

AS90695

**Determine the concentration of an oxidant or reductant by titration  
Level 3, Credits 2**

This achievement standard involves individually carrying out a titration involving an oxidation-reduction reaction, and calculating the concentration of the oxidant or reductant in the solution.

Achievement	Achievement with Merit	Achievement with Excellence
<ul style="list-style-type: none"> <li>Carry out an oxidation-reduction titration with limited precision.</li> <li>Calculate the concentration of the oxidant or reductant using titration data.</li> </ul>	<ul style="list-style-type: none"> <li>Carry out an oxidation-reduction titration with reasonable precision.</li> <li>Determine the composition of the sample being analysed.</li> </ul>	<ul style="list-style-type: none"> <li>Carry out an oxidation-reduction titration with high precision.</li> <li>Accurately calculate the composition of the sample being analysed.</li> </ul>

- Titration procedure (provided)
- Balanced equation (provided); calculations will involve reactions where the reactants are not in a 1:1 mole ratio
- Preparation of burette and pipette for use
- Preparation of the conical flask
- Reading the burette & pipette correctly
- Recording results in a systematic format
  - initial volume, final volume, volume used
  - units – mL
  - burette readings recorded to 2 d.p. e.g. 12.30 mL, 12.50 mL
- Calculation of average titre correctly, showing which titres have been selected
- Use of formulae;  $n = CV$  &  $C = n/V$  (not supplied)
- Units; mol,  $\text{mol L}^{-1}$ , L
- Amount,  $n$ , in moles, must be correct, i.e. convert mL to L correctly
- Determination of the composition of the sample will involve one mathematical conversion between the concentration of the solution analysed and the composition of the sample, e.g.
  - concentration of the sample before dilution
  - concentration in grams per litre ( $\text{g L}^{-1}$ )
  - concentration in % (w/v).
  - % composition (or purity) of a solid.
- Appropriate use of significant figures and units (made on the final concentration, and composition, determined)

Possible systematic format:

	1	2	3	4	5
Final volume (mL)	16.50	31.90			
Initial volume (mL)	1.00	16.50			
Volume used (mL)	15.50	15.40			

<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
at least 2 recorded titre values must fall within a range of 0.6 mL	at least 3 recorded titre values must fall within a range of 0.4 mL	at least 3 recorded titre values must fall within a range of 0.2 mL
average titre value within 0.6 mL of expected outcome	average titre value within 0.4 mL of expected outcome	average titre value within 0.2 mL of expected outcome
use only titre values within a range of 0.6 mL to calculate the average volume	use only titre values within a range of 0.4 mL to calculate the average volume	use only titre values within a range of 0.2 mL to calculate the average volume
calculation of the concentration of the unknown solution must be carried out using an appropriate procedure; a minor numerical error is allowed	composition of the sample is determined using a correct procedure (concentration of unknown & conversion calculation)	correctly determining the composition of the sample using correct units and appropriate number of significant figures

An error which shows a lack of understanding of the chemistry involved in the analysis is not a minor error. Where the error leads to a concentration which is not a sensible one, it is not a minor error.