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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, 2004

90172 Describe atomic structure and bonding

Credits: Three
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 atomic structure and bonding. ☐	Link principles of atomic structure, bonding and selected properties. ☐	Discuss selected properties in terms of atomic structure and bonding. ☐
Overall Level of Performance ☐		

You are advised to spend 30 minutes answering the questions in this booklet.

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QUESTION ONE

(a) Complete the following table about the atomic structures of some elements. You should refer to the Periodic Table in your Resource Booklet.

Atomic number	Number of protons	Number of electrons	Number of neutrons	Symbol
	8		9	
11				^{23}Na
	47			$^{108}Ag^{+}$

(b) The electron arrangement of boron can be written as: **2 , 3**

Write the electron arrangement for the following.

(i) a fluorine atom: _____

(ii) an aluminium atom: _____

(iii) an oxide ion: _____

(iv) a lithium ion: _____

(c) **Magnesium**, atomic number 12 and **calcium**, atomic number 20 are found close together in the Periodic Table. Explain fully what their position in the periodic table means in terms of their **electron arrangements** and their **chemical properties**.

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(d) Potassium-40 (^{40}K) is used to date very old rocks. Potassium also exists as ^{39}K and ^{41}K. The atomic mass on the Periodic Table in the Resource Booklet is 39.1

Explain how potassium can exist as these three isotopes and discuss any conclusion that can be drawn from the given data.

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QUESTION TWO

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(a) For each substance below, state whether the bonding is **ionic** or **covalent** and explain your choice of bond type using the atomic structure of the atoms.

(i) The bonding in chlorine (Cl_2) is _____ because

(ii) The bonding in lithium chloride (LiCl) is _____ because

(iii) The bonding in sulfur chloride (SCl_2) is _____ because

(b) Chlorine can form compounds with the elements sodium and magnesium. The ratio of each of these elements to chlorine is not the same in each compound. Explain this statement. Diagrams may be included.

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QUESTION THREE

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The melting point of oxygen (O_2) is –219°C and magnesium oxide (MgO) 2800°C.

Discuss why the melting points of these two substances are so different.

QUESTION FOUR

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The table below gives information about **carbon dioxide** and **sodium chloride**.

Compound	State at room temperature (25°C)	Melting point °C
Carbon dioxide	Gas	–101
Sodium chloride	Solid	801

(a) Draw diagrams to show how the particles would be arranged in each substance **at room temperature.** Use ●◯● to represent carbon dioxide and ●◯ to represent sodium chloride.

Carbon dioxide	Sodium chloride

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Information about the electrical conductivity of carbon dioxide and sodium chloride is given in the table below.

	Electrical conductivity	
Compound	**Solid**	**Liquid**
Carbon dioxide	Nil	Nil
Sodium chloride	Nil	Good

(b) Discuss the **electrical conductivity** information for the two compounds, in terms of **structure and bonding.**

QUESTION FIVE

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The Lewis diagram of a chlorine atom can be shown as: 

Draw Lewis diagrams for the following atoms and molecules.

Oxygen atom O	**Nitrogen molecule N_2**
Methane molecule CH_4	**Sulfur dioxide molecule SO_2**

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

Question number

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