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NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

*For Supervisor's use only*

# Level 1 Chemistry, 2009

## 90173 Describe selected non-metals and their compounds

Credits: Four
2.00 pm Friday 27 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 and other reference material are provided in the Resource Booklet L1–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 2–8 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.**

| *For Assessor's use only* | **Achievement Criteria** | |
|---|---|---|
| **Achievement** | **Achievement with Merit** | **Achievement with Excellence** |
| Describe the properties, preparations and reactions of selected non-metals and their compounds. ☐ | Link the properties, reactions and uses of selected non-metals and their compounds. ☐ | Apply an understanding of the properties, reactions and uses of selected non-metals and their compounds. ☐ |
| **Overall Level of Performance** ☐ | | |

You are advised to spend 40 minutes answering the questions in this booklet.

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## QUESTION ONE: SULFUR DIOXIDE

Sodium sulfite ($Na_2SO_3$) is used as a preservative in food, although sulfur dioxide ($SO_2$) is the active component in the preservative.

Discuss the reasons why sodium sulfite is suitable for this purpose.

Your answer should include:

- a description of TWO chemical properties of sulfur dioxide that enable it to act as a food preservative
- links between the chemical properties of sulfur dioxide and how it acts as a food preservative.

## QUESTION TWO: SULFURIC ACID

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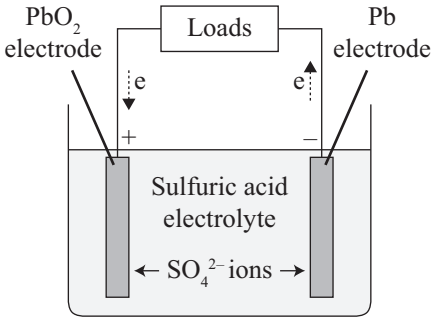
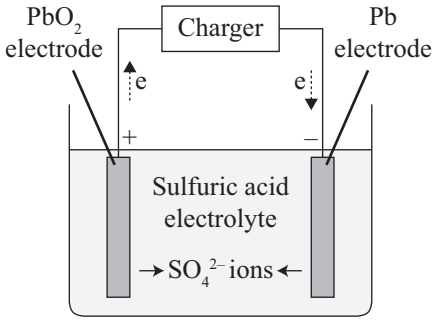
A solution of sulfuric acid in water is used in lead-acid batteries found in cars.




Lead-acid battery discharging




Lead-acid battery charging

Discuss the role of sulfuric acid solution in the reactions of a lead-acid battery.

Your answer should include:

- the properties of sulfuric acid that make it a good electrolyte
- how sulfuric acid is involved in the reactions that occur when the battery is discharging **and** when it is charging
- how the concentration of sulfuric acid changes while the battery is discharging **and** while it is charging
- any relevant balanced equations.

Balanced equations:

## QUESTION THREE: CHLORINE

Assessor's use only

Electrolysis of brine (a solution of sodium chloride, NaCl, in water) is a process used to produce chlorine gas.
One of the uses of chlorine gas is in the production of bleach (sodium hypochlorite solution, NaOCl).


Adapted from http://willsworld.org/sodiumhydroxidecell.jpg

Discuss the chemistry of this process.

Your answer should include:

- how chlorine is formed at the anode
- how sodium hydroxide is formed at the cathode
- how bleach (sodium hypochlorite solution) is then produced using this process
- an equation for the formation of sodium hypochlorite.

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The equation for the formation of sodium hypochlorite is:

## QUESTION FOUR: NITROGEN OXIDES

Assessor's use only

(a) Discuss how you would prepare some nitrogen dioxide gas in a school laboratory, using copper metal and **concentrated** nitric acid.

Your answer should include:

- any observations you would make during the reaction
- the products formed
- links between the observations you would make and the relevant chemical species
- safety considerations to be followed during the reaction
- a balanced chemical equation.

The balanced chemical equation is:

(b) Discuss why nitrogen dioxide can be a dangerous air pollutant.

Your answer should include:

- TWO relevant properties of nitrogen dioxide
- ONE effect of nitrogen dioxide on the environment **and** ONE effect on people.

Assessor's use only

**Extra paper for continuation of answers if required.**
**Clearly number the question.**

Assessor's use only

Question number