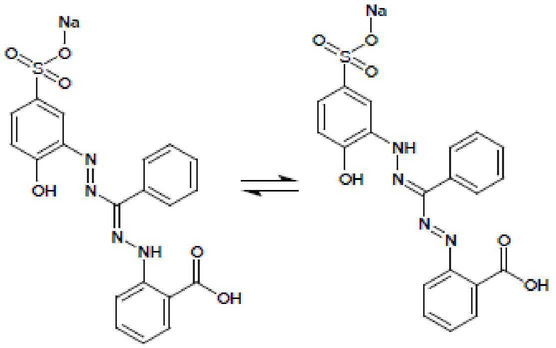
Zinc by zincon assay

Student worksheet

Principle

Zn(II) ions in solution react with zircon to form a blue complex. You can use this reaction for the quantitative analysis of low concentrations of Zn^{2+}(aq) in solution. You can find the concentration of the solution of Zn^{2+} using a colorimeter. You can also use simple colour matching although the results will be less precise.



Equipment and materials

- test tube x 6
- 5 cm^3 volumetric flask x 7 (or use one, thoroughly washing it between samples)
- 1 cm^3 graduated pipettes x 3
- colorimeter and suitable filter (red) A solution of the complex displays maximum absorption at 620 nm.
- buffer solution, pH 9 (3.5 cm^3)
- Zincon solution (2.1 cm^3)
- zinc sulfate solution containing 0.01 g dm^{-3} Zn^{2+} (10 ppm) (24 cm^3)
- solution of unknown Zn^{2+} concentration (10 cm^3)

Method

Care: Wear eye protection.

1. Fill two burettes, one with the 10 ppm Zn^{2+} solution and one with deionised water
2. Label six boiling tubes and use the burettes to add the volumes of solutions shown in the table:
3.

Beaker	A	B	C	D	E	F
Volume of 10 ppm Zn^{2+} solution / cm^3	8.0	6.0	4.0	3.0	2.0	1.0
Volume of water / cm^3	2.0	4.0	6.0	7.0	8.0	9.0
Concentration of Zn^{2+} / ppm	8.0	6.0	4.0	3.0	2.0	1.0

4. Use a graduated pipette to transfer a 1 cm^3 aliquot of the sample containing 8.0 ppm of Zn^{2+} to a 5 cm^3 volumetric flask.
5. Add 0.5 cm^3 of buffer solution to the sample and mix well.
6. Add zincon solution drop by drop until the red colour is one drop in excess, mix well again and dilute to 5 cm^3 using distilled or deionised water.
7. Measure the absorbance of the solution.
8. Repeat the procedure for the solutions containing 6.0, 4.0, 3.0, 2.0, 1.0 ppm Zn^{2+} and for a solution where the concentration of Zn^{2+} is unknown.
9. Plot a graph of absorbance (*y* axis) against Zn^{2+}(aq) concentration (in ppm Zn^{2+}) (*x* axis) for the six samples A-F.
10. Use the graph to find the concentration in ppm of Zn^{2+}(aq) in the unknown solution.