Question	Marking Guidance	Mark	Comments
5(a)	Electron acceptor / gains electrons / takes electrons away	1	Do not allow electron pair acceptor / gain of electrons / definition of redox (QWC)
5(b)	$Cd(OH)_2$ Species (on LHS) with the least positive/most negative electrode potential / lowest *E* / smallest *E*	1 1	Do not allow '$Cd(OH)_2$/Cd' Only allow this mark if M1 answer given correctly or blank Do not allow negative emf
5(c)(i)	1.5 (V) / 1.50	1	
5(c)(ii)	$2MnO_2 + 2H_2O + Zn \rightarrow 2MnO(OH) + 2OH^- + Zn^{2+}$	1	Ignore state symbols e^- must be cancelled (take care that Zn^{2+} is on RHS)
5(c)(iii)	Allows ions to pass (through it) or words to that effect	1	Penalise passage of electrons Allow mention of particular ions
5(c)(iv)	Allows electrons to flow / makes electrical contact / conductor	1	Allow acts as an (inert) electrode / anode / cathode
5(c)(v)	Zn is 'used up' / has reacted / oxidised	1	Allow idea that zinc reacts Do not allow just zinc corrodes

5(d)(i)	3 / +3 / III $2Ni(OH)_2 + Cd(OH)_2 \rightarrow 2NiO(OH) + Cd + 2H_2O$	1 1 1	 For correct nickel and cadmium species in correct order (allow H_2O missing and OH^- not cancelled) For balanced equation (also scores M2) Allow max 1 for M2 and M3 if correct balanced equation but reversed. Ignore state symbols
5(d)(ii)	Metal / metal compounds are re-used / supplies are not depleted / It (the cell) can be re-used	1	Allow does not leak / no landfill problems / less mining / less energy to extract metals / less waste Do not allow less CO_2 unless explained
5(e)(i)	$C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$	1	Allow C_2H_6O
5(e)(ii)	$C_2H_5OH + 3H_2O \rightarrow 2CO_2 + 12H^+ + 12e^-$	1	Allow C_2H_6O
5(e)(iii)	(+)0.23 (V)	1	
5(e)(iv)	$\underline{CO_2}$ released by combustion / fermentation / fuel cell / reaction with water (atmospheric) $\underline{CO_2}$ taken up in <u>photosynthesis</u>	1 1	Can be answered with the aid of equations