

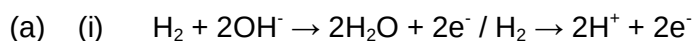
Name of the Student: _____

Max. Marks : 21 Marks

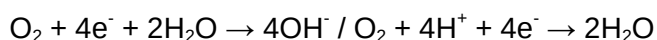
Time : 21 Minutes

Mark Schemes

Q1.

*Any order*

1



1

(ii) Hydrogen (electrode) produces electrons

*Ignore reference to salt bridge**Do not allow at negative / positive electrode – must identify hydrogen and oxygen*

1

Oxygen (electrode) accepts electrons

Allow electrons flow to the oxygen electrode

1

(b) Hydrogen / the fuel / reactants supplied continuously / fed in

Do not accept oxygen supplied as the only statement

1

(c) In the fuel cell, a greater proportion of the energy available from the hydrogen–oxygen reaction is converted into useful energy

*Allow less energy wasted / more efficient**Do not allow reference to safety*

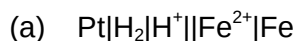
1

(d) Hydrogen is flammable / H^+ corrosive / OH^- corrosive / hydrogen explosive

1

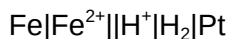
[7]

Q2.



Allow 1 for correct order of symbols but lose second mark for a wrong phase boundary(s) / Pt missing / extra Pt on RHS, additional phase boundary

Note, allow one mark only for correct symbol in reverse:



Allow dashed lines for salt bridge

Ignore state symbols

Ignore 2 if used before H^+

2

(b) Electron donor

Allow (species that) loses electrons

Do not allow reference to electron pairs

1

(c) Cl_2 / chlorine

If M1 blank or incorrect cannot score M2

1

(Species on RHS / electron donor) has most positive / largest $E^\ominus$ / has highest potential

Do not allow reference to e.m.f. or $E(\text{cell})$

1

(d) (i) Cl / chlorine

1

(ii) Chlorine +1 to chlorine 0

CE if chlorine not identified in part (i)

Allow chlorine +1 to chlorine -1 (in Cl^-)

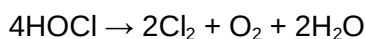
Allow oxidation state decreases by one OR two

Allow oxidation state changes by -1 OR -2

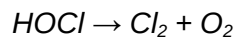
1



OR



Allow one mark for any incorrect equation that shows



Allow multiples

Ignore state symbols

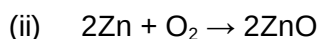
Penalise one mark for uncanceled or uncombined species (eg $\text{H}_2\text{O} + \text{H}_2\text{O}$ instead of $2\text{H}_2\text{O}$)

2

(f) (i) $\text{e.m.f.} = 0.40 - (-1.25) = \underline{1.65} \text{ (V)} / \underline{+1.65} \text{ (V)}$

Allow -1.65 (V)

1



Allow multiples

Ignore state symbols
Do not allow uncanceled species
If more than one equation given, choose the best

1

(iii) A / stainless lid

If M1 incorrect or blank CE=0

1

O₂ (electrode) has a more positive $E^\ominus$ / oxygen (electrode) requires / gains electrons from external circuit

Or reference to the overall equation and a link to electrons going into A

Allow oxygen is reduced and reduction occurs at the positive electrode

OR Zinc (electrode) has more negative $E^\ominus$

Do not allow reference to e.m.f. or E(cell)

1

(iv) (Cell) reaction(s) cannot be reversed / zinc oxide cannot be reduced to zinc by passing a current through it / zinc cannot be regenerated

Allow danger from production of gas / oxygen produced / hydrogen produced

1

[14]