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90308

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NZQA

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MANA TOHU MĀTAURANGA O AOTEAROA

For Supervisor's use only

Level 2 Chemistry, 2009

90308 Describe the nature of structure and bonding in different substances

Credits: Four
2.00 pm Monday 23 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 is provided on the Resource Sheet L2–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 2–10 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.

For Assessor's use only	**Achievement Criteria**		
Achievement	**Achievement with Merit**	**Achievement with Excellence**	
Describe the bonding in simple molecules and the nature of types of solids.	Link selected properties of simple molecules and different types of solids to their structure.	Discuss properties of substances in terms of structure and bonding.	
Overall Level of Performance			

You are advised to spend 45 minutes answering the questions in this booklet.

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QUESTION ONE

(a) Complete the table below by:

(i) Drawing the Lewis structure (electron dot diagram) for each molecule.

(ii) Drawing a diagram to show the shape of the molecule.

(iii) Naming the shape of the molecule.

Molecule	(i) Lewis Structure	(ii) Diagram of Shape	(iii) Name of Shape
H_2O			
CO_2			
CH_2Br_2			

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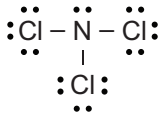
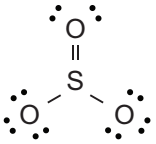
(b) The Lewis structures of the molecules NCl_3 and SO_3 are given below.





Discuss the shapes and bond angles of these two molecules. For each molecule:

- name the shape
- determine the bond angle
- justify your answers.

(i) NCl_3

Shape _____ Bond angle _____

Justification _____

_____

_____

_____

_____

_____

_____

_____

(ii) SO_3

Shape _____ Bond angle _____

Justification _____

_____

_____

_____

_____

_____

_____

_____

QUESTION TWO

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(a) For each of the following molecules, state whether they contain **polar** or **non-polar** bonds. Justify your answer.

Cl_2 F_2 HCl

Molecule(s) that contain **polar** bonds: _____

Justification: _____

_____

_____

_____

_____

Molecule(s) that contain **non-polar** bonds: _____

Justification: _____

_____

_____

_____

_____

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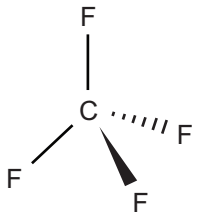
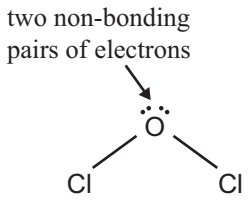
(b) Diagrams showing the shapes of the molecules CF_4 and Cl_2O are shown below.





Circle the answer which describes the **polarity** of each of these molecules.

Discuss the reasons for your choice.

CF_4 **polar** **non-polar**

Cl_2O **polar** **non-polar**

QUESTION THREE

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(a) Complete the table below by stating the type of solid, the type of particle present and identifying the bonding (attractive forces) between the particles in the **solid** state. The first one has been done for you.

Solid	Type of solid	Type of particle	Bonding between particles
Chlorine (Cl_2)	molecular	molecule	weak intermolecular forces
Silicon dioxide (SiO_2)			
Copper chloride ($CuCl_2$)			
Potassium (K)			
Carbon dioxide (CO_2)			

(b) Use the information given below to answer the question that follows.

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- **Diamond** is a covalent network solid. It has a very high melting point of 3 550°C.
- **Magnesium oxide**, MgO, is an ionic solid. It has a high melting point of 2 800°C.
- **Sulfur dichloride**, SCl_2, is a molecular substance. It has a low melting point of –80°C.

Discuss the melting points of these three substances by referring to the **particles** and the **forces between the particles** in the solids.

QUESTION FOUR

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Discuss the **electrical conductivity** of the following THREE substances using your knowledge of structure and bonding.

Sulfur, S_8, **does not conduct** electricity in the solid state nor in the liquid state.

Magnesium chloride, $MgCl_2$, **conducts** electricity when it is dissolved in water, but not in the solid state.

Lead, Pb, **conducts** electricity in the solid state and when molten (liquid).

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

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Question number