Question	Marking Guidance	Mark	Comments
7(a)(i)	Ammonia	1	If reagent is missing or incorrect cannot score M3
	Starts as a pink (solution)	1	
	Changes to a yellow/straw (solution)	1	Allow pale brown Do not allow reference to a precipitate
7(a)(ii)	(dark) brown	1	Do not allow pale/straw/yellow-brown (i.e. these and other shades except for dark brown)
7(b)(i)	Ruby / red-blue / purple / violet / green	1	Do not allow red or blue If ppt mentioned contradiction/CE =0
	Green	1	If ppt mentioned contradiction/CE =0
	$[Cr(H_2O)_6]^{3+} + 6OH^- \rightarrow [Cr(OH)_6]^{3-} + 6H_2O$	1	
	Formula of product	1	Can score this mark in (b) (ii)
7(b)(ii)	$H_2O_2 + 2e^- \rightarrow 2OH^-$	1	
	$2[Cr(OH)_6]^{3-} + 3H_2O_2 \rightarrow 2CrO_4^{2-} + 8H_2O + 2OH^-$	2	Allow 1 mark out of 2 for a balanced half-equation such as $Cr(III) \rightarrow Cr(VI) + 3e^-$ or $Cr^{3+} + 4H_2O \rightarrow CrO_4^{2-} + 8H^+ + 3e^-$ etc also for $2Cr(III) + 3H_2O_2 \rightarrow 2CrO_4^{2-}$ (unbalanced)
	Yellow	1	Do not allow orange

7(c)	$2MnO_4^- + 6H^+ + 5H_2O_2 \rightarrow 2Mn^{2+} + 8H_2O + 5O_2$	1	if no equation and uses given ratio can score M2, M3, M4 & M5
	Moles MnO_4^- = (24.35/1000) x 0.0187 = $\underline{4.55 \times 10^{-4}}$	1	Note value must be quoted to at least 3 sig. figs. M2 is for 4.55×10^{-4}
	Moles H_2O_2 = (4.55×10^{-4}) $\underline{\times 5/2}$ = 1.138×10^{-3}	1	M3 is for x 5/2 (or7/3) Mark consequential on molar ratio from candidate's equation
	Moles H_2O_2 in 5 cm^3 original = (1.138×10^{-3}) $\underline{\times 10}$ = 0.01138	1	M4 is for x 10
	Original $[H_2O_2]$ = 0.01138 $\underline{\times (1000/5)}$ = 2.28 mol dm^{-3} (allow 2.25-2.30)	1	M5 is for consequentially correct answer from (answer to mark 4) x (1000/5) Note an answer of between 2.25 and 2.30 is worth 4 marks) If candidate uses given ratio 3/7 max 4 marks: **M1**: Moles of MnO_4^- = $\underline{4.55 \times 10^{-4}}$ **M2**: Moles H_2O_2 = (4.55×10^{-4}) $\underline{\times 7/3}$ = 1.0617×10^{-3} **M3**: Moles H_2O_2 in 5 cm^3 original = (1.0617×10^{-3}) x 10 = 0.01062 **M4**: Original $[H_2O_2]$ = 0.01062 x (1000/5) = 2.12 mol dm^{-3} (allow 2.10 to 2.15)