1

90172

NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

For Supervisor's use only

Level 1 Chemistry, 2009

90172 Describe atomic structure and bonding

Credits: Three
2.00 pm Friday 27 November 2009

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.

A periodic table and other reference material are provided in the Resource Booklet L1–CHEMR.

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

Check that this booklet has pages 2–7 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.

For Assessor's use only	**Achievement Criteria**		
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: CARBON AND ITS COMPOUNDS

There are three naturally occurring isotopes of carbon: carbon-12 (^{12}C), carbon-13 (^{13}C) and carbon-14 (^{14}C).

(a) Describe what the term isotope means, with reference to the atomic structure of these three isotopes of carbon.

Three compounds of carbon are methane, CH_4; carbon monoxide, CO; and calcium carbide, CaC_2.

(b) Draw Lewis structures for methane and carbon monoxide.

CH_4	CO

(c) Discuss the reasons why the following two carbon-containing compounds (methane and calcium carbide) have different melting points. The melting points are given in the table below.

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Name	Formula	Melting point (°C)
Methane	CH_4	–182.50
Calcium carbide	CaC_2	2300.0

Your answer should include:

- the type of particle found in each compound
- the attractive forces found in each compound
- the strength of these attractive forces.

QUESTION TWO: ELEMENTS OF THE PERIODIC TABLE

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(a) Explain the similarities and differences in the chemical reactivity of the elements fluorine and chlorine versus neon and argon. Link your answer to the electron configurations of each atom.

Comparing fluorine with chlorine:

Comparing neon with argon:

Comparing fluorine and chlorine with neon and argon:

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(b) Neon is a monatomic substance (it exists as a single atom). Chlorine exists as a diatomic molecule (two atoms bonded together).

Discuss why the melting and boiling points of neon are so much lower than the melting and boiling points of chlorine. See the table below for the actual melting and boiling points of each element.

Element	Melting Point (°C)	Boiling Point (°C)
Neon	–249	–246
Chlorine	–101	–35

Your answer should include:

- the attractive forces found in each element
- the strength of these attractive forces.

QUESTION THREE: CONDUCTIVITY

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Discuss the electrical conductivity of solid magnesium chloride, $MgCl_2(s)$, molten magnesium chloride, $MgCl_2(\ell)$, and gaseous chlorine, $Cl_2(g)$.

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

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Question number