

Determination of total suspended solids (expressed as p.p.m.) in a water sample by filtration

Theory

Insoluble substances that are too finely divided to settle may reduce light penetration in surface waters and interfere with plant and aquatic life. These substances may also affect fish life or they may indicate sewage discharges. The solids can consist of plant or animal matter and inorganic material such as sand.

Determination of total suspended solids is done by firstly filtering a known volume of the water sample through small-pore filter paper. The increase in mass of the dry filter paper is then determined.

Procedure

NB: Wear your safety glasses.

Find the mass of a dry filter paper. Filter 1 litre of the water sample. Dry the filter paper at about 105 °C overnight. Find the mass of the dried filter paper. Calculate the mass of total suspended solids in mg/l (p.p.m.).

Sample Results and Calculations

Mass of dry filter paper before use	= 1.42 g
Mass of the dried filter paper after filtration	= 1.60 g
Mass of the suspended solids	= 0.18 g
Volume of water sample	= 1 l
Total suspended solids in mg/l (p.p.m.)	= 180

student questions

Suggest some possible causes of high levels of total suspended solids.

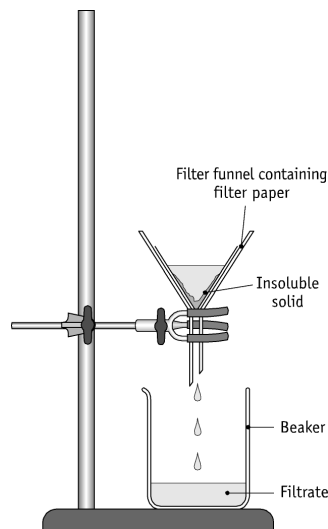
Algal growth. Sandpit washings. Sewage discharges.

What undesirable effects could result from high levels of total suspended solids?

Eutrophication. Damage to aquatic plants and animals. Sludge deposits.

How are these particles removed in water treatment?

In settling tanks, the action of gravity allows much of the suspended solids to settle as sediment. The remainder are removed by filtration through sand supported by gravel.



Determination of total dissolved solids (expressed as p.p.m.) in a water sample by evaporation

Theory

Dissolved solids can affect the colour or taste of water and, if very high, may be an indication that the water sample is saline. Determination of total dissolved solids is done by evaporating a known volume of the filtered water sample. The increase in mass of the container is then determined.

Procedure

Find the mass of a clean dry 250cm³ beaker. Add 100cm³ of a filtered water sample to the beaker. Evaporate to dryness in a dust-free oven at 105 °C. Find the mass of the cool dry beaker. Calculate the total dissolved solids in the water sample in mg/l (p.p.m.).

Table of results

Copy this table into your practical report book.

Mass of beaker	=
Mass of beaker after the evaporation	=
Mass of the dissolved solids	=
Volume of water sample	=
Total dissolved solids in mg/l (p.p.m.)	=

Sample Results and Calculations

Mass of beaker	= 99.05 g
Mass of beaker after the evaporation	= 100.54 g
Mass of the dissolved solids	= 1.49 g
Volume of water sample	= 100 cm ³
Total dissolved solids in mg/l (p.p.m.)	= 14,900

student questions

Why must filtered water be used in this experiment?

If the water has not been filtered, the result obtained will be the sum of the total suspended solids and total dissolved solids.

Suggest some possible reasons for high levels of total dissolved solids.

The sample contains a high level of inorganic and /or organic soluble salts. This could indicate that the sample is saline or that the water basin contains naturally occurring minerals such as limestone. Alternatively a high level of total dissolved solids could be an indication of domestic, agricultural or industrial pollution.

A volume of 1200 cm³ of water was found to contain 0.09 g of dissolved solids. Express the concentration of the dissolved solids in p.p.m.

1,200 cm ³	-----	0.09 g
1,200 cm ³	-----	90.0 mg
1,000 cm ³	-----	75.0 mg
1,000 cm ³	-----	75.0 p.p.m.

Determination of pH of a water sample

Theory

The most common range of pH present in fresh waters is 6.0 to 8.0. However, the range can extend from 4.5 for acidic, peaty waters to over 10.0 where there is intense, photosynthetic activity by algae. Water flowing over limestone tends to have its pH raised, due to the dissolving of calcium hydrogencarbonate in the water. Extremes of pH can affect the palatability and the corrosiveness of water as well as affecting plant and animal life. The pH of the water samples may be measured using a pH meter or pH paper or universal indicator solution.

Procedure

Find the pH of each water sample by taking the respective readings on the pH meter, or by comparing the colours obtained using pH paper or universal indicator solution with the appropriate colour charts. Record your results.

student questions

Suggest possible reasons for a relatively high pH value in a water sample.

The water sample is very hard, due to running over limestone, or is subject to intense photosynthetic activity due to the presence of algae.

Suggest possible reasons for a relatively low pH value in a water sample.

The water is acidic or peaty. Organic material decomposes to form acidic substances.