UNIT 1 - LIFE

1. LIVING THINGS AND NON LIVING THINGS

In this unit we are going to study "**LIFE**". Biology is the study of living things. Consider what this means for a minute or two. Think about the different kinds of living things you know. The study of living things teaches us that, in life, there is a great **diversity**, but also a great **unit**.
All living things have certain characteristics in common. We are going to find them out.

ACTIVITY 1

Look at the pictures below and name each one with one of the given words: tree, ball, apple, stone, rabbit, moon, snake, mushroom, fire, frog, water, starfish, spider, car, bacterium, and flower.

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Make a list of living things and another one of nonliving things.

LIVING THINGS	NONLIVING THINGS

Can you find any organisms that are neither plants nor animals? Which ones?

ACTIVITY 2

For each statement below, decide if it describes
- only living things (L),
- only nonliving things (N)
- both (B)

…….. use energy

…….. can reproduce

…….. can grow

…….. breathe

…….. get rid of waste

…….. have no cells

…….. respond to changes in the environment

…….. can move

…….. die

Write down some basic functions of life. Begin the sentence with:

All living things …

ACTIVITY 3

Cells are the smallest units of living things.

Tick the places where we can find cells:

In a person's arm

In a mushroom

In a rock

In a piece of wood from a table

In a frog's leg

In a plastic pen

In animal's blood

In a bone

In a seed

ACTIVITY 4

Do you know the difference between nonliving things and a dead organism? Fill in the blanks using these words: alive (2), reproduce, time, dies , cells, environment.

Nonliving organisms have never been…… They have never done the three basic functions of organisms: Feed, interact with the …… and …… Nonliving things are not made up with …….
A dead organism has been …… for certain …… and finally it ……

2. FEATURES OF LIVING THINGS (Powerpoint)

Living things move, have senses, feed, respire, excrete, reproduce, grow…

We can group all the features of living things in three vital functions: Nutrition, Interaction and Reproduction.

Nutrition means using matter and energy. All living things need matter to grow and to repair their body and energy for movement and work. Nutrition is the way living things take and use food. Animals, for example, need to digest food (**digestion**) in order to obtain nutrients. When nutrients combine with oxygen in the cells, it produces energy (this is **respiration**). This process also produces wastes. When we breathe out, we produce waste products (water and carbon dioxide). Some waste is poison and we must remove it by **excretion**. Plants do not get their energy from food. They make their food by **photosynthesis**. This means that they catch energy from sunlight and they trap this energy in food (sugar). To take energy from food, plants respire, so they combine sugar with oxygen and this process produces wastes: carbon dioxide, and water vapor.

Interaction means responding or reacting to changes in the surroundings. For example, when we are hot, we sweat and when we are cold we shiver. These are body responses to the temperature changes. Plants also respond by moving towards or away from the sunlight (**phototropism**).

Reproduction is the way living things make more of themselves. It allows each kind of living thing to exist on Earth for a period of time.

Most animals reproduce using **sexual reproduction**. This requires two parents- a male and a female. Males make sex cells called **sperm** cells and female make sex cells called **egg cells**. Each cell contains a nucleus and they join in a process called **fertilization**. For fertilization to happen, the sperm cells need to get the egg cells. In some animals, this process occurs in water, this is external fertilization. In other animals, the male places the sperm inside the female. This is called internal fertilization. In plants, sexual reproduction also occurs. For this to happen, pollen from one flower needs to get to the stigma of another flower. This is called **cross-pollination**. If pollen of a flower lands on the stigma from the same plant, we call this **self-pollination**.
The sexual reproduction produces offspring which are similar to their parents. They are not identical. The offspring have traits from both parents.
When reproduction requires only one parent, it occurs **asexual reproduction**. Sponges and cnidarians reproduce by **budding.** A bud forms in the adult body. The bud breaks off after some time and develops into a new animal. Another kind of asexual reproduction is **regeneration.** Sponges and planaria reproduce through regeneration. A whole animal develops from just a part of the original animal.
The asexual reproduction produces **clones**. A clone is an exact copy of its parent. The clone's traits are identical to the traits of its parent.

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ACTIVITY 1

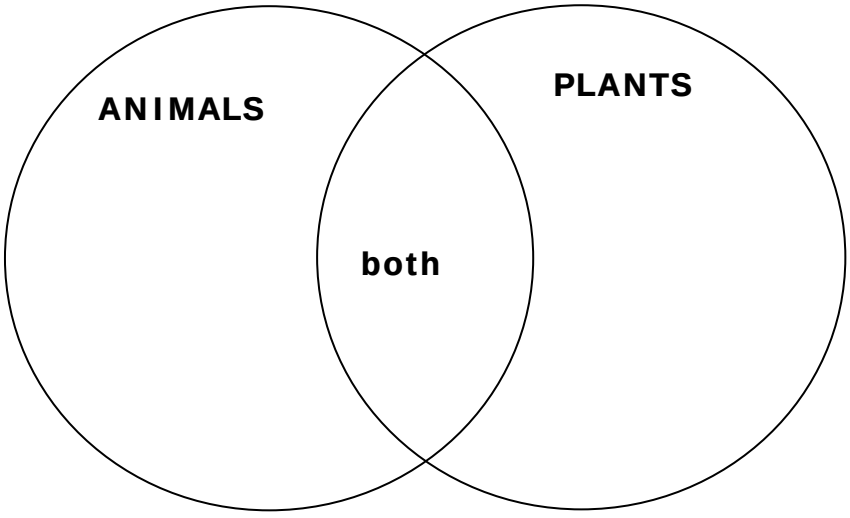
Classify the following verbs into the three vital functions.

Run, eat, mate, grow, see, breath, listen, drink, taste, reproduce, digest, smell, talk, excrete.

ACTIVITY 2

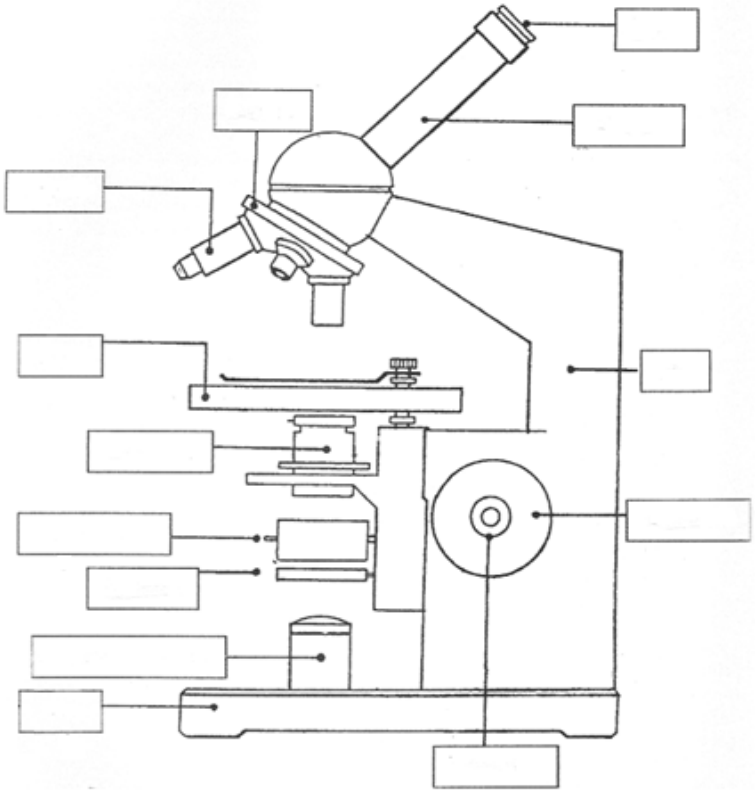
Draw a Venn diagram using the following categories:" Animals only", "Plants only" and "Both animals and plants".

Excretion, photosynthesis, movement from place to place, respiration, growth throughout life, eating other living things, growth towards light, growth stops when adult size is reached, reproduction.



3. THE MICROSCOPE

Fill in the gaps using the words below, and listening to what the teacher explains about each one:



1. Turret/Revolving nosepiece
2. Objectives
3. Stage
4. Condenser
5. Diaphragm
6. Filter
7. Light
8. Base
9. Fine focusing knob
10. Coarse focusing knob
11. Arm
12. Optic tube
13. Eyepiece

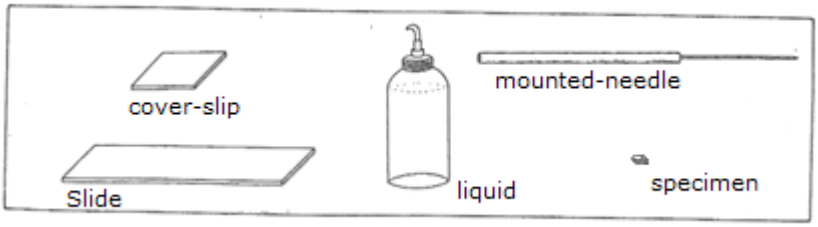
MAGNIFICATION:

When a microscope makes an object bigger, we say the object has been magnified. Magnification is how much bigger the object looks than it really is. You can find the total magnification by looking on the side of the objective lenses and the eyepiece lens.

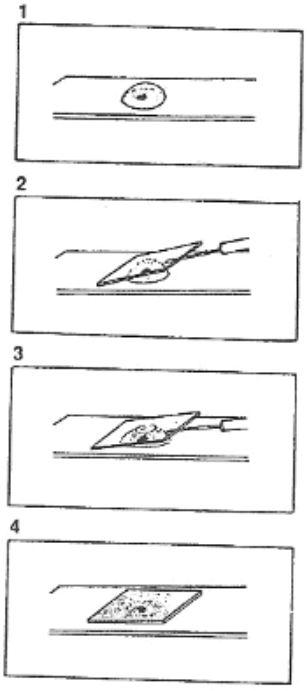
Total Magnification(X) = M. of objective lens X M. of eyepiece lens

➡ A microscope has a X10 eyepiece lens and a X15 objective lens. What is the total magnification?

This is the material that is normally used to prepare a microscope slide:



Complete the following sentences about the steps that are needed to prepare a microscope slide. Use the words in the box above.



- Place the _____ on a_____ (in the centre) with a drop of _____ (water).

- Lower carefully with a _____ in order not to get any air bubbles.

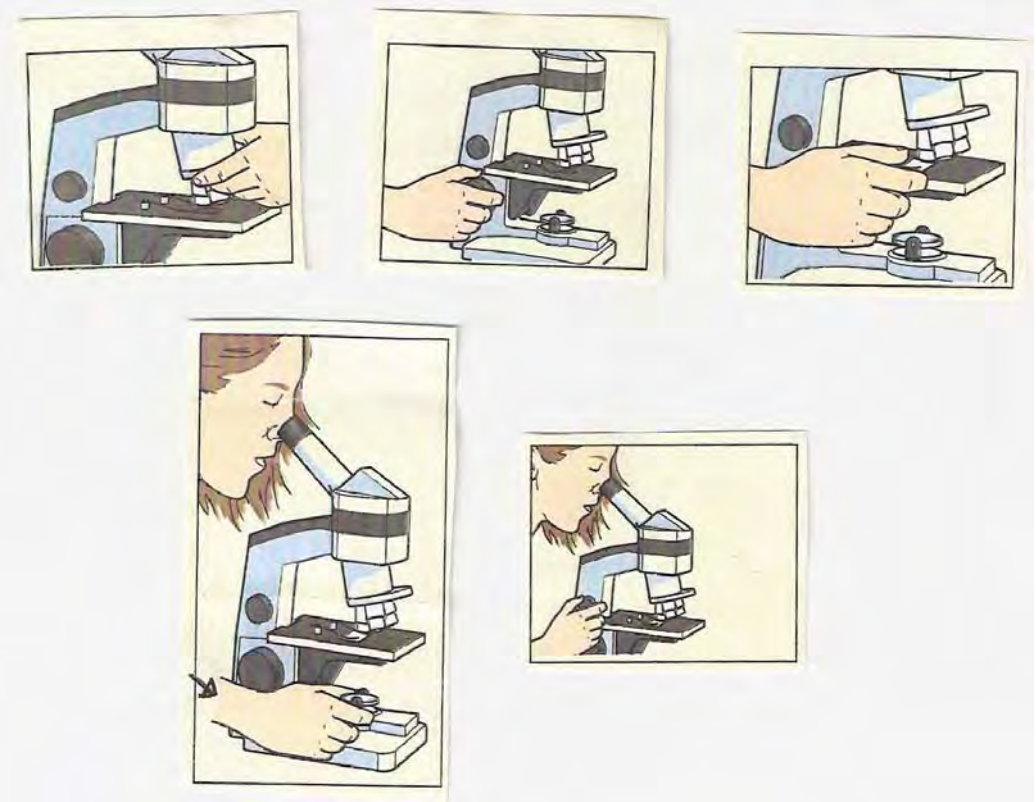
- The _____ slide is _____ to be looked at.

- Cover the _____ with a _____.

4. HOW DO WE USE A MICROSCOPE?

Write the following instructions in the correct order below the pictures:

A- Look into the eyepiece lens.
B- Turn the coarse focusing knob to focus.
C- Place the smallest objective lens over the hole in the stage.
D- Adjust the light source.
E- Place the slide under the clips of the stage.



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ACTIVITY 1 Answer the following questions using the answers given (there are extra answers and one is left)

Questions:

1. Why does a specimen need to be thin?

2. Why do we use cover-slips?

3. Why do we have to adjust the light source?

4. Why can we use stains in the drop of water we place on the slide?

5. Why can we sometimes get some air bubbles when we prepare things to be looked at with a microscope?

Answers:

A. Because we need light to go up through the hole in the stage.

B. Because we don't lower the cover-slip carefully and slowly.

C. Because light has to pass through it.

D. Because we need to have the object magnified.

E. Because they hold the specimen in place and stop it drying out.

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LABORATORY 1- MAKING A SLIDE OF ONION CELLS

LAB REPORT:

Aim: This experiment aims at looking at plant cells.

Material: Onion

Instruments	Substances
• Forceps,slide,cover-slip,mounted-needle, microscope	• Iodine solution

Procedure:

First, we cut a small piece of onion.
Then, we peel off the inner surface with forceps or finger nails.
Next, we put the piece of onion ”skin” on a slide and we add two drops of iodine solution.
After this, we lower the cover-slip using a mounted-needle.
Finally, we place the slide on the stage of the microscope and focus carefully with the lower objective.

Results:

We can distinguish plant cells with.....

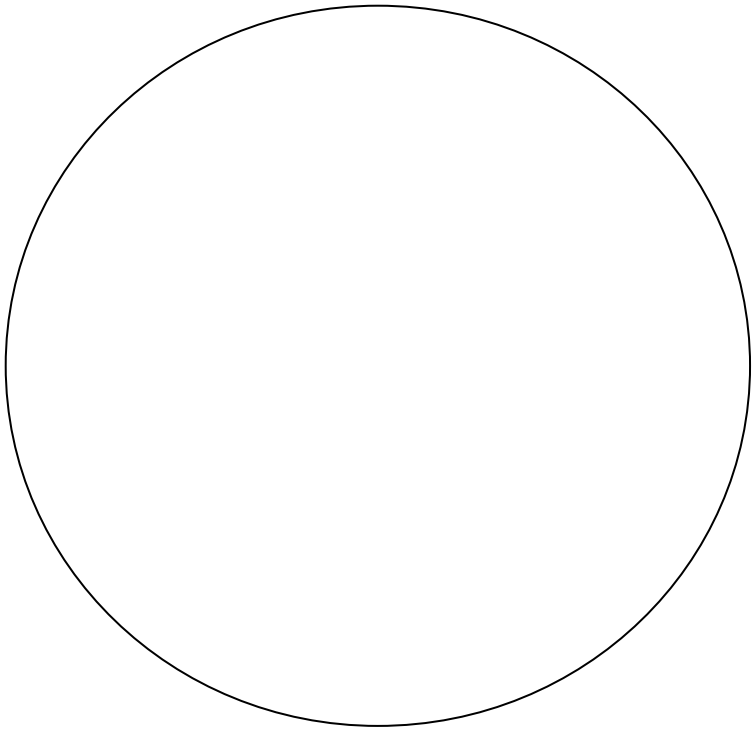
We cannot see chloroplasts because.....

Conclusions:
The experiment has shown that.....

I have learnt that.....

The most interesting thing is...

Drawing:



Discussion:
In groups of four try to evaluate your drawings. Think about the criteria to be assessed.

5. WHAT ARE CELLS?

Living things or organisms have cells. A **cell** is the smallest part of an organism. Cells keep the organism alive. That is why cells are called the basic units of life.

Cells have different **structures**. Some structures make food. Some structures give the cell energy. Other structures move material from one place to another.

Different organisms have different kinds of cells. Plant cells are different from animal cells.

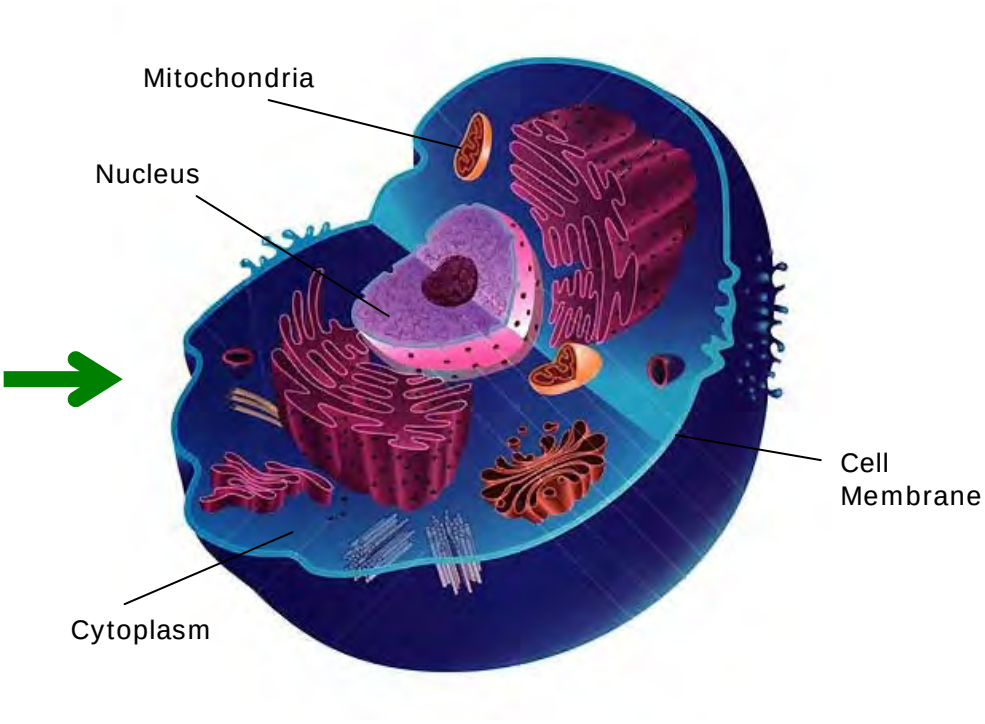
Plant cells have a chemical called **chlorophyll**. Chlorophyll uses sunlight to make food. It also makes the plant green. Chlorophyll is in the chloroplasts.

Plants and trees rise up from the ground. They need to "stand" by themselves. This is why plant cells have a cell wall. Cell walls are rigid. They make the plants strong.

Animal cells do not have cell walls. They do not have chloroplasts either. But animal cells have many of the same structures. For example, plant cells and animal cells have a **cell membrane, nucleus** and **cytoplasm**. In the cytoplasm they have **mitochondria** and **vacuoles**. The nucleus controls everything the cell does. The cytoplasm is the liquid inside the cell. The mitochondria give the cell energy. The cell's vacuoles store food, water, and waste. The cell membrane holds the cell together.

Inside an animal cell

Your cells are not very different from the cells of a frog, a cat or a horse. In fact, all animal cells have these parts:



- **Cell membrane**. This is a thin skin around the cell. It lets some things pass through, but stops others.

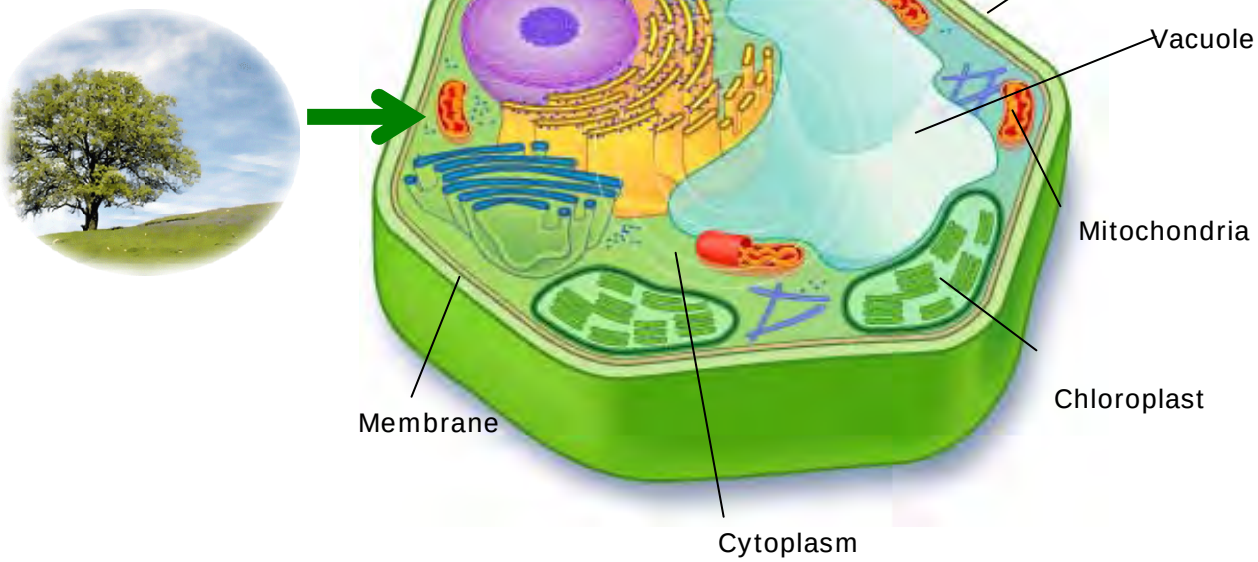
- Cytoplasm. This is a jelly containing hundreds of chemicals. Lots of chemical reactions go on in it. It fills the cell. It contains structures that give energy: the **mitochondria.**

- Nucleus. It controls what a cell does, and how it develops.

- Vacuole. This is a space within the cell containing air, liquids, or food particles. Animal cells usually have several small vacuoles.

Inside a plant cell

All plant cells have these parts:



- Cell wall of cellulose. It covers the cell membrane.

- Cytoplasm. All plant cells have this. The liquid inside it is called cell sap.

- Vacuole. They store food. Mainly starch.

- Chloroplasts. These are tiny discs full of a green substance called chlorophyll.
They trap the light energy that plants need for making food by photosynthesis.

- **Mitochondria**. Plants also need to burn the food they make to get energy.

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ACTIVITY 1

a. Write the differences between plant and animal cells:

Plant cells	Animal cells
1	**1**
2	**2**
3	**3**
4	**4**

b. Write down the common features of animal and plant cells:

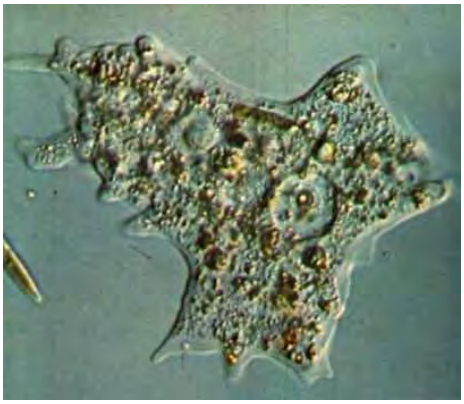
1.

2.

3.

All organisms are made up of cells but some of them are made up of only one cell. You need a microscope to see them. If you look at a drop of pond water under a microscope, you may find organisms made up of one cell. For example, amoebas or paramecia are one-celled organisms that may be in water, soil, or air. Bacteria are also one-celled organisms. We can find them on material from teeth and inside animal bodies.

Amoeba:



Paramecium:

ACTIVITY 2 **(internet searching)**

Find out information about the cells of **bacteria**. Draw a typical cell of a bacterium and compare it with an amoeba, an animal cell and a plant cell.

True or false:

- Amoebas have a nucleus and a cytoplasm.
- Bacteria have a cell membrane and a nucleus.
- Bacteria have a cell wall.
- Bacteria have mitochondria.
- Amoebas and bacteria are one-celled organisms.
- Plant cells have a cell wall.
- Animal cells have chloroplasts.
- Plant cells do not have mitochondria.
- Bacteria cells are simpler than animal and plant cells.
- Animal and plants are many-celled organisms.
- All bacteria are harmful.

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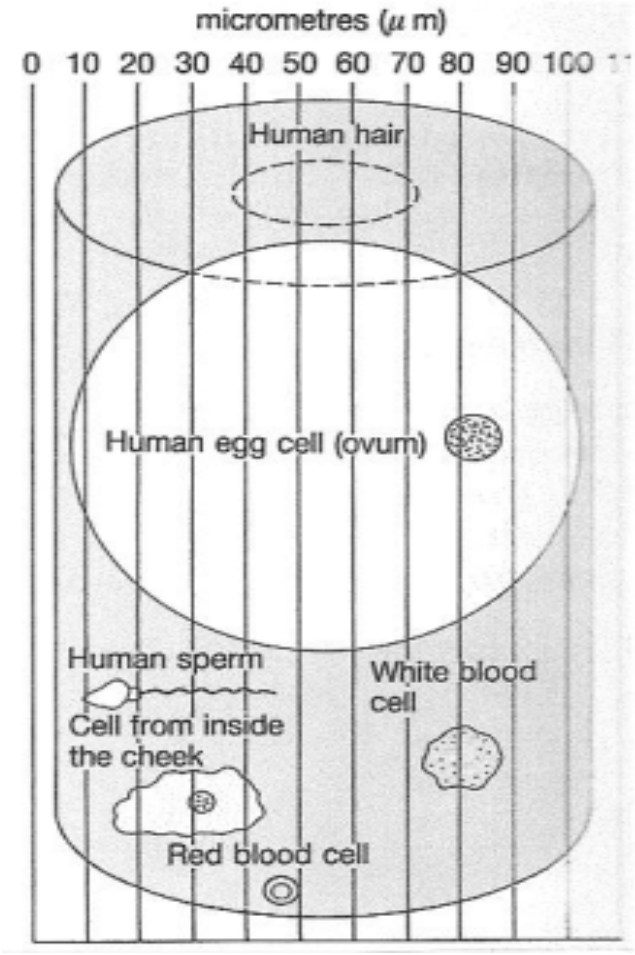
6. SIZE AND SHAPES OF ANIMAL CELLS



a) How wide is a hair in micrometres µm?

b) How wide is a red blood cell in µm?

c) About how many red cells side-by-side equal the diameter of a hair?

d) About how many times would you have to enlarge a cheek cell to make it the same diameter as a tennis ball?

7. SPECIALIZED CELLS

Animal cells usually look very different from the cells we have seen before. By looking at their features you can tell which is which. The shape and structure helps each one to do its job properly. We say cells are specialized because they have special structures for special functions.

Unjumble the words and use them to fill in the table below. After this, draw the picture according to the description.

REPSM
LLECS LCSEMU
DER ODOLB LLECS
ORNUNE

	NAME	PICTURE
They carry oxygen and in order to give space they have no nucleus. They are disc-shaped.		
They are produced by male animals and they have a long tail in order to swim to find the egg.		
They carry messages around the body. They are long and branched at the ends to pick up and deliver messages.		
They area able to change length. They allow us to move.		

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8. HOW IS AN ORGANISM PUT TOGETHER?

Look at these pictures. What do they suggest to you?
Can you compare them to the levels of organisation of your body? Say how.

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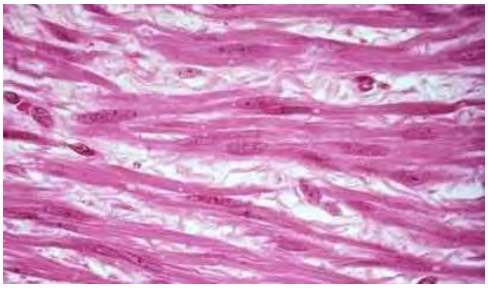
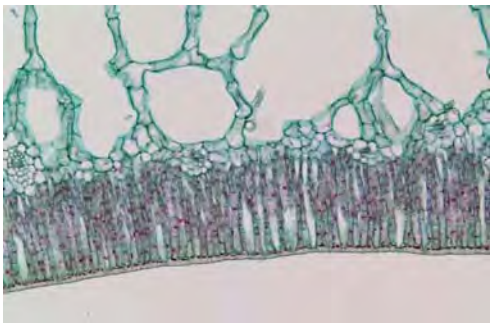
A human and a euglena are both organisms. But a euglena is a **one-celled organism** and a human is a **multi-celled organism**. We are made of millions and millions of cells. All the cells work together. Plants and animals are multi-celled organisms. In multi-celled organisms there are different kinds of cells. For example, in your body there are blood cells, bone cells, skin cells… A plant has root cells, stem cells, and leaf cells.

Cells work together in groups. These groups are called **tissues**. A tissue is a group of similar cells that work together to do a job. For example, skin cells are flat and wide to cover and protect our body. Plant cells are also organized into tissues. The leaves of a plant have tissues that help the plant to make food.

Muscle tissue: It allows us to move.



Palisade tissue: It forms a layer near the top of leaves to help the plant make food.



Tissues are grouped together in your body. Your heart contains muscle tissue, nerve tissue, and blood tissue. Your heart is an example of **organ**. An organ is a group of tissues

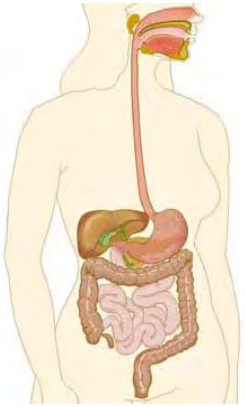
that work together to do a job. The job of your heart is to pump blood through your body.

Heart: It contains muscle and nerve tissues.

A group of organs that work together to do a life function is an **organ system**. The roots, stem and leaves of plants are organ systems. Your digestive system is an organ system. It is made of your mouth, oesophagus, stomach, small and large intestine, and liver. This system breaks down food and absorbs the nutrients you need to live.

Root:

Digestive system:



All the organ systems together make up an **organism.**

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One-celled living things are organisms that carry out all their life activities in just one cell.

After reading this text can you review the answers you have given in the introduction?

ACTIVITY 1 **(internet; in pairs)**

Research on the function of an organ system. Use encyclopaedias, internet, and other resources to learn about the function of an organ system in your body. What happens if this organ system does not work correctly? Explain it to the rest of the class.

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ACTIVITY 2

Fill in the blanks with the appropriate word of the list the text you will be given. The words are:

Circulatory system, tissues, red blood cells, heart, organs , daughter, stomach, muscle cells, cell division, brain, organism, specialized, nerve cells, digestive system, nervous system, organ systems, white blood cells.

Hello, my name is _____ and this is the story of my BIOLOGICAL LIFE.

I started life as a single cell that became a fertilized egg cell. I grew because that cell divided to make two cells, these divided to make four, and so on. This is called .....[1]. When a cell divides it makes two .....[2] cells, which are identical. These divide to make four identical cells, which divide again and again to make a ball of cells.

Some cells in the ball grow and change shape to do a particular job – they become .....[3]. Cells that do the same job group together to form .....[4]. Some cells become specialized .....[5]. These form tissue which can tighten up and relax. .....[6]are specialized to carry messages around the body. .....[7] carry oxygen and .....[8] kill germs.

Different tissues combine to make .....[9]. The .....[10] is an organ which pumps blood around the body. The .....[11] is an organ which digests food. The .....[12] is an organ which controls parts of the body.

An .....[13] is made up of many different organs. Some of its organs work together to form .....[14]. The .....[15] is made up of the heart and blood vessels.

The ..... is made up the gullet, the stomach and intestine. The ..... is made up of the brain, spinal cord, and nerves.

9. WE NEED GROUPS OF CLASSIFICATION…

Elephants and earthworms belong to the animal kingdom because they have some common features, but elephants have a backbone and earthworms do not.

We need to divide kingdoms into smaller groups: All animals with backbones belong to the same **phylum**. The phylum of *Vertebrates* includes seals, dogs, fishes, frogs, snakes,… and humans. Earthworms are grouped in a phylum together with other animals that do not have a backbone. They are the *Invertebrates.*

Each phylum is divided into smaller groups called **classes**. For example, Class *Mammals* includes animals that have fur and feed their young with milk.

There are members of a class that have more in common. We put them together in the same **order**. For example, Mammals with sharp teeth and claws for eating meat are classified in the order *Carnivore*.

The members of an order that have the most in common are put into the same **family**. The members of a family that have the most in common are classified into the same **genus**.

The most similar members of a genus are grouped in **species**. All members of a species are very similar and can mate together and reproduce.

Each living thing is given a **scientific name** based on its genus and species. Latin is used in scientific names to make them easier to understand.

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ACTIVITY 1

Stick the pictures of the animals the teacher will give you in the chart. The chart shows the groups from largest to smallest.

HELP! There are fewer organisms in each group as you move down the chart.

KINGDOM
PHYLUM
CLASS
ORDER
FAMILY
GENUS
SPECIES

ACTIVITY 2

Find one characteristic in common and one characteristic which is different between the following pairs of organisms:
Example
Snail and spider: Neither have a backbone. Snails have a shell and spiders do not.

* Goldfish and hamster:

* Mushroom and geranium:

* Jellyfish and cuttlefish:

* Bird of paradise and gorilla:

* Mosses and roses:

* Horsetail and pine:

ACTIVITY 3:

Viruses are not included in the kingdoms of living things. They are not made of cells. Viruses can reproduce. Visit some websites to do a research on the differences between viruses and bacteria.

10. DIVERSITY AND ADAPTATIONS

Living beings adapt, or change, to survive. For example, the snowshoe hare changes colour. It is white in the winter. It is brown in the summer. Why would this animal want to be white in the winter?

The traits that animals have to help them survive in their environments are called **adaptations.** Some adaptations protect animals from **predators**. Predators are animals that eat other animals.
One of these adaptations is **mimicry.** Mimicry is when an organism looks like something else. For example, the syrphid fly is an insect that does not sting, but it has black and yellow stripes that make it look like a yellowjacket. Yellowjackets sting. Predators think that syrphids are yellowjackets and they stay away.

syrphid fly

yellowjacket

Camouflage is another adaptation. When an animal is camouflaged, it looks as its surroundings. For example, the wings of a butterfly are shaped as leaves. Birds look for the butterfly but they only see leaves. Sometimes it is the colour what protects animals from predators. For example, there were two kinds of moths in England. One moth was lighter and the other one was darker. Birds ate both kinds of moths. When factories began to make dark smoke, it stuck to the trees. The trees became dark. Birds could see the lighter moths better, so they started to eat more of the lighter moths. The lighter moths started disappearing. This did not happen to the darker moths because their colour protected them from predators.

Moths

These examples of animal adaptations show that to be diverse is good for animals. Diversity helps animals to survive because the environment is always changing. Animals that do not adapt

may not live. Sometimes, some changes in the environment can hurt an entire species. A species an even become **extinct**, or die. This almost happened to the bald eagle. Bald eagles lived in almost every part of North America a long time ago. Today, most bald eagles live in Alaska. Species that are in danger of becoming extinct are **endangered species.**
Plant also adapt to their environment. Plants in the desert can collect, store and save water. Some plants cannot get enough nutrients from the soil. They have adapted to become carnivorous. They eat insects.

ACTIVITY 1

Here are a few physical adaptations that help animals survive. Complete the sentences choosing the following species: elephant, male cardinal, giraffe, horse, fish, polar bear, and turtle.

Gills and fins allow a …… to breathe and swim underwater.
White fur helps a …… blend in the snow.
The legs of a …… help it to run fast.
The neck of a …… allows it to reach leaves high up in trees.
A hard outer shell protects a ……´s body.
A trunk helps an …….. to grab things and feed itself.
The red body of a …… …… helps it attract a mate.

ACTIVITY 2

Many types of animals have special behaviours that help them survive. When a squid senses danger, it shoots a dark liquid.
What responses do these animals to survive?

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armadillo

porcupine

ACTIVITY 3 (at home) (in small groups of 3-4 students)

Prepare a power point presentation (10 slides) about an endangered species. Follow the instructions that your teacher will give you. This activity will serve as an assessment. You will explain to the rest of the class all the information.

Plants also are adapted where they live

Plants also change to adapt to their environments. A cactus is adapted to living in the desert:

cactus

- no leaves, but spines, which means the cactus loses less water than a plant with leaves
- stem stores water
- Roots cover a large area to absorb as much water as possible when it rains.

There are also changes throughout the year. In winter, some trees lose their leaves since there is not much light for photosynthesis. These are **deciduous** trees. **Evergreen** trees have tougher leaves and keep them all year round. Evergreen trees often grow quite far north where the summers are short.

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evergreen tree

deciduous tree

ACTIVITY 1

Complete the sentences:

A …….. tree loses its leaves in winter.

An …… tree keeps its leaves in winter.

ACTIVITY 2

Find out the name of three different deciduous trees and three evergreen trees. Write down the name in English, Catalan, Spanish and Scientific name.

COMPLEMENTARY MATERIAL

Part 9, activity 1: