

91164



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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SUPERVISOR'S USE ONLY

Level 2 Chemistry, 2012

91164 Demonstrate understanding of bonding, structure, properties and energy changes

9.30 am Tuesday 20 November 2012

Credits: Five

| Achievement | Achievement with Merit | Achievement with Excellence |
|---|--|---|
| Demonstrate understanding of bonding, structure, properties and energy changes. | Demonstrate in-depth understanding of bonding, structure, properties and energy changes. | Demonstrate comprehensive understanding of bonding, structure, properties and energy changes. |

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 attempt 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 2–11 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.

TOTAL

ASSESSOR'S USE ONLY

You are advised to spend 60 minutes answering the questions in this booklet.

QUESTION ONE

(a) Draw the Lewis structure (electron dot diagram) for each of the following molecules.

| Molecule | PCl ₃ | CO ₂ | H ₂ S |
|-----------------|------------------|-----------------|------------------|
| Lewis structure | | | |

(b) The following table shows the Lewis structures and bond angles for the molecules SO₂ and H₂CO.

| Molecule | SO ₂ | H ₂ CO |
|--|--|---|
| Lewis structure | $\ddot{\text{O}}::\ddot{\text{S}}::\ddot{\text{O}}:$ | $\begin{array}{c} \text{H} \\ \vdots \\ \text{C}::\text{O} \\ \vdots \\ \text{H} \end{array}$ |
| Approximate bond angle around the central atom | 120° | 120° |

Explain why these molecules have different shapes, but have the same approximate bond angle.

In your answer you should include:

- the shapes of SO₂ and H₂CO
- factors which determine the shape of each molecule
- an explanation of why the approximate bond angle is the same by referring to the arrangement of electrons for each molecule.

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The examination continues on the following page.**

QUESTION TWO

- (a) Complete the table below by stating the type of particle and the bonding (attractive forces) between the particles for each of the substances.

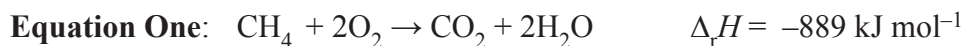
| Substance | Type of particle | Attractive forces between particles |
|-----------------------------------|------------------|-------------------------------------|
| Ammonia, NH ₃ | | |
| Zinc, Zn | | |
| Silicon dioxide, SiO ₂ | | |

- (b) Silicon dioxide has a melting point of 1770°C.

Explain why silicon dioxide has a high melting point by referring to the particles and the forces between the particles in the solid.

QUESTION THREE

- (a) Some Bunsen burners use methane gas, CH_4 , as a fuel. The reaction for the combustion of methane in a Bunsen burner is shown in **Equation One** below.



When this reaction occurs, bonds are broken and bonds are formed.

State which bonds are broken and which bonds are formed during the reaction.

Bonds broken: _____

Bonds formed: _____

- (b) Calculate the energy released when 128 g of methane is burnt.

$$M(\text{CH}_4) = 16.0 \text{ g mol}^{-1}.$$

- (c) The equation for water boiling at 100°C is shown below in **Equation Two**.



Explain why this equation is endothermic.

You should relate the energy changes that are occurring to the specific bonds being broken or formed.

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