Question	Marking Guidance	Mark	Comments
5(a)	loses electrons / donates electrons	1	penalise donates electron pair
5(b)	Zn	1	
	(most) negative E^o / lowest E^o / least positive	1	can only score M2 if M1 correct do not allow e.m.f instead of E^o
5(c)	$\underline{E^o\ F_2}$ ($/F^-$) > $\underline{E^o\ O_2}$ ($/H_2O$)	1	or e.m.f is positive or e.m.f = 1.64 V
	Fluorine reacts to form oxygen (can score from equation in M3 even if equation unbalanced provided no contradiction) or fluorine oxidises water or fluorine is a more powerful oxidising agent than oxygen	1	
	$2F_2 + 2H_2O \rightarrow 4F^- + 4H^+ + O_2$	1	allow 4HF in equation balanced equation scores M2 and M3

5(d)(i)	order correct Zn Zn^{2+} Ag_2O Ag or reverse of this order all phase boundaries correct e.g. $Zn\|Zn^{2+}\|\|Ag_2O\|Ag$ or $Ag\|Ag_2O\|\|Zn^{2+}\|Zn$ scores 2	1 1	ignore ss , H^+ and H_2O, no. of moles allow $Zn\|Zn^{2+}\|\|Ag_2O$,Ag or $Zn\|Zn^{2+}\|\|Ag_2O\|H^+\|Ag$ for M1 & M2 M2 cannot be gained unless M1 scored allow H^+ either side of Ag_2O with comma or | for M2 penalise • wrong phase boundary (allow dashed lines for salt bridge) • Pt • use of + (from half equation) • water/H^+ outside Ag in Ag electrode
5(d)(ii)	1.1 (V)	1	Allow no units, penalise wrong units allow correct answer even if no answer to (d)(i) or answer to (d)(i) incorrect allow –1.1 if silver electrode on Left in (d)(i) even if the species are in the wrong order.
5(d)(iii)	Reaction(s) not reversible or H_2O electrolyses	1	do not allow hard to reverse mention of primary cell is not enough to show that reaction(s) are irreversible
5(e)(i)	–0.46 (V)	1	Allow no units, penalise wrong units

5(e)(ii)	$2PbSO_4 + 2H_2O \rightarrow Pb + PbO_2 + 2HSO_4^- + 2H^+$ lead species correct on correct sides of equation equation balanced and includes H_2O, HSO_4^- and H^+ (or H_2SO_4)	 1 1	 allow ions / species must be fully cancelled out or combined allow 1/2 for balanced reverse equation
5(f)(i)	reagents / PbO_2 / H_2SO_4 /acid / ions used up (or concentration decreases)	1	
5(f)(ii)	fuel cell	1	Ignore any other words
5(f)(iii)	reagents / fuel supplied continuously concentrations (of reagents) remain constant	1 1	