

Exercise walk-through

5.2.3

Link catalyst cycles and chelation to evidence

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 Define homogeneous and heterogeneous catalysis, giving one example of each from this unit. [2]

2.2 Add the two worked iron steps and identify the regenerated species. [2]

2.3 Explain why carbon monoxide binding to haemoglobin interferes with oxygen transport. [2]

Exercises 2.1·2.3

2.1 Define homogeneous and heterogeneous catalysis, giving one example of each from this unit. [2]

2.1 Homogeneous: same phase, for example aqueous iron ions catalysing iodide/peroxodisulphate
Heterogeneous: different phase, for example solid V_2O_5 with gaseous SO_2/O_2 .

2.2 Add the two worked iron steps and identify the regenerated species. [2]

2.2 $S_2O_8^{2-} + 2I^- \rightarrow 2SO_4^{2-} + I_2$; Fe^{2+} is regenerated via Fe^{3+} .

2.3 Explain why carbon monoxide binding to haemoglobin interferes with oxygen transport. [2]

2.3 CO competes for binding to haem Fe^{2+} , strongly occupying sites needed for reversible oxygen binding.

Exercises 3.1·3.3

3.1 Use $\text{V}_2\text{O}_5 + \text{SO}_2 \rightarrow \text{V}_2\text{O}_4 + \text{SO}_3$ and $2\text{V}_2\text{O}_4 + \text{O}_2 \rightarrow 2\text{V}_2\text{O}_5$ to derive the overall equation. Explain the role of variable oxidation states. [4]

3.2 An acidified manganate(VII)/ethanedioate mixture starts slowly then speeds up. Explain this without claiming reactant concentrations rise. [3]

3.3 Six water ligands are replaced by three bidentate en ligands. Explain why the product may be favoured and why “twice as many bonds” is incorrect. [3]

Exercises 3.1·3.3

3.1 Use $\text{V}_2\text{O}_5 + \text{SO}_2 \rightarrow \text{V}_2\text{O}_4 + \text{SO}_3$ and $2\text{V}_2\text{O}_4 + \text{O}_2 \rightarrow 2\text{V}_2\text{O}_5$ to derive the overall equation. Explain the role of variable oxidation states. [4]

3.1 Double the first step; cancel $2\text{V}_2\text{O}_5$ and $2\text{V}_2\text{O}_4$, giving $2\text{SO}_2 + \text{O}_2 \rightarrow 2\text{SO}_3$. Vanadium changes oxidation state and returns, providing an alternative pathway.

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3.2 Mn^{2+} product acts as catalyst. Its concentration builds up and supplies more catal-

3.3 Six water ligands are replaced by three bidentate en ligands. Explain why the product may be favoured and why “twice as many bonds” is incorrect. [3]

3.3 Six free waters replace three free en particles, often increasing entropy. Each en gives two donor bonds, so both complexes have six metal–donor bonds/coordination six.