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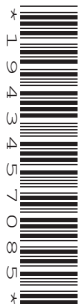
Friday 20 June 2025 – Morning

A Level Chemistry B (Salters)

H433/03 Practical skills in chemistry

Practical Insert

Time allowed: 1 hour 30 minutes



INSTRUCTIONS

- Do **not** send this Insert for marking. Keep it in the centre or recycle it.

INFORMATION

- This document has **4** pages.

Determining the percentage by mass of manganese in a steel paperclip

Most steels contain some manganese to increase the hardness of the alloy.
A group of students use colorimetric analysis to determine the percentage by mass of manganese in a steel paperclip.

Background

The students first convert the manganese in the paperclip into a solution containing the purple manganate(VII) ion, MnO_4^- (aq).

The students then use colorimetry to determine the concentration of MnO_4^- (aq) in the solution.

Method – Part 1 (dissolving the paperclip)

- The students cut up a paperclip and weigh out **about** 0.2 g.
- They dissolve this in 70 cm³ of hot dilute nitric acid in a beaker.
The nitric acid oxidises the manganese to Mn^{2+} (aq) ions.
- They then add about 10 cm³ of KIO_4 (aq) to the beaker which oxidises the Mn^{2+} (aq) to purple MnO_4^- (aq) ions.
- They then make the solution accurately up to 100.0 cm³.

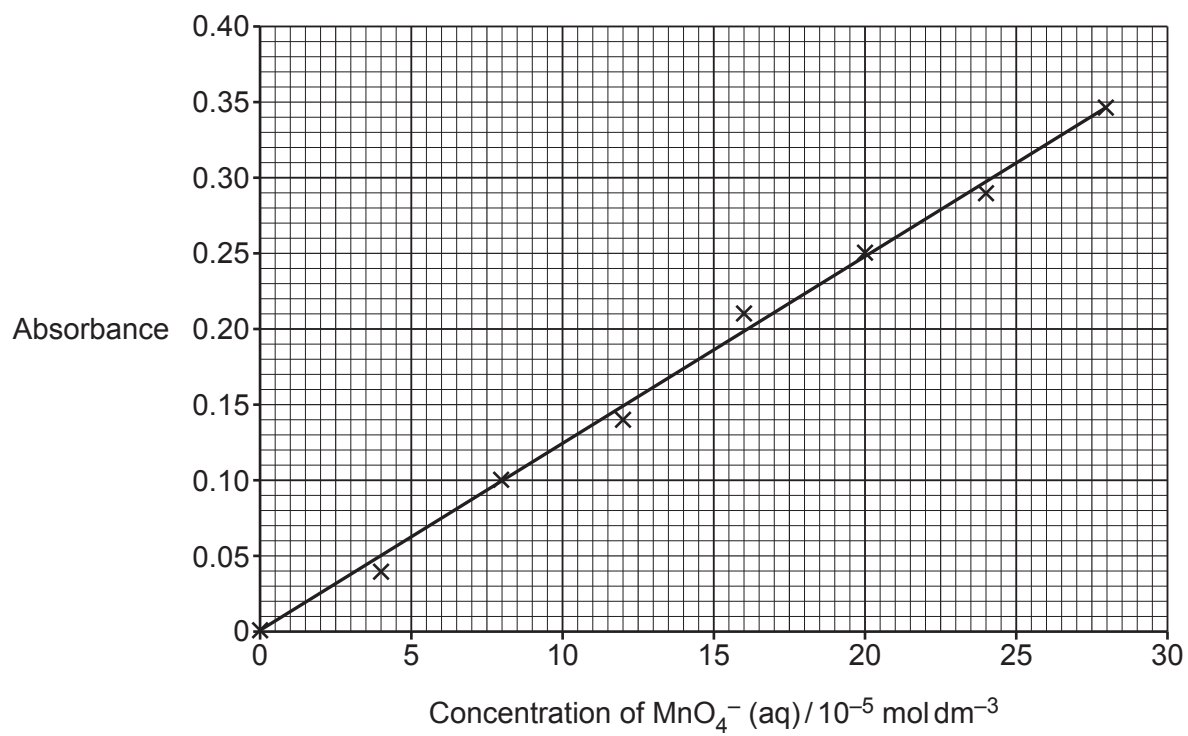
Method – Part 2 (preparing a calibration graph to determine the concentration of the MnO_4^- (aq) solution from the paperclip)

- The students set up a colorimeter with a green filter and zero the colorimeter using deionised water.
- The students have a set of standard solutions of MnO_4^- (aq) in sulfuric acid.
- They measure the absorbance of these standard solutions.
- They plot a calibration graph.
- They measure the absorbance of their MnO_4^- (aq) from **Part 1**.
- They use their result to calculate the concentration of MnO_4^- (aq) in the solution.
- They use this result to calculate the percentage of manganese in the paperclip.

Results

Mass of paperclip dissolved = 0.198 g

Absorbance value of paperclip solution = 0.18

Calibration graph**END OF INSERT**

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