EXEMPLAR

90172

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For Supervisor's use only

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 A			

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

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QUESTION ONE

Complete the following table.

24 • 3 not accepted.

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+}	~~18~~ 20	20	18	20	40

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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.

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

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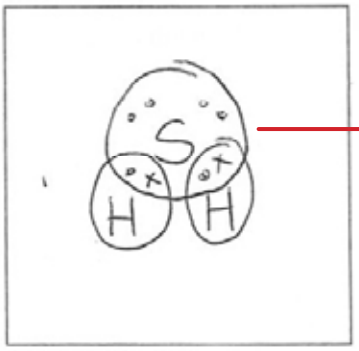

Circles accepted

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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.

S , Na_2S

Ionic bonding = Na_2S - (3-1) electrostatic attraction between oppositely charged particles to form a crystal lattice)
Sodium is a non metal, it does not conduct as a solid. Sodium is highly reactive so there is a strong +/- attraction force between Na_2S.
Sodium sulfide will not conduct as a solid but will when molten or dissolved, because there are free ions to carry an electrical charge when molten or dissolved but not as a solid.

Sulfur is a metal and will conduct

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QUESTION THREE

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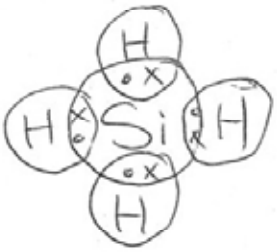
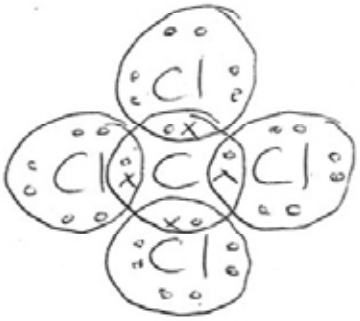
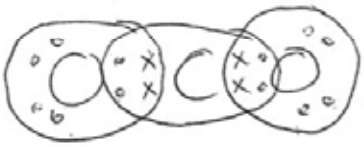
Draw the Lewis structures for the molecules given in the box below.

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

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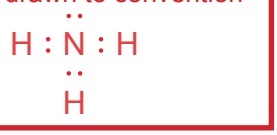
Shape not drawn to convention



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.

~~pe~~ Nitrogen and phosphorus are both located in ~~the~~ group 15. Both of these elements need to gain 3 electrons to complete their outer shell. ~~with~~ In doing this they become an ion. It ~~is~~ has a charge of -3 because it has 3 extra electrons. Electrons have a negative charge, so it will have a charge of -3. It is more negatively charged by 3 electrons.

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QUESTION FIVE

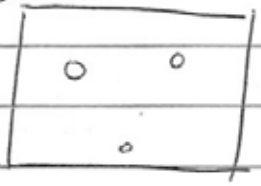
Assessor's use only

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.

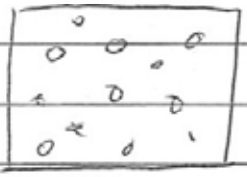
You should include in your answer information on particle separation, energy, particle motion and the attractive forces between the particles.

~~How~~ Fluorine F_2 is a gas. The particles in Fluorine are moving around extremely fast, bouncing every where.



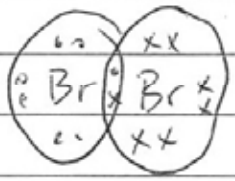
gas.

Bromine Br_2 is a liquid. The particles in bromine are moving, but not a fast as a gas.



liquid

F_2 is covalent bonding



Br_2 is also covalent bonding

These elements are highly reactive as they only need one more electron to complete their outer shell.

N

Only one point made for each of F_2 and Br_2.