# Unit 3:
## The hydrosphere

1. **The water on the Earth**
2. **The water cycle**
3. **Water in the oceans**
4. **Water on the continents**
5. **Importance of water**

**Think and answer?**

a. Where can water be found in our planet?

b. What is the water cycle?

c. What can you see in the photo? What is its origin?

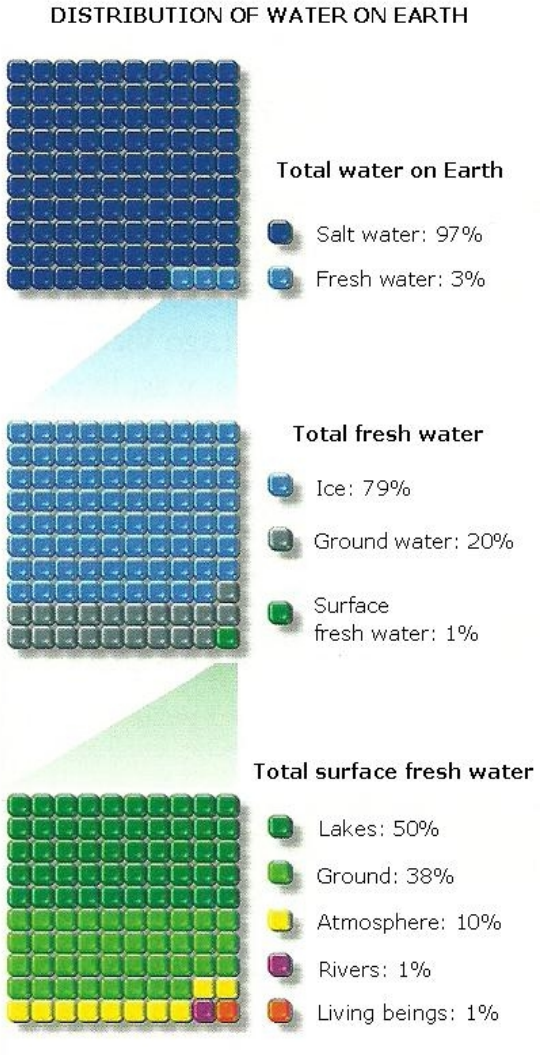
d. Why is important not to waste water?

**UNIT OBJECTIVES**

In this unit you will learn:

- To find out how water is distributed on Earth
- To relate the properties of water and its importance for living beings
- To distinguish the different movements of oceanic water
- To describe the steps of the water cycle.
- To identify the uses of water and the causes of its pollution
- To enumerate several ways to save water.

# 1. The water on the Earth




The Earth is the only planet in the solar system that has surface water: three quarters of the Earth is covered with water.

The water on the Earth's surface is called the **hydrosphere.**

Water on the Earth is found mainly in liquid state, but it also exists as ice and water vapour.
It is distributed in this way:

- 97 % Oceans and seas. It is **salt water**.
- 3% Poles, glaciers, lakes, rivers, groundwater, clouds and living beings. It is **fresh water**.

## a) Origin of the hydrosphere

The Earth's hydrosphere has two origins:

- In the primitive Earth there was an intense **volcanic activity** that released great amounts of water vapour in the primitive atmosphere. This water vapour condensed and became rainfall as the planet slowly cooled down and created the oceans.

- **Comets** and **asteroids** entering the Earth's atmosphere also contributed to increase the amount of water in these primitive oceans.

## b) Properties of water

Water is a substance with unique properties. It plays an important part in the geological processes that occur on the Earth's surface and is essential to living beings.

The main properties of water are:

- **Water is a very good solvent**

  It is used in many life functions. For example, blood contains water and transports dissolved nutrients and waste products. Plants can only absorb nutritive substances if they are dissolved in water.

  On the other hand, it dissolves many components of rock. When water evaporates, it leaves deposits of mineral salts.

- **Water has a high thermal capacity.**

  This means that it heats up and cools down slowly, so that water regulates temperature and moderates the Earth's climate.

  Many living beings also used water to regulate their body temperature. Sweating is the mechanism that allows them does it.

- **Water reaches its maximum density in a liquid state at 4°C.**

  Unlike other liquids, water is less dense and has more volume in a solid state (ice) than in a liquid state. This is important for aquatic living things: when the temperature drops and ice forms, the ice floats on top of the liquid water, which means life can continue below the ice.

## READING ACTIVITIES

**After read the text, copy and answer the following questions on your notebook:**
Remember: you must make complete sentences.

**1.1. Look at the diagram on the text about the distribution of water on the Earth and answer:**

a. What percentage of water is in oceans?
What percentage represents fresh water?

b. What percentage of fresh water is at disposal of living beings?
What part of it is accumulated as ice and ground water?

c. What percentage forms part of living beings

**1.2. What relationship is there between volcanic activity and the hydrosphere?**

**1.3. Answer these questions about the properties of water:**

a. When a lake freezes in winter, why does the ice layer float on the surface of the water?

b. Why is water a good regulator of temperature?

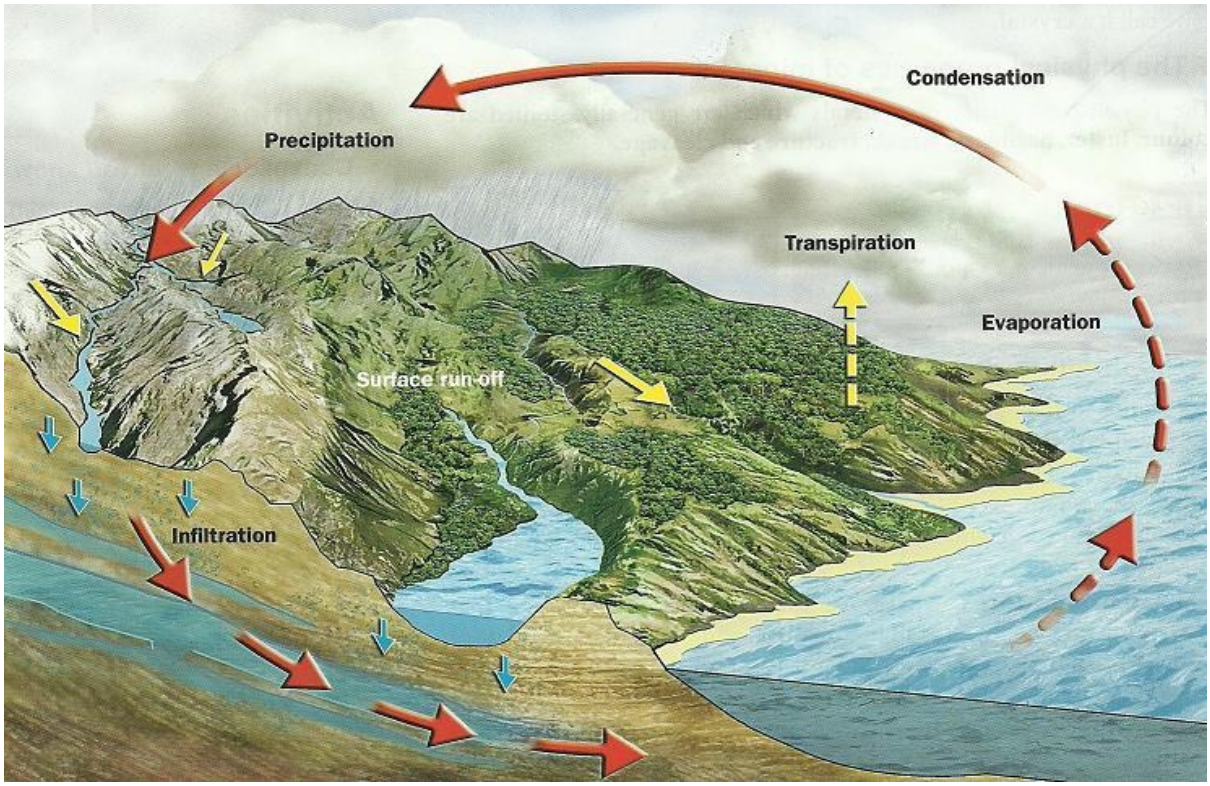
c. Why is water a good medium to transport substances for living beings?

# 2. The water cycle

The **water cycle** is the movement of water throughout the Earth. Water is continuously changing its location on the Earth and its physical state, but the total amount of water remains constant.

It consists of the following processes:

- **Evaporation**
  Liquid water changes to a gas (water vapour). It evaporates.
  Water passes from the hydrosphere to the atmosphere.
- **Transpiration**
  Water evaporates into the atmosphere from living beings, mainly plants.
- **Condensation**
  Water vapour changes to liquid, forming clouds and dew. It condenses.
- **Precipitation**
  Water returns to the Earth's surface as rain, snow or hail.
- **Surface run-off**
  Surface water moves across the land and it forms rivers and streams, and finally flows into the sea
- **Infiltration**
  Surface water filters in part into the ground. It forms groundwater.




## READING ACTIVITIES

**After read the text, copy and answer the following questions on your notebook:**
Remember: you must make complete sentences.

**2.1. Indicate what process allows the pass of the water:**

a. From rivers to sea
b. From living beings to atmosphere
c. From Earth's surface to ground.
d. From sea to atmosphere
e. From clouds to Earth's surface

# 3. Water in the oceans

## a) Properties of sea water

Sea water has special properties:

- It is **salty.** Each liter of sea water contains about 35 grams of dissolved salts.
- It contains **dissolved gases:** mainly nitrogen, oxygen and carbon dioxide. These gases are dissolved in the water by two processes:
  - **the movement of the waves** which mixes water with air.
  - **the activity of aquatic living beings.** Oxygen is produced by the photosynthesis of algae; living things breathe out carbon dioxide.
- The **temperature** of salt water varies with depth.
  - At the sea surface, the temperature is higher.
  - In the deepest zones, the temperature of the water is lower: between 4°C and -2°C.

## b) Movements of the sea water

Ocean waters move in three ways: **waves, currents** and **tides.**

### - Waves

They are movements of the surface water caused by the wind.

- Waves mix water with the air above the surface, dissolving gases from the atmosphere (a lot of oxygen and carbon dioxide).
- Wave action causes coastal erosion and creates beaches. Waves transport materials (sand and mud) along the coast and out to sea.

### - Ocean currents

They are masses of water which move like rivers through the sea.

The currents are produced by wind or differences in temperature and salinity.

Salter and cold water is denser and falls down, while water less salty and warm is slight and rises up. This produce circulation of water masses from Equator to the Poles.

### - Tides

Tides are the periodic rise and fall of the sea level.

They are caused by the gravitational attraction of the Moon and the Sun.

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### READING ACTIVITIES

**After read the text, copy and answer the following questions on your notebook:**
Remember: you must make complete sentences.

**3.1. Answer the questions:**

a. Why is there more oxygen dissolved in sea water near the surface than in the deep?

b. What gases are added to sea water by the action of living beings?

c. What are the different movements of sea water in oceans?

# 4. Water on the continents

Fresh water is found on the continents. It contains much less salt than sea water.

It is found in different forms:

- **Rivers** are permanent water courses.
- **Streams** or **torrents** are water courses fed by rain. The flow of water varies a lot from season to season.
- **Glaciers** are formed from the accumulation of snow on mountain tops or covering large areas on Poles.
- **Lakes** and **pools** are permanent bodies of water deposited in depressions.
- **Wetlands, marshlands** and **swamps** are areas where the ground is inundated all year round.
- **Groundwater** is water located beneath the ground surface.

## READING ACTIVITIES

**After read the text, copy and answer the following questions on your notebook:**
Remember: you must make complete sentences.

**4.1. Answer the questions, after consult the diagram of Point 1.**

a. Why continental water is called fresh water?

b. Where we can find fresh water on Earth?

c. What percentage of the total amount of water on Earth is fresh water?

d. Indicate how is distributed (%) this water among:
- Ice
- Groundwater
- Surface fresh water (rivers, lakes, etc)

**4.2. Indicate which is the main difference between:**

a. A river and a stream

b. A lake and a pool

# 5. The importance of water

## a) Ecological importance of water

- **Water and climate**.
  Water regulates the temperature of the Earth.
  Oceans absorb a lot of solar energy, without getting too hot, and they then release it slowly without getting too cold. That is why the coastal climate is temperate.
- **Water forms landscapes**.
  Water transforms the landscape by eroding the rocks that form the Earth's crust.
- **Water and living things**.
  Water is essential for life and it creates ideal living conditions on our planet.
  It is very stable and it contains substances that organisms need to live.
  Water is also the main component of living things.

## b) Human uses of water

We use water:

- To **satisfy the basic needs**: feeding, hygiene, etc.
  (about 5 daily liters per person).
- To **improve our quality of life**: washing, cleaning, and eliminating waste
  (about 80 daily liters per person).
- To **generate wealth**: agriculture, industry, transport.
  (about 3,200 daily liters per person).
- For **recreational activities**: sports, tourism, etc.

To cover all those needs we need a huge quantity of water. This is why:

- We should only **use the necessary** amount of it. Ways to save water at home can be:
  - Take a shower instead a bath.
  - Keep close the tap while we clean our teeth or soap ourselves.
  - Don´t use the loo as a wastepaper basket.
  - Install save water mechanisms into the cistern and on the taps.
- We should **not waste** water or pollute it.
- We should always **treat** or **purify** it and reuse it whenever possible.

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### READING ACTIVITIES

**After read the text, copy and answer the following questions on your notebook:**
Remember: you must make complete sentences.

**5.1. The following sentences are wrong, correct them:**

a. The coastal climate is temperate because water releases solar energy very quickly.
b. Water cannot transform Earth´s surface by eroding rocks.
c. Water is not essential for living beings because is the less important component of them.

**5.2. Water is very important for us and it is a limited resource. So that we have to save as much water as we can. Relate every way to save water with the correspondent picture.**