EXEMPLAR

90172

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NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Level 1 Chemistry, 2007

90172 Describe atomic structure and bonding

Credits: Three
9.30 am Monday 19 November 2007

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 metal activity series, solubility rules, a table of ions and a periodic table are provided in 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	E				

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

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QUESTION ONE

Complete the following table.

Symbol	Number of Protons	Number of Neutrons	Number of Electrons	Atomic Number	Mass Number
Mg	12	12	12	12	24
Li	3	3	3	3	6
Li	3	4	3	3	7
N^{3-}	7	7	10	7	14
Ca^{2-}	20	20	18	20	40

A

QUESTION TWO

Use the Periodic Table provided to answer the following questions on sulfur.

(a) (i) Write the chemical symbol for the sulfur atom. S

(ii) Write the electron arrangement for the sulfur atom. 2,8,6

(iii) Write the chemical symbol for the sulfide ion. S^{2-}

(iv) Write the electron arrangement for the sulfide ion. 2,8,8

(b) (i) Draw the Lewis structure for the sulfur atom.

Must show unpaired electrons.

A

(ii) Draw the Lewis structure for hydrogen sulfide, H_2S.

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(c) Discuss the electrical conductivity of sulfur and sodium sulfide as solids and as liquids (when heated to molten).
You should include in your answer information on the types of particles in each substance, and the attractive forces between them.

Sulphur will never conduct, not in a molten state or a solid, this is because it has no free electron and no ions that are free to move and could carry a charge
Sodium sulphide will not conduct when in a solid state but in a molten state the IONS are free to move and carry a charge //

Sulphur molecules S_2 are bonded covalently and therefore their intermolecular forces are van der waals temporary dipole-dipole attractions //

Sodium Sulphide is bonded ionically an electrostatic 3D attraction between oppositely charged IONS to form a crystal lattice //

E

QUESTION THREE

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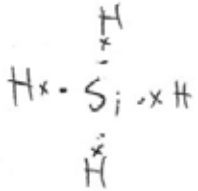
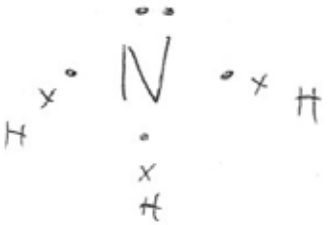
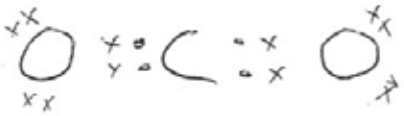
Draw the Lewis structures for the molecules given in the box below.

(a) Silicon hydride, SiH_4 	(b) Tetrachloromethane, CCl_4 
(c) Ammonia, NH_3 	(d) Carbon dioxide, CO_2 

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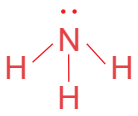
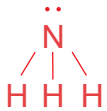


Shape accepted



Not acceptable

QUESTION FOUR

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Nitrogen and phosphorus can both form ions with a charge of –3. Nitrogen forms the nitride ion, N^{3-}, and phosphorus forms the phosphide ion, P^{3-}.

Explain why both of these elements form ions with the same charge of –3.

they're both in group 15 and both have the same number of electrons in their valence shell. Therefore they both need to gain 3 electrons to fill their valence shell and become stable so they will both form 3^- IONs //

Both non-metals

M

QUESTION FIVE

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Fluorine, F_2, is a gas and bromine, Br_2, is a liquid at room temperature.

Discuss the different states of these elements at room temperature.

You should include in your answer information on particle separation, energy, particle motion and the attractive forces between the particles.

F_2 and Br_2 are covalently bonded and their intermolecular forces are Van der waal forces. One end of the molecule becomes temporarily nigative and is attracted to the positive end protons of a nearby molecule. A temporary dipole-dipole attraction. //
Fluorine is a smaller molecule and has fewer electrons so less electrons mean there is less chance of temporary dipole-dipole attraction therefore it is a gas at room temperature. //
Bromine is a relatively much larger molecule than fluorine and has more electrons so more chance of forming temporary dipole-dipole attractions to neighbouring molecules //

A