

Name of the Student: _____

Max. Marks : 20 Marks

Time : 20 Minutes

Mark Schemes

Q1.

- (a) By definition
allow 'set to this value'
1
- (b) 1.23 V
Allow + or –
1
- (c) $\text{Pt}|\text{H}_2(\text{g})|\text{OH}^-(\text{aq}), \text{H}_2\text{O}(\text{l})||\text{O}_2(\text{g})|\text{H}_2\text{O}(\text{l}), \text{OH}^-(\text{aq})|\text{Pt}$
H₂O not essential, allow reverse order
- Correct but with Pt missing
1
- Includes Pt with correct representation
1
- (d) Uses $\text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^- \rightarrow 4\text{OH}^-$
And $(2\times) 2\text{OH}^- + \text{H}_2 \rightarrow 2\text{H}_2\text{O} + 2\text{e}^-$
1
- $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
1
- (e) Increases the surface area (so reaction faster)
1
- (f) Overall reaction is the same ($2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$)
Or shows e.m.f. is the same
1
- (g) Hydrogen and oxygen supplied continuously
- OR**
- Can be operated without stopping to recharge
Or can be refuelled quickly
Allow any one mark
1
- (h) Hydrogen may need to be made using an energy source that is not 'carbon neutral'
1

[10]

Q2.

- | | | | |
|-----|-------|---|---|
| (a) | (i) | Fe^{2+} | 1 |
| | (ii) | F_2O | 1 |
| | (iii) | Fe^{2+} | 1 |
| | | Cl^- | 1 |
| | | <i>Use list principle if more than two answers</i> | |
| (b) | (i) | $\text{e.m.f.} = E(\text{rhs}) - E(\text{lhs})$ | 1 |
| | | $= 1.52 - 0.77 = 0.75$ | |
| | | <i>(0.75 scores first mark also)</i> | 1 |
| | (ii) | $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + \text{e}^-$ | 1 |
| | (iii) | Decrease | |
| | | <i>(Increase is CE, no further marks)</i> | 1 |
| | | Equilibrium (or reaction) shifts to R | |
| | | (or L if refers to half equation in table) | |
| | | (or in favour of more Fe^{3+}) | |
| | | (or more Fe^{3+} formed) | |
| | | (or more electrons formed) | 1 |
| | | Electrode potential (for $\text{Fe}^{3+}/\text{Fe}^{2+}$) less positive (or decreases) | 1 |

[10]