NZIC 2008
CHEMISTRY - 2.7
(Describe oxidation-reduction reactions)
ASSESSMENT SCHEDULE

While the writers of this assessment have worked to compile a resource that meets NCEA requirements, it has no official status and teachers may wish to adjust questions and the assessment schedule as they see fit.
Note: Oxidation equations can be written with the electrons on the right side of the equation.

	Evidence	Achievement	Merit	Excellence
One (a)	<u>O.N in reactant</u> <u>ON in product</u> <u>Reaction</u> (i) +3 +4 oxidation (ii) +3 +5 oxidation (iii) +5 0 reduction	Four out of six oxidation numbers correct.	All correct	
One (b) & (c)	<u>Only</u> C and E circled. Only in the reactions chosen do the oxidation numbers of the atoms involved change during the reaction.	Correct reactions chosen but explanation incorrect	Both reactions and explanation correct.	
Two (a)	Oxidation: $SO_2 + 2H_2O \rightarrow SO_4^{2-} + 4H^+ + 2e$ Reduction: $MnO_4^- + 8H^+ + 5e \rightarrow Mn^{2+} + 4\,H_2O$ Overall: $5SO_2 + 2H_2O + 2MnO_4^- \rightarrow 5SO_4^{2-} + 2\,Mn^{2+} + 4H^+$	Both half equations correct but overall equation incorrectly balanced and identification of oxidation and reduction reactions incorrect.	Both half equations correct but <u>either</u> identification as oxidation or reduction reactions incorrect <u>or</u> overall equation incorrectly balanced	Half equations correct and correctly identified and overall equation correctly balanced (including cancellation)
Two (b)	The purple acidified $KMnO_4$ solution is reduced to pale pink/colourless Mn^{2+}.	Colour change correct	Correct identification of colour of both species	

	Evidence	Achievement	Merit	Excellence
Two (c)	Either HSO_3^- + $H_2O \rightarrow SO_4^{2-}$ + H^+ + 2e or $5\ HSO_3^- + 2MnO_4^- + H^+ \rightarrow 5SO_4^{2-} + 2\ Mn^{2+} + 3H_2O$ In both equations same number of MnO_4^- ions react because oxidation of both SO_2 and HSO_3^- produces 2 electrons. The oxidation number of S in both SO_2 and HSO_3^- is +4.	Supplies either correct equation **or** gives one reason why number of MnO_4^- ions is the same	Supplies either correct equation **and** gives one reason why number of MnO_4^- ions is the same	Either correct equation plus both points made.
Three (a)	(i) Products are hydrogen gas/ $H_{2\,(g)}$ and solution of zinc sulfate/ $ZnSO_4$ (ii) The hydrogen ion H^+ is the oxidant and it is reduced to hydrogen gas (H_2)	Both products correct OR Oxidant and product correctly identified.	Both products correct AND Oxidant and product correctly identified	
(b)	(i) Products are (aqueous) bromine/ Br_2 and potassium chloride / KCl (ii) Chlorine gas is the oxidant and it is reduced to chloride ions	Both products correct OR Oxidant and product correctly identified.	Both products correct AND Oxidant and product correctly identified	
Four (a)	Oxidation	Correct		
Four (b)	• The anode reaction is Cu(s) → Cu^{2+} + 2e, so the two electrons produced pass to the cathode while the Cu^{2+} ions are released into the solution. • At the cathode each Cu^{2+} ion reacts with two electrons to be reduced to solid copper which plates out on the saucepan. Cu^{2+} + 2e → Cu(s) • The Cu electrode gradually loses mass as the copper builds up on the saucepan, but the colour of the Cu^{2+} solution does not change as the ions are constantly replaced by the anode reaction.	Equation of one reaction correct even if electrodes incorrectly identified in part (a).	Equations of both reactions correct but part (a) must be correct	Merit plus observations correct.

	Evidence	Achievement	Merit	Excellence
Five (a)	$H_2O_2 + 2H^+ + 2e \rightarrow 2H_2O$	Correct		
(b)	(i) Pale green colour of solution of Fe^{2+} would turn orange due to formation of Fe^{3+}. (Peroxide and water are both colourless) (ii) Colourless solution of I^- would turn dark brown due to formation of I_2	Both species correct OR Both colour changes correct OR One species and its colour change correct	Colour and identification of reactant and product of both reactions correct	
(c)	In (a) hydrogen peroxide is acting as an oxidising agent while in this reaction (c) it is acting as a reducing agent $H_2O_2 \rightarrow O_2 + 2H^+ + 2e$	Correct explanation or equation	Both explanation and equation correct.	

12 Achieved opportunities
10 Merit opportunities
3 Excellence opportunities

Sufficiency Statement:

Achieved **A total of SIX opportunities correct at the Achieved level or higher**

Merit **A total of EIGHT opportunities correct; 4 at the Merit level or higher and 4 at the Achieved level or higher.**

Excellence **A total of TEN opportunities correct; 2 at the Excellence level, 4 at the Merit level or higher and 4 at the Achieved level or higher.**