See back cover for an English translation of this cover

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91164M

911645

SUPERVISOR'S USE ONLY

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Te Mātauranga Matū, Kaupae 2, 2012

91164M Te whakaatu māramatanga ki te honohono, te hanganga, ngā āhuatanga me ngā huringa pūngao

9.30 i te ata Rātū 20 Whiringa-ā-rangi 2012
Whiwhinga: Rima

Paetae	Paetae Kaiaka	Paetae Kairangi
Te whakaatu māramatanga ki te honohono, te hanganga, ngā āhuatanga me ngā huringa pūngao.	Te whakaatu māramatanga hōhonu ki te honohono, te hanganga, ngā āhuatanga me ngā huringa pūngao.	Te whakaatu māramatanga matawhānui ki te honohono, te hanganga, ngā āhuatanga me ngā huringa pūngao.

Tirohia mehemea e ōrite ana te Tau Ākonga ā-Motu (NSN) kei tō pepa whakauru ki te tau kei runga ake nei.

Me whakautu e koe ngā pātai KATOA kei roto i te pukapuka nei.

He taka pūmotu kua whakaritea ki te Pukaiti Rauemi L2-CHEMMR.

Ki te hiahia koe ki ētahi atu wāhi hei tuhituhi whakautu, whakamahia te wāhi wātea kei muri i te pukapuka nei, ka āta tohu ai i ngā tau pātai.

Tirohia mehemea kei roto nei ngā whārangi 2–19 e raupapa tika ana, ā, kāore hoki he whārangi wātea.

HOATU TE PUKAPUKA NEI KI TE KAIWHAKAHAERE HEI TE MUTUNGA O TE WHAKAMĀTAUTAU.

TAPEKE

MĀ TE KAIMĀKA ANAKE

Kia 60 meneti hei whakautu i ngā pātai o tēnei pukapuka.

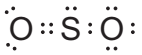
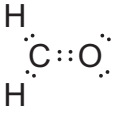
MĀ TE KAIMĀKA ANAKE

PĀTAI TUATAHI

(a) Tāngia te hanganga a Lewis (he hoahoa tongi irahiko) mō ia rāpoi ngota e whai ake nei:

Te Rāpoi Ngota	PCl_3	CO_2	H_2S
Te hanganga a Lewis			

(b) E whakaatu ana te tūtohi e whai ake i ngā hanganga a Lewis me ngā koki honohono mō ngā rāpoi ngota SO_2 me te H_2CO.

Te Rāpoi Ngota	SO_2	H_2CO
Te hanganga a Lewis		
Te koki honohono āwhiwhi e rawhi ana i te ngota pūwaenga	120°	120°

Whakamāramahia te take e whai āhua rerekē ēnei rāpoi ngota, engari he ōrite te koki honohono āwhiwhi.

I roto i tō whakautu me whakauru e koe:

- ngā āhua o te SO_2 me te H_2CO
- ngā take e whakariterite ai i te āhua o ia rāpoi ngota
- he whakamārama he aha i ōrite ai te koki honohono āwhiwhi mā te kōrero mō te raupapa o ngā irahiko mō ia rāpoi ngota.

MĀ TE KAIMĀKA ANAKE

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

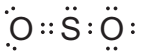
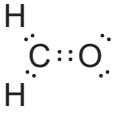
ASSESSOR'S USE ONLY

QUESTION ONE

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

Molecule	PCl_3	CO_2	H_2S
Lewis structure			

(b) The following table shows the Lewis structures and bond angles for the molecules SO_2 and H_2CO.

Molecule	SO_2	H_2CO
Lewis structure		
Approximate bond angle around the central atom	120°	120°

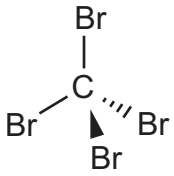
Explain why these molecules have different shapes, but have the same approximate bond angle.

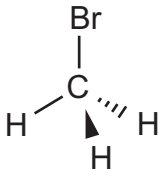
In your answer you should include:

- the shapes of SO_2 and H_2CO
- 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.

ASSESSOR'S USE ONLY

(c) E whakaaturia ana ngā hoahoa ahu-3 o ētahi rāpoi ngota e rua i raro nei.





Porohitatia te kupu e whakamārama ana i te **pitoruatanga** o ia rāpoi ngota **CBr_4** me te **CH_3Br**.

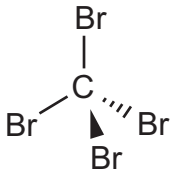
CBr_4	**Pitorua**	**Pitokore**
CH_3Br	**Pitorua**	**Pitokore**

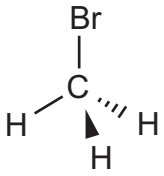
Mō ia rāpoi ngota, parahautia tō kōwhiringa.

MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

(c) The 3-dimensional diagrams of two molecules are shown below.





Circle the word that describes the **polarity** of each of the molecules **CBr_4** and **CH_3Br**.

CBr_4	**Polar**	**Non-polar**
CH_3Br	**Polar**	**Non-polar**

For each molecule, justify your choice.

PĀTAI TUARUA

MĀ TE KAIMĀKA ANAKE

(a) Whakaotihia te tūtohi i raro mā te tuhi mai i te momo korakora me te momo honohono (tōpana kume) i waenga i ngā korakora mō ia matū.

Matū	**Momo korakora**	**Tōpana kume i waenga i ngā korakora**
Haukini, NH_3		
Konutea, Zn		
Takawai hāorarua, SiO_2		

(b) He ira rewa tō te takawai hāorarua o te 1770°C.

Whakamāramatia mai te take e teitei ake te ira rewa o te takawai hāorarua mā te kōrero mō ngā korakora me ngā tōpana kei waenga i ngā korakora i roto i te totoka.

QUESTION TWO

ASSESSOR'S USE ONLY

(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.

(c) Whakatauritea te kawenga hiko, me te memehatanga i rō wai, mō te konutea, Zn, me te konutea pūhaumāota, $ZnCl_2$, mā te whakamahi i tō mōhio ki te hanganga me te honohono.

MĀ TE KAIMĀKA ANAKE

(c) Contrast both the electrical conductivity, and solubility in water, for both zinc, Zn, and zinc chloride, $ZnCl_2$, using your knowledge of structure and bonding.

ASSESSOR'S USE ONLY

PĀTAI TUATORU

MĀ TE KAIMĀKA ANAKE

(a) Whakamahia ai ētahi muratahi i te haurehu mewaro, CH_4, hei kora. Ko te tauhohenga mō te ngingiha o te mewaro i roto i te muratahi e whakaaturia ana i te **Whārite Tuatahi** i raro nei.

Whārite Tuatahi:	$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$	$\Delta_r H = -889$ kJ mol^{-1}

Ina pā tēnei tauhohe, ka wāhia he honohono, ka hangaia hoki he honohono.

Tuhia ko ēhea ngā honohono ka wāhia, ko ēhea ngā honohono ka hangaia i te wā o te tauhohe.

Ngā honohono ka wāhia: _____

Ngā honohono ka hangaia: _____

(b) Tātaihia te pūngao ka puta ina tahuna te mewaro 128 g.

M (CH_4) = 16.0 g mol^{-1}.

(c) E whakaaturia ana i raro nei i te **Whārite Tuarua** te whārite mō te wai e koropupū ana i te 100°C.

Whārite Tuarua:	$H_2O(\ell) \rightarrow H_2O(g)$	$\Delta_r H = 40.7$ kJ mol^{-1}

Whakamāramahia te take he pauwera tēnei whārite.

Me whakahāngai e koe ngā huringa pūngao ki ngā honohono tauwhāiti e wāhia ana, e hangaia ana hoki.

QUESTION THREE

ASSESSOR'S USE ONLY

(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.

Equation One: $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ $\quad\quad$ $\Delta_r H = -889$ kJ mol^{-1}

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 (CH_4) = 16.0 g mol^{-1}.

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

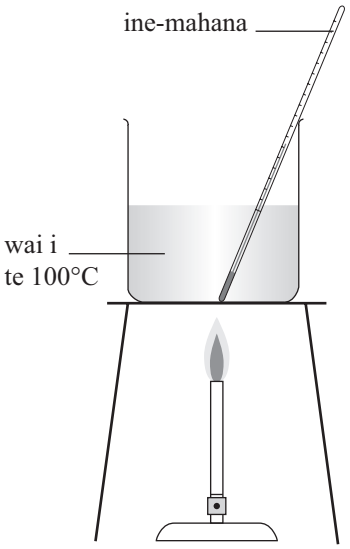
Equation Two: $H_2O(\ell) \rightarrow H_2O(g)$ $\quad\quad$ $\Delta_r H = 40.7$ kJ mol^{-1}

Explain why this equation is endothermic.

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

MĀ TE KAIMĀKA ANAKE

(d) Ka whakawerahia e tētahi ākonga tētahi rahinga wai 72.0 g ki te 100°C mā te whakamahi i tētahi muratahi.



Kātahi ka korohūtia e te ākonga te wai.

Tātaihia te papatipu o te haurehu mewaro, CH_4, e hiahiatia ana hei ngingiha i roto i tētahi muratahi kia korohū ai te wai e 72.0 g.

M (H_2O) = 18.0 g mol^{-1}.

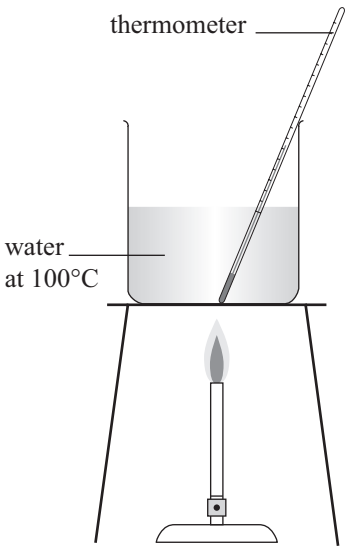
I tō whakautu me:

- whakamahi te **Whārite Tuarua** hei whakatau i te rahinga pūngao e hiahiatia kia korohū ai te wai
- whakamahi te **Whārite Tuatahi** hei whakatau i te papatipu o te mewaro e hiahiatia ana kia hua ake te rahinga pūngao e hiahiatia
- ū ki te whakaaro kāore e ngaro he pūngao ki te taiao paetata.

MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

(d) A student heats 72.0 g of water to 100°C using a Bunsen burner.



The student then boils the water.

Calculate the mass of methane gas, CH_4, that would need to be combusted in a Bunsen burner to boil the 72.0 g of water.

M (H_2O) = 18.0 g mol^{-1}.

In your answer you will need to:

- use **Equation Two** to determine the amount of energy required to boil the water
- use **Equation One** to determine the mass of methane needed to produce the required amount of energy
- assume that no energy is lost to the surrounding environment.

ASSESSOR'S USE ONLY

He puka anō mēnā ka hiahiatia.
Tuhia te (ngā) tau pātai mēnā e hāngai ana.

TAU PĀTAI

MĀ TE KAIMĀKA ANAKE

Extra paper if required.
Write the question number(s) if applicable.

QUESTION NUMBER

ASSESSOR'S USE ONLY

English translation of the wording on the front cover

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.

91164M

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 2–19 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.