For Supervisor's use only

1

90189

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

Level 1 Science, 2004

90189 Describe aspects of chemistry

Credits: Five
2.00 pm Wednesday 17 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 pages provided at the back of this booklet and clearly number the question.

A Table of Ions and a Periodic Table are provided in the RESOURCE BOOKLET attached in the centre of this booklet. You may detach the RESOURCE BOOKLET.

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.

Achievement Criteria	*For Assessor's use only*	
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Describe aspects of chemistry. ☐	Explain aspects of chemistry. ☐	Discuss aspects of chemistry. ☐
Overall Level of Performance ☐		

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

Assessor's use only

QUESTION ONE: METALS

(a) Complete the table below by writing the appropriate metal from the following list in each of the three boxes, (i), (ii), (iii):

zinc, copper, iron, sodium, magnesium

Characteristic	**Metal**
This metal does not react with water.	(i)
This metal rusts.	(ii)
This metal reacts violently with water.	(iii)

(b) (i) When calcium metal is placed in water it reacts vigorously, producing a gas.

(1) Name the gas.

_____

(2) Name **another** product of this reaction.

_____

(ii) When calcium is placed in hydrochloric acid it reacts violently. Write the balanced **symbol equation** for this reaction.

_____

(c) (i) In 1982 a British ship, the *Sir Galahad*, was hit by a torpedo and started to burn. The structure of the ship contained a large amount of aluminium metal.

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

Source: http://news.bbc.co.uk/onthisday/hi/dates/stories/june/8/newsid_2500000/2500607.stm

Complete the **word equation** for the reaction of aluminium burning in air:

aluminium + $\rightarrow$

Assessor's use only

(ii) Discuss the high reactivity of aluminium metal shown in the burning ship compared with the low reactivity of aluminium when aluminium foil is used to wrap food for storage or cooking. You should consider the properties of aluminium, the different conditions present in the examples, and reasons for the different reactivity.

(d) (i) Copper is a metal that is used for electrical wiring.

Give TWO **physical properties** of copper that make it suitable for electrical wiring.

1. _____

2. _____

(ii) The diagram below shows a model that can be used to represent the structure of metals:

Metallic Solid

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

Source: Croucher, May & Paul, *NZ Pathfinder Series Chemistry, Year 12*, New House Publications, Auckland, 2000

Explain how the model above accounts for ONE of the properties of copper you have given that make copper suitable for electrical wiring.

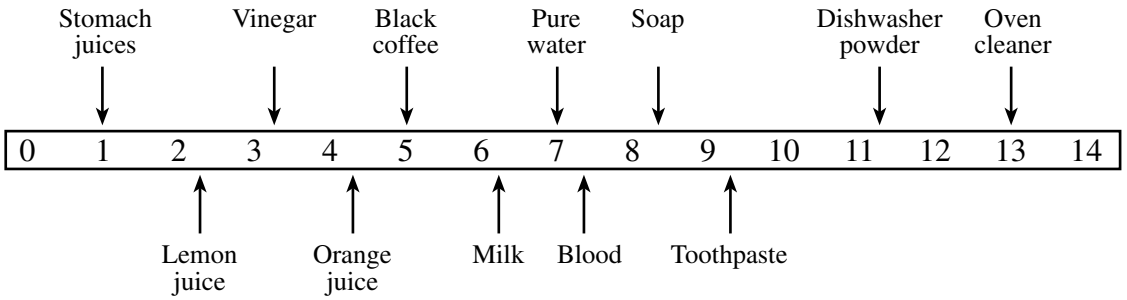
QUESTION TWO: ACIDS AND BASES

Assessor's use only

(a) Complete the following table by writing the colour you would see:

Substance	**Colour with litmus solution**	**Colour with universal indicator solution**
Hydrochloric acid		
Calcium oxide		

(b) Use the information on this pH scale to answer the questions that follow.



(i) Name the most strongly alkaline substance shown above.

_____

(ii) Which fruit juice is more acidic than vinegar?

_____

(iii) Bacteria can turn sugar in your mouth to acid that attacks teeth. Explain why toothpaste has such a high pH.

_____

_____

_____

_____

_____

_____

Assessor's use only

(c) Hydrochloric and sulfuric acids both react with carbonates and hydrogen carbonates to produce a gas.

(i) Name the gas.

_____

(ii) Write the **word equation** for the reaction of hydrochloric acid with copper carbonate.

(iii) Write a fully balanced **symbol equation** for the reaction of sulfuric acid with sodium hydrogen carbonate.

_____

(iv) Explain why the reactions of acids with carbonates and hydrogen carbonates are called neutralisation reactions.

_____

_____

_____

_____

_____

_____

QUESTION THREE: ATOMIC STRUCTURE

Assessor's use only

You will need to use the Periodic Table provided in your Resource Booklet to answer these questions.

(a) **Complete** the table below by putting the appropriate numbers in the boxes (i) – (vi).

Symbol	Atomic number	Mass number	Number of protons	Number of electrons	Number of neutrons
Al	13	27	13	(i)	(ii)
C	(iii)	12	(iv)	6	6
Na^+	11	23	11	(v)	12
O^{2-}	8	16	(vi)	10	8

(b) The electron arrangement for nitrogen (N) is 2,5. Write the electron arrangement for:

Li _____

P _____

Mg^{2+} _____

(c) Compare the positions of sodium (Na), potassium (K) and rubidium (Rb) on the Periodic Table.

(i) What is the charge on a rubidium ion?

_____

(ii) Explain your answer.

_____

_____

_____

_____

(d) (i) (1) How many atoms of **oxygen** are there in the formula $Mg(HCO_3)_2$? _____

(2) What is the **total** number of atoms in the formula? _____

Assessor's use only

(ii) Using the Table of Ions provided in your Resource Booklet, write formulae for:

(1) calcium oxide _____

(2) copper hydroxide _____

(3) sodium carbonate _____

(iii) Name each of these compounds:

(1) MgO _____

(2) Na_2S _____

(3) $Ca(NO_3)_2$ _____

(e) The doctor told Miriam she was tired and pale because she was low in iron. The iron tablets Miriam was given to take did not look like the iron nails they used in woodwork.

Discuss how the **chemical** differences between the iron in the tablets and the iron in the nails are related to their uses.

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

Assessor's use only

Question number