1-What is the water like inside?

The water molecule has a very simple structure, but it must be well known to understand its behaviour.

1.1 To build the structural models of the water molecule.

Approximate time: 15 minutes.

OBJECTIVES

To build the molecular water model and understand its **structure** and **composition**.

WE NEED

- Ball-and-stick model (hydrogen and oxygen atoms and bonds)
- Protractor

PROCEDURE

1. Build a water molecule with the balls and sticks available.
2. Measure the angle between the two bonds. Write it down and compare it with the other groups' values.

QUESTIONS

1. How would you describe the structure of water and its characteristics? How many atoms of each type does it have?
2. Which is the angle between the two sticks (bonds)? Compare it with the measured by other groups.

MARIE-ANNE PIERRETTE PAULZE

(1758-1836) Considered the **mother of modern chemistry**, her interest in this discipline stemmed from her marriage to Antoine Lavoisier. However, her contributions to this field are less well-known than those of her husband. After Lavoisier’s death during the French Revolution, she gathered his documentation, organised it, and **published “Memories of Chemistry,”** which laid the foundations for modern chemistry. The first volume contains works on heat and the formation of liquids, while the second is dedicated to ideas about combustion, air, metal calcination, acid action, and **water composition.**

2-Is water always the same?

OBJECTIVES

To visualize **water's phase changes**: solid, liquid, and gas. **Physical processes** of vaporization, condensation, sublimation, liquefaction, freezing, and melting temperatures. The salt effect on the physical processes: different temperatures of phase change .

WE NEED

- One glass cup
- Glass marker
- Digital kitchen scale
- Graduated container (volume)
- Cooking pot (1L)
- Gloves
- Digital thermometer
- Heater
- Fridge/freezer
- Balloons
- Salt
- Tap water

PROCEDURE

In this experiment, the three main water phases will be observed: solid, liquid, gas

Part 1 (10 minutes preparation + freezing time)

1. Weight an empty glass.
2. Add water to the glass and weigh it. To find the amount of water added you can subtract the weight of the empty glass from the filled glass.
3. Draw a line on the glass to mark the water level.
4. Afterwards, we will freeze the filled glass. It can take some time, depending on how cold your freezer is.
5. Observe how water expands as it freezes!Use your marker to point out the ice height in your glass.
6. Weight it.
7. Measure the temperature.

2-Is water always the same?

PROCEDURE

Part 2 (30-40 minutes):

1. When you are done weighing the glass, cover the glass by stretching out a balloon. Be careful to avoid breaking the balloon!
2. Let the **ice melt**, either leaving the glass at room temperature or surrounding the glass with water, using an additional container at room temperature. Be careful not to accelerate the process using hot water, because probably it will produce the **glass to crack**.
3. Once the system is liquid again, pour a bit of water into your cooking pot and place the flask at the centre (we are going to prepare a **Bain Marie**). Make sure the flask rests firmly at the bottom of the cooking pot, we do not want it to spill or float.
4. Turn on the heater and start heating the cooking pot's water. It is soon expected to **boil**.
5. Let it warm at low heat not letting the water completely evaporate.The glass must be always **surrounded** by water (bain-marie). Be careful not to let the water boil vigorously: The strength of the **bubbling** could spill the glass!
6. The reasoning behind placing the glass in water (Bain-Marie) is that we want to **uniformly** distribute the heat around the glass and in this way avoid the **cracking**. We don't place it directly in the heater because it would heat it **unevenly**. The heat would also **melt the balloon**.
7. After the water boiling for around 15 minutes, look at the balloon.
8. Observe the **water vapour** of the heating pot. The water molecules evaporate and leave the cooking pot. They have been so heated that they are more comfortable hanging around the room in **gas form**. They are still water molecules, but now they are added to the air. We can measure water's boiling point with a thermometer. You can do it directly on Bain Marie's water.
9. If we want to observe this water again, we must **cool it down** so it condenses. Firstly, it would condense at the coldest parts of the room, like windows.
10. You can **demonstrate the condensation** by placing a cold water glass on the counter. In seconds or minutes, you should observe **water drops forming at the exterior of the glass.**

2-Is water always the same?

PROCEDURE

Part 3 (time can be optimized by performing it simultaneously with parts 1 and 2)
Repeat part 1 and part 2 with water in which much salt has been dissolved.

	Pes	Volum (si el got està graduat)	Temperatura
Aigua inicial			
Aigua congelada			
Aigua calenta			

	Pes	Volum (si el got està graduat)	Temperatura
Aigua inicial amb sal			
Aigua amb sal congelada			
Aigua amb sal calenta			

QUESTIONS

1. Does water take up the same space being liquid or gas?
2. If it freezes, does it lose weight?
3. In the experiment, why do we have to heat to inflate the balloon?
4. Can you relate what you have done with the formation of clouds and rain?
5. When adding salt to the water, can it freeze? If it is true, why do they add salt to the roads during snowfalls?

HYPATIA OF ALEXANDRIA (370-415)

Even though she is known for her contributions to philosophy, maths and astronomy, Hypatia was also interested in mechanics and contributed to water's world with the invention of a distiller, a device to measure water's level and a graduated hydrometer, to measure the relative density of the liquids, a precursor of the actual aerometer. Although none of her work made it to nowadays, she is considered one of the most important scientists in history.

MARY THE JEWESS

Also known as Mary the Prophetess or Maria the Copt (lived between the first and third centuries). She was the first alquemist woman and she is considered the founder of the alchemy and a great contributor to practical science. She is attributed with "Bain-Marie", a technique consisting of introducing a container into a larger one with boiling water, and it is used to indirectly and uniformly heat matter. It is known that she wrote many texts about alchemy, but none of her original writings have been preserved. Nevertheless, her lessons were subsequently very cited.

3-How does water behave?

Water is abundant on our planet and presents unique and fascinating properties. In this contents block, we will study properties like density, surface tension, capillarity and polarity through different experiments.

This workshop consists of 5 experiences

3.1. Columna de colors

Approximate time: 10-15 minutes.

OBJECTIVES

This practice aims to build a column with **different coloured** liquids.

WE NEED

- Four glasses/beakers
- One measuring device for liquids
- One plastic teaspoon
- Two test tubes
- Four plastic pipettes
- Sugar
- Water
- Food colouring

PROCEDURE

1. We add 100 mL of water to each glass. We do not add anything else to the first glass. To the second, we add three teaspoons of sugar; to the third, we add six teaspoons of sugar and to the last one, nine teaspoons of sugar.
2. We mix well until all the sugar is dissolved.
3. To differentiate the glasses, we add a 2-3 drops of **different colouring** to each glass.
4. We add all the liquids **carefully** to the test tube, starting with the one with more sugar.

QUESTIONS

1. Which glass contains the densest liquid?
2. What have you observed while slowly adding the liquids?
3. Would the experiment work if we add the liquids in the opposite order?
4. Try it in another test tube and write down the conclusions here.

3-How does water behave?

3.2. How many drops fit in a coin?

Approximate time: 5 minutes.

OBJECTIVES

Observe the **surface tension** effects of water when pouring water drops on a coin.

WE NEED

- One glass
- One plastic pipette
- One coin
- Water
- Soap or dishwasher soap

PROCEDURE

1. We add water to the glass.
2. We pick a coin and wash it deeply to remove any dirt remainings.
3. We place the coin on a table and ask ourselves how many drops we could pour without spilling. We can check who guesses correctly or gets closer to the actual value.
4. We slowly add the water drops while counting.

QUESTIONS

1. How many drops could you pour? Was it what you were expecting?
2. If the experiment was repeated using a drop detergent on the coin, would you observe any difference? Which one? Why?
3. Try it and write down your conclusions here.

3-How does water behave?

3.3. Will it float or not float?

Approximate time 5 minutes.

OBJECTIVES

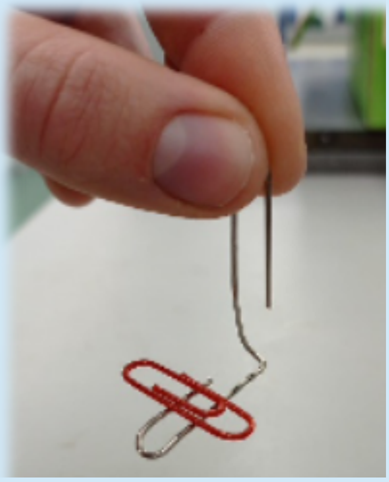
Observe the **surfactant effects on the buoyancy** of different objects.

WE NEED

- One glass
- Two clips
- Water
- Dishwasher soap

PROCEDURE

1. We add water to a beaker.
2. We let the clip fall into the water, and we check if it **floats**. Next, we bend another clip to create a mount, as it is shown in the image.
3. With the help of the **support**, we try to introduce the clip into the water **very slowly**. If you have done it correctly, the clip must float.
4. If it does not, pick it up and try again.
5. Lastly, when the clip is floating, we add a bit of **dishwasher soap** to the water and observe what happens.



QUESTIONS

1. Is the clip more or less dense than water?
2. Which water property makes the clip float?
3. What happens when dishwasher soap is added? Why?

3-How does water behave?

3.4. Full colour

Approximate time: 10 minutes.

OBJECTIVES

The aim of this experiment is to simulate a **thin layer chromatography**

WE NEED

- Transparent container (glass)
- Filter paper
- Felt-tip pens
- Water

PROCEDURE

1. Draw a line at the **filter paper** end with a felt-tip pen of the color you prefer.
2. In a beaker, we add a bit of water and we introduce the paper inside, **standing up** but without the water level reaching the line (like in the image).
3. Observe during some minutes how the **chromatography evolves.**
4. Start creating! Do you have any creative idea?

QUESTIONS

1. Which property allows water to climb up through the paper?
2. What happens when water touches the felt-tip pen line and continues rising? Why does it happen?

3-How does water behave?

3.5. Branch off the water

Approximate time: 5 minutes.

OBJECTIVES

Observe water's **polar** behaviour.

WE NEED

- Balloon
- Water

PROCEDURE

1. We open up the tap, letting a trickle of water come out
2. We put the balloon close to the **water trickle** and observe what happens.
3. We **rub** the balloon energetically with a jumper/jacket/shirt to charge it with **static electricity**, and we put the balloon close to the trickle again, observing what happens now.

QUESTIONS

1. What happens when you put the balloon closer to the trickle before rubbing it with a jumper? And after?
2. Can you explain the observed behaviour?

4-Can everything be hidden inside water?

4.1 Dissolve substances in water

OBJECTIVES

To observe and measure **water's solubility** in some substances, to detect the **solution's saturati**on and to observe the **effect of the temperature (T).**

WE NEED

- Glasses (6 minimum)
- Graduated containers (volume), capacity between 100 and 300 mL
- Teaspoon
- Digital Thermometer
- Microwave
- Kitchen's digital weighing scale
- Signs with written names: sand, salt, sugar, food colouring, alcohol, oil.
- Tap water (approx. 0.5 L)
- Common sugar (500 g)
- Food colouring powder (a small unit)
- Beach sand (a few handfuls)
- Cleaning methylic alcohol, coloured (200-400 mL)
- Sunflower oil (less than 30 g)
- Table salt (30 g)

PROCEDURE

1. Prepare 6 glasses and add 50 mL of tap water to each one.
2. Place a sign in front of each glass.
3. Measure the **temperature** of one glass (it is expected to be the same in all ones) and note it down.
4. In the corresponding glass, add a small amount of oil and stir with the spoon. Wait for 1 minute and observe the result.
5. Add a spoonful of sand to the corresponding glass and stir with the spoon. Wait a few seconds until the water calms down, and observe the result.
6. In the corresponding glass, add a spoonful of food colouring and mix. Observe the result and compare it with the previous 2 cases.
7. In the corresponding glass, add a spoonful of salt and stir well with the spoon. If no crystals are observed in the following seconds, add successive spoonfuls until **undissolved crystals** are observed. Write down how many spoonfuls have been added in total. (The amount added to the glass can be weighted putting from the beginning the glass on top of the weighting scale).
8. In the corresponding glass, perform the same procedure with sugar. When you are done, don't throw anything.
9. Finally, in another glass, add a generous amount of alcohol (be careful!). Observe what happens. If a **new phase** is not formed, add more. Repeat up to three times.
10. Take the glass with sugar and **heat it** until a temperature of 50° C minimum is reached. Try to add some extra spoonful of sugar and stir. Has it been dissolved?

4-Can everything be hidden inside water?

QUESTIONS

1. From the substances that you have tried, which ones can't "hide" inside water? Do you know why in each case?
2. In this experiment, what are the names given to water, salt and the mixture of both?
3. When you add colouring powder, do you observe the same as in steps 4 or 5?
4. Between table salt and sugar, of which one could you add more quantity while they seem to "disappear" in water?
5. When you have added so much amount of salt or sugar to the glass that some crystals remain at the bottom, what happens? We say that the solution is...
6. After step 10, what can you say about the effect of the temperature on the solubility of sugar in water?
7. When you tried to add alcohol to water, did you see anything different?
8. When someone prepares a coffee or a tea, how is the water we use? Why? How does the water change during the preparation and what is happening?

RACHEL HOLLOWAY LLOYD

She is special to the field of chemistry as she is thought to be the **first female to earn a PhD in chemistry**. Additionally, in 1891, Rachel was the second woman to join the **American Chemical Society**. Her most famous contribution to chemistry was her study on how beets can be used as a sugar substitute and sweetening agent. Beets were a new crop in the United States and her colleagues at the University of Nebraska were unsure if they would be able to grow in the cold climate. **Through her perseverance and continued studies**, the beet crop was a success and became one of Nebraska's top crops.

4-Can everything be hidden inside water?

4.2 Obtain what is dissolved by evaporating the water from a sample

We have seen that water can hide things like alcohol, sugar...
Might there be something hidden in normal water that we do not expect? And the other way around:
Can we add things to water that change it so much that it is unrecognisable? For example, is a soft drink made of water with added things? If so, what does it contain?

OBJECTIVES

To observe and measure **water's solubility** in some substances, to detect the **solution's saturation** and to observe the **effect of the temperature (T).**

WE NEED

- Three plastic trays
- Stirring rod/spoon
- Kitchen's digital weighing scale
- Seawater (330 mL)
- Tap water (330 mL)
- Can of cola drink (330 mL)
- Natural fruit juice drink

PROCEDURE

Preparation of the experiment 5-10 days in advance

Day 1:

1. Label the trays with markers (1, 2, and 3).
2. Weigh them and write down the results in the notebook.

- Tray 1 weight:
- Tray 2 weight:
- Tray 3 weight:

3. Place the cola drink in tray 1. Rinse the can. Fill it with tap water and pour its contents into tray 2. Now, fill the can with seawater and place it in tray 3. Keep the can until the end of the experiment.
4. Weigh the trays again.

- Tray 1 weight with cola drink:
- Tray 2 weight with tap water:
- Tray 3 weight with seawater:

5. Calculate the weight of the liquids:

- Weight of cola drink in tray 1:
- Weight of tap water in tray 2:
- Weight of seawater in tray 3:

6. Leave the trays on a radiator or in direct sunlight to let the liquids evaporate.

4-Can everything be hidden inside water?

QUESTIONS

Let's observe what happened to the trays

Day 1:
Tray 1:
1. What happened to the liquid in it?
2. What does the remaining substance look like? Describe colour and texture.
3. How much does the tray weigh with the residue?
4. Calculate the weight of the residue.
5. What do you think is the main component of the residue? (Refer to the composition of the drink indicated on the can)

Tray 2:
1. What happened to the tap water?
2. What can be said about the residues from the tap water?

Tray 3:
1. What happened to the seawater?
2. What does the remaining substance look like? Describe colour and texture.
3. How much does the tray weigh with the residue?
4. Calculate the weight of the residue.
5. What do you think is the main component of the residue? (Think about your experience when swimming in the sea)

LET'S GO FURTHER!

If the liquid of the cola drink was water, we could recreate the drink by adding water to it. Let's try it.

PROCEDURE:
1. Fill the can with water (preferably mineral water).
2. Stir with the stirring rod/spoon.

QUESTIONS:
1. What do you observe?
2. Do you believe the main component of the drink was water?

4-Can everything be hidden inside water?

4.3 Measuring the sugar content in some commercial drinks

OBJECTIVES

Identify the sugar content in grams of a commercial drink. Calculate its equivalence with typical sugar cubes or packets. Become aware of the sugar content in readily available beverages.

WE NEED

- Empty container of fruit juice-based drink
- Empty container of cola drink
- Empty container of energy drink
- Sugar packets from cafes (7-8 g/unit): 12 in total. Or sugar cubes (4 g/unit): 20 in total
- Paper and pen
- Calculator (optional)

PROCEDURE

1. Take the drink containers and locate the **nutritional information** on them.
2. For each container, read the total grams of sugar that it contains. (If the data is given per 100 mL, apply the **corresponding factor** if the container has a larger capacity).
3. Write down the sugar quantity for each drink container.
4. Find out how many grams of sugar are in one sugar cube or packet. (There are some in the box).
5. Calculate the **equivalence in number** of sugar cubes or packets for each drink (better if done manually).
6. From the box, take the number of sugar cubes or packets that are equivalent to the content of each drink and place them together to get an idea of the quantity.

QUESTIONS

1. When you compared the grams of sugar from the drink container with the pile of sugar cubes or packets for each drink, did it help you understand better if the drinks have a lot of sugar or not?
2. Do you think the amount of sugar in a 500 mL can is healthy for an adult, even if consumed throughout a whole day?
3. What about the 330 mL fruit juice drink, do you consider it healthy for an adult?
4. Now that you know the amount of sugar in each drink, which one surprised you the most? Why?
5. If natural fruit contains sugar, why is it recommended to consume it throughout the day? What is the difference with sugary drinks?

5-How can we clean water?

5.1 Did you know that macroinvertebrates can tell us if a river is in good condition?

Approximate time: 2 hours

OBJECTIVES

Macroinvertebrates are animals without **internal skeletons** and are relatively large (over 500 micrometres). They are generally insect larvae, molluscs, and annelids. They can be semi-aquatic, like caddisflies, or aquatic, like crayfish and molluscs. The **quantity and variety** of macroinvertebrates can vary depending on the **river's condition**. Poor rivers (ecosystems) will **have fewer and less diverse** macroinvertebrates. Each macroinvertebrate species is assigned a colour (blue-very good, green-good, yellow-moderate, orange-deficient, or red-poor) that determines the river's quality from very good (blue) to poor (red). A macroinvertebrate species is assigned the blue colour if it requires a river with perfect conditions to live, and it is given the red colour if it can live in any situation. To determine a **specific quality for the river**, at least two different macroinvertebrate species representing the same colour must be identified.

WE NEED

- Measuring tape
- Stopwatch or clock capable of measuring
- Cork stopper
- Calculator
- Two white plastic trays
- Fine mesh sieve, around 20 cm in diameter
- Magnifying glass
- White plastic spoon
- Cards printed with pictures of macroinvertebrates
- Water boots or water sandals (if the weather is good)
- Towel
- Notebook
- Pen

5-How can we clean water?

A. Hydromorphological quality: measuring the river flow.

Approximate time: 15 minutes

PROCEDURE

1. Measure the **width** of the river (A) in meters (m). Use the measuring tape to measure the river's width at 5 different points and calculate the average (sum of all values divided by
2. Measure the **depth** of the river (F) in meters. Submerge a pole (usually available nearby, but it should be straight) and use the measuring tape to measure the wet part. Repeat this at 5 points along the river and calculate the average.
3. Calculate the **cross-sectional area** of the river (S) in m^2 by multiplying A and F.
4. Measure the water **velocity (v)** in meters per second (m/s). Use the measuring tape to measure 10 m in a flowing section of the river. Stand at one end and release the cork stopper, while others at the other end use the stopwatch to measure how long it takes for the cork to travel to their end. Repeat this measurement 5 times and calculate the average time in seconds. Divide the measured distance (usually 10 m) by the average time to find the velocity in m/s.
5. Calculate the **river flow** in cubic meters per second (m^3/s) by multiplying S by v.

QUESTIONS

1. What is the measured river flow? Do you think it is typical?
2. What is the importance of knowing the river flow?

5-How can we clean water?

B. Physicochemical quality: measuring water temperature.

Approximate time: 15 minutes.

PROCEDURE

1. **Submerge** the thermometer at the bottom of the river (if possible, towards the centre of the **riverbed**, away from the edge) for about 5 minutes and read the temperature. If the river flow is strong, you can place a stone on the thermometer to prevent it from being **carried away by the current.**

QUESTIONS

1. What is the measured temperature?
2. Why should not the river water temperature exceed 20°C?

Biological quality control: Macroinvertebrates.

Approximate time: 1,5 h

PROCEDURE

1. **Submerge** the sieve against the current at the bottom of the river.
2. Stir the riverbed in front of the sieve with your foot or hand. The **current** will carry the **macroinvertebrates** into the sieve. Also, pick up stones from the riverbed.
3. Place everything in one of the trays containing a bit of river water.
4. Use the spoon to pick up different macroinvertebrates and place them in the second tray, which should also have some water. Here is where you will observe and **identify** them with the **magnifying glass**.
5. Check under the stones to see if any macroinvertebrates are attached, such as caddisfly larvae.
6. Count how many **different species** you have identified and determine their **representative** quality to have an approximate idea of the **river's quality** regarding macroinvertebrates.

5-How can we clean water?

AMERICAN RIVER CRAB

They are **crustaceans**, and have a segmented body with more than 6 legs, a head, and appendages. It is an **invasive species** (not native to the fauna) and is **dangerous** as it grows rapidly and is **omnivorous** and **voracious**.

LEECH

It has a worm-like shape and **lacks** both a **head** and **legs**, but it has **suckers**.

WATER STRIDER

With a segmented body and 6 legs, they are found on the **water's surface**.

AMPHIPOD

It is a **crustacean-like** the American river crab, having a segmented body with more than 6 legs, a head, and **appendages**.

5-How can we clean water?

WATER SCORPION

Segmented body, 6 **jointed legs**, and a pair of **false anal legs**

CADDISFLY LARVA

They are found inside cases, **small tubes** made of **tiny stones stuck together**.

MAYFLY NYMPH

Segmented body and 6 **jointed legs.**

STONEFLY NYMPH

Segmented body and 6 **jointed legs.**

5-How can we clean water?

QUESTIONS

1. List the identified macroinvertebrates and state their corresponding quality representation.
2. What is the river's quality based on the identified macroinvertebrates? The quality is determined by the colour assigned to at least 2 different species.

OBSERVATIONS

There are photos of the **most common** macroinvertebrates attached, found in Catalan rivers and their corresponding colours. The student should learn to identify and interpret their significance regarding the **river's quality**. Please note that due to the **non-exhaustive identification** of all macroinvertebrates, the river's quality cannot be **accurately** determined.

5-How can we clean water?

5.2 Water treatment to improve its properties.

Approximate time: 1 hour

OBJECTIVES

Water is the **most essential component of our plane**t, and all living beings depend on it. Therefore, it is of **vital importance**. Moreover, water is also crucial for industries, cities oragriculture, among others.

Humans must **become aware of its importance** and recognise that there are areas where water is very scarce. Water is a **limited resource**, so we must be **responsible** for its consumption and take accurate measures in bathing, cooking, household chores, street cleaning, gardening, swimming pools, etc. to limit its consumption.

Water found in nature is **mostly saltwater**; only 3% of the Earth's water is f**reshwater**. Furthermore, 99% of this freshwater is in the form of polar ice caps, glaciers, and groundwater, leaving a tiny fraction of available water. This surface water (rivers, lakes, etc.) is typically treated in **drinking water treatment plants** (DWTP) to **improve its quality and transform it into potable wate**r, which reaches our homes and is then **contaminated** by our consumption, turning into **wastewater**. This wastewater needs treatment to enhance its quality, and this is done in wastewater treatment plants (WWTP).

Water can have **different origins**, and depending on the source, its properties can vary significantly. For example, drinking water must be high quality, while wastewater contains many impurities. Seawater or rainwater also have distinct characteristics from the others.

This activity aims to help students understand the need for **water treatment processes** to improve its properties.

5-How can we clean water?

WE NEED

- Two water bottles from different sources, labelled Water 1 and Water 2.

PROCEDURE

1. Observe the two waters and identify their sources.

QUESTIONS

1. Identify the origin of each of the two waters, fill in the following table, and justify your response.

	Water 1	*Water 2*
Origin		

5-How can we clean water?

OBJECTIVES

The identified wastewater undergoes a cleaning process, similar to what happens in an urban wastewater treatment plant (WWTP).
Wastewater is water that cannot be returned to the environment because it contains impurities that could harm the flora and fauna. Therefore, before releasing it back into the environment, this water must undergo a treatment process in an WWTP.

The wastewater identified is subjected to a cleaning process, which involves filtering the water with the filtration tank which is a filter composed with activated carbon and sand. The process is as follows:
The filtration tank is constructed with activated carbon and sand to separate a significant part of the dissolved and suspended particles which can be present in the water.
Activated carbon is a type of carbon that has been processed to make it highly porous, with a large surface area. It has many micropores (pores smaller than 2 nanometers). Thanks to its microporosity, one gram of activated carbon has a surface area of more than 500 m2/g. Activated carbon is used, among other things, for metal extraction (such as gold) or water purification.

5-How can we clean water?

WE NEED

- Plastic cartridge with a cap
- Plastic syringe
- Support and clamp
- Vial
- Cap
- Substance scale
- Spatula
- Sand and finely divided activated carbon
- Wastewater

PROCEDURE

1. Hold the plastic cartridge with the clamp and secure it to the support. This will be the body of our **filtration tank**, and it should always remain vertical.
2. Place an empty vial under the cartridge to collect the **purified sample.**
3. Add 0.5 g of activated carbon and 2 g of sand to the filtration tank. The first layer to add is the **activated carbon**, followed by the **sand**. This way, the wastewater will encounter the sand first as it passes through the tank.
4. Pour the **wastewater** into the upper part of the filtration tank.
5. Close the cartridge with the transparent cap.
6. Raise the syringe plunger and fit it into the cap.
7. Slowly lower the syringe plunger to allow the water to pass through the cartridge, and wait for it to be **filtered through the different layers** until it comes out **clear**. Keep in mind that this water, **no matter how clean it appears physically, is not drinkable.**

QUESTIONS

1. What difference do you observe between the initial water and the water that comes out of the filtering tank?
2. What is the function of the sand?
3. What is the function of the activated carbon?
4. Why is the activated carbon placed at the bottom of the syringe and the sand at the top?
5. What would happen if we passed the water through the tank more quickly?