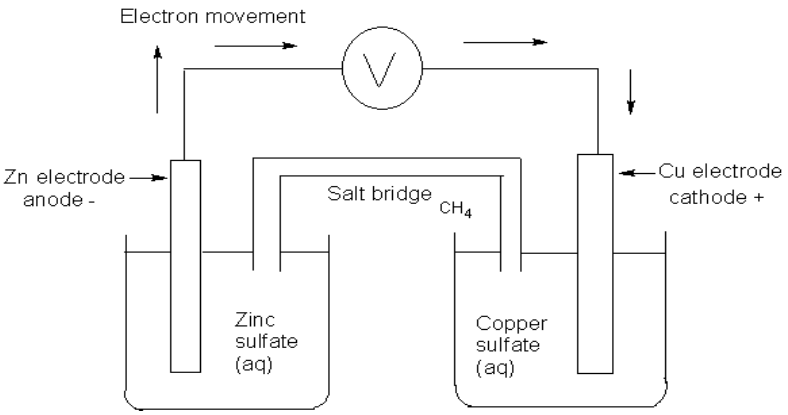
3.3 Describe oxidation-reduction processes assessment schedule 2007

Question number	Answer	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	$SO_2 = 4^+$ $H_2SO_4 = 6^+$ $SO_4^{2-} = 6^+$ $H_2S = 2^-$	3 correct		
(b)	$SO_4^{2-} + 10H^+ + 8e^- \rightarrow H_2S + 4H_2O$ $(2I^- \rightarrow I_2 + 2e^-) \times 4$ --- $SO_4^{2-} + 10H^+ + 8I^- \rightarrow H_2S + 4H_2O + 4I_2$	One half-equation correct	Both half-equations correct	Full equation correct
(c)	Iodide ions are the stronger reducing agent **Because** iodide reduces sulfur by more oxidation numbers than bromide.	Identifies iodide strongest reducing agent	Explains why they chose iodide	
TWO (a)	**(i)** $Fe^{2+}_{(aq)} \rightarrow Fe^{3+}_{(aq)} + e^-$ Observation: green solution → yellow solution	Equation correct	Both equation and observation correct	
	(ii) $H_2C_2O_4 \rightarrow 2CO_2 + 2H^+ + 2e^-$ Observation: colourless solution → colourless solution + gas	Equation correct	Both equation and observation correct	
	(iii) $Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$ Observation: orange solution → green solution	Equation correct	Both equation and observation correct	
(b)	$(MnO_4^- + 2H_2O + 3e^- \rightarrow MnO_2 + 4OH^-) \times 2$ $I^- + 6OH^- \rightarrow IO_3^- + 3H_2O + 6e^-$ --- $2MnO_4^- + I^- + H_2O \rightarrow 2MnO_2 + IO_3^- + 2OH^-$	One half-equation correct	Both half-equations correct	Full equation correct
THREE (a)	$Zn \rightarrow Zn^{2+} + 2e^-$ Oxidant is copper $Cu^{2+} + 2e^- \rightarrow Cu$ Reductant is Zinc	Both equations correct **OR** both oxidant and reductant identified	All correct	

(b)		Electrodes, Voltmeter and solutions labelled correctly	Electrodes, Voltmeter, solutions and salt bridge labelled correctly	Electrodes, Voltmeter solutions, salt bridge and electron direction labelled correctly
(c)	$E^{\circ}_{(cell)} = E^{\circ}_{(RHE)} - E^{\circ}_{(LHE)}$ $E^{\circ}_{(cell)} = +0.34\ V - -0.76\ V$ $E^{\circ}_{(cell)} = +1.10\ V$	Correct answer		
FOUR (a)	$Pb \rightarrow Pb^{2+} + 2e^-$ Oxidation $PbO_2 + 4H^+ + 2e^- \rightarrow Pb^{2+} + 2H_2O$ Reduction --- $Pb + PbO_2 + 4H^+ \rightarrow 2Pb^{2+} + 2H_2O$	One half-equation correct and identified	Both half-equations correct and identified	Full equation correct plus identified
(b)	$PbSO_4$ precipitate and sulfuric acid concentration decreases.	Both correct		
(c)	$2Pb^{2+} + 2H_2O \rightarrow Pb + PbO_2 + 4H^+$	Equation correct		

FIVE **(a)** **(b)** **(c)**	$E^{\circ}_{(cell)} = E^{\circ}_{(RHE)} - E^{\circ}_{(LHE)}$ $E^{\circ}_{(cell)} = +1.07\ V - +0.77\ V$ $E^{\circ}_{(cell)} = +\ 0.30V$ $E^{\circ}_{(cell)}$ is positive, so Br_2 **will** oxidise Fe^{2+} to Fe^{3+} $E^{\circ}_{(cell)} = E^{\circ}_{(RHE)} - E^{\circ}_{(LHE)}$ $E^{\circ}_{(cell)} = +1.78\ V - +2.87\ V$ $E^{\circ}_{(cell)} = -1.09\ V$ $E^{\circ}_{(cell)}$ is negative, so H_2O_2 **will not** oxidise F^- to F_2 $E^{\circ}_{(cell)} = E^{\circ}_{(RHE)} - E^{\circ}_{(LHE)}$ $E^{\circ}_{(cell)} = +\ 1.33\ V - -0.76\ V$ $E^{\circ}_{(cell)} = +\ 2.09\ V$ $E^{\circ}_{(cell)}$ is positive, so Zn **will** reduce $Cr_2O_7^{2-}$ to Cr^{3+}	One correct calculation and answer	Two correct calculations and answers	Three correct calculations and answers
SIX **(a)**	$Ag^+ + 1e^- \rightarrow Ag$ $Cl^- \rightarrow Cl + 1e^-$	Two correct equations		
(b) **(i)** **(ii)**	$Cu^+ + Cl \rightarrow Cu^{2+} + Cl^-$ $Cu^{2+} + Ag \rightarrow Ag^+ + Cu^+$	One correct equation	Two correct equations	

Sufficiency statement:

Achievement: 8 out of the 16 achievement opportunities
Merit: Achievement, plus 6 out of the 11 merit opportunities
Excellence: Merit, plus 3 out of the 5 excellence opportunities