Redox Titrations Map

Cambridge International AS & A Level Chemistry · Topic 28 Chemistry of transition elements · 28.2 Redox titrations

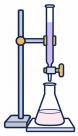
1 Manganate(VII) and iron(II) 28.2.9

- 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 28.2.9

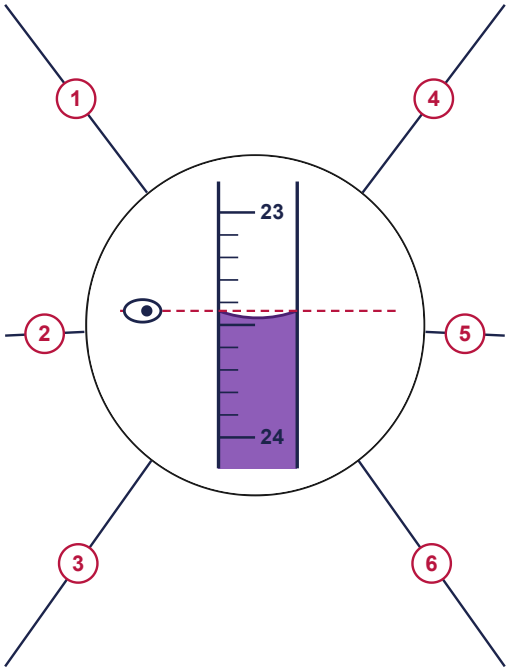
- Pipette Fe^{2+}, excess acid
- **Self-indicating**
- End: first permanent **pale pink**
- Read the **top** of the meniscus



3 Other reducing agents 28.2.9

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





4 Iodine and thiosulfate 28.2.9

- Oxidant + **excess KI** → I_2
- $I_2 + 2S_2O_3^{2-} \rightarrow 2I^- + S_4O_6^{2-}$
- Starch near the end: **blue-black**
- End: **colourless**



5 Ratios through iodine 28.2.9

- Cu^{2+} : $S_2O_3^{2-}$ = **1 : 1**
- ClO^- : $S_2O_3^{2-}$ = **1 : 2**
- IO_3^- : $S_2O_3^{2-}$ = **1 : 6**
- Moles, ratio, scale up



6 Non-familiar systems 28.2.10

- Write **both** half-equations
- $Cr_2O_7^{2-}$: Fe^{2+} = **1 : 6**
- Back titration: added − left
- Moles, ratio, scale up



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
$S_2O_3^{2-}$	I_2	2 : 1
$S_2O_3^{2-}$	Cu^{2+} (via I_2)	1 : 1
$S_2O_3^{2-}$	IO_3^- (via I_2)	6 : 1

Worked examples

Iron tablet

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

Brass

- 18.90 cm^3 of 0.100 $S_2O_3^{2-}$
- 1 : 1, × 10 × 63.5
- **1.20 g Cu**

Tin(II)

- 15.00 cm^3 of 0.0200 MnO_4^-
- × 5/2 ÷ 0.0250 dm^3
- **0.0300 mol dm^{-3} Sn^{2+}**

Electrode potentials explain the choice of acid (Topic 24); Mn^{2+} autocatalysis returns in Topic 28.

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