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AN EPA WATER QUALITY TEST FOR MIDDLE SCHOOLS: FILTERABLE RESIDUE

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Introduction

One part of the Clean Water Act requires monitoring the quantity of suspended particles in water. Water is tested before and after being used by industries. The quantity of suspended particles is measured by weighing the residue filtered from the water.

This experiment, appropriate for use with upper elementary and junior high students, provides an opportunity to participate in a water quality test used by the Environmental Protection Agency (EPA). Minimal equipment is needed; no hazardous material is involved and the experiment gives interesting results on local water. The results are recorded in milligrams per liter, which is parts per million (ppm). Water samples can be taken from rivers, lakes or local tap water. (In the author's hometown in central Kansas, the results were surprisingly high.) This experiment can be extended over three laboratory periods with each section completed easily in a 40-minute period.

Summary of Method

A water sample is passed through a standard glass fiber filter. The material retained on the filter is dried at 103° to 105° C and the amount of material retained is measured.

Apparatus/Chemicals

Glass fiber filters¹

Filtering apparatus using a water aspirator

- a) Water aspirator (plastic or metal)
- b) 250 mL filter flask
- c) Büchner funnel (size to fit available filters)

Balance that weighs to at least milligrams

Aluminum boats or aluminum foil with the edges turned up to hold the filter paper

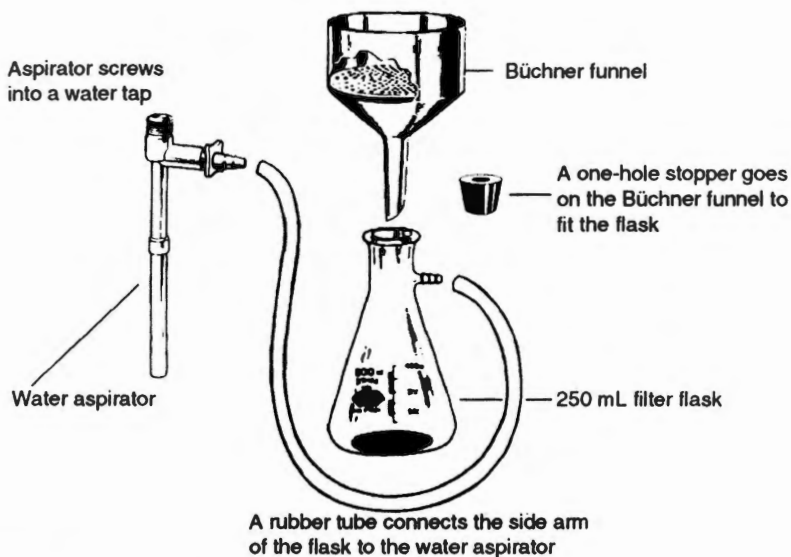
Oven

Graduated cylinders

Distilled water

Any equipment which is not purchased might be borrowed from the local high school. If a milligram balance is not available, a balance which weighs to centigrams may be used, but the amount of water filtered should be increased to a litre.

¹A source of glass-filter paper is MSI, Westboro, MA 01581. Catalog number 40WP04705. If you cannot obtain glass-fiber filter paper, experiment with any retentive filter paper.



Procedure

Preparation of glass filters: Place filter in suction filter apparatus. Apply vacuum and wash the filter with three 20-mL portions of distilled water. Continue suction to remove all of the water possible. Discard the washings. Transfer the filter to the aluminum boat and dry for an hour in the oven at about 103° to 105° C². (Allowing the filters to remain in the oven until the next day would not drastically hurt the experiment.) Remove the filters, cool and weigh. Record the weight.

Sample treatment: Filter 50-mL of the well-mixed sample under vacuum. (If the water is very dirty, use less sample.) Rinse with three 10-mL portions of distilled water. Remove the filter paper. Put it in the same aluminum boat as before and dry at 103° to 105° C for approximately the same length of time as it was dried the first time. Remove from the oven, cool and weigh.

Calculations

$$\text{mg/L} = \frac{(\text{final wt. of Al boat + filter}) - (\text{init. wt. of boat + filter})}{(\text{volume of the sample in liters})}$$

$$\text{mg/L} = \text{ppm}$$

Application

An inquiry to the local office of the Department of Natural Resources, Environmental Protection Agency or local water control agency will provide information regarding the amount of particulate matter considered acceptable in local streams and lakes.

²This is the temperature range set by the EPA. If you cannot keep this exact range, try to do both dryings at the same temperature.