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90172

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

Level 1 Chemistry, 2003

90172 Represent and describe atomic structure and bonding

Credits: Three
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 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 2–8 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.

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Achievement Criteria		
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Represent and describe atomic structure and bonding. ☐	Explain atomic structure and bonding. ☐	Apply understanding of atomic structure and bonding. ☐
Overall Level of Performance ☐		

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

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QUESTION ONE

(a) Use the Periodic Table provided in the Resource Booklet to help you complete the table below:

Symbol of atom or ion	Atomic number	Electron arrangement
C	6	
N	7	
	15	2, 8, 5
	19	2, 8, 8

(b) Lithium (Li) has only two isotopes: one with mass number 6 and the other with mass number 7.

(i) Complete the following table:

isotope	Number of particles present in the nucleus	
	protons	neutrons
^{6}Li		
^{7}Li		

(ii) Explain what **isotopes** are, using the information about lithium provided in the table above.

(iii) The atomic mass for lithium on the Periodic Table is 6.9.

What does this tell you about the relative abundance of the two isotopes of lithium?

QUESTION TWO

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(a) All of the following elements, except one, have similar chemical properties.

(i) Circle the ONE element that is the exception.

Ca Mg S Sr

(ii) Use the Periodic Table and electron arrangements to justify your choice for (i).

(b) Information about the physical properties of two compounds is given in the table below.

Name	Formula	Melting point/°C	Boiling point/°C	Conductivity in liquid state
sodium chloride	NaCl	801	1413	high
sulfur chloride	SCl_2	–80	59	very low

(i) Explain the difference in conductivity of the two compounds in the liquid state.

(ii) Explain the difference in melting point of the two compounds.

QUESTION THREE

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When magnesium reacts with chlorine, the compound magnesium chloride ($MgCl_2$) is formed.

Explain how this compound is formed.

Your answer should refer to electron arrangements and may include diagrams.

QUESTION FOUR

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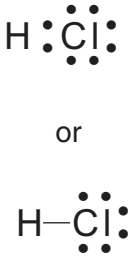
Draw the Lewis diagram for EACH gas in the table below.
The first one has been done for you as an example.

Name	Formula	Lewis Diagram
hydrogen chloride	HCl	 or
argon	Ar	
hydrogen sulfide	H_2S	
carbon dioxide	CO_2	

QUESTION FIVE

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(a) A year 9 student reports that a new chemical element has been discovered. It is a gas with relative atomic mass (molar mass) 17.0.

Explain why the report of a new chemical element must be incorrect.
(Hint: use information from the Periodic Table provided.)

(b) More than 99% of hydrogen exists as the ^{1}H isotope

Explain why the term **proton** is often used to describe a hydrogen ion (H^{+}).

QUESTION SIX

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When a substance in the gas state is cooled down, it will form a liquid and, if the temperature is low enough, a solid. As each change of state occurs, the following properties of the particles change:

- energy of the particles
- motion of the particles
- relative position of the particles.

Choose TWO of these properties and discuss how EACH property changes in the **gas**, **liquid** and **solid** states. (Note: the property should be described in all three states.) Diagrams may be included.

Property 1: _____

Property 2: _____

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

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Question Number