

Experiment 1:

Sources of microplastics

- Materials required:**
- Tea filters
 - Spatulas
 - Pipettes
 - Petri dish
 - Hair dryer
 - Binoculars / magnifying glass
 - Cosmetic products
 - Tap water



Experimental procedure:

Using a pipette, pour approx. 0.25 to 1 ml of the cosmetic product into the tea filter and fold the opening over several times so that no particles can leak. Now rinse the filled tea filter with tap water until no more soapy water comes out of the tea filter. Then blow-dry on a medium setting until the filter is dry. **(Caution, risk of burns!)** Transfer the residue to a petri dish using the spatula. Make sure that as many particles as possible are transferred from the tea filters to the Petri dish.

Now examine the filtrate under the binoculars/magnifying glass and document the shape and colour of the residue. Count the particles found in the filtrate and calculate the total number of particles per packaging unit using the analysed quantity and the total contents of the packaging.

Results:

Product: _____

Residues: _____

Total content of the packaging	Analysed quantity	Number of particles found	Total number of particles

Experiment 2:

Methods for detecting plastic in the environment - what characterises a 'good method'?

If you want to determine how much plastic waste is in the water or on the beaches in an area as large as the Baltic Sea, you need the support of many working groups. However, to ensure that all results are comparable, they must be obtained using identical methods. These are then called standard methods. It usually takes a long time to determine what is suitable as a standard method and the methods must first be extensively tested in practice. Scientists at the Leibniz Institute for Baltic Sea Research played a key role in the development of methods that can be used to determine the quantity and composition of litter on Baltic Sea beaches.

However, it is much more difficult to detect small and tiny waste particles, which are difficult to distinguish from the surrounding sand due to their size. A trick is used to estimate the load relatively quickly:

In pilot studies in which the smaller plastic waste particles in particular were recorded, it was shown that the pollution is around 10 times higher than that of large plastic pieces. It is therefore possible to estimate the quantities of microplastics on the basis of the relatively easy to determine contamination of large pieces of plastic.



Collected and sorted waste on a beach

A large proportion of beach litter consists of larger pieces of plastic, which can break down into smaller and smaller pieces over time. It is relatively easy to determine how much plastic waste is found on beaches and from which sources. All pieces of waste visible to the naked eye on the beach surface are collected and then categorised, counted and recorded.

An important requirement for scientific methods is that the results are reproducible. This means that if tests are repeated under the same conditions, the results should always be the same. You can check whether the method used fulfils this requirement by carrying out tests of the kind you will be doing below.

Task:

Beach litter monitoring in a practical test

Materials required:

- Measuring tape
- Writing pad
- Measuring log/pen
- Marking rod
- Cone for marking
- Bucket
- Gloves
- Clothing suitable for the weather
- Optional: PC with Excel

Experimental procedure:

Choose a suitable collection point. Divide into groups of 4 - 5 pupils.

Use the cones to mark out a collection area for each group (approx. 100 x 50 metres).

Each collection area is visually described by each group in turn. The pieces of rubbish seen are not collected, but only recorded in the log.

Once all test fields have been sighted by each group, each test field is sampled again by one group. All items of waste are collected and then categorised, counted and recorded.

Results:

Make a sketch showing the location and size of the collection fields!

Record the results of your group in a protocol. Use the table on the back for each group.

Exchange the results between the groups.

Evaluation:

Analyse the results obtained with regard to the questions listed below for the last collection point you worked on. Include the measurement data from the other groups for your measurement field.

- 1) How many pieces of waste were found on average per square metre at your collection point during the visual inspection?
- 2) What is the average proportion of plastic waste in your collection centre during optical collection?
- 3) Is there a difference in the number of litter items detected between purely 'visual detection' and 'collection'? In your opinion, which method is therefore more suitable for collecting scientific data?
- 4) What are the main sources of the rubbish you find?
- 5) Discuss measures in the group that could help to reduce the amount of waste. Write down your suggestions and then present them to the class.

Notes: