

Exercise walk-through

5.1.2

Use redox titration ratios and uncertainty

Pearson Edexcel · International A-Level · Chemistry

Choose a cell voltage

Your turn

Reduction potentials are $+0.80\text{ V}$ and $+0.34\text{ V}$. What is spontaneous E°_{cell} ?

- A. $+1.14\text{ V}$
- B. $+0.46\text{ V}$
- C. -0.46 V

Find oxidation state and coordination

Your turn

$[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]^+$ has which chromium state and coordination number?

- A. +1 and 4
- B. +3 and 6
- C. +3 and 2

Aspirin transfer calculation

Your turn

2.76 g salicylic acid, $M=138$, gives aspirin $M=180$ in 1:1 ratio. Dry mass is 2.52 g. What is yield?

- A. 50.0%
- B. 70.0%
- C. 91.3%

Exercises 2.1·2.3

2.1 Balance MnO_4^- reduction to Mn^{2+} in acid, including electrons. [3]

2.2 Explain the choice of sulfuric acid rather than hydrochloric acid, and state the manganate(VII) endpoint. [2]

2.3 A titre has two readings, each $\pm 0.05 \text{ cm}^3$. Find worst-case percentage uncertainty for 16.00 cm^3 . [2]

Exercises 2.1·2.3

2.1 Balance MnO_4^- reduction to Mn^{2+} in acid, including electrons. [3]

2.1 $\text{MnO}_4^- + 8\text{H}^+ + 5\text{e}^- \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$. Correct O/H balance, electron count,

2.2 Explain the choice of sulfuric acid rather than hydrochloric acid, and state the manganate(VII) endpoint. [2]

2.2 Chloride can be oxidised, consuming extra titrant; first persistent faint pink is slight manganate(VII) excess.

2.3 A titre has two readings, each $\pm 0.05 \text{ cm}^3$. Find worst-case percentage uncertainty for 16.00 cm^3 . [2]

2.3 Absolute uncertainty = 0.10 cm^3 ; $100(0.10/16.00) = 0.625\%$.

Exercises 3.1·3.3

3.1 $25.00 \text{ cm}^3 \text{ Fe}^{2+}$ requires 22.40 cm^3 of $0.0200 \text{ mol dm}^{-3} \text{ MnO}_4^-$. Calculate Fe^{2+} concentration. [4]

3.2 Excess iodide reacts with 25.00 cm^3 of an oxidant sample: $\text{X} + 2\text{I}^- \rightarrow \text{Y} + \text{I}_2$. The

3.3 Explain when to add starch, why water in the conical flask does not change the titre, and why concordant titres do not remove every error. [3]

Exercises 3.1·3.3

3.1 $25.00 \text{ cm}^3 \text{ Fe}^{2+}$ requires 22.40 cm^3 of $0.0200 \text{ mol dm}^{-3} \text{ MnO}_4^-$. Calculate Fe^{2+} concentration. [4]

3.1 $n(\text{MnO}_4^-) = 0.0200 \times 0.02240 = 4.48 \times 10^{-4} \text{ mol}$. Fe^{2+} amount is five times

3.2 Excess iodide reacts with 25.00 cm^3 of an oxidant sample: $\text{X} + 2\text{I}^- \rightarrow \text{Y} + \text{I}_2$. The

3.2 Thiosulfate = 0.001860 mol ; iodine = half, 0.000930 mol . X:iodine is 1:1, so $c(\text{X}) = 0.000930/0.02500 = 0.0372 \text{ mol dm}^{-3}$.

3.3 Explain when to add starch, why water in the conical flask does not change the titre, and why concordant titres do not remove every error. [3]

3.3 Add near pale yellow to avoid strong iodine/starch binding at high iodine concentration. Water changes volume but not moles of transferred analyte. A systematic error such as incorrect titrant concentration remains.