
A-level Chemistry exemplar for required practical 11

Carry out simple test-tube reactions to identify transition metal ions in aqueous solution: An investigation of some transition metal compounds.

Student sheet

Most transition metal compounds are coloured. Some of them are used as dyes and pigments. A dye is a soluble coloured compound. A pigment is an insoluble coloured compound. Both dyes and pigments have to be resistant to chemical change.

Three solutions, labelled **Q**, **R** and **S**, have been provided by a supplier as possible dyes.

- You will carry out tests on these solutions.
- You will record what you **observe** for each test.
- You should ensure that you record observations on dropwise addition, on addition to excess and on standing.
- Where no visible change is observed, write 'no visible change'.

In this task, you are **not** required to identify any of the solutions or any of the reaction products.

Requirements

You are provided with the following:

- three solutions – labelled 'Solution **Q**', 'Solution **R**' and 'Solution **S**'
- sodium hydroxide solution
- sodium carbonate solution
- silver nitrate solution
- 12 test tubes
- 7 dropping pipettes
- test-tube rack
- 250 cm³ beaker
- access to hot water
- plentiful supply of distilled or deionised water.

Suggested method

Test 1(a)

- a) Place about 10 drops of solution **Q** in a test tube.
- b) Add sodium hydroxide solution, dropwise with gentle shaking, until in excess.
- c) **Do not discard this mixture.**
- d) Repeat this test with solution **R** and then solution **S**.

Test 1(b)

- a) Half fill a 250 cm³ beaker with the freshly boiled water provided.
- b) Allow the four test tubes containing the mixtures from **Test 1(a)** to stand in the beaker of hot water for about 10 minutes.
- c) While you are waiting, begin **Test 2**.

Test 2

- a) Place about 10 drops of sodium carbonate solution in a test tube.
- b) Add about 10 drops of solution **Q** and shake the mixture gently.
- c) Repeat this procedure with solution **R** and then solution **S**.

Test 3

- a) Place about 10 drops of solution **Q** in a test tube.
- b) Add about 10 drops of silver nitrate solution and shake the mixture gently.
- c) Repeat this procedure with solution **R** and then solution **S**.
- d) Allow the four test tubes to stand for about 10 minutes.