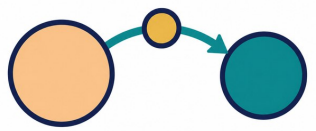
Electrochemistry Map

Cambridge International AS & A Level Chemistry · Topic 24 Electrochemistry

1 Redox and half-equations 24.2.7

- Oxidation: **loss** of e^-, ox. no. up
- Balance O with H_2O, H with H^+
- Balance charge with e^-
- Match electrons, then add



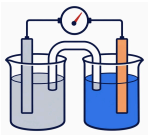
2 Standard electrode potentials 24.2.1–24.2.3

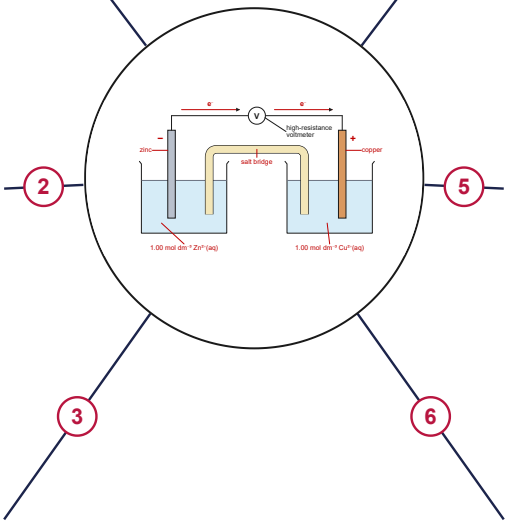
- SHE: H_2 100 kPa, 1.00 mol dm^{-3} H^+, Pt
- **298 K**; E⊖(SHE) = 0.00 V
- E⊖: emf against the SHE
- Written as **reductions**



3 Cells and E⊖cell 24.2.3–24.2.5

- Salt bridge KNO_3: **ions** move
- E⊖cell = E⊖(+) − E⊖(−)
- Ion pairs: Pt, both ions 1.00 mol dm^{-3}
- Gases over Pt at 100 kPa





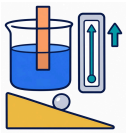
4 Series and feasibility 24.2.5–24.2.6

- Most positive: best **oxidising** agent
- Most negative: best **reducing** agent
- E⊖cell **positive**: feasible
- $2Cu^+ \rightarrow Cu + Cu^{2+}$: +0.37 V



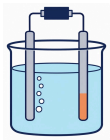
5 Nernst and ΔG⊖ 24.2.8–24.2.10

- More oxidised species: E **more positive**
- E = E⊖ + (0.059/z) log [ox]/[red]
- Solids are left out of the ratio
- ΔG⊖ = −nE⊖cellF: E⊖cell +, ΔG⊖ −



6 Electrolysis 24.1.1–24.1.4

- Cathode: the **more positive** E⊖ is reduced
- Conc. Cl^-: Cl_2; dilute: O_2
- Q = It; n(e^-) = Q ÷ F
- F = Le = 9.65 × 10^4 C mol^{-1}



Some standard electrode potentials

data booklet values, 298 K

Half-equation	E⊖ / V	Strongest
$F_2 + 2e^- \rightleftharpoons 2F^-$	+2.87	oxidising agent
$Cl_2 + 2e^- \rightleftharpoons 2Cl^-$	+1.36	
$Fe^{3+} + e^- \rightleftharpoons Fe^{2+}$	+0.77	
$Cu^{2+} + 2e^- \rightleftharpoons Cu$	+0.34	
$2H^+ + 2e^- \rightleftharpoons H_2$	0.00	reference
$Zn^{2+} + 2e^- \rightleftharpoons Zn$	−0.76	reducing agent

Worked examples

Cell potential

- Zn and Cu half-cells
- +0.34 − (−0.76)
- **+1.10 V**

Nernst

- Cu^{2+} 0.010 mol dm^{-3}
- 0.34 + 0.0295 × log 0.010
- **E = +0.28 V**

Electrolysis

- 0.400 A, 50.0 min: 1200 C
- ÷ F = 1.24 × 10^{-2} mol e^-; ÷ 2
- **0.395 g Cu**

Redox titrations with manganate(VII) and thiosulfate follow in 28.2; transition-element redox returns in Topic 28.

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