Question 33 **(12 marks)**

(a) Consider the following oxidation-reduction equation:

$$C\ell O_3^- + 3\ H_2O + 3\ SO_2 \rightarrow 3\ SO_4^{2-} + C\ell^- + 6\ H^+$$

Complete the table below by writing the appropriate formula of the species required. (3 marks)

Description	Formula
Species increasing in oxidation number	
Species with highest oxidation number	
Species acting as the oxidising agent	

(b) Write the **two** half-equations and the overall equation for the reaction between excess $MnO_4^-(aq)$ and $CH_3OH(\ell)$ in acidic conditions. (5 marks)

Reduction half-equation

Oxidation half-equation

Overall redox equation

(c) Select a species on the Standard Reduction Potential table with which $MnO_4^-(aq)$ would **not** be expected to react. Include a calculation as part of an explanation for why this is so. (4 marks)

Species: _____

Explanation: _____