

91164



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

2

SUPERVISOR'S USE ONLY

Level 2 Chemistry, 2014

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

2.00 pm Tuesday 11 November 2014

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 2–10 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.

TOTAL

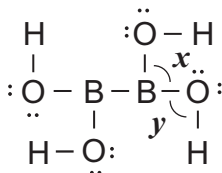
ASSESSOR'S USE ONLY

QUESTION ONE

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

Molecule	HCN	CH ₂ Br ₂	AsH ₃
Lewis structure			

- (b) The Lewis structure for a molecule containing atoms of boron, oxygen, and hydrogen, is shown below.



- (i) The following table describes the shapes around two of the atoms in the molecule above.

Complete the table with the approximate bond angles x and y .

Central atom	Shape formed by bonds around the central atom	Approximate bond angle
B	trigonal planar	$x =$
O	bent	$y =$

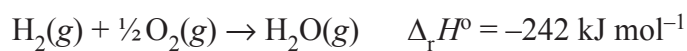
- (ii) The bond angles
- x
- and
- y
- in the molecule above are different.

Elaborate on why the bond angles are different.

In your answer you should include:

- factors which determine the shape around the:
 - B** atom for bond angle x
 - O** atom for bond angle y
- reference to the arrangement of electrons around the **B** and **O** atoms.

- (d) Hydrogen gas, $\text{H}_2(\text{g})$, reacts with oxygen gas, $\text{O}_2(\text{g})$, as shown by the following equation



Given the average bond enthalpies in the table below, calculate the average bond enthalpy of the **O–H** bond in H_2O .

Bond	Average bond enthalpy / kJ mol^{-1}
H–H	436
O=O	498

QUESTION THREE

- (a) (i) When solid sodium hydroxide is added to water, the temperature increases.

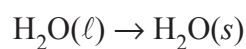
Circle the term that best describes this reaction.

Exothermic

Endothermic

Give a reason for your choice.

- (ii) The freezing of water to form ice can be represented by the following equation.



Circle the term that best describes this reaction.

Exothermic

Endothermic

Explain your choice.

- (b) Use your knowledge of structure and bonding to explain the dissolving process of sodium chloride in water.

Support your answer with an annotated (labelled) diagram.

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