The **topics** and **types of questions** examined in this Achievement Standard. Use this sheet to plan and organise your study so that you cover everything that is required.

2.7 OXIDATION REDUCTION AS 90311

Describe oxidation-reduction reactions

2.7 1. Determine oxidation numbers

- oxidation numbers of elements within species

Write the oxidation number of the underlined element in each of the following species.

(a) $\underline{Mn}^{2+}$ (b) $H_2\underline{O}_2$ (c) $\underline{Br}_2$ (d) $\underline{S}O_2$ (e) $\underline{C}O$

- identifying oxidation and reduction

Identify which of the following reactions is an oxidation-reduction reaction. Justify your answer.

Reaction **A** $CaCO_3 \rightarrow CO_2 + CaO$

Reaction **B** $PbO + H_2 \rightarrow Pb + H_2O$

Reaction **C** $SO_3 + H_2O \rightarrow H_2SO_4$

2.7 2. Write balanced oxidation-reduction equations

- identify oxidants and/or reductants
- oxidants limited to: O_2, I_2, Cl_2, H^+, Fe^{3+}, H_2O_2, $MnO_4^-(aq)$ / H^+, $Cr_2O_7^{2-}(aq)$ / H^+
- reductants limited to: metals, C, CO, H_2, Fe^{2+}, Br^-, I^-, SO_2, HSO_3^-

Write balanced half-equations for the oxidation and reduction reactions occurring, and then the overall balanced equation, for the following reaction in acidic solution.

$$IO_3^- + SO_3^{2-} \rightarrow I_2 + SO_4^{2-}$$

(a) Oxidation half-equation

(b) Reduction half-equation

(c) Overall balanced equation

2.7 3. Write balanced equations and describe observations

- describe expected observations for oxidation reduction reactions.

Chlorine and iodine can act as oxidants in some reactions. Discuss the reactions of chlorine and iodine with potassium bromide solution.

In your answer, you must include:

- details of oxidation and reduction processes
- experimental observations linked to the species involved in any reaction(s)
- balanced equation(s).

- recognise the ability of halogens to act as oxidants in reactions with other elements, water or halide ions.

Group 17 elements, the halogens, act as oxidants in reactions.

(a) Aqueous chlorine, $Cl_2(aq)$, can react with a solution containing iodide ions, $I^-(aq)$.

Write balanced half-equations for the oxidation and reduction reactions that occur.

Use these to write a balanced equation for the overall oxidation-reduction reaction that occurs.

(b) Use the balanced equation to predict expected observations for this reaction, and justify these observations by referring to the species involved.

2.7 4. Given observations, identify oxidation and reduction

An oxidation-reduction reaction was carried out and the observation recorded. Use the information provided to answer the questions that follow.

Reactants	Observation
Acidified hydrogen peroxide, $H_2O_2(aq)$ and bromide ions in solution, $Br^-(aq)$	Both reactant solutions were colourless but when added together an orange colour was observed.

(a) Identify the species oxidised and the species reduced in the above reaction.

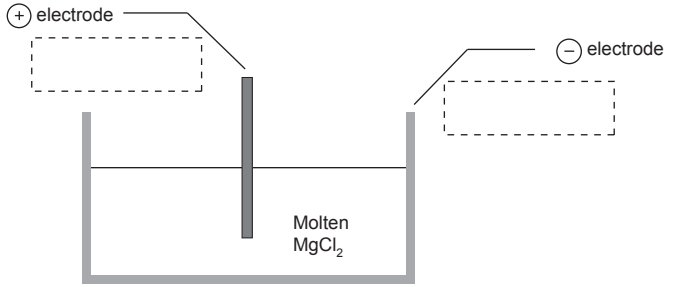
(b) Use oxidation-reduction processes to explain why the solution goes orange.

2.7 5. Electrolysis

- simple electrolytic cells

Magnesium can be produced by the electrolysis of molten magnesium chloride.

A simplified diagram of the cell used to manufacture magnesium is shown below.



(a) Label the electrodes as anode and cathode by writing in the boxes in the diagram above.

(b) Write half-equations for the reactions occurring at each electrode.