

FLOCCULATION

Background

Estuaries are full of mud because as the river water mixes with seawater the clay comes out of suspension and sinks to the bottom. This process is called flocculation.

Activity I

Purpose

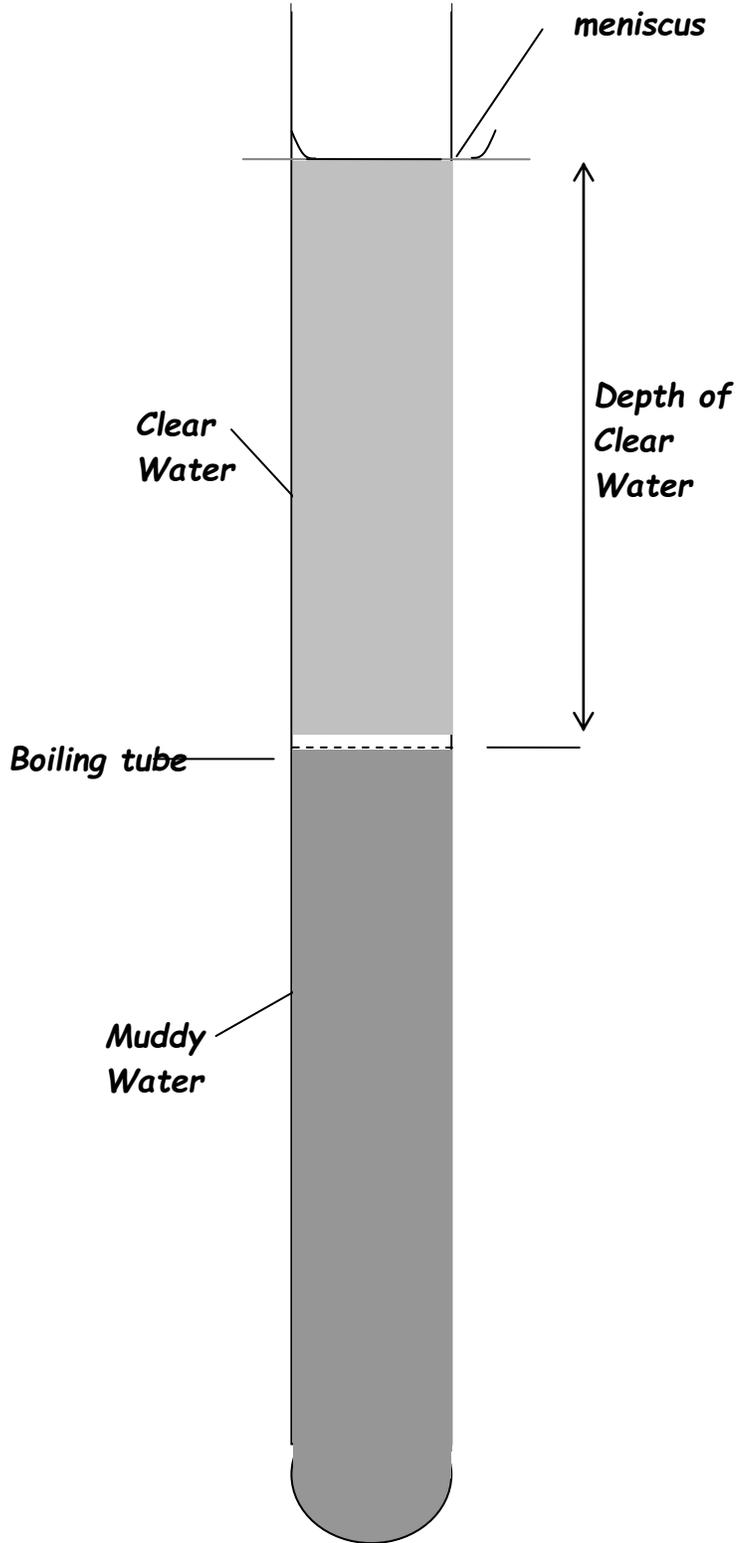
To determine what chemicals in seawater cause the clay to flocculate. This will be done by mixing each of the main chemicals found in sea water with muddy water.

- 1. Mark each boiling tube at the 20ml level.*
- 2. Fill each tube with 20ml of well-stirred muddy water.*
- 3. Label each tube with the formula for one of the solutions and also ones for distilled water and for seawater.*
- 4. Fill and label each measuring cylinder with 20ml of solution*
- 5. Add 20ml of each solution to the appropriate tube.*
- 6. Put corks in and shake each tube and start the timer.*
- 7. Record the depth of clear water in each tube every half-hour for two hours. Look again after 24 hours.*
- 8. Draw your conclusions.*

Activity II

To determine what effect different concentrations of sodium chloride solution have on the rate of flocculation.

Follow the instructions for activity I but use the NaCl solutions instead and take your readings every 10 minutes for one hour.



Teacher's Section

Requirements

Muddy water. This is best made by adding cat litter to distilled water, about 50ml cat litter to 1 litre distilled water, let it settle for one hour and then keep the top 500ml.

Distilled water

Boiling tubes with corks and stand

Measuring cylinders 20ml or 50ml

1 timer for each activity

Labels for boiling tubes

Activity 1

The following solutions. 20 ml is needed for each pair of students.

<i>Salt</i>	<i>grams per litre</i>
<i>Sodium chloride</i>	<i>27.3</i>
<i>Magnesium chloride</i>	<i>3.2</i>
<i>Magnesium sulphate</i>	<i>2.3</i>
<i>Calcium sulphate</i>	<i>1.2</i>
<i>Potassium chloride</i>	<i>0.7</i>
<i>Calcium carbonate</i>	<i>0.1</i>

Sea, river, rain water as interesting comparisons

Activity II

Solutions of Sodium chloride. 20 ml is needed per pair of students.

1g, 2g, 5g, 10g, 20g, 30g per litre

Notes

It is important to make sure the clay suspension is well stirred.

The boundary between the clear water and the water with the flocculated clay is distinct and sharp.

Checks

Make sure students stir the muddy water before adding it to the tubes and that they shake the tubes after the solutions have been added. Also check that they put the right solution into the labelled tube.

Results

MgCl₂ causes the fastest flocculation, then seawater, then NaCl, then MgSO₄ and CaSO₄. KCl has a slight effect and CaCO₃ has no effect, neither does distilled water.

Initially the stronger the concentration of NaCl the faster the clay flocculates but the weaker solutions have caught up after one hour. Estuaries are muddy because this is where muddy fresh water mixes with salt water.

Time

Activity I. Initially about 20 minutes and then 5 minutes every half-hour. Clear results can be seen after one hour.

Activity II 1 hour. Both activities can be done at the same time.