

Solutions

Original marking guidance: M1 method, A1 accuracy, B1 explanation.

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

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 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 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.