

Exercise walk-through

5.1.4

Select half-cell apparatus and write conventional diagrams

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 Select the conducting electrode for a Cu^{2+}/Cu half-cell and for an $\text{Fe}^{3+}/\text{Fe}^{2+}$ half-cell.

2.2 For a theoretical chlorine/chloride gas half-cell under an approved supervised procedure, identify the electrode, gas condition and ion concentration for a standard measurement. [3]

2.3 Write a conventional diagram with zinc oxidation on the left and Fe^{3+} reduction to

Exercises 2.1·2.3

2.1 Select the conducting electrode for a Cu^{2+}/Cu half-cell and for an $\text{Fe}^{3+}/\text{Fe}^{2+}$ half-cell.

2.1 Copper metal for Cu^{2+}/Cu ; inert platinum for $\text{Fe}^{3+}/\text{Fe}^{2+}$, because both members of the iron pair are dissolved and need a separate electron contact.

2.2 For a theoretical chlorine/chloride gas half-cell under an approved supervised procedure, identify the electrode, gas condition and ion concentration for a standard measurement. [3]

2.2 Inert platinum electrode, chlorine at 100 kPa, chloride at 1.00 mol dm^{-3} , with temperature 298 K. This is apparatus interpretation, not a student instruction to generate chlorine.

2.3 Write a conventional diagram with zinc oxidation on the left and Fe^{3+} reduction to

2.3 $\text{Zn(s)} \mid \text{Zn}^{2+}(\text{aq}) \parallel \text{Fe}^{3+}(\text{aq}), \text{Fe}^{2+}(\text{aq}) \mid \text{Pt(s)}$. Correct metal half-cell, solution pair/platinum, boundaries and states.

Exercises 3.1·3.3

3.1 Write a cell diagram with hydrogen oxidation on the left and Cu^{2+} reduction on the

3.2 An $\text{Fe}^{3+}/\text{Fe}^{2+}$ electrode is positive relative to hydrogen. Describe how to measure

3.3 A cell voltage is initially below the standard prediction. Give three measurement checks and distinguish a concentration effect from random reading scatter. [4]

Exercises 3.1-3.3

3.1 Write a cell diagram with hydrogen oxidation on the left and Cu^{2+} reduction on the

3.1 $\text{Pt(s)} \mid \text{H}_2(\text{g}) \mid \text{H}^+(\text{aq}) \parallel \text{Cu}^{2+}(\text{aq}) \mid \text{Cu(s)}$. 298 K, hydrogen 100 kPa, ions at 1.00 mol dm^{-3} .

3.2 An $\text{Fe}^{3+}/\text{Fe}^{2+}$ electrode is positive relative to hydrogen. Describe how to measure

3.2 Connect the iron solution/platinum half-cell to the standard hydrogen electrode with salt bridge and external high-resistance voltmeter. Keep standard conditions. Only a potential difference can be measured, so the defined-zero reference establishes the comparison.

3.3 A cell voltage is initially below the standard prediction. Give three measurement checks and distinguish a concentration effect from random reading scatter. [4]

3.3 Check actual ion concentrations, temperature/gas pressure as applicable, clean electrodes/good contacts or bridge continuity. A persistent non-standard concentration shift changes the electrode equilibrium rather than being removed simply by repeating the meter reading.