relationship between autotrophic and heterotrophic organisms and answer the questions.



- Which process does transform inorganic matter into organic matter?
- Which living things do transform inorganic matter into organic matter?
- Which living things do transform organic matter into inorganic matter?

Unit 9
ADAPTATIONS

YouTube: *FuseSchool - Global Education*:

- *"What Is Adaptation? Ecology & Environment Biology"*
- *"Adaptations Of Camels Ecology & Environment Biology"*
- *"Adaptations Of Predators And Prey Ecology & Environment Biology"*
- *"Adaptations Of Plants &Extremophiles Ecology & Environment Biology"*

An **ADAPTATION** is a characteristic which helps an organism to survive in its environment. These adaptations are determined by different environmental factors depending on the type of ecosystem:

- The most important adaptations to the**terrestrial environment**are to light, temperature and humidity.
- The most important adaptations to the**aquatic environment**are to light, dissolved O_2, salt concentration, density and pressure.

Look through the gallery below and notice the adaptations:

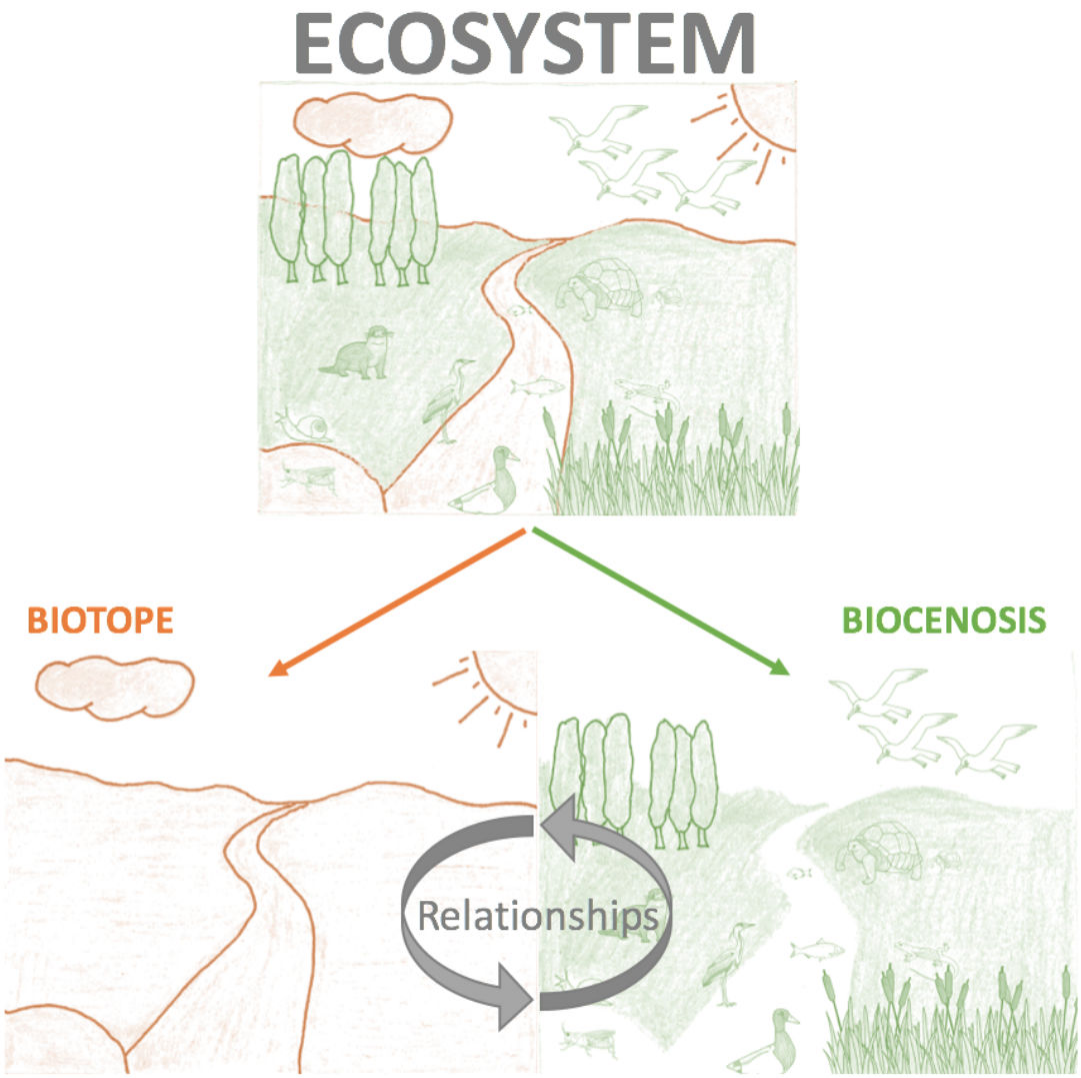
	A dromedary camel with its very long eyelashes, and nostrils that can open and close.		A giraffe reaching leaves way up in the tree.
	The fennec fox's long ears.		Black circles around a meerkat's eyes.
	A jackrabbit's long ears and powerful hind legs that help it move very quickly.		A lioness's sandy-coloured fur and long, rough tongue.
	Emperor penguins huddling together to keep warm.		A stingray that's buried itself in the ocean floor.

	This wood frog's skin looks a lot like the branch it's sitting on.		Clownfish in anemone tentacles.
	A porcupine and its quills.		A sea urchin's spiky shell.
	You can barely see the snowy owl in the snow… and behind all its feathers.		A tapir swimming with its long nose held up out of the water.
	This cactus displays several desert adaptations: it has spines rather than leaves and it stores water in its stem.		Drip-tips on leaves help shed excess water.
	Soft stems enable prairie grasses to bend in the wind. Narrow leaves minimize water loss.		Broad leaves can capture a lot of sunlight for a tree.

https://www.theschoolrun.com/homework-help/animal-adaptation

Unit 10
ECOSYSTEMS

10.1. GENERAL CHARACTERISTICS OF ECOSYSTEMS



Biotope is the inert part of the ecosystem formed by:

- the physical environment (rocks, air and/or water)
- the abiotic factors: they are the physical and chemical elements of an ecosystem which affect living organisms, such as temperature, humidity, solar radiation, etc.

Biocenosis is the living part of the ecosystem formed by the set of living beings (animals, plants, fungi, protoctists and bacteria). They are known as biotic factors.

An ecosystem, therefore, consists of **3** elements:

1. **BIOTOPE**: it includes the physical components and conditions of an ecosystem.
2. **BIOCENOSIS**: it is the collection of organisms which lives in an ecosystem.
3. **RELATIONSHIPS**: the living beings of an ecosystem are related to each other and to the physical environment.

Ecosystems can be very diverse:

- They can be **aquatic**(e.g. a river) and **terrestrial** (e.g. a field).
- They can be **small** and with well-defined limits, like for example, a lake, and they can be **large** and with undefined limits such as an ocean or a forest.

BIOMES are large geographical areas with similar climatic conditions that have similar ecosystems too.

The ECOSPHERE is formed by all ecosystems of the Earth.

PRÁCTICA DE LABORATORIO Nº 13: *Red trófica de un lago.*

YouTube: *Lincoln Learning Solutions "Earth's Interconnected Cycles"*

10.2. BALANCED AND IMBLANCED ECOSYSTEMS

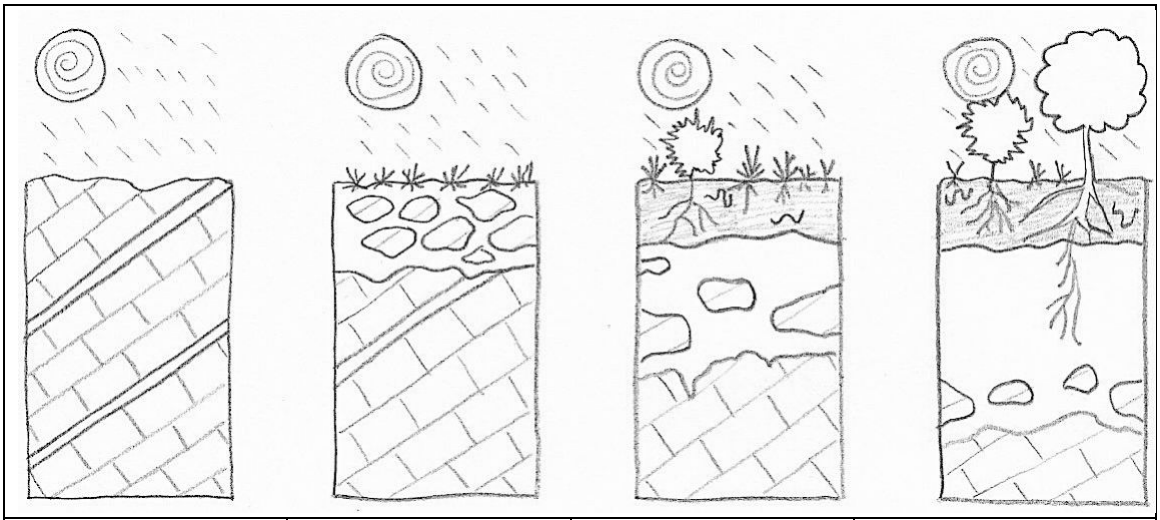
All parts of an ecosystem must work together to reach a balance that allows each of the members of the system to thrive. In a **BALANCED ECOSYSTEM**, for instance, predators keep the population of rabbits from growing too large because when there are too many rabbits they eat too many plants. If rabbits ate too many plants, the plants would not be able to grow back fast enough and other animals that need the plants would not have enough to eat. **ECOSYSTEMS** can become **IMBALANCED** when something disrupts their normal workings. Many factors can lead to this situation:

- **Natural disruptions:** wildfires, flooding or volcanic eruptions.
- **Human disruptions:**
    - Invasive species: (zebra mussel, tiger mosquito, red palm weevil...)
    - Extensive crops (reduction of biodiversity)
    - Forest fires (long recovery time)
    - Pollution:
        - Oil spills damage marine and coastal ecosystems.
        - Trophic networks are specially affected by rubbish (mostly plastic and its chemical additives; bioaccumulation).
        - Air pollutants affect the health of the living things.

YouTube: *WillDiv "Por qué BOO casi destruye Monstruos S.A \| Biología de Disney"*

10.3. SOIL FORMATION

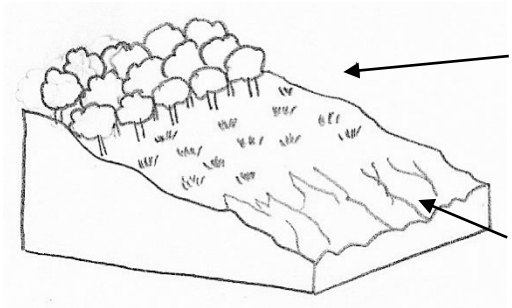
Soil is the top fertile layer of the Earth's surface where plants grow. Soil is also an ecosystem with its own biocenosis and biotope which change often. Soil consists of: 45% mineral matter, 25% water, 25% air and 5% organic matter.



1. Bedrock begins to disaggregate by wind, rain and snow. Smaller rock particles mix with other sediments.	**2.** Breakdown of rocks is accelerated by some bacteria, lichen and fungi. Rock particles are tiny and have nutrients.	**3.** Small plants and many invertebrates (eg. worms) colonize the topsoil. Soil thickness keeps increasing.	**4.** Plant roots of different sizes make the soil more porous, which increases the amount of nutrients and its fertility.

10.4. THE IMPORTANCE OF SOIL

Terrestrial ecosystems depend on soil. Without soil, there would be no agriculture, for instance. The proper use of soil and conservation measures are necessary to protect it from degradation. The destruction or degradation of soil creates a serious loss because recovery is a very slow process.



The loss of vegetation especially trees and shrubs, leaves the soil unprotected against erosion and reduces the soil's ability to retain water.

Sediments are washed away by the rain.

Soil degradation has three main causes:

- **Pollution.** When toxic substances (Hg, Pb, etc.) are accumulated in the topsoil, they are absorbed by plants, making them unsafe for food.
- **Soil compaction**. It is the loss of porosity. Rock particles get closer together, reducing the water and air content. Agricultural vehicles and deforestation lead to soil compaction.

- **Salinization.** Whether due to natural causes or improper irrigation, the consequence is a build-up of mineral salts in the topsoil.

Desertification consists of a complete loss of soil, generally produced by erosion. It can be caused by natural factors (extreme weather events) or human activities (e.g. deforestation).

ACTIVITIES

ACTIVITY 37. Define the following terms:

a. Ecosystem:

b. Biome:

c. Ecosphere:

d. Biotope:

e. Biocenosis:

ACTIVITY 38. Underline the correct option (italic):

- *Rivers / Fields* belong to aquatic ecosystems.
- *Ecosphere / Biome* is formed by all ecosystems of the Earth.
- Rocks, air and water belong to *abiotic factors / physical environment*.
- Solar radiation is *a biotic factor / an abiotic factor*.
- The different populations that live together in an ecosystem are *a community / the biotope*.

ACTIVITY 39. Read the following terms and choose the correct words to fill in each column:

FUNGI	ROCKS	WATER	BACTERIA	HUMIDITY
PLANTS	AIR	WIND	ANIMALS	RAINFALL
SUNLIGHT	ALGAE	LION	TEMPERATURE	WORM

BIOCENOSIS	BIOTOPE

ACTIVITY 40. Watch and listen to the video to complete the text.
YouTube: *Free School "Understanding Ecosystems for Kids: Producers, Consumers, Decomposers"*

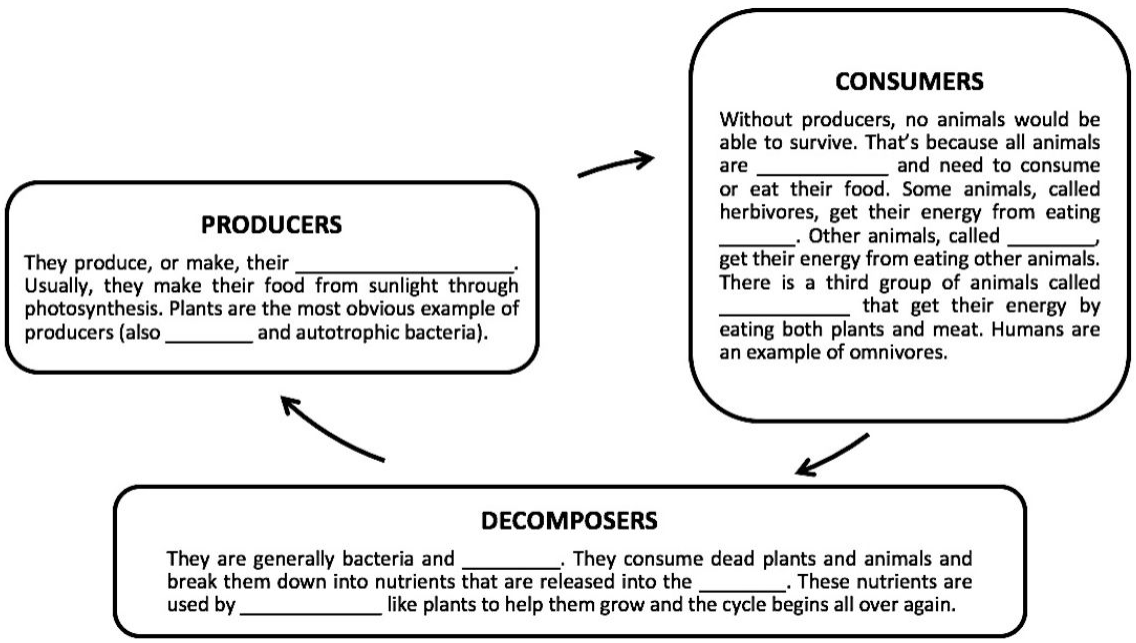
The Earth is covered in living things. From very large organisms to the tiniest creatures, all living things on Earth have one thing in common: they cannot survive alone. To grow and flourish, living things need the support of an _____.

An ecosystem is what we call all the things that interact in a specific area, both _____ and non-living. Ecosystems can be hard to define. They are interconnected in many ways, and it is not always easy to see _____ one ecosystem ends and another begins. Different ecosystems may look very similar or very different from one another, but all ecosystems are made of the same basic parts. Ecosystems have both living and non-living parts:

- The non-living parts of an ecosystem include things like _____ and _____, _____ and _____, the types and amount of _____ available and _____ and _____ (abiotic factors).
- The living parts of an ecosystem are the _____ and _____ in it, also fungi, protoctists and bacteria (biotic factors).

The non-living parts of an ecosystem combine to create the conditions that will determine what kinds of living things will be able to _____ there. You won't find a coral reef in the desert or cactus in the ocean, because the conditions are wrong for them to live and grow.

There are three main types of living things in an ecosystem: producers, consumers and decomposers:



…

All the parts of an ecosystem must work _____ to reach a balance that allows each of the members of the system to thrive.

- For example, in a **_____ ECOSYSTEM** predators _____ the population of _____ from growing too large because when there are too many rabbits they eat too many _____. If rabbits ate too many plants, the plants would not be able to grow back fast enough and other animals that _____ the plants would not have enough to eat. _____ enough plants the animals that depend on them for food would start to die and the soil begins to erode, or wash away, which makes it harder for new plants to _____ in the future.
- **ECOSYSTEMS** can become **_____** when something _____ their normal workings. Anything from bad weather to diseases to an erupting volcano can disturb an ecosystem. _____ activity can also _____ the balance of natural ecosystems. By cutting down trees and clearing forests, building roads and cities, killing some animals, introducing new ones or creating pollution, it can become impossible for the plants and animals in an _____ to grow and thrive.

ACTIVITY 41. Draw an ecosystem of a LITTLE LAKE with 5 biotic elements and 5 abiotic elements (use two colours to differentiate biotic and abiotic factors); name each element. Explain two **relationships** between biotope and biocenosis of your picture.

ACTIVITY 42. Underline actions that unbalance an ecosystem:

Cutting down trees	Oil spills	Indiscriminate hunting
Fire	Invasive species	Building roads
Rain	Extensive crops	Living inside a trunk

ACTIVITY 43

A. Which actions do prevent negative impacts on the environment?

   a. Adopt innocuous agro-ecological practices for the environment.

   b. Rehabilitate sites contaminated by mining waste.

   c. Devise hybrid and electric vehicles and implement their use.

   d. Reduce emissions from important industrial and manufacturing sources.

   e. Increase the treatment, recycling and reuse of wastewater.

B. Read again the actions above and circle the ones about soil pollution:

   a. b. c. d. e.

ACTIVITY 44

A. Explain the following sentence: *Soil is not only made of stones*.

B. Draw a picture of the soil which represents your explanation.

Unit 11
RESEARCH WORK

Esta unidad se trabajará a través de la realización de un proyecto de investigación en el que tendrán que elaborar un informe y una presentación. A modo de ejemplo se adjunta un documento proforma adaptado al ecosistema de la "Laguna de las Moreras", localizado en el Puerto de Mazarrón.

LAGUNA DE LAS MORERAS

Puerto de Mazarrón

NAME:

INDEX

Page

1. LOCATION

Localización del ecosistema en un mapa

2. CLIMATE GRAPH

Climograma

3. FLORA AND FAUNA

3.1. FLORA

Scientific name: Classification: *Imagen*	Scientific name: Classification: *Imagen*
Scientific name: Classification: *Imagen*	Scientific name: Classification: *Imagen*

3.2. FAUNA

Scientific name: Classification: *Imagen*	Scientific name: Classification: *Imagen*
Scientific name: Classification: *Imagen*	Scientific name: Classification: *Imagen*

3.3. ENDEMIC SPECIES

Scientific name: *Imagen*
Breve descripción

3.4. ENDENGERED SPECIES

Scientific name: *Imagen*
Breve descripción y motivo por el que está en peligro de extinción

4. TROPHIC NETWORK ILLUSTRATION

Diagram *Red trófica de la malvasía cabeciblanca*
Explanation

5. IMBALANCED ECOSYSTEM AND PREVENTIVE ACTIONS

6. BIBLIO/WEBGRAPHY

PRÁCTICAS DE LABORATORIO

NOTA: Las prácticas se plantean en español con ampliación de vocabulario en inglés.

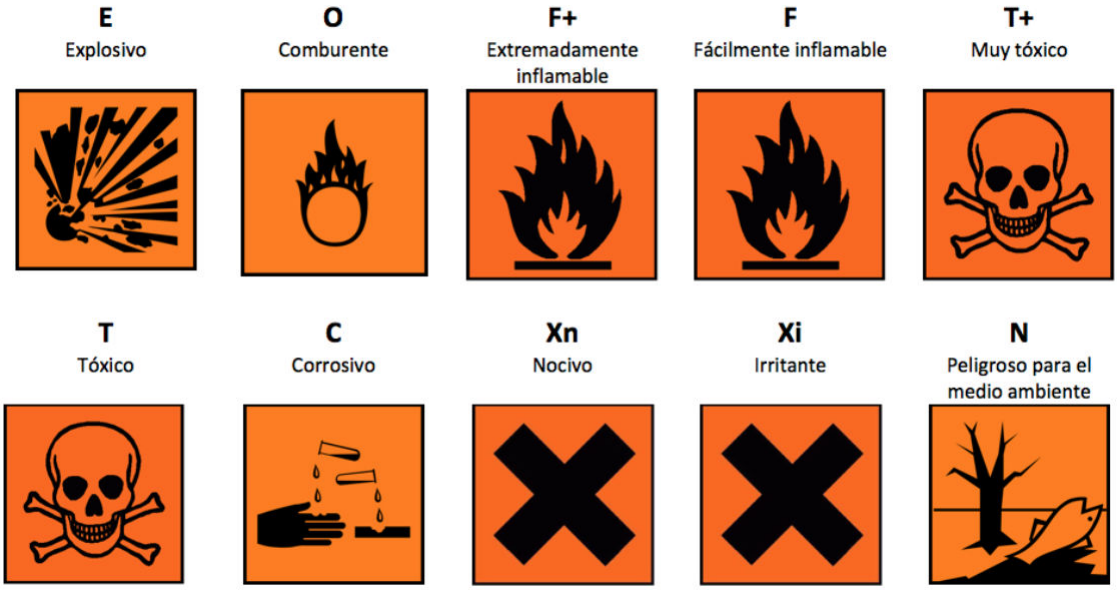
Práctica de laboratorio nº 1
NORMAS DE FUNCIONAMIENTO Y MATERIAL

NORMAS

1) **Atender las indicaciones del profesor**
   Sentarse y depositar los enseres en el lugar indicado por el profesor. Es importante que las mesas sólo se ocupen con el material de trabajo de la práctica correspondiente. Por lo general, se trabajará en pareja.
2) **Leer detenidamente el guion antes de su desarrollo**
   Se esta manera se adquiere una idea clara de su objetivo, fundamento y técnica.
3) **Comprobar, antes de comenzar, que el material necesario está preparado**
   Según la relación que aparece en el guion de la actividad, y que ese material está en perfectas condiciones de uso. Si no fuera así, comunícaselo a tu profesor.
4) **Evitar todo desplazamiento innecesario**
   No moverse del puesto de trabajo salvo que la práctica lo requiera o lo indique el profesor. Queda terminantemente prohibido desplazarse corriendo o jugar con el material de laboratorio; estas acciones podrían provocar un accidente.
5) **Recoger, limpiar y ordenar al finalizar la práctica**
   Si sobra tiempo, pide a tu profesor que te indique lo que puedes hacer.

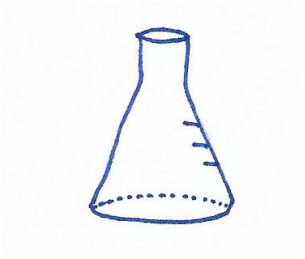
SÍMBOLOS DE PELIGROSIDAD

Aparecen en el etiquetado de los productos químicos de un laboratorio e indican la peligrosidad de la sustancia.



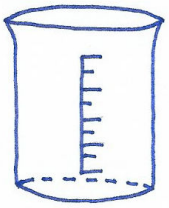
MATERIAL DE LABORATORIO · *LABORATORY EQUIPMENT*

MATRAZ · ***flask***
Recipiente de vidrio que se usa para medir líquidos o mezclar soluciones químicas. Hay varios tipos. En la imagen se muestra el matraz Erlenmeyer.

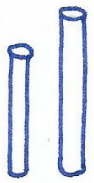


PROBETA · ***graduated cylinder***
Cilindro graduado de vidrio para medir volúmenes de forma exacta. La parte superior suele tener un pico que facilita el vertido.

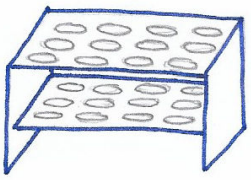
VASO DE PRECIPITADO · ***beaker***
Recipiente cilíndrico de vidrio de diferentes capacidades para preparar o calentar sustancias, medir o traspasar líquidos.



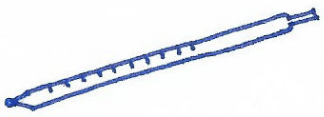
TUBOS DE ENSAYO · ***test tube***
Pequeños tubos cilíndricos de vidrio con un extremo abierto (que puede poseer una tapa) y el otro cerrado y redondeado para contener pequeñas muestras líquidas o sólidas y/o realizar reacciones químicas en ellos.



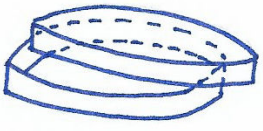
GRADILLA · ***test tube rack***
La gradilla es un soporte para mantener los tubos de ensayo en posición vertical.



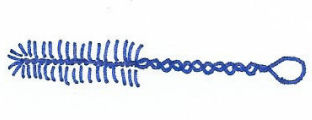
PIPETA · ***graduated pipet***
Tubo transparente (vidrio o plástico) graduado con un extremo en forma cónica que permite medir con mucha precisión el volumen de un líquido succionado (pipeteado).



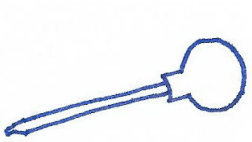
PLACA O CAJA DE PETRI · ***Petri dish***
Recipiente redondo (cristal o plástico) con una cubierta de diámetro algo mayor que no lo cierra de forma hermética. Se usa para cultivos celulares y germinación de semillas.



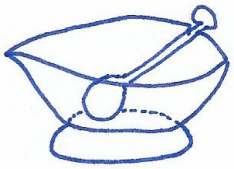
ESCOBILLA · ***test tube brush***
Cepillo utilizado para la limpieza de tubos de ensayo y otros utensilios de vidrios tales como probetas, vasos de precipitados y matraces.



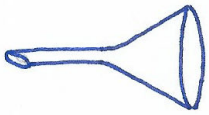
CUENTAGOTAS · ***dropper***
Tubo hueco, cónico en su extremo inferior y cerrado por la parte superior con una perilla o dedal de goma. Se utiliza para trasvasar pequeñas cantidades de líquido.



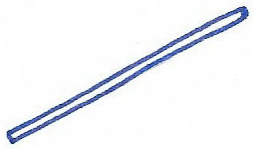
MORTERO · ***mortar***
Utensilio de vidrio o cerámica compuesto de un recipiente cóncavo y una mano · ***pestle***. Se utiliza para triturar.



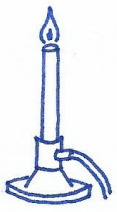
EMBUDO · ***funnel***
Pieza cónica utilizada para filtrar o trasvasar sustancias líquidas.



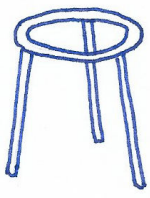
VARILLA DE VIDRIO · ***glass rod***
Su nombre la describe. Permite mezclar o disolver sustancias con el fin de homogeneizarlas.



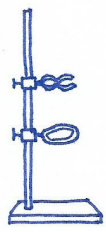
MECHERO BUNSEN · ***Bunsen burner***
Instrumento utilizado para calentar, esterilizar o proceder a la combustión de muestras o reactivos químicos. Funciona con butano. También existe el mechero de alcohol.



TRÍPODE · ***tripod***
Formado por tres patas fijadas a un círculo o triángulo. Se usa como soporte de recipientes de vidrio para su calentamiento (se coloca sobre una rejilla metálica para difundir mejor el calor).



SOPORTE O PIE · ***stand***
Pieza donde se sujetan las pinzas de laboratorio para sujetar tubos de ensayo, embudos, etc. También se emplea para montar aparatos de destilación y otros equipos similares.



Práctica de laboratorio nº 2
UN COHETE PARA EXPLORAR EL UNIVERSO

INTRODUCCIÓN Y OBJETIVOS

No hay nada mejor que un cohete · ***rocket*** para explorar el universo de primera mano.

Aunque nuestro objetivo es más modesto que el de Elon Musk o cualquier agencia espacial (NASA, ESA…), en esta práctica se construirá un cohete que, al menos, cruzará parte de la troposfera.

MATERIAL Y MÉTODOS

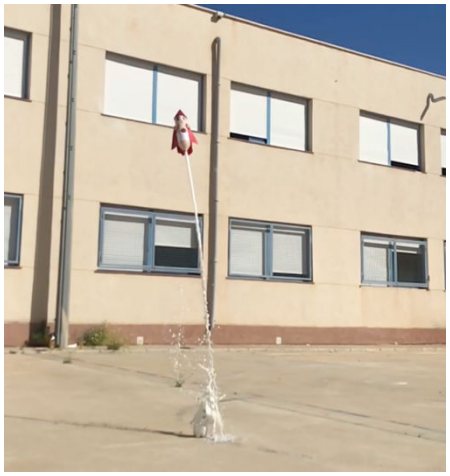
- 2 botellas · ***bottles***
- Papel WC · ***toilet paper***
- Hilo · ***thread***
- Cinta adhesive · ***adhesive tape***
- Tijeras · ***scissors***
- Corcho · ***cork***
- Cutter
- Rotuladores · ***markers***
- Cartulina · ***cardboard***
- Bicarbonato sódico · ***sodium bicarbonate (3 spoons)***
- Vinagre · ***vinegar (3 fingers)***
- Elementos decorativos · ***any decorative element***

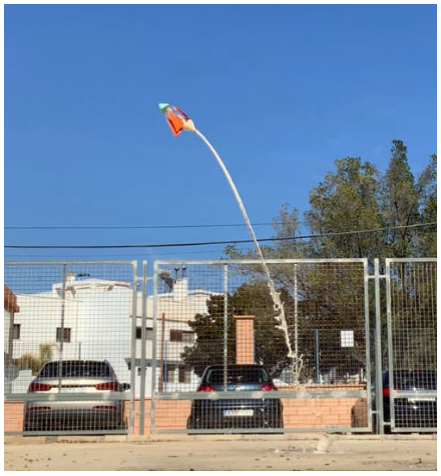
En el siguiente vídeo se presentan los materiales necesarios y el procedimiento para la construcción de un cohete con materiales sencillos y el empleo de productos cotidianos como combustible para su lanzamiento:

YouTube: *Uno para todo "Cohete casero de vinagre y bicarbonato de sodio | Experimento Fácil"*

RESULTADO

http://www.csicenlaescuela.csic.es/proyectos/moleculas/experiencias/iesantonio-hellin/cohete-para-el-aula.htm





Práctica de laboratorio nº 3
ESTRUCTURA DE LA GEOSFERA

INTRODUCCIÓN Y OBJETIVOS

La geosfera se divide en capas de distintos materiales según su densidad:

- Corteza (capa de menor densidad)
- Manto
- Núcleo (capa de mayor densidad)

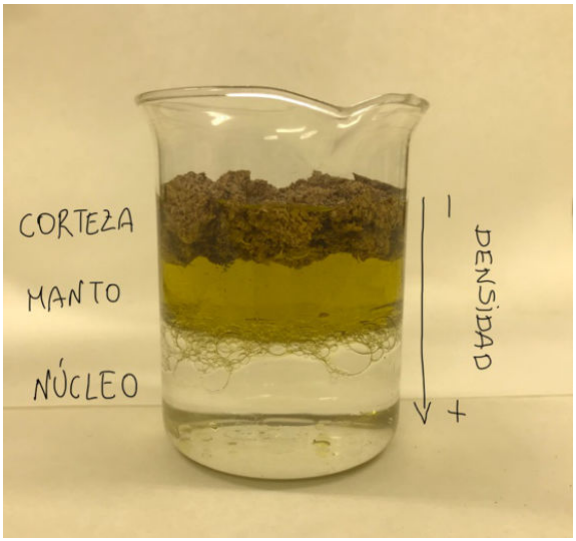
En esta práctica se van a representar cada una de las capas desde el principio de la formación del planeta Tierra, momento en el que estaban muy calientes y mezcladas, hasta su momento actual, en el que están separadas en función de la densidad como consecuencia de su enfriamiento.

MATERIAL Y MÉTODOS

- Virutas de corcho · ***cork shavings***
- 200 ml de aceite · ***oil***
- 100 ml de agua
- Vaso de precipitado de 250 ml
- Varilla de vidrio

1. Añadir al vaso de precipitado de 250 ml las virutas de corcho y verter el agua y el aceite simultáneamente. Esta acción representa una Tierra muy caliente con todos los materiales mezclados.
2. Dejar reposar para que se estratifique. Esta acción representa el enfriamiento del planeta y la disposición de los materiales en función de su densidad, dando lugar a las 3 capas principales de la geosfera.

RESULTADO



Práctica de laboratorio nº 4
RECONOCIMIENTO DE MINERALES Y ROCAS

INTRODUCCIÓN Y OBJETIVOS

Un **mineral** es una sustancia natural, de composición química definida, normalmente sólido e inorgánico, y que tiene una cierta estructura cristalina. Los minerales presentan ciertas *propiedades* a través de las cuales pueden identificarse.

Una **roca** es un agregado mineral, es decir, una combinación única de minerales. Las rocas se pueden clasificar atendiendo a propiedades, como la composición química, la textura, la permeabilidad, etc., pero el criterio más usado es el origen: ígneas (o magmáticas), sedimentarias y metamórficas.

En esta práctica se van a reconocer y clasificar una serie de minerales y rocas, observando sus propiedades y características.

MATERIAL Y MÉTODOS

- Colección de minerales y rocas
- Moneda, llave, vidrio y cuarzo
- Placa de porcelana
- Ácido clorhídrico 5%

Emplear la información y las claves dicotómicas adjuntas para identificar los ejemplares seleccionados de la colección de minerales y rocas.

Propiedades de los minerales

El **COLOR** puede estar enturbiado por impurezas que lleva el mineral mezcladas.

El **COLOR DE LA RAYA** se observa al frotar el mineral sobre una placa de porcelana. Hay que tener en cuenta que puede no TENER RAYA.

El **BRILLO** puede ser metálico o no metálico. A su vez, el no metálico puede ser vítreo (si recuerda al vidrio), marmóreo (mármol), céreo (cera) o adamantino (diamante). Si no tiene brillo se dice que es mate.

La **DIAFANIDAD** consiste en observar cómo se desplaza la luz a través del mineral. Puede ser opaco (no deja pasar la luz), translúcido (la deja pasar la luz parcialmente) o transparente (deja pasar totalmente la luz).

La **DUREZA** de un mineral es “la resistencia que ofrece el mineral a ser rayado”. Existe una escala de dureza de los minerales llamada **ESCALA DE MOHS:**

DUREZA	MINERAL	Ejemplar	PRUEBA
1	Talco *Talc*		Se raya fácilmente con la uña.
2	Yeso *Gypsum*		Se raya con la uña con más dificultad.
3	Calcita *Calcite*		Se raya con una moneda de cobre.
4	Fluorita *Fluorite*		Se raya con un cuchillo.
5	Apatito *Apatite*		Se raya con un cuchillo con más dificultad.
6	Ortosa *Orthose*		Se raya con una lija de acero.
7	Cuarzo *Quartz*		Raya al vidrio.
8	Topacio *Topaz*		Rayado por herramientas de carburo de tungsteno.
9	Corindón *Corundum*		Rayado por herramientas de carburo de silicio.
10	Diamante *Diamond*		Rayado sólo por otro diamante.

https://www.pinterest.es/pin/314126142730032162/

Claves dicotómicas para el reconocimiento de rocas

CLAVE DICOTÓMICA PARA ROCAS SEDIMENTARIAS

A.- Rocas formadas por fragmentos ..... ROCAS DETRÍTICAS
B.- Rocas no formadas por fragmentos ..... ROCAS NO DETRÍTICAS

A - Rocas detríticas

1.- Rocas formadas por fragmentos que se ven a simple vista	2
1.- Rocas formadas por fragmentos tan pequeños que no se ven a simple vista. Si se acerca a los labios húmedos se adhiere ligeramente	**Arcilla** · ***Clay***
2.- Rocas formadas mayoritariamente por granos de arena	**Arenisca** · ***Sandstone***
2.- Rocas formadas mayoritariamente por fragmentos mayores que granos de arena	3
3.- Fragmentos de forma redondeada	**Conglomerado**
3.- Fragmentos angulosos	**Brecha**

B - Rocas no detríticas

1.- Rocas muy oscuras con aspecto de **carbón** o líquidas	**Rocas organógenas**
1.- Rocas que no cumplen lo anterior	2
2.- Rocas que al añadir unas gotas de HCl producen efervescencia ...	**Caliza** · ***Limestone***
2.- Rocas que no producen efervescencia	3
3.- Rocas incoloras o blanquecinas	4
3.- Rocas de color carne o rojizo	**Carnalita o Silvina**
4.- Rocas insípidas	**Yeso**
4.- Rocas de sabor salado	**Halita**

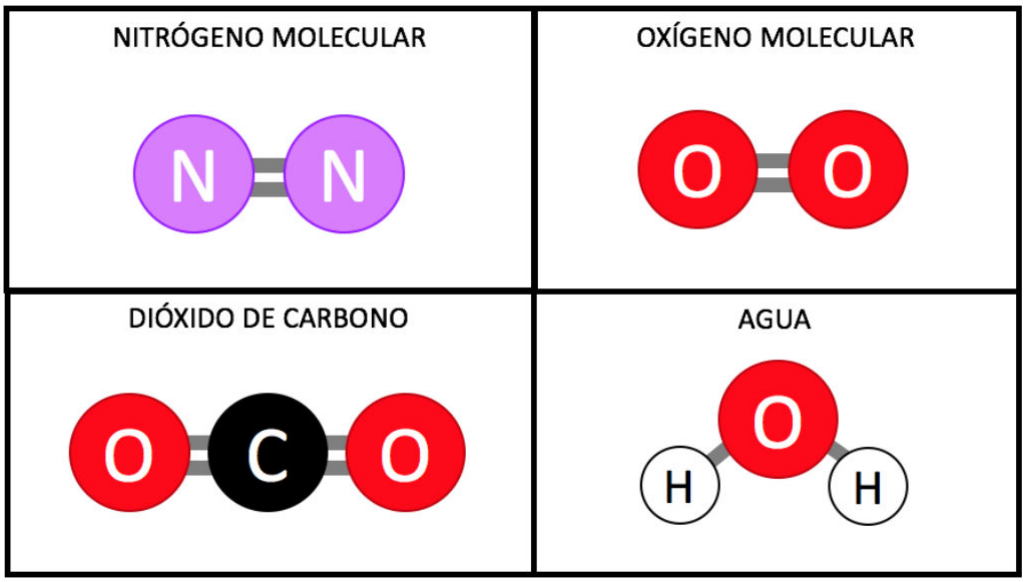
CLAVE DICOTÓMICA PARA ROCAS MAGMÁTICAS Y METAMÓRFICAS

1.- Rocas cristalizadas, al menos en parte	2
1.- No cristalizadas, todo pasta vítrea	8
2.- Cristales dispuestos en bandas delgadas y paralelas (estructura foliada)	3
2.- Cristales no dispuestos en bandas	5
3.- Roca de color oscuro, que forma láminas	**Pizarra** · ***Slate***
3.- Roca con minerales alineados en bandas claras (cuarzo y feldespatos) y oscuras (micas)	4
4.- laminas con cristales de grosor desigual	**Gneis**
4.- Láminas visibles y el mismo grosor	**Esquisto**
5.- Roca formada enteramente por cristales del mismo mineral	6
5.- Roca formada por pequeños cristales de diferentes minerales	7
6.- Hace efervescencia con el ácido	**Mármol** · ***Marble***
6.- No hace efervescencia con el ácido; raya el vidrio	**Cuarcita**
7.- Roca de aspecto claro cristales trasparentes, blancos/rosas y negros bien diferenciados	**Granito**
7.- Roca de aspecto oscuro; sin cuarzo y sin mica	**Diorita**
8.- Pasta vítrea de color negra o gris oscuro	**Basalto**
8.- Color claro, muy porosa y ligera (no pesa)	**Pumita**

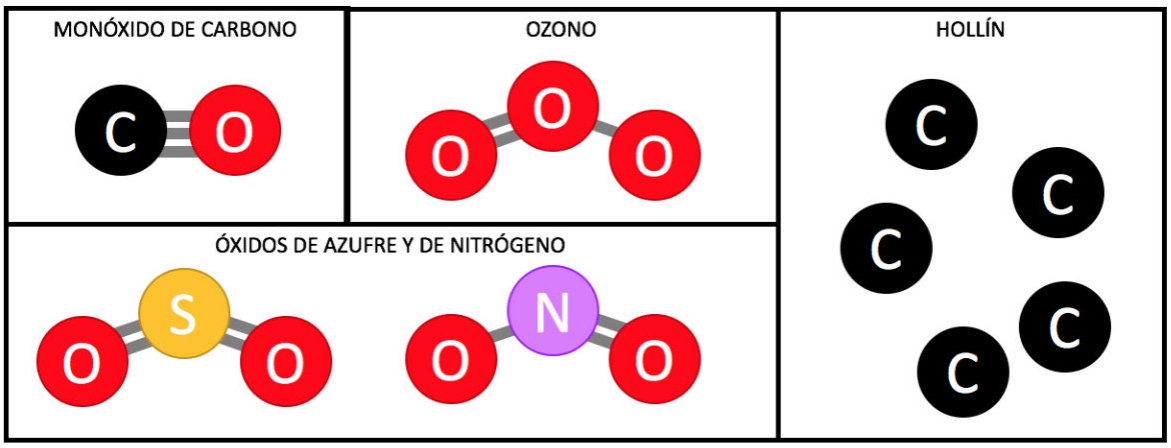
Práctica de laboratorio nº 5
COMPOSICIÓN DE LA ATMÓSFERA Y CONTAMINANTES ATMOSFÉRICOS

INTRODUCCIÓN Y OBJETIVOS

La composición actual de la atmósfera y su estructura estratificada permite representarla fácilmente mediante la construcción de modelos moleculares 3D y su disposición en capas.



Del mismo modo, se pueden incluir los principales contaminantes atmosféricos que se vierten a la troposfera: monóxido de carbono, ozono, óxidos de azufre y de nitrógeno y hollín.

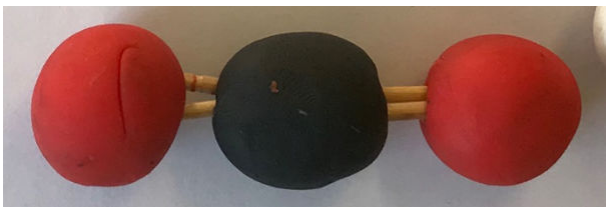


En esta práctica se pretende realizar una representación doble de los 50 primeros kilómetros de la atmósfera (troposfera y estratosfera), uno de los cuáles incluirá los contaminantes atmosféricos, en los que se identificará su procedencia.

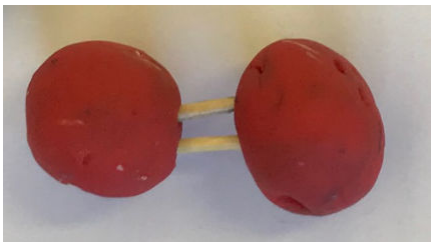
MATERIAL Y MÉTODOS

- Plastilina · ***modeling clay*** violeta, roja, negra, blanca y amarilla
- Palillos · ***sticks***
- Superficie horizontal amplia (tablero de laboratorio o varias mesas juntas si se des)
- Cartulina para cartelería
- Cinta adhesiva

Ejemplo modelo CO_2



Ejemplo modelo O_2



Ejemplo modelo H_2O

Representación de la troposfera y la estratosfera a escala 1:50.000 (20 cm = 10 km).

	NÚMERO DE MOLÉCULAS POR REPRESENTACIÓN	
	Sin contaminantes	**Con contaminantes**
78% de **N_2**	40	40
21% de **O_2**	10	10
Otros 1% (H_2O y CO_2)	1 agua + 1 CO_2	1 agua + 1 CO_2 5 (1 de cada contaminante)
Capa de O_3	10	10

Práctica de laboratorio nº 6
DEPURADORA CASERA

INTRODUCCIÓN Y OBJETIVOS

Las aguas urbanas tienen que ser procesadas en las depuradoras antes de volver al medio natural. Se separa así el agua limpia del resto de residuos. En esta práctica se verá cómo se puede limpiar el agua fabricando un filtro casero · ***homemade filter***. El agua que se obtiene es NO POTABLE.

MATERIAL Y MÉTODOS

- Botella de agua cortada
- Hojas
- Arena
- Grava muy fina
- Grava cada vez más gruesa
- Cantos rodados
- Algodón
- Muestra de agua sucia
- Vaso

SeCyT 2018

Práctica de laboratorio nº 7
CULTIVO DE MICROORGANISMOS

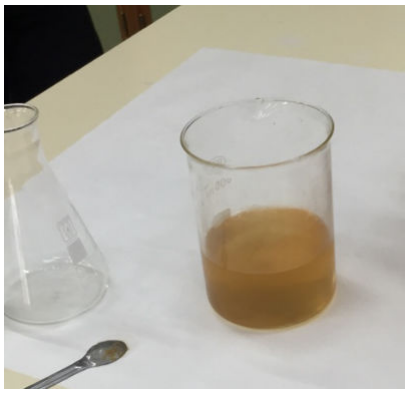
INTRODUCCIÓN Y OBJETIVOS

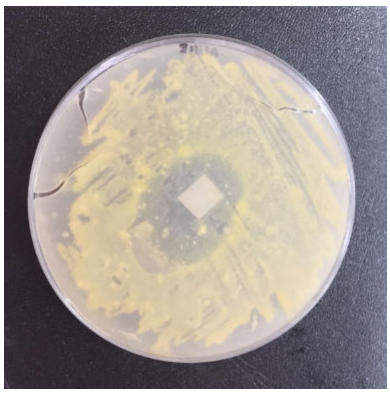
Los microorganismos no se ven a simple vista. Sin embargo, estamos rodeados de ellos y, a los que viven de forma natural en nuestra piel, hay que añadir los de las superficies de los objetos que tocamos. En ocasiones, estos microorganismos pueden ser patógenos (causar enfermedades), por lo que es importante tener una buena higiene de manos a la hora de comer o cuando se van a manipular alimentos. En esta práctica se comprobará, no sólo la existencia de microorganismos en nuestra piel, sino cómo varía la cantidad con y sin lavado de manos.

MATERIAL Y MÉTODOS

- 1 sobre de gelatina · ***jelly*** sin sabor
- Un cubito de concentrado de carne
- Agua
- Placas de Petri estériles
- Vaso de precipitado de 1 litro
- Mechero Bunsen
- Varilla de vidrio
- Trípode con rejilla

1) Para preparar el medio de cultivo (sustancia de la que se alimentarán los microorganismos) hay que disolver el cubo de caldo y el sobre de gelatina en 1/2 litro de agua.
2) Poner al fuego y llevar a ebullición. Hervir durante 10'.
3) Trasvasar la mezcla a las cajas de Petri y colocarles la tapa. Dejar enfriar hasta que gelifique el medio de cultivo.
4) Cultivo:
    a. Mano no lavada: plasmar los dedos de una mano sobre el medio de cultivo y etiquetar la placa con la siguiente información: nombre – fecha – mano no lavada.
    b. Mano lavada con agua y jabón: plasmar los dedos de una mano sobre el medio de cultivo y etiquetar la placa con la siguiente información: nombre – fecha – mano lavada.
5) Incubar las placas en oscuridad durante 24-48 horas.

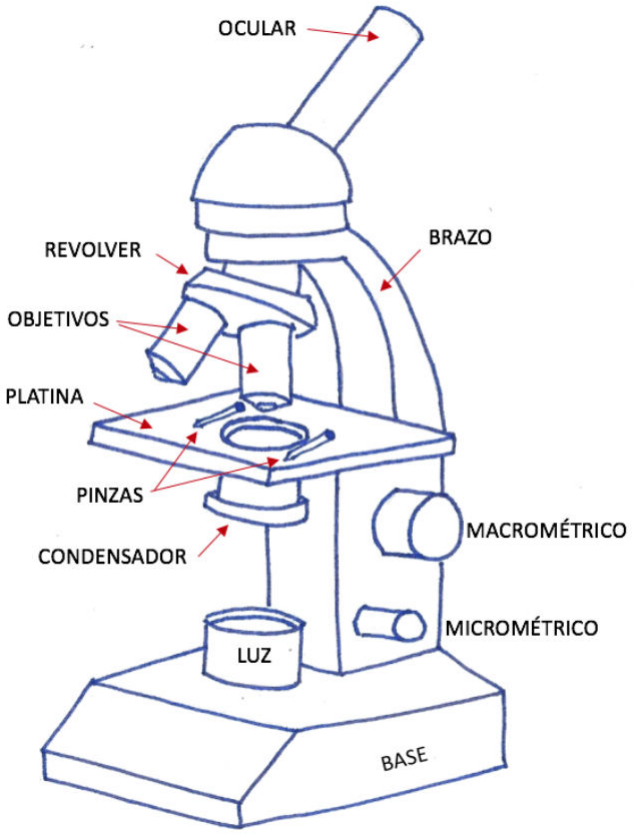




Práctica de laboratorio nº 8
MICROSCOPIO ÓPTICO Y OBSERVACIÓN DE PROTOCTISTAS

El **MICROSCOPIO ÓPTICO** es un instrumento empleado habitualmente en la observación de células animales, vegetales y bacterias Puede llegar a aumentar 500 veces la visión del ojo humano y su poder de resolución es de 0,2 micrómetros.

PARTES DEL MICROSCOPIO ÓPTICO · ***optical or light microscope***	
Sistema óptico	**Sistema mecánico**
Foco. Dirige los rayos luminosos hacia el condensador. **Diafragma.** Regula la cantidad de luz que entra en el condensador. **Condensador.** Lente que concentra los rayos luminosos sobre la preparación. **Objetivo.** Lente situada cerca de la preparación. Amplía la imagen de ésta. **Ocular.** Lente situada cerca del ojo del observador. Amplía la imagen del objetivo.	**Soporte**. Mantiene la parte óptica. Tiene dos partes: el pie o base y el brazo. **Platina**. Lugar donde se deposita la preparación. **Cabezal**. Contiene los sistemas de lentes oculares. Puede ser monocular o binocular. **Revólver**. Contiene los sistemas de lentes objetivos. Al girar, permite cambiar los objetivos. **Tornillos de enfoque**. El **macrométrico** aproxima el enfoque y el **micrométrico** lo ajusta.



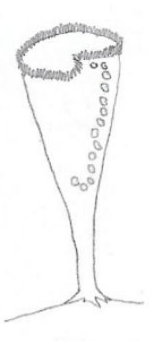
INTRODUCCIÓN Y OBJETIVOS

Las aguas estancadas son un perfecto caldo de cultivo para el desarrollo de microorganismos del reino protoctista. La toma de muestras de este tipo de agua permite la observación al microscopio de algas y protozoos que viven en este medio. En esta práctica se van a observar al microscopio óptico algunos ejemplares pertenecientes a microorganismos del reino protoctista. Se adjunta una pequeña colección de imágenes de protozoos como referencia. En cuanto a las algas, las más comunes son las diatomeas y el género *Euglena*.

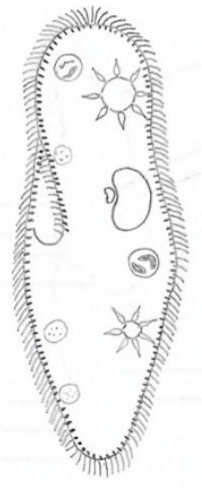
Tetrahymena

Euplotes

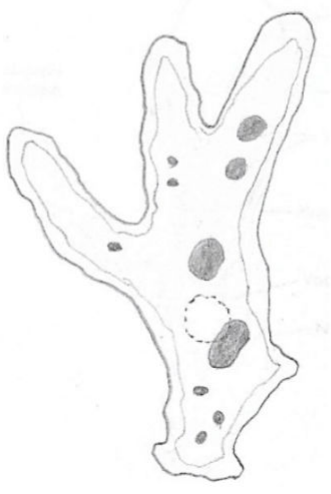
Epistilis



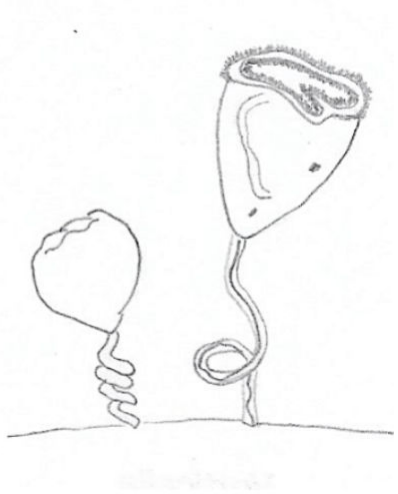
Stentor



Paramecium sp.



Amoeba proteus



Vorticella

MATERIAL Y MÉTODOS

- Muestra de agua estancada
- Cuentagotas
- Microscopio óptico
- Porta y cubreobjetos

1) Con el cuentagotas, coger agua de la muestra y colocarla en el portaobjetos.
2) Colocar el cubreobjetos sobre la muestra evitando la formación de burbujas.
3) Observar al microscopio la muestra *in vivo*.

Práctica de laboratorio nº 9
LUPA BINOCULAR Y OBSERVACIÓN DE MOHO

La lupa binocular es un instrumento que se emplea para la observación de objetos opacos. Sin embargo, su capacidad es menor que la del microscopio, alcanzando los 80 o 100 aumentos.

PARTES DE LA LUPA BINOCULAR · ***loupe***

OCULARES
A través de ellos se realiza la observación. El nº que indica el aumento viene señalado como 10X, 15X…

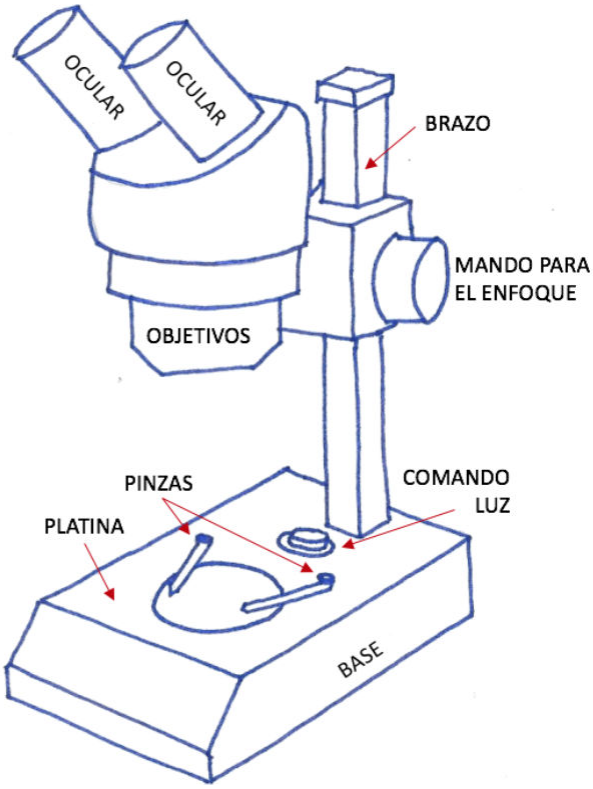
OBJETIVOS
Suele tener 1 o 2. Proporcionan diferentes aumentos cuando se seleccionan.

MANDO DE ENFOQUE
Sirve para enfocar la imagen (similar a unos prismáticos).

COLUMNA
Permite desplazar los oculares y objetivos hacia arriba o hacia abajo.

PLATINA
Zona donde se deposita la muestra que vamos a observar, puede tener pinzas.

ILUMINACIÓN
Algunas lupas tienen 1 bombilla en el objetivo y otra en la platina.



INTRODUCCIÓN Y OBJETIVOS

El deterioro de los alimentos es uno de los procesos en los que se observa con mayor claridad el desarrollo de hongos. Entre los más habituales, se encuentran los siguientes géneros: *Penicillium*, *Alternaria*, *Botrytis* y *Rhizopus*. En esta práctica se observarán a la lupa mohos crecidos en distintos alimentos.

Deterioro de alimentos provocado por hongos: pepino.

Deterioro de alimentos provocado por hongos: queso.

MATERIAL Y MÉTODOS

- Alimentos enmohecidos
- Lupa binocular
- Vidrio de reloj
- Lanceta

1) Cortar un trozo enmohecido del alimento deteriorado y colocar la muestra en el vidrio de reloj.
2) Situar el vidrio en la lupa para la observación de las estructuras del hongo.

Práctica de laboratorio nº 10
DISECCIÓN DE UN PEZ ÓSEO

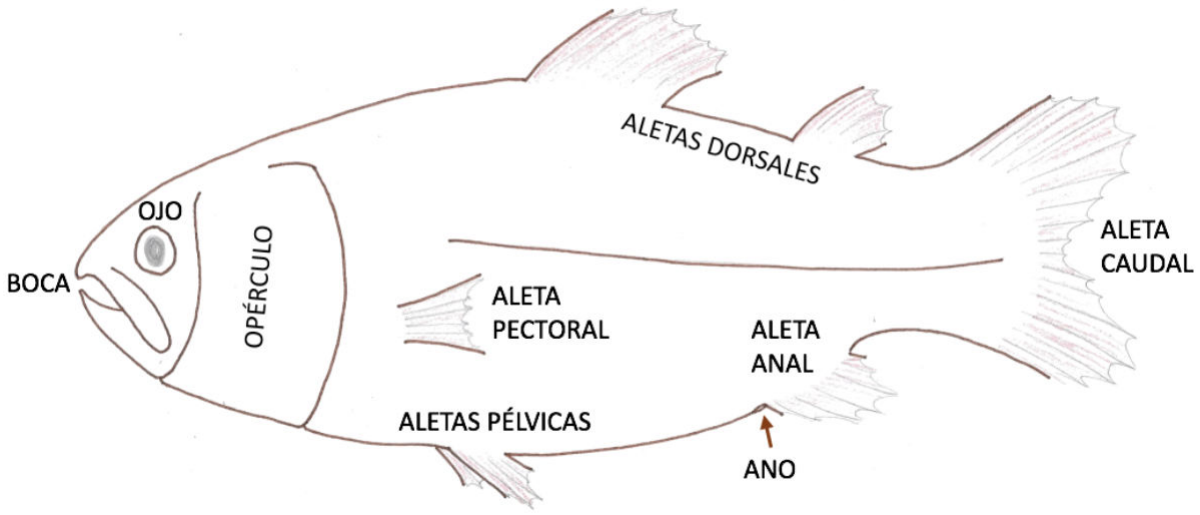
INTRODUCCIÓN Y OBJETIVOS

Como vertebrados que son, los peces tienen el cuerpo dividido en cabeza, tronco y cola, presentando internamente una columna vertebral. La forma del cuerpo es fusiforme o hidrodinámica, por lo que ofrece poca resistencia al agua y facilita su desplazamiento. En esta práctica se estudiará la anatomía externa e interna de un pez óseo como ejemplo de vertebrado.

MATERIAL Y MÉTODOS

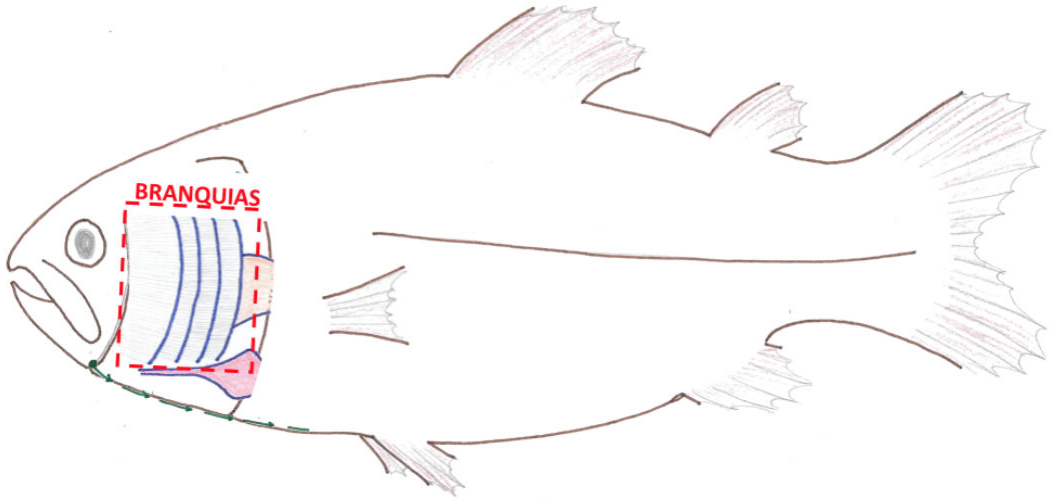
- Tijeras
- Bisturí
- Pinzas
- Cubeta de disección
- Pezóseo
- Aguja enmangada

1) Introducir el pez en la cubeta de disección y observar las estructuras señaladas de su anatomía externa.

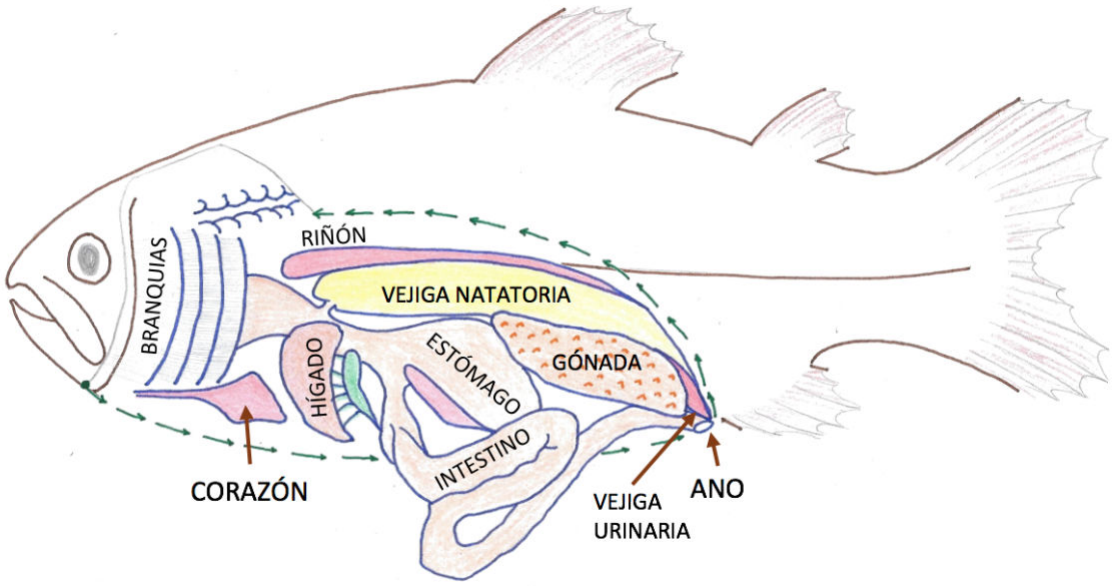


ALETA · *fin*
ANO · *anus*
OPÉRCULO · *operculum or opercule*

2) Cortar el opérculo y observar la estructura de las branquias.



3) Con las tijeras, cortar siguiendo la línea de flechas verdes hasta la altura del ano y, posteriormente, subir en arco. Retirar cuidadosamente el trozo de musculatura y observar todas las estructuras señaladas de la anatomía interna.



BRANQUIAS · ***gills***
CORAZÓN · ***heart***
VEJIGA · ***bladder***
HÍGADO · ***liver***
INTESTINO · ***intestine***
GÓNADA · ***gonad***
RIÑÓN · ***kidney***
ESTÓMAGO · ***stomach***

Práctica de laboratorio nº 11
DISECCIÓN DE UN MEJILLÓN

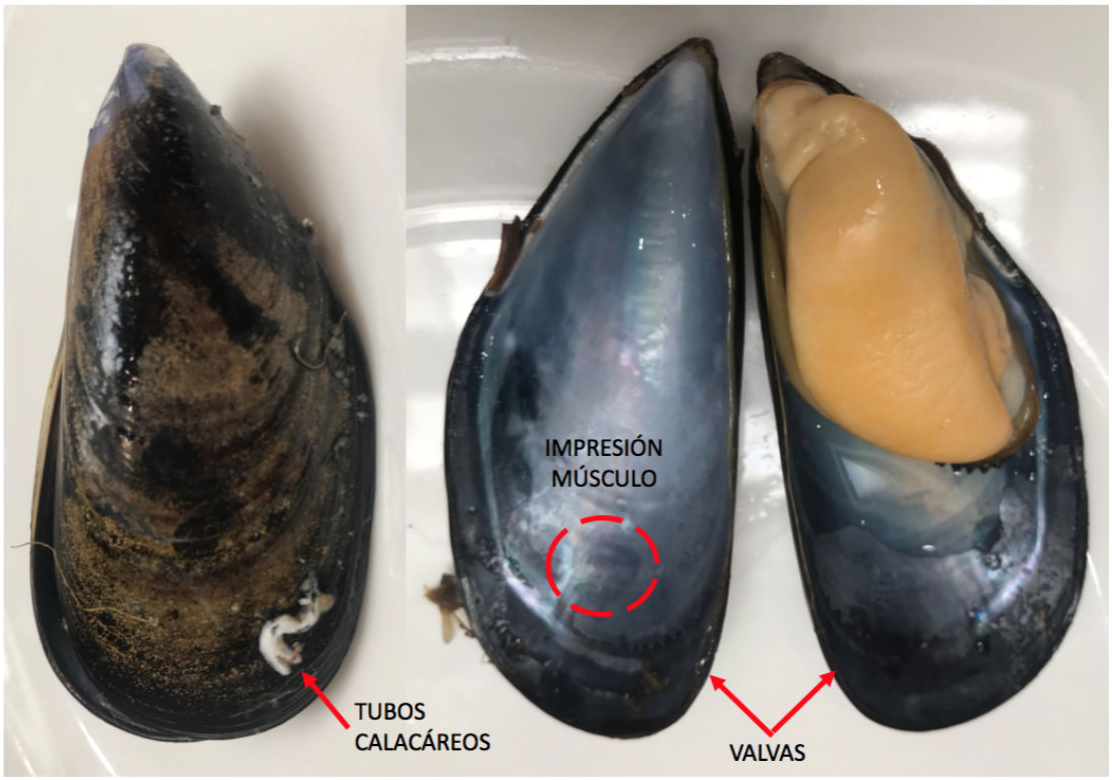
INTRODUCCIÓN Y OBJETIVOS

El mejillón (*Mytilus edulis*) es un invertebrado marino incluido en el grupo de los moluscos bivalvos. Se alimenta por filtración y vive adherido a la roca. En esta práctica se estudiará su anatomía externa e interna como ejemplo de vertebrado.

MATERIAL Y MÉTODOS

- Tijeras
- Escalpelo
- Pinzas
- Trípode con rejilla
- Agua
- Cubeta de disección
- Mejillones frescos
- Aguja enmangada
- Mechero Bunsen

1) Depositar el mejillón en la cubeta. Observar la concha, su forma y el número de valvas. Las líneas concéntricas que presentan indican las etapas de crecimiento. Puede que en la concha existan tubos calcáreos de gusanos.

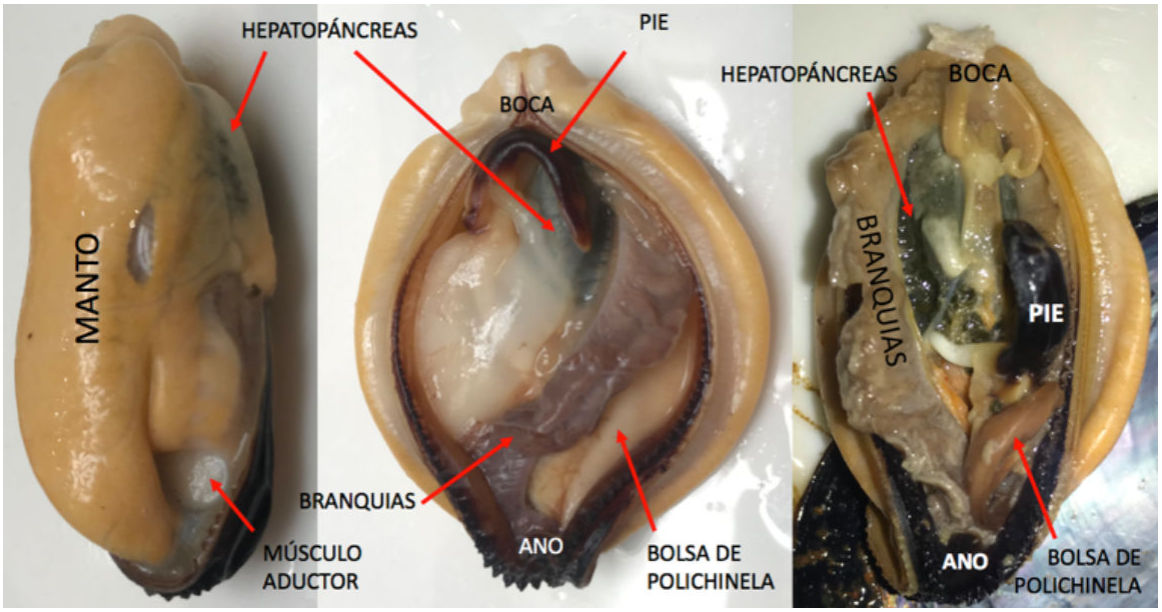


2) Introducir el mejillón durante unos minutos en un vaso de precipitados con agua previamente calentada con el Bunsen hasta que las valvas se abran. Extraer el animal y depositarlo en la plancha de disección.

3) Devolver el espécimen a la cubeta y separar la concha del resto del animal cortando los músculos aductores con el escalpelo o la tijera, observar su tamaño y la impresión que dejan en el interior de la concha.

4) Depositar lateralmente el mejillón sobre la plancha de disección y observar el manto (repliegue carnoso exterior), los músculos aductores y el hepatopáncreas (glándula digestiva de color verdoso).

5) Abrir con cuidado los lóbulos del manto e identificar boca, ano, hepatopáncreas, pie, bolsa reproductora de Polichinela y branquias.



VALVAS · ***valves***
PIE · ***foot***
IMPRESIÓN MÚSCULO · ***muscle imprint***
MÚSCULO ADUCTOR · ***adductor muscle***

Práctica de laboratorio nº 12
HERBARIO

https://www.youtube.com/watch?v=klU7kSOGxOs

INTRODUCCIÓN Y OBJETIVOS

Un herbario es una colección de plantas o partes de ellas que han sido secadas, prensadas, montadas e identificadas. Permite conocer qué plantas existen en cada lugar, conservar ejemplares de especies endémicas o en peligro, obtener material genético, realizar estudios taxonómicos, entre otros. En esta práctica se aprenderá a elaborar un herbario que incluya ejemplares de los cuatro grandes grupos de plantas.

MATERIAL Y MÉTODOS

- Papel absorbente
- Cartulina (blanca o de color claro)
- Cinta de papel finita
- Un par de libros grandes
- Cartulinas de colores
- Etiquetasy rotulador

1) Recoger 10 ejemplares de plantas asegurándose de seleccionar, al menos, un representante de musgo, de helecho, de gimnosperma y de angiosperma. En un herbario científico las plantas deben estar lo más completas posible, incluyendo todas sus partes (hojas, flores…) en función del grupo al que pertenezcan.

2) Identificar el grupo de plantas al que pertenece cada ejemplar con ayuda de una **CLAVE DICOTÓMICA**:

1.	a) They do not have vessels ……	**MOSSES**
	b) They have vessels ……	Go to 2
2.	a) They do not have flowers ……	**FERNS**
	b) They have flowers ……	Go to 3
3.	a) They have cones ……	**GYMNOSPERMS**
	b) They have fruits ……	**ANGIOSPERMS**

3) Completar la **etiqueta** · ***label*** identificativa con ayuda de la aplicación "PlantSnap: identifica plantas":

Lugar y fecha de recolección:
Clasificación:
- Reino
- Sin flores / con flores
- Musgo / Helecho / Gimnosperma / Angiosperma
- Nombre científico
- Nombre común

4) Poner cada planta lo más extendida posible entre papeles absorbentes y estos entre dos cartulinas. Guardar la etiqueta con la información indicada junto con la planta. Para guardar semillas o frutos secos se puede adjuntar un pequeño sobre.
5) Someter el conjunto a presión colocando los libros encima y ubicarlo en un lugar seco.
6) Revisar a diario los papeles absorbentes y renovarlos si están húmedos para que no se formen hongos (esto ocurre con mayor frecuencia al principio).
7) Cuando la planta ya esté completamente seca, colocarla en el formato definitivo del herbario (ej. cartulina). Fijar el ejemplar con cinta adhesiva y la etiqueta.
8) Elaborar una portada · ***cover*** en la que figure el autor.

NOTA: los pasos 2 y 3 se desarrollarán en el laboratorio; el resto de la práctica se realizará en casa.

Práctica de laboratorio nº 13
RED TRÓFICA DE UN LAGO

INTRODUCCIÓN Y OBJETIVOS

Las relaciones tróficas (alimentarias) · ***trophic or feeding relationship*** son las más importantes en un ecosistema. En esta práctica se van a representar en una cartulina las relaciones de este tipo que se dan en un lago.

MATERIAL Y MÉTODOS

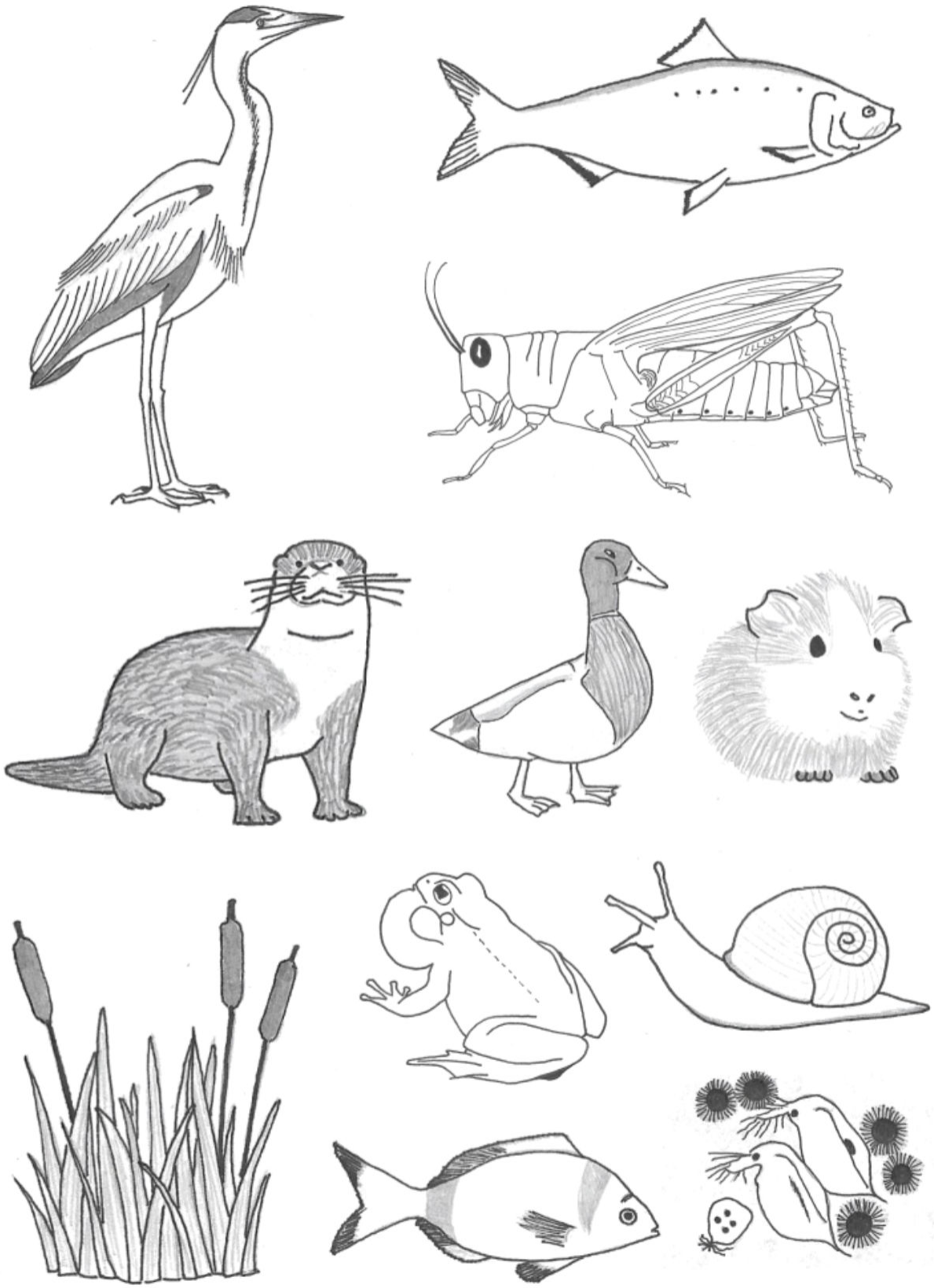
- Fotocopia de los factores bióticos
- Cartulina
- Pegamento
- Tijeras

1. Paso previo a la realización de la práctica en el laboratorio.
2. Buscar en internet la información necesaria para identificar las imágenes recogidas en "ELEMENTOS DE LA BIOCENOSIS" con el nombre común (todos los nombres comunes aparecen en la tabla "RELACIONES TRÓFICAS") y científico.
3. Recortar cada uno de los seres vivos identificándolos con su nombre común y científico en el reverso.
4. Marcar en la cartulina el perfil de un lago incluyendo los elementos característicos del biotopo (agua, piedras, aire, sol…).
5. Distribuir los factores bióticos sobre la cartulina y marcar con flechas las relaciones tróficas en función de la información recogida en la tabla "RELACIONES TRÓFICAS".
6. NOTA: las relaciones tróficas se representan con flechas (*la flecha apunta a la boca del que se lo come*).
7. Escribir en la cartulina los nombres científicos correspondientes junto a cada uno de los factores bióticos.

"RELACIONES TRÓFICAS"

FACTORES BIÓTICOS	Comido por…	FACTORES BIÓTICOS	Comido por…
Caracol	la rana y la garza	**Langosta**	la nutria, el pato, la garza y la rana
Plancton	el caracol, la mojarra y el sábalo	**Sábalo**	la nutria
Garza	---	**Cuy**	---
Rana	la garza	**Nutria**	---
Mojarra	la nutria	**Junco**	el cuy y la langosta
Pato	---		

“ELEMENTOS DE LA BIOCENOSIS”



Biology and Geology.Teoría, actividades y prácticas de laboratorio
1º ESO Programa SELE

Esta obra surge como una selección de recursos destinada a cubrir las necesidades que presenta la enseñanza en inglés de la Biología y Geología en 1º ESO.

Se organiza en una primera parte con teoría y actividades y una segunda parte en la que se detallan los protocolos para el desarrollo de las prácticas de laboratorio sugeridas a lo largo de la teoría. Además, recoge un modelo prediseñado de trabajo de investigación con el que se pretenden facilitar los primeros pasos en la elaboración de informes.

Esta propuesta didáctica está concebida para materializarse en una encuadernación sencilla con gusanillo y facilitar así su uso, convirtiéndolo en un verdadero material de batalla. Los alumnos podrán anotar el vocabulario nuevo en el propio texto, realizar las actividades propuestas en los espacios destinados para ello, recurrir al apoyo audiovisual recomendado y preparar previamente el trabajo de laboratorio.

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