

90311



903110


 NEW ZEALAND QUALIFICATIONS AUTHORITY
 MANA TOHU MĀTAURANGA O AOTEAROA

For Supervisor's use only

Level 2 Chemistry, 2009

90311 Describe oxidation-reduction reactions

Credits: Three

2.00 pm Monday 23 November 2009

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should answer ALL the questions in this booklet.

A periodic table is provided on the Resource Sheet L2-CHEMR.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–10 in the correct order and that none of these pages is blank.

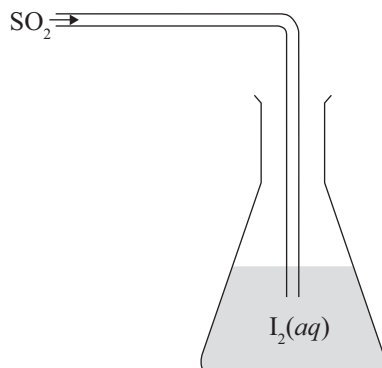
YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

<i>For Assessor's use only</i>		Achievement Criteria	
Achievement		Achievement with Merit	Achievement with Excellence
Describe oxidation-reduction reactions.	<input type="checkbox"/>	Apply oxidation-reduction principles.	<input type="checkbox"/>
		Discuss oxidation-reduction processes.	<input type="checkbox"/>
Overall Level of Performance		<input type="checkbox"/>	

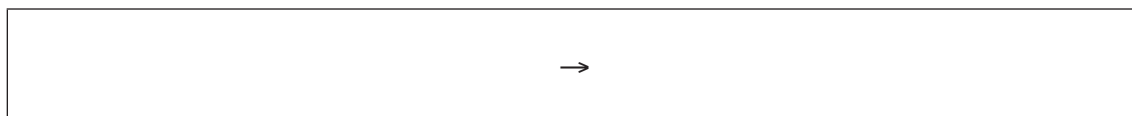
You are advised to spend 35 minutes answering the questions in this booklet.

QUESTION ONE

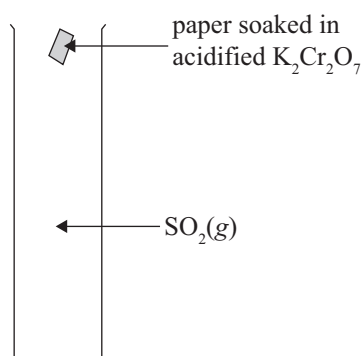
- (a) Sulfur dioxide gas, SO_2 , is bubbled through iodine solution, I_2 , until no further change occurs. During the reaction the sulfur dioxide is oxidised to form sulfate ions, SO_4^{2-} .



- (i) Describe the colour change that occurs.
- _____
- (ii) Link this colour change to the species involved in this reaction.
- _____
- _____
- (iii) Write the half-equation for the reduction of **iodine** that occurs during this reaction.



- (b) Sulfur dioxide gas, SO_2 , is a significant air pollutant. Paper soaked in acidified potassium dichromate, $\text{K}_2\text{Cr}_2\text{O}_7$, can be used to detect the presence of sulfur dioxide, as shown in the diagram below.



- (i) Describe the colour change that occurs to the paper.
- _____

(ii) Link this colour change to the species involved in this reaction.

(c) A fresh piece of paper is now soaked in **acidified potassium permanganate**, KMnO_4 . This is held in a container containing sulfur dioxide gas, SO_2 .

(i) Describe the colour change that occurs to the paper.

(ii) Link this colour change to the species involved in this reaction.

(iii) Potassium permanganate acts as an **oxidant** in this reaction and the sulfur dioxide reacts to form sulfate ions. With reference to this reaction, explain what is meant by the term **oxidant**.

- (iv) Write half-equations and the overall balanced equation for the reaction that occurs between acidified potassium permanganate, KMnO_4 , and sulfur dioxide gas, SO_2 .

Oxidation half-equation

Reduction half-equation

Overall balanced equation

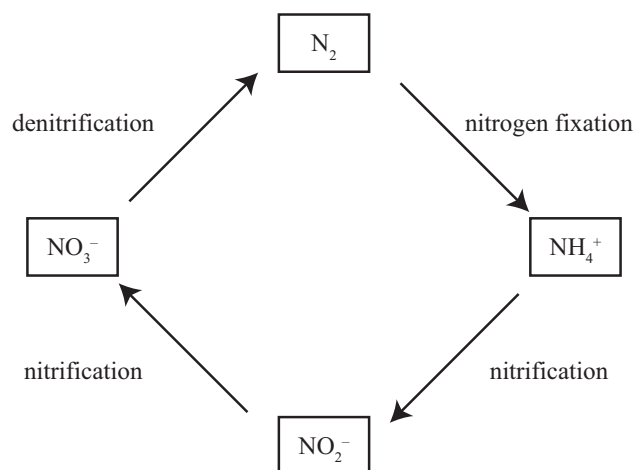
This page has been deliberately left blank.

QUESTION TWO

- (a) Complete the following table with the oxidation number of **nitrogen, N**, in each of the species. The first two have been done for you.

	Species	Oxidation number
	NO_2^-	+3
	NO_3^-	+5
(i)	N_2	
(ii)	NH_4^+	
(iii)	NH_3	
(iv)	N_2O	

- (b) The diagram below shows a simplified nitrogen cycle. The nitrogen cycle involves a number of oxidation and reduction reactions.



- (i) The nitrification reaction $\text{NO}_2^- \rightarrow \text{NO}_3^-$ is an example of an oxidation reaction.

Complete the half-equation for this reaction.



Explain why this is an oxidation reaction. You may use either oxidation numbers or electron transfer (or both).

(ii) Discuss the reactions shown in the simplified nitrogen cycle on the facing page.

In your answer, you must include:

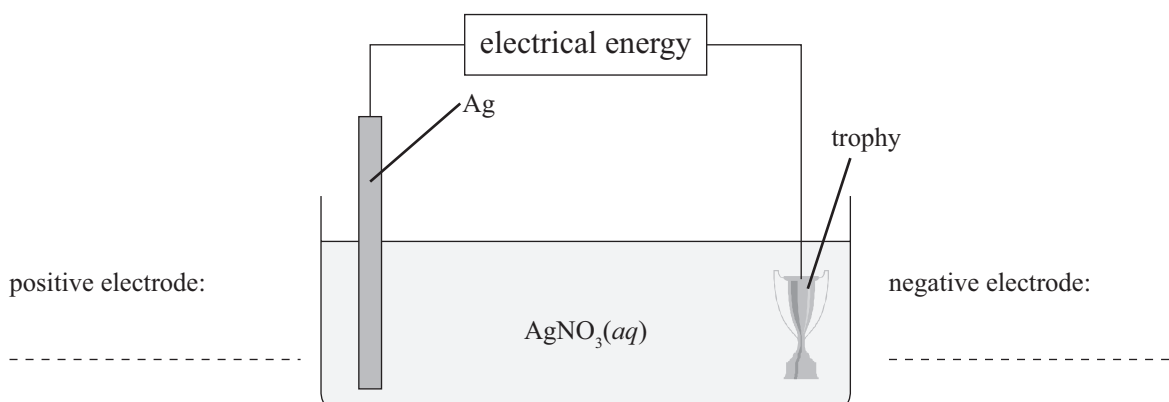
- reference to the reactions in the nitrogen cycle
- details of oxidation-reduction processes
- balanced half-equation(s).

Assessor's
use only

QUESTION THREE

Electroplating can be used to coat an object with a thin layer of a metal to improve appearance.

A diagram of a cell used to coat a trophy with silver metal is shown below.



- (a) (i) Label the electrodes as anode and cathode by writing on the dashed lines in the diagram above.
- (ii) Write half-equations for the reactions occurring at each electrode.

Cathode:

Anode:

- (b) Discuss how silver metal is deposited onto the trophy.

Your answer must include:

- observations at both electrodes
- details of oxidation-reduction processes
- movement of species.

Assessor's
use only

