Manganese by manganate(VII) assay

Student worksheet

Principle

You can use the intensity of the colour to determine the concentration of manganate(VII) ions in solution. You can find the concentration of the solution of MnO_4^-(aq) using a colorimeter. You can also use simple colour matching although the results will be less precise.

Equipment and materials

- burette
- 100 cm^3 volumetric flask x 7 (or use one, thoroughly washing it between samples)
- colorimeter and suitable filter (green) - a solution of manganate(VII) ions displays maximum absorption at 530 nm
- potassium manganate(VII) solution containing 0.1 g dm^{-3} manganese as manganate(VII) ions (100 ppm) (34 cm^3)
- solution of unknown manganese concentration (5 cm^3)

Method

Care: Wear eye protection

1. Fill a burette with the standard manganate(VII) solution containing 0.1 g dm^{-3} manganese as manganate(VII) ions (100 ppm).
2. Label seven 100 cm^3 volumetric flasks A-G (or use one, thoroughly washing it between samples) and add the volumes of manganate(VII) solution shown in the table, making the solution up to the mark with deionised water:

Volumetric flask	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Volume of standard manganate(VII) solution / cm^3	10.0	8.0	6.0	4.0	3.0	2.0	1.0
ppm manganese	10.0	8.0	6.0	4.0	3.0	2.0	1.0

3. Measure the absorbance of each of the seven solutions of potassium manganate(VII) and also the solution in which the concentration of manganate(VII) is unknown.
4. Plot a graph of absorbance (*y* axis) against MnO_4^-(aq) concentration (in ppm manganese) (*x* axis) for flasks A-G.
5. Use the graph to find the concentration of MnO_4^-(aq) as ppm manganese in the unknown solution.