Microplastics in Table Salts? How to easily study them

INSTRUCTIONS MANUAL FOR **CHEMICAL LABORATORY OF EDUCATIONAL CENTER**

What is it for?

The aim of this instruction manual is to illustrate the procedure to separate, observe and quantify microplastics and other insoluble particles present in table salts in an educational center that has a chemical laboratory. In addition, these activities are based on four of the Sustainable Development Goals (SDGs): 3, 4, 6 and 12.

Who is it for?

This manual is aimed at secondary and high school students (12-17 years old). It includes a section with a slightly modified protocol, for those educational centers that have a poorly equiped chemical laboratory.

Why to use this manual?

We will use this manual as complementary material to the educational guide and the workbook for the student.

How to use the manual?

The manual is structured in 5 parts, where it is illustrated how we should prepare the laboratory, the material that we will need, the procedure and finally the observations and results, and finally, other laboratory options. To facilitate the development of the activity, additional material can be consulted at:

http://www.ub.edu/sedimentary-geology/microplastics-salt

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Consolidated Research Group of the Generalitat de Catalunya

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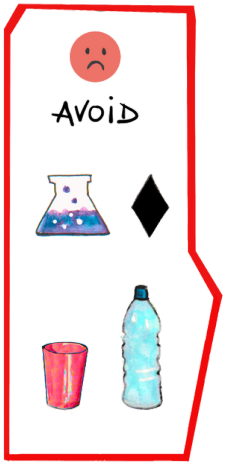
LABORATORY PREPARATION
How to avoid sample contamination?

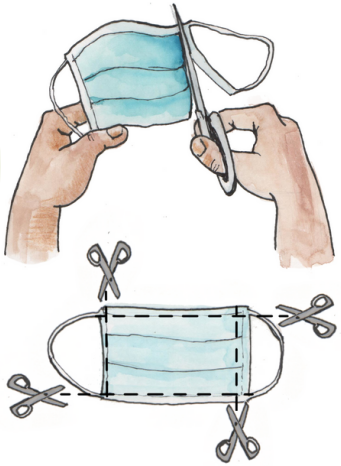
1
- Hair tied back or with a cotton cap.
- Wear brightly colored cotton clothing.
- Wash hands with soap and water.
- Do not use hand cream or makeup.
- Do not wear plastic gloves.

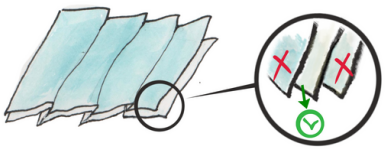
2
- Clean work surfaces and material (inside and outside) with filtered or bottled water.
- Mop the laboratory floor with water.

3
- Use glass, metal or ceramic containers.
- Avoid the use of plastic.



4
Prepare filters and contamination controls:
- Cut and separate the central filter of a mask*.





5
- Use a filter to control airborne contamination during laboratory work.
- Uncap and cover the control filter when running salt samples.
- Airborne microplastics will be retained and we will be able to quantify them.

* We can replace the small pore membrane filters with the fabric of a surgical mask.

REMEMBER!
Expose the control filter during the experiment and cap after completion. If the salt filter is exposed, it will control environmental microplastic contamination during sample treatment.

SCHOOL LABORATORY MATERIAL

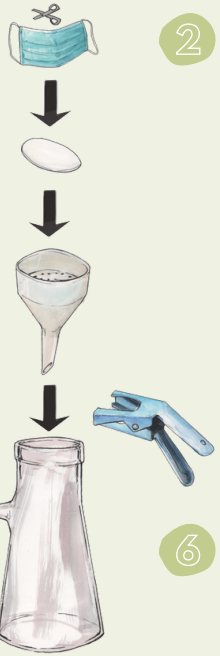
A. Analytical balance
B. Petri dishes
C. Aluminium foil
D. Glass rod
E. Surgical mask
F. Magnetic stirrer and magnet
G. Scissors
H. Spatula with spoon
I. Water (bottled, tap,...)
J. Table salt
K. Beaker
L. Büchner funnel
M. Membrane filter (optional)
N. Flask clamps
O. Water suction pump
P. Magnifying binocular
Q. Tweezers
R. Notebook and pencil
S. Kitasato flask

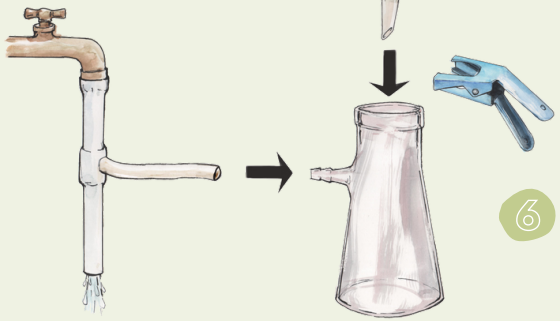
GENERAL CONSIDERATIONS:

- Note the color of the clothes worn during the experiment.
- Write down the type of water and filter it previously.
- Note the type of filter.
- Clothes can be rubbed with a filter to see how fibers come off.

PROCEDURE IN EDUCATIONAL CENTER

1. Water filtration:
Filter at least **2 times 1-2 L** with a water suction pump, kitasato system and cut-out mask filter.



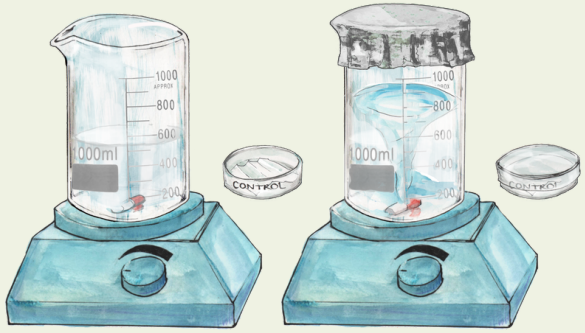


2. Place the control filter in an exposed petri dish near the salt and weigh out 50 or 100 g of salt.

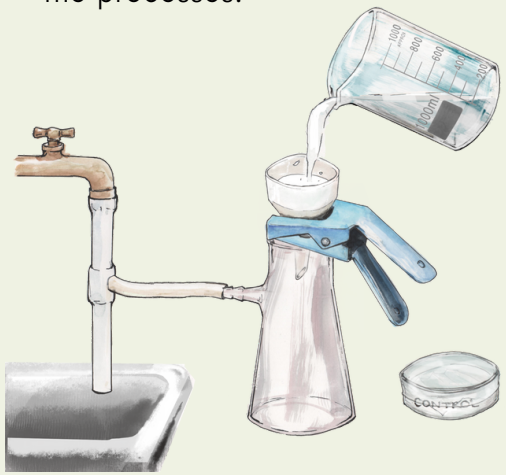
3. Record the weight and cover the salt and control filter.

4. Dissolve the salt in 500 mL (for 50 g) or 1000 mL (for 100 g) of filtered water.

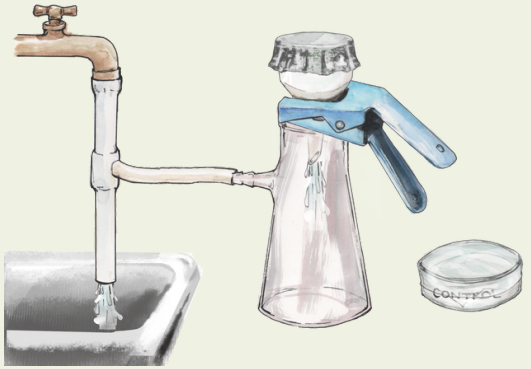
5. Leave the solution under stirring until the total dissolution of the salt.



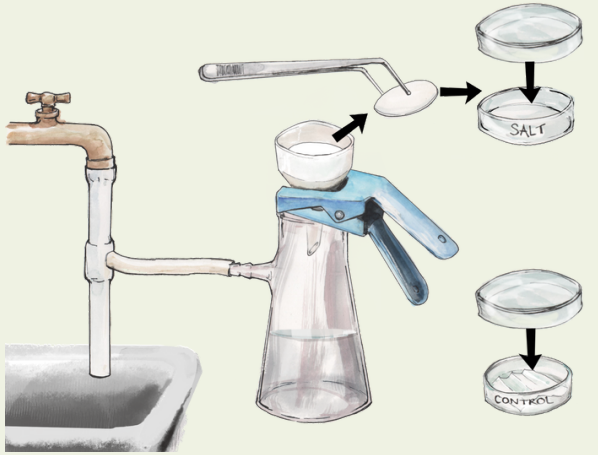
6. Put a new mask filter in the büchner funnel and pour in the salt water solution.
Discover the control filter during the process, just like in the rest of the processes.



7. Open the tap water and filter. Cover the funnel and control filter during the filtering process.



8. Pick up the filter and cover it. Cover the control filter.

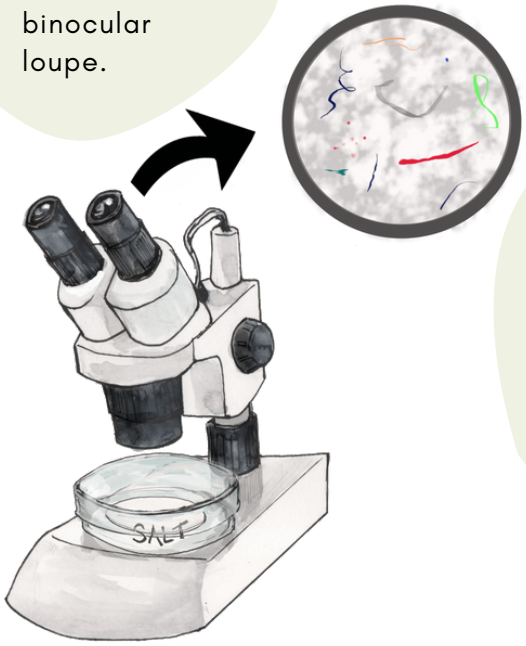


REMEMBER!
Always cover and uncover the control filter and the experimental sample at the same time. This way you will know if the sample is being contaminated.

OBSERVATIONS AND RESULTS

1 WHAT SHOULD YOU DO?

- Observe the filters with a binocular loupe.



2 WHAT CAN YOU SEE?

- Microplastics (fibers normally).
- mineral particles.
- Remains of insects or other organisms.

3 HOW TO DESCRIBE MICROPLASTICS?

- Shape (fibers normally)
- Size
- Color
- Quantity

You can use one token for each sample.
You can use a ruler to compare sizes.

Sample:

Type of sample:

	Dark	Light	TOTAL
Grey (G)			
Green (E)			
Blue (B)			
Violet (V)			
Magenta (M)			
Pink (P)			
Red (R)			
Orange (O)			
Brown (W)			
Yellow (Y)			

BLACK		
WHITE/ TRANSPARENT		
UNKNOWN		

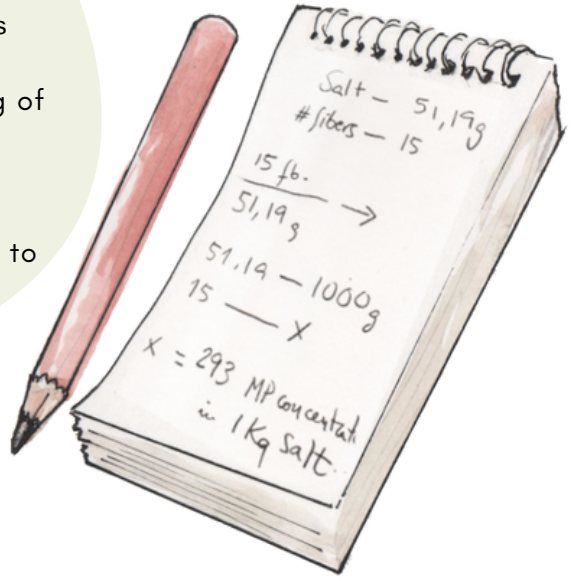
OBSERVATIONS:

4 HOW TO QUANTIFY MICROPLASTICS?

- Draw a grid on top of the petri dish with a permanent marker.
- Count the microplastics in each grid, add them up and write them down.
- Subtract the microplastics counted in the control filters (environmental contamination).

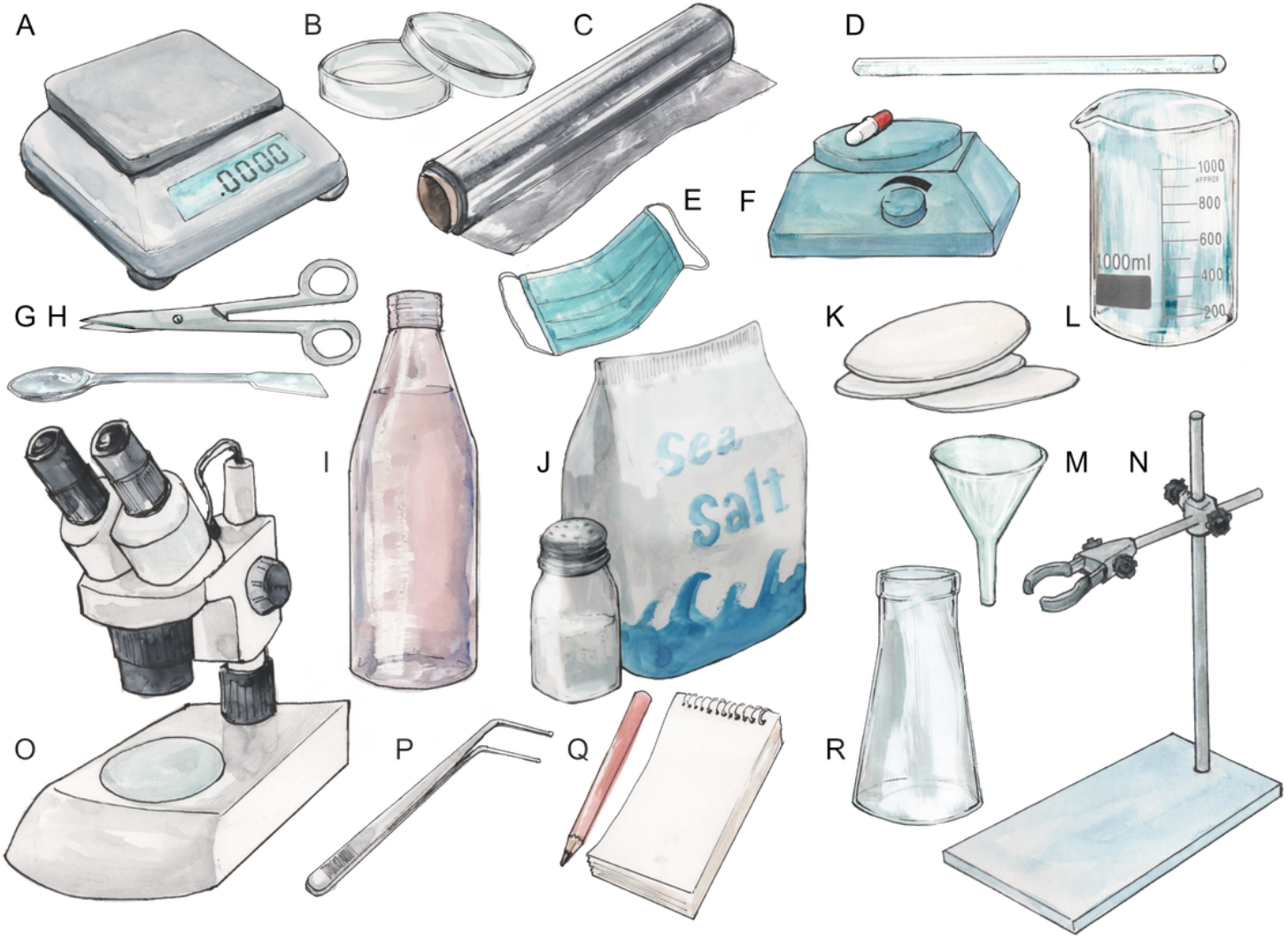
5 HOW TO CALCULATE THE CONCENTRATION IN MICROPLASTICS?

- The concentration is the number of microplastics per Kg of salt.
- Based on the initial salt weight of each sample, recalculate to 1000 g.



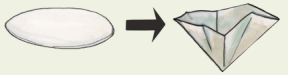
OTHER LABORATORY OPTIONS

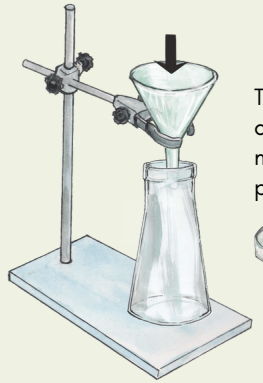
If some filtration materials are not available, let's look at other lab procedures that use gravity filtration!



A. Balance
B. Petri dishes
C. Aluminium foil
D. Glass rod
E. Surgical mask (optional)
F. Magnetic stirrer and magnet
G. Scissors
H. Spatula with spoon
I. Water
J. Table salt
K. Filter paper
L. Beaker
M. Glass funnel
N. Lab hold and utility clamp
O. Magnifying binocular
P. Tweezers
Q. Notebook and pencil
R. Kitasato flask

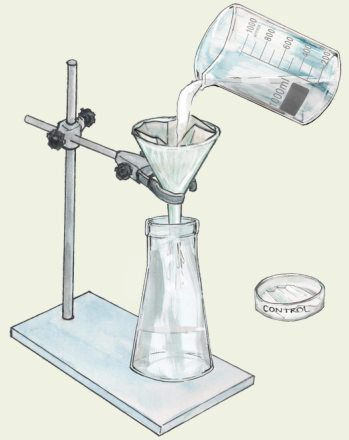
1





The control filter can be from the mask or the filter paper.

2



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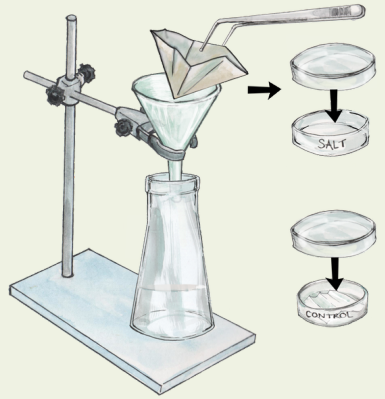

ATTENTION!
Some particles will not be retained as the pores in the filter are larger than the particles themselves.