Redox Titrations Map

AQA A-level Chemistry · 3.2.5.5 Redox titrations

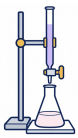
1 Manganate(VII) and iron(II) 3.2.5.5

- MnO_4^- + $8H^+$ + $5Fe^{2+}$: **1 : 5**
- Purple → colourless
- **Dilute H_2SO_4** only
- Not HCl, HNO_3 or ethanoic acid



2 The manganate(VII) titration 3.2.5.5

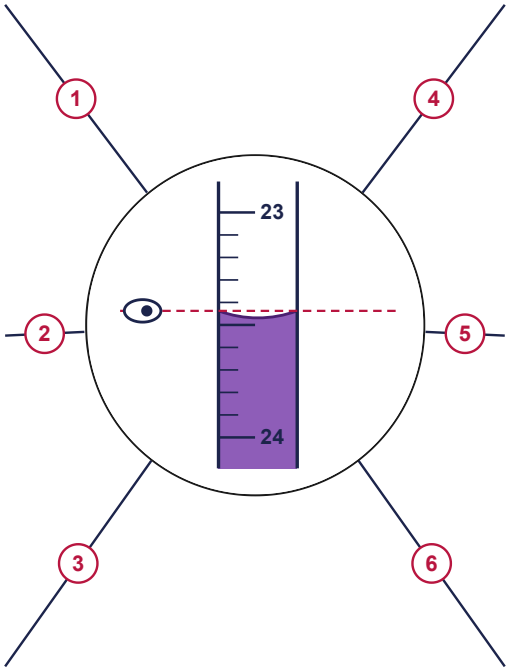
- Pipette Fe^{2+}, excess acid
- **Self-indicating**
- End: first permanent **pale pink**
- Read the **top** of the meniscus



3 Other reducing agents 3.2.5.5

- $C_2O_4^{2-}$: **2 : 5**, warm to 60 °C
- Mn^{2+} catalyses: autocatalysis
- H_2O_2 → O_2: **2 : 5**
- FeC_2O_4: **3 : 5**





4 The choice of acid 3.2.5.5

- MnO_4^-/Mn^{2+} **+1.51 V**
- Cl_2/Cl^- +1.36 V: HCl is **oxidised**
- Ethanoic acid: too **weak**
- **Dilute H_2SO_4**: excess, never limiting



5 Similar redox titrations 3.2.5.5

- Write **both** half-equations
- $Cr_2O_7^{2-}$: Fe^{2+} = **1 : 6**
- MnO_4^- : VO^{2+} = **1 : 5**
- MnO_4^- : Sn^{2+} = **2 : 5**



6 The calculation 3.2.5.5

- Moles of titrant: c × V ÷ 1000
- × the **ratio**
- × the **dilution** factor
- Mass, % or formula



Reacting ratios in redox titrations

titrant : substance

Titrant	Substance	Ratio
MnO_4^-	Fe^{2+}	1 : 5
MnO_4^-	$C_2O_4^{2-}$ or H_2O_2	2 : 5
MnO_4^-	FeC_2O_4	3 : 5
MnO_4^-	VO^{2+}	1 : 5
MnO_4^-	Sn^{2+}	2 : 5
$Cr_2O_7^{2-}$	Fe^{2+}	1 : 6

Worked examples

Iron tablet

- 11.20 cm^3 of 0.00500 MnO_4^-
- × 5 × 10 × 55.8
- **0.156 g Fe**

Hydrogen peroxide

- 21.60 cm^3 of 0.0200 MnO_4^-
- × 5/2 ÷ 0.0250 dm^3
- **0.0432 mol dm^{-3}**

Dichromate(VI)

- 20.80 cm^3 of 0.0150 $Cr_2O_7^{2-}$
- × 6 ÷ 0.0250 dm^3
- **0.0749 mol dm^{-3} Fe^{2+}**

Electrode potentials explain the choice of acid (3.1.11); Mn^{2+} autocatalysis returns in 3.2.5.6.

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