

Name of the Student: _____

Max. Marks : 19 Marks

Time : 19 Minutes

Mark Schemes

Q1.

(a) Hydrogen/H₂ gas/bubbles 11.0 mol dm⁻³ HCl/H⁺ 1
 At 298K and 100kPa
Allow 1 bar instead of 100 kPa
Do not allow 1 atm 1

Pt (electrode) 1

 (b) $\text{Li}^+ + \text{MnO}_2 + \text{e}^- \rightarrow \text{LiMnO}_2$
Ignore state symbols 1

-0.13(V) 1

 (c) Fe³⁺ ions reduced to Fe²⁺
Can score from equation/scheme 1

 Because $E(\text{Fe}^{3+}/\text{Fe}^{2+}) > E(\text{H}^+/\text{H}_2)/E(\text{hydrogen})$
Allow emf/ E_{cell} +ve/0.77V
Allow Fe³⁺ better oxidising agent than H⁺
Allow H₂ better reducing agent than Fe²⁺
Only award this explanation mark if previous mark given 1
(d) Moles Cr₂O₇²⁻ = 23.7 × 0.01/1000 = 2.37 × 10⁻⁴ 1
 1 mol Cr₂O₇²⁻ reacts with 6 mol Fe²⁺ so moles
 Fe²⁺ in 25 cm³ = 6 × 2.37 × 10⁻⁴ = 1.422 × 10⁻³ 1
 M1 × 6

 Moles Fe²⁺ in 250 cm³ = 1.422 × 10⁻²
 M2 × 10 or M4/10 1
Original moles Fe²⁺ = 10.00/277.9 = 0.0360

Independent mark

1

Moles Fe^{2+} oxidised = $0.0360 - 0.0142 = 0.0218$

M4 – M3

1

% oxidised = $(0.0218 \times 100)/0.0360 = 60.5\%$

(M5 × 100)/M4

Allow 60 to 61

Note Max 3 if mol ratio for M2 wrong

eg 1:5 gives 67.1%

1:1 gives 93.4%

Note also, 39.5% (39-40) scores M1, M2, M3 and M4 (4 marks)

1

[14]

Q2.

(a) 1.4 V

Allow + or –

1

(b) $2\text{NiO}(\text{OH}) + 2\text{H}_2\text{O} + \text{Cd} \rightarrow 2\text{Ni}(\text{OH})_2 + \text{Cd}(\text{OH})_2$

*Mark for species, Deduct a mark for additional species
(eg OH^-) but allow balance mark*

1

Balanced

If equation is reversed $\text{CE}=0$

1

(c) $\text{NiO}(\text{OH})$ or $\text{Ni}(\text{III})$ or nickel

1

+3

Allow conseq on wrong species

1

[5]