

Exercise walk-through

5.1.1

Choose cell direction and interpret electrode data

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 State the standard hydrogen electrode materials and conditions. [4]

2.2 For $\text{Ag}^+/\text{Ag} = +0.80 \text{ V}$ and $\text{Cu}^{2+}/\text{Cu} = +0.34 \text{ V}$, identify the positive electrode and calculate E°_{cell} . [2]

2.3 Explain why an $\text{Fe}^{3+}/\text{Fe}^{2+}$ half-cell uses platinum and a salt bridge. Identify what

3 Exam-style questions

Exercises 2.1·2.3

2.1 State the standard hydrogen electrode materials and conditions. [4]

2.1 Platinum and hydrogen/ H^+ contact, 298 K, hydrogen at 100 kPa, H^+ at 1.00 mol

2.2 For $\text{Ag}^+/\text{Ag} = +0.80 \text{ V}$ and $\text{Cu}^{2+}/\text{Cu} = +0.34 \text{ V}$, identify the positive electrode and calculate E°_{cell} . [2]

2.2 Silver is positive, with Ag^+ reduced; $E^\circ = 0.80 - 0.34 = +0.46 \text{ V}$.

2.3 Explain why an $\text{Fe}^{3+}/\text{Fe}^{2+}$ half-cell uses platinum and a salt bridge. Identify what

3 Exam-style questions

2.3 Platinum provides an inert electron contact because neither couple member is a conducting solid. Bridge ions complete the circuit/maintain charge balance; electrons move in the external wire.

Exercises 3.1·3.3

3.1 Combine Ag^+/Ag and Cu^{2+}/Cu into a spontaneous equation. Explain why doubling the silver half-equation does not double its potential. [4]

3.2 A proposed reaction has positive E°_{cell} but shows no visible change. Give two distinct reasons why this need not contradict the standard prediction. [2]

3.3 Hypothetical $\text{A}^{3+}/\text{A}^{2+}$ is +0.20 V and A^{2+}/A is +0.60 V. Test disproportionation

Exercises 3.1·3.3

3.1 Combine Ag^+/Ag and Cu^{2+}/Cu into a spontaneous equation. Explain why doubling the silver half-equation does not double its potential. [4]

3.1 $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^-$; $2\text{Ag}^+ + 2\text{e}^- \rightarrow 2\text{Ag}$. Overall $\text{Cu} + 2\text{Ag}^+ \rightarrow \text{Cu}^{2+} + 2\text{Ag}$. Voltage

3.2 A proposed reaction has positive E°_{cell} but shows no visible change. Give two distinct reasons why this need not contradict the standard prediction. [2]

3.2 A high activation barrier can make it too slow. Actual concentrations/temperature may differ from standard conditions, changing potentials.

3.3 Hypothetical $\text{A}^{3+}/\text{A}^{2+}$ is +0.20 V and A^{2+}/A is +0.60 V. Test disproportionation

3.3 $3\text{A}^{2+} \rightarrow 2\text{A}^{3+} + \text{A}$. Reduction is A^{2+} to A, oxidation reverses $\text{A}^{3+}/\text{A}^{2+}$; $E^\circ = 0.60 -$