

Air, pollution and clean water resources

Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Lab

Name: _____ Date: _____ Class: _____

Fresh water is scarce, and many countries must clean polluted or salty water. In this lab you treat a muddy salt solution in two stages, filtration and distillation, then use mass measurements and a chemical test to show what each stage removes and what it leaves behind.

Level: Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** HS-ESS3-6, GCSE C9-C10

Aim

To make clean water from a muddy salty sample by filtration and distillation, and to measure how much solid is removed at each stage.

Equipment

- sample A (soil and salt stirred in water), filter funnel and paper, beakers
- conical flask with bung and delivery tube, test tube, beaker of cold water, heat source and tripod
- 25 cm³ measuring cylinder, evaporating dishes, balance (± 0.001 g)
- dilute nitric acid, dilute silver nitrate solution, goggles

Safety

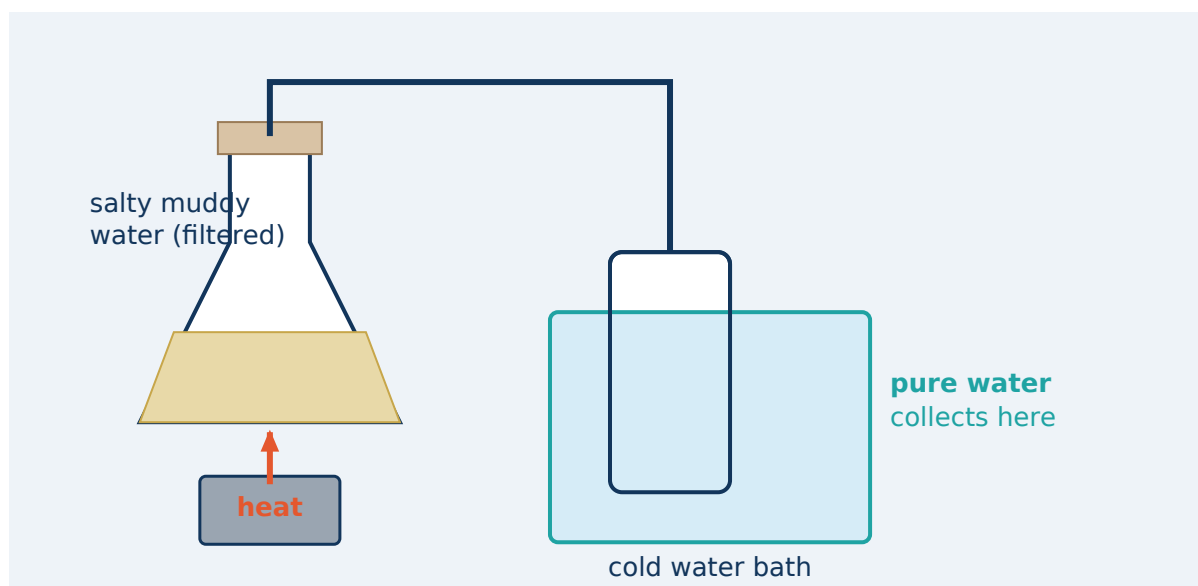
Safety

Wear goggles. Silver nitrate stains skin and is harmful; dilute nitric acid is irritant. Never heat the flask until it is dry, and remove the delivery tube from the collecting tube before the heat is turned off. Hot steam can scald.

Method

1. Measure 25 cm³ of sample A into a weighed evaporating dish, heat it gently until dry, cool it and reweigh. Record the mass of solid.
2. Filter the rest of sample A to make sample B. Repeat step 1 with 25 cm³ of B.
3. Distil about 50 cm³ of B and collect the liquid as sample C. Repeat step 1 with 25 cm³ of C.
4. Put 2 cm³ of each sample in a test tube, add 3 drops of dilute nitric acid and 3 drops of

silver nitrate. Record what you see.



Simple distillation set-up used to make sample C.

Results

The class results were:

Sample	Appearance	Silver nitrate test	Solid left from 25 cm ³ (g)
A original	brown, muddy	heavy white precipitate	1.075
B filtered	clear, pale	heavy white precipitate	0.875
C distillate	clear, colourless	no precipitate	0.000

Analysis questions

Question 1 Dissolved solids

Calculate the concentration of dissolved solids in sample B in g/dm³.

Question 2 Mud removed

Calculate the mass of mud in 25 cm³ of A and in 1 dm³ of A.

Question 3 Fraction of solid that is mud

Calculate the percentage of the total solid in A that is mud.

Question 4 Why filtering is not enough

Explain why filtration cannot make sample A drinkable.

Question 5 Silver nitrate test

Name the ion detected, give the ionic equation, and explain the result for sample C.

Question 6 Chloride concentration

Sample B contains sodium chloride only ($M = 58.5 \text{ g/mol}$). Calculate the concentration in mol/dm^3 .

Question 7 Role of the cold water

Explain the roles of the cold water bath and of not heating to dryness.

Question 8 Evaluate the method

Distilled water is not what is supplied to homes. Give two reasons and one improvement to the lab.