



For Supervisor's use only

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90173



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA



National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Level 1 Chemistry, 2003

90173 Describe the chemistry of selected non-metals and their compounds

Credits: Five

9.30 am Monday 24 November 2003

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.

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

A metal activity series, solubility rules, a table of ions and a periodic table are provided in the Resource Booklet in your Level 1 Chemistry package.

Check that this booklet has pages 2–11 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.

Achievement Criteria			For Assessor's use only	
Achievement		Achievement with Merit		Achievement with Excellence
Describe the properties and preparation of, and state the importance of, selected non-metals and their compounds.	<input type="checkbox"/>	Explain the properties, preparation and importance of selected non-metals and their compounds.	<input type="checkbox"/>	Analyse the properties and preparation of selected non-metals and their compounds, and evaluate their importance.
Overall Level of Performance			<input type="checkbox"/>	

You are advised to spend 50 minutes answering the questions in this booklet.

QUESTION ONE: Sulfur and its Compounds

Part A: Sulfur

- (a) Sulfur is a by-product when natural gas is purified.

Name the **compound** in natural gas that is the source of this sulfur.

- (b) Name and describe TWO allotropes of sulfur.

(1) Name: _____

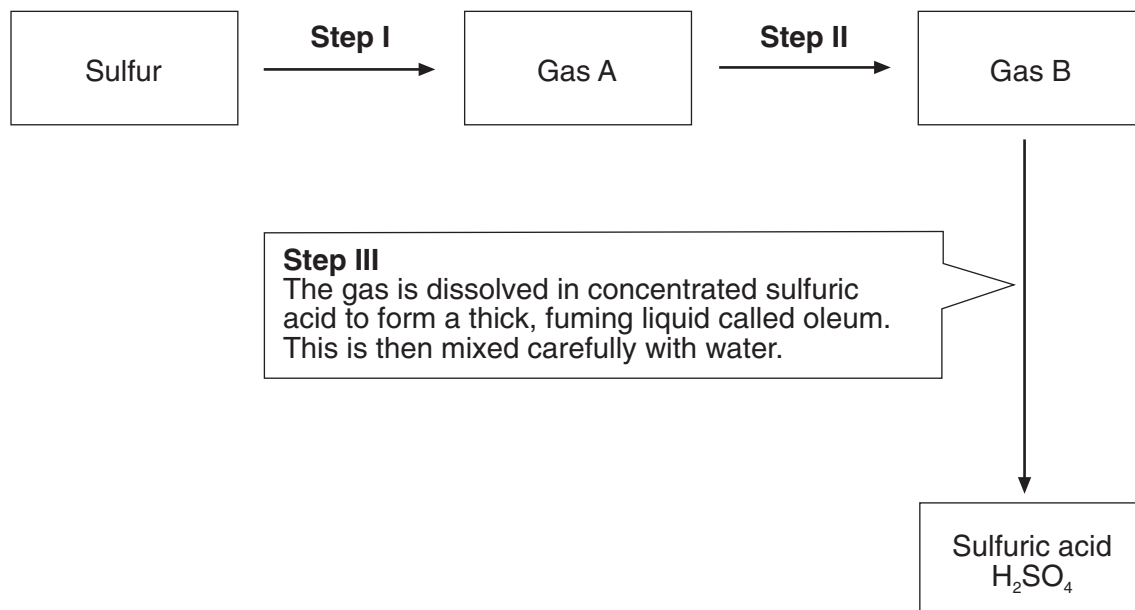
Description: _____

(2) Name: _____

Description: _____

Part B: Sulfuric acidAssessor's
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In New Zealand, sulfuric acid is made from sulfur by the contact process, summarised in the diagram below.



(a) Name or give the formula of:

(i) Gas A: _____

(ii) Gas B: _____

(b) (i) Write an equation to describe the reaction occurring at Step I of the process.

(ii) Describe the conditions required for Step II and explain why these conditions are necessary.

- (c) Containers and tankers of sulfuric acid display the warning sign at right.



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What property of sulfuric acid makes this warning sign necessary?

- (d) Explain why concentrated sulfuric acid can be stored in steel tanks but dilute sulfuric acid cannot.

Part C: Superphosphate

Sulfuric acid is used to convert rock phosphate (calcium phosphate) into superphosphate, which is widely used as a fertiliser on New Zealand farms.

Explain why rock phosphate has to be converted to superphosphate before it is useful as a fertiliser.

QUESTION TWO: Nitrogen and its CompoundsAssessor's
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Nitrogen dioxide gas is prepared in the laboratory by adding copper metal to concentrated nitric acid.

(a) Describe THREE observations you would make for this reaction.

(1) _____

(2) _____

(3) _____

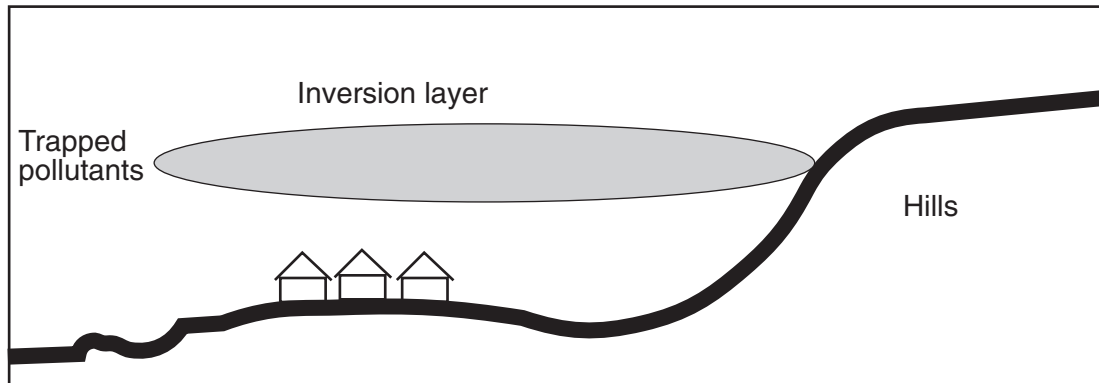
(b) Why must this reaction be carried out in a fume cupboard?

(c) Complete and balance the chemical equation for the reaction between copper metal and concentrated nitric acid.



Part B: Nelson's pollution problems

Nelson is a small city surrounded by hills. It has a stable temperature inversion that traps ground-level air and allows air pollutant levels to build up.



Monitoring equipment measures the air pollution levels in Nelson. **Figure 1** below shows the readings taken between 28 July 2002 and 11 August 2002. The guideline maximum is 50 particles of solids per cubic metre of air.

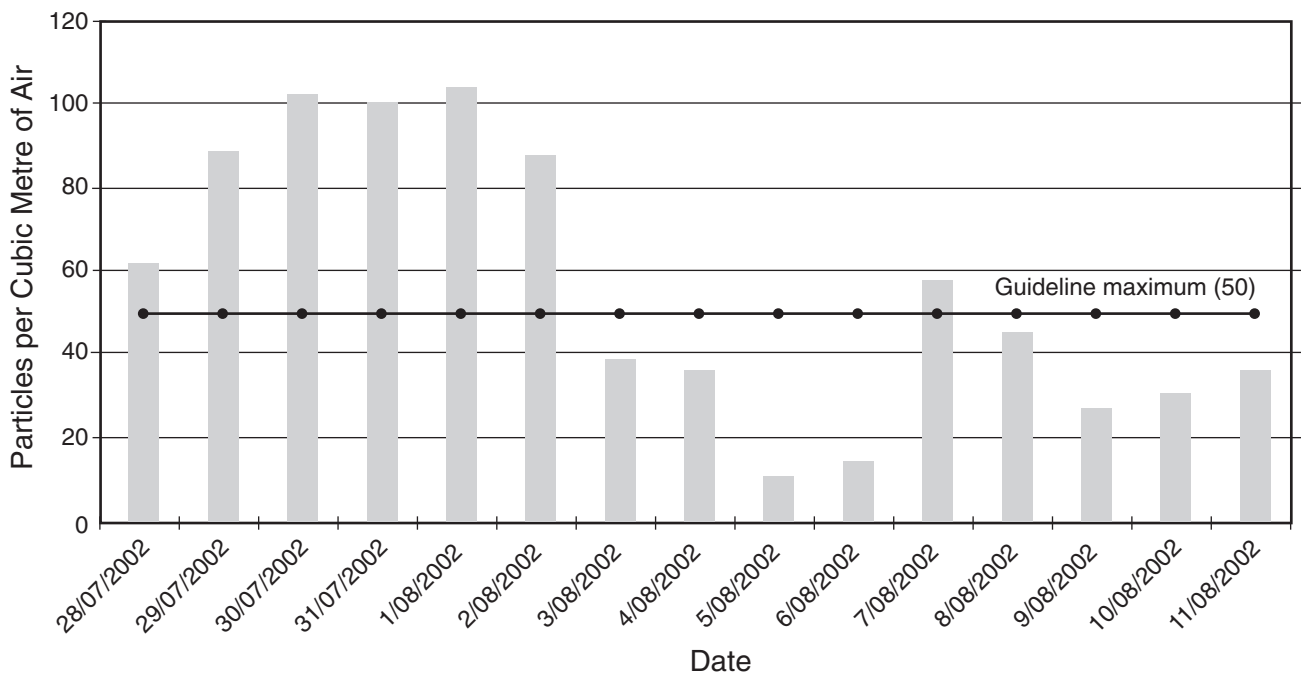


Figure 1

Pollutants from petrol and diesel engines are shown in **Figure 2** below. They are shown in grams of pollutant produced per kilogram of fuel.

Fuel	Carbon monoxide	Hydrocarbons	Nitrogen oxides	Sulfur dioxide	Particles of soot
Petrol	236	25	29	0.9	0.6
Diesel	10	17	59	3.8	18.0

Figure 2

- (a) Which of the pollutant(s) listed in **Figure 2** causes the air quality to exceed the guideline maximum on SEVEN of the days in the period recorded in **Figure 1**?

- (b) Describe TWO effects of the presence of sulfur dioxide on people or the natural environment.

(1)

(2)

- (c) Discuss the relative contribution of petrol and diesel engines to **photochemical smog**.

- (d) Discuss the effects of **photochemical smog** on both people and the environment, and the steps that could be taken by people living in Nelson to reduce the level of pollutants.

QUESTION THREE: Chlorine and its CompoundsAssessor's
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Chlorine gas can be made in the laboratory by the reaction of concentrated hydrochloric acid with sodium hypochlorite, NaOCl. **Figure 3** below shows how the preparation of chlorine can be carried out.

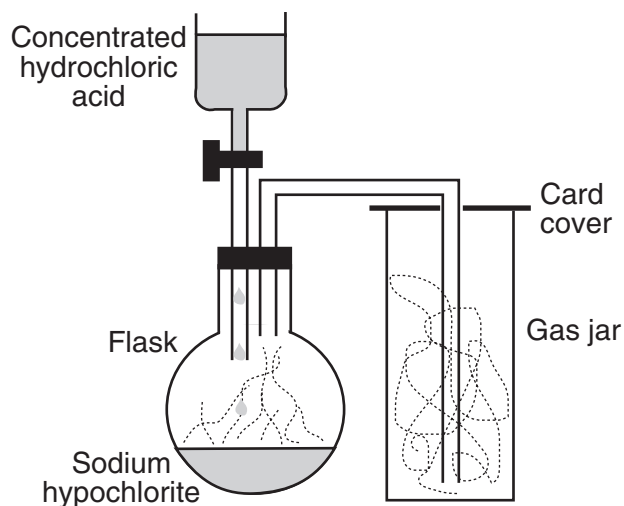


Figure 3

- (a) What colour is chlorine gas?
- _____
- (b) Another product of this reaction is NaCl. What is the chemical name of NaCl?
- _____
- (c) Explain why chlorine gas can be collected in the way shown in the diagram above rather than by water displacement.
- _____
- _____
- _____
- _____
- (d) When NaCl is reacted with concentrated sulfuric acid, hydrogen chloride gas is formed. Write a balanced chemical equation for this reaction.
- _____

Part A: Mineral water

A stylized illustration of a glass bottle of pure mineral water. The bottle is dark with a white label that reads "PURE MINERAL WATER" and "340ml". The bottle is set against a light gray circular background.

- (b) What effect would this solution have on litmus paper?

Liquid carbon dioxide is stored in fire extinguishers. When the pressure is released, it instantly converts to gas and some solid.

Link the physical and chemical properties of carbon dioxide to its suitability for use in fire extinguishers.

[illegible]

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

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Question Number	Question	Answer
1	What is the primary purpose of a business plan?	To outline the business's goals and strategies for achieving them.
2	Which of the following is NOT a typical component of a business plan?	Financial statements (e.g., income statement, balance sheet).
3	What is the difference between a mission statement and a vision statement?	A mission statement describes the company's current purpose and goals, while a vision statement describes the company's long-term aspirations.
4	What is the primary purpose of a market research report?	To provide information about the market and its potential customers.
5	Which of the following is NOT a typical component of a market research report?	Financial statements (e.g., income statement, balance sheet).
6	What is the primary purpose of a financial statement?	To provide information about the company's financial performance.
7	Which of the following is NOT a typical component of a financial statement?	Market research data (e.g., customer surveys, focus groups).
8	What is the primary purpose of a business plan?	To outline the business's goals and strategies for achieving them.
9	Which of the following is NOT a typical component of a business plan?	Financial statements (e.g., income statement, balance sheet).
10	What is the primary purpose of a market research report?	To provide information about the market and its potential customers.
11	Which of the following is NOT a typical component of a market research report?	Financial statements (e.g., income statement, balance sheet).
12	What is the primary purpose of a financial statement?	To provide information about the company's financial performance.
13	Which of the following is NOT a typical component of a financial statement?	Market research data (e.g., customer surveys, focus groups).
14	What is the primary purpose of a business plan?	To outline the business's goals and strategies for achieving them.
15	Which of the following is NOT a typical component of a business plan?	Financial statements (e.g., income statement, balance sheet).

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

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Question Number	Question	Answer
1	What is the primary purpose of a business plan?	To outline the business's goals and strategies for achieving them.
2	Which of the following is NOT a typical component of a business plan?	Financial statements (e.g., income statement, balance sheet).
3	What is the primary purpose of a marketing plan?	To define the target market and develop strategies to reach and persuade them.
4	Which of the following is NOT a typical component of a marketing plan?	Product development strategy.
5	What is the primary purpose of a financial plan?	To project the business's financial performance over time.
6	Which of the following is NOT a typical component of a financial plan?	Marketing strategy.
7	What is the primary purpose of an operations plan?	To define the processes and resources needed to produce the business's products or services.
8	Which of the following is NOT a typical component of an operations plan?	Marketing strategy.
9	What is the primary purpose of a human resources plan?	To define the organization's staffing needs and develop strategies to attract and retain talent.
10	Which of the following is NOT a typical component of a human resources plan?	Marketing strategy.

[illegible]