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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, 2004

90173 Describe selected non-metals and their compounds

Credits: Four
9.30 am Wednesday 10 November 2004

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 page 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 2–10 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.

Achievement Criteria *For Assessor's use only*		
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 35 minutes answering the questions in this booklet.

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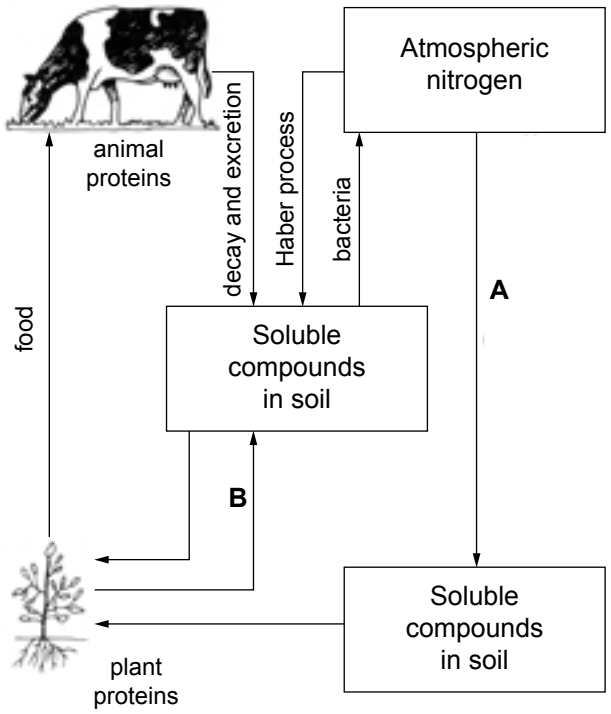
QUESTION ONE: NITROGEN

(a) This diagram of the Nitrogen Cycle shows how nitrogen and its compounds are maintained in the environment.



Explain what is happening during the processes A and B in the cycle. Include in your answer the names or formulae of the chemical compounds involved.

Process A:

Process B:

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(b) Ammonia (NH_3) can be made in an industrial process.

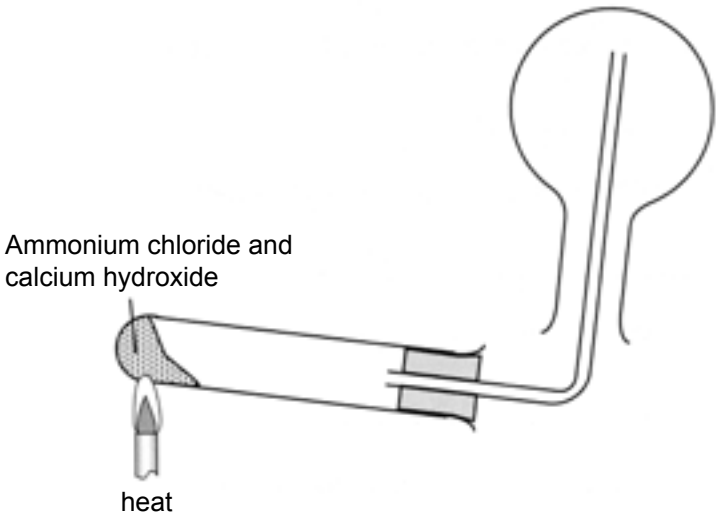
(i) Name the industrial process.

_____

(ii) Name, or give the formula of, the catalyst in this process.

_____

(c) Ammonia is prepared in the laboratory by heating solid **ammonium chloride** and solid **calcium hydroxide** together.



(i) State why ammonia is collected by the downward displacement of air.

_____

_____

_____

(ii) Write a balanced equation for this reaction.

QUESTION TWO: GASES IN THE AIR

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Oxygen and nitrogen can be separated from air for use in industry.

Use the diagram and information given below, and your own knowledge, to answer the questions that follow.

[For copyright reasons, this resource cannot be reproduced here. See below.]

Acknowledgement: *Co-ordinated Science Chemistry 2nd Edition*, Rose/Marie Gallagher, Paul Ingram, Peter Whitehead. Oxford University Press, 1996, p.210.

(a) Explain why the filter is needed at step 1.

(b) Step 3 and step 4 are repeated several times. Explain why the air is compressed and then expanded each time.

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Boiling points of the gases in air (°C)	
Carbon dioxide (sublimes)	–32
Xenon	–108
Krypton	–153
Oxygen	–183
Argon	–186
Nitrogen	–196
Neon	–246
Helium	–269

(c) Describe the composition of the liquid air mixture at **–200 °C** and explain how nitrogen is then obtained from it.

QUESTION THREE: CHLORINE FROM SEA WATER

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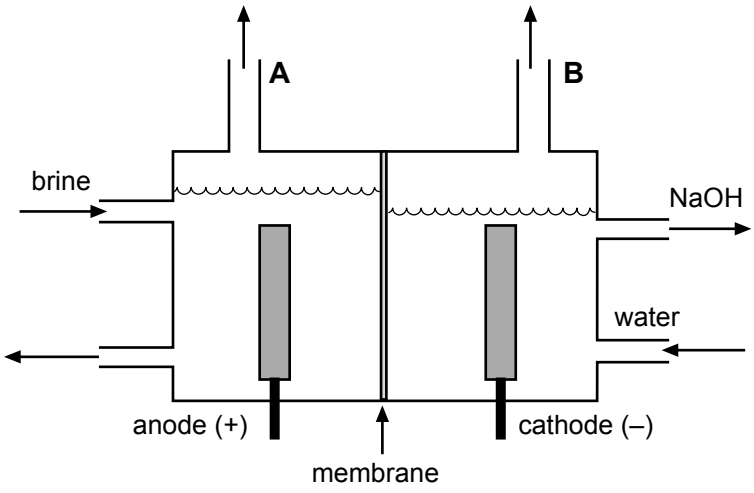
Chlorine is not found as a free element in nature. It occurs mainly as sodium chloride in rock salt and in sea water.

(a) Describe the colour and state of chlorine at room temperature.

(b) Write an equation for the reaction of chlorine with water.

Chlorine is obtained by electrolysis of brine (a concentrated solution of sodium chloride in water). A membrane cell, shown in the diagram below, is used.



(c) Write the equation for the reaction that occurs at the anode.

(d) Explain how the membrane works and why it is needed.

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QUESTION FOUR: SULFUR

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Sulfur is a yellow solid at room temperature.

(a) Describe ONE observation that would be made when sulfur is burned in air.

(b) State, with reasons, any special conditions needed to burn sulfur safely in the laboratory.

(c) Wine makers add sulfur dioxide to grape juice **before** yeast is added to start the fermentation process.

Using a property of sulfur dioxide, discuss why it is added at this point. Predict, with reasons, what could happen if sulfur dioxide is not added before fermentation.

QUESTION FIVE: OZONE

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The ozone layer is very important to planet Earth.

Discuss fully this statement. Consider the following in your answer

- reasons why it is important to people and the environment
- effects on people and the environment if the ozone layer is damaged
- how human activities can damage the ozone layer.

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

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Question number