Determination of thiocyanate ions in waste water

Teacher and technician sheet

Equipment and materials

Each student or pair of students will require:

- *Determination of thiocyanate using iron(III): Student worksheet*
- burettes x 3
- 100 cm^3 volumetric flasks x 7 (or use one, thoroughly washing it between samples)
- colorimeter and suitable filter (blue) A solution of the complex displays maximum absorption at 480 nm.
- potassium thiocyanate containing 250 mg dm^{-3} thiocyanate (250 ppm) (30 cm^3)
- iron(III) chloride solution 0.41 mol dm^{-3} (70 cm^3)

Make sure that students wear eye protection. Iron(III) chloride solution is an irritant to eyes, lungs and the respiratory system.

Preparation of solutions

For the calibration graph

- Potassium thiocyanate solution containing 250 mg dm^{-3}: Dissolve 4.5 g potassium thiocyanate in distilled or deionised water and dilute to 500 cm^3 in a volumetric flask. This solution contains 5000 mg dm^{-3} thiocyanate ions. Dilute 50 cm^3 of this solution to 1 dm^3 in a volumetric flask. The diluted solution contains 250 mgdm^{-3} (250 ppm) thiocyanate ions.
- Iron(III) chloride solution, 0.41 mol dm^{-3}: Dissolve 50 g iron(III) chloride-6-water in a beaker in about 200 cm^3 1 mol dm^{-3} hydrochloric acid. Make up to 250 cm^3 in a volumetric flask with more 1 mol dm^{-3} hydrochloric acid.

Samples requested by students

Students are asked to request samples from the water treatment plant. If they ask for samples taken from the inlet pipe of effluent into the waste water treatment plant then samples 1, 2, 3 and 4 should be supplied as follows:

- Samples 1, 2, 3 and 4 taken from the inlet pipe of effluent into the waste water treatment plant: solutions based on 25 mg dm^{-3} thiocyanate, slightly diluted to provide some variation in concentration (10 cm^3 each).

  25 mg dm^{-3} thiocyanate: Pipette 10 cm^3 of 250 mg dm^{-3} solution of potassium thiocyanate into a 100 cm^3 volumetric flask and make up to the mark with distilled or deionised water.

If students ask for samples taken from the pipe releasing effluent from the waste water treatment plant to the river then samples 5, 6, 7 and 8 should be supplied as follows:

- Sample 5, 6, 7 and 8 taken from the pipe releasing effluent from the waste water treatment plant to the river: all solutions to contain 5 mg dm^{-3} thiocyanate (10 cm^3 each).

  5 mg dm^{-3} thiocyanate: Pipette 10 cm^3 of the 250 mg dm^{-3} solution of potassium thiocyanate into a 500 cm^3 volumetric flask and make up to the mark with distilled or deionised water.

If students ask for samples taken from the settling tanks then solutions should be made up by mixing 25 mg dm^{-3} thiocyanate solutions with an equal volume or twice the volume of distilled or deionised water. The exact proportions of the thiocyanate solution to water are not critical.