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90944M



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NEW ZEALAND QUALIFICATIONS AUTHORITY  
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD  
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

SUPERVISOR'S USE ONLY

## Pūtaiao, Kaupae 1, 2019

### 90944M Te whakaatu māramatanga ki ngā āhuatanga o te waikawa me te pāpāhua

9.30 i te ata Rāpare 14 Whiringa-ā-rangi 2019  
Whiwhinga: Whā

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki ngā āhuatanga o te waikawa me te pāpāhua.	Te whakaatu māramatanga hōhonu ki ngā āhuatanga o te waikawa me te pāpāhua.	Te whakaatu māramatanga matawhānui ki ngā āhuatanga o te waikawa me te pāpāhua.

Tirohia mēnā e rite ana te Tau Ākonga ā-Motu (NSN) kei runga i tō puka whakauru ki te tau kei runga i tēnei whārangi.

**Me whakamātau koe i ngā tūmahi KATOA kei roto i tēnei pukapuka.**

Tangohia te Pukapuka Rauemi 90944MR i waenga o tēnei pukapuka.

Mēnā ka hiahia whārangi atu anō koe mō ō tuinga, whakamahia ngā whārangi wātea kei muri o tēnei pukapuka, ka āta tohu ai i te tau tūmahi.

Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–15 kei roto i tēnei pukapuka, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

**ME HOATU RAWA KOE I TĒNEI PUKAPUKA KI TE KAIWHAKAHAERE Ā TE MUTUNGA O TE WHAKAMĀTAUTAU.**

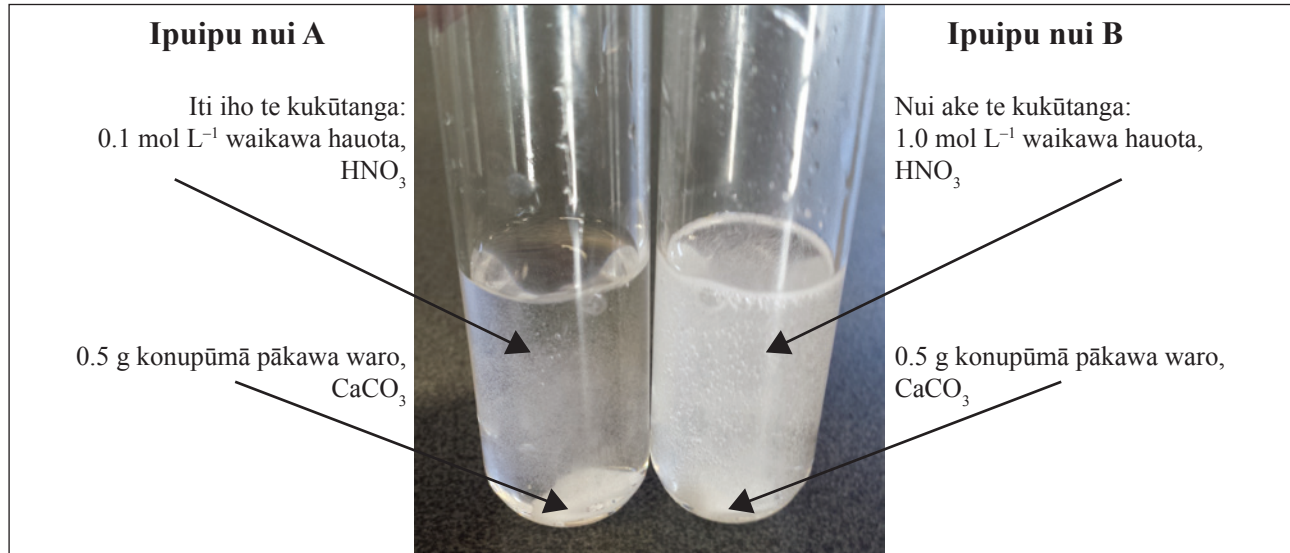
TAPEKE

MĀ TE KAIMĀKA ANAKE

## TŪMAHI TUATAHI

E rua ngā ipuipu nui he 10 mL o te waikawa hauota,  $\text{HNO}_3$ , kei roto. Kei roto i te ipuipu nui A ko tētahi mehanga  $0.1 \text{ mol L}^{-1}$  o te waikawa hauota, ā, kei roto i te ipuipu nui B ko tētahi mehanga kukū ake  $1.0 \text{ mol L}^{-1}$  o te waikawa hauota. Ka tāpirihia tētahi kongakonga māpara (konupūmā pākawa waro,  $\text{CaCO}_3$ ) he 0.5 g te papatipu ki ia ipuipu nui, ā, ka mātakina te tauhohenga, ka whakaahuahia.

He  $20^\circ\text{C}$  te paemahana o te waikawa i roto i ngā ipuipu nui e rua.



- (a) Tuhia te whārite kupu ME te whārite tohu taurite mō te tauhohenga i waenga i te waikawa hauota me te konupūmā pākawa waro.

Whārite kupu

Whārite tohu taurite

- (b) Whakamāramahia te pānga o te whakamahi i tētahi kukūtanga nui ake o te waikawa hauota ki te **pāpātanga** o tēnei tauhohenga, tēnā i te whakamahi i tētahi kukūtanga iti iho o te waikawa. I tō tuhinga me kōrero koe mō ngā tukinga korakora.

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- (c) I tētahi tūhuratanga tuarua, e rua ngā ipuipu nui rerekē he ōrite te kukūtanga 10 mL o te 1 mol L<sup>-1</sup> waikawa hauota, HNO<sub>3</sub>. Ko te waikawa hauota kei te ipuipu nui A he 20°C, ā, ko te waikawa hauota kei te ipuipu nui B he 40°C. Ka tapirihia he kongakonga māpara (konupūmā pākawa waro, CaCO<sub>3</sub>) he 0.5 g te papatipu ki ia ipuipu nui, ā, ka mātakina te tauhohenga.

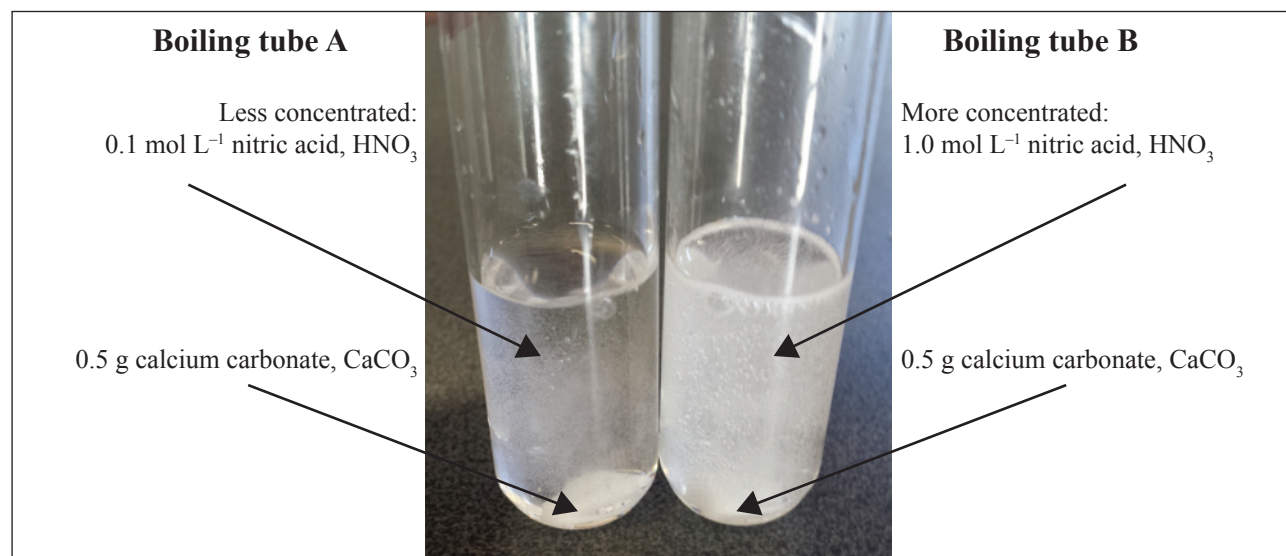
Whakamāramahia mai te pānga o te pikitanga o te paemahana o te waikawa hauota mai i te 20°C ki te 40°C ki te **pāpātanga** o te tauhohe.

I tō tuhinga me kōrero koe mō ngā tuinga korakora.

**QUESTION ONE**

Two boiling tubes both contain 10 mL of nitric acid,  $\text{HNO}_3$ . Boiling tube A contains a  $0.1 \text{ mol L}^{-1}$  solution of nitric acid and boiling tube B contains a more concentrated  $1.0 \text{ mol L}^{-1}$  solution of nitric acid. A piece of marble chip (calcium carbonate,  $\text{CaCO}_3$ ) with a mass of 0.5 g is added to each boiling tube and the reaction is observed and photographed.

The temperature of the acid in both boiling tubes is  $20^\circ\text{C}$ .



- (a) Write the word equation AND the balanced symbol equation for the reaction between the nitric acid and calcium carbonate.

Word equation

Balanced symbol equation

- (b) Explain the effect of using a higher concentration of nitric acid on the **rate** of this reaction, compared to using a lower concentration of acid.

Your answer should refer to particle collisions.

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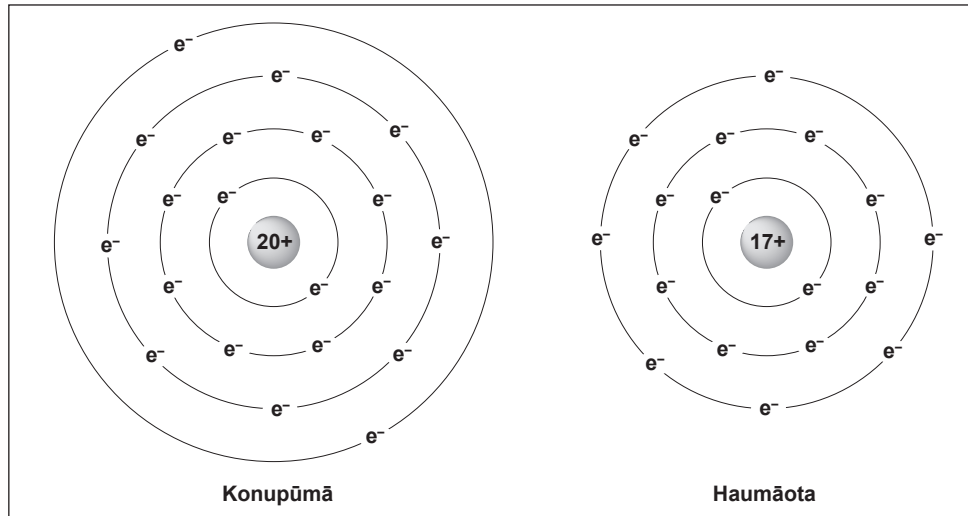
- (c) In a second investigation, two different boiling tubes each contain 10 mL of the same concentration  $1 \text{ mol L}^{-1}$  nitric acid,  $\text{HNO}_3$ . The nitric acid in boiling tube A is at  $20^\circ\text{C}$  and the nitric acid in boiling tube B is at  $40^\circ\text{C}$ . A piece of marble chip (calcium carbonate,  $\text{CaCO}_3$ ) with a mass of 0.5 g is added to each boiling tube, and the reaction is observed.

Explain the effect of increasing the temperature of the nitric acid from  $20^\circ\text{C}$  to  $40^\circ\text{C}$  on the **rate** of reaction.

Your answer should refer to particle collisions.

## TŪMAHI TUARUA

E whakaatu ana te hoahoa i ngā taurira o ngā ngota e rua.



(a) Tuhia te whakanahatanga irahiko o ngā ngota e rua.

Ngota konupūmā, Ca: \_\_\_\_\_

Ngota haumāota, Cl: \_\_\_\_\_

(b) Ka puta ngā katote i ngā ngota konupūmā me te haumāota me te **whakanahatanga irahiko** ōrite.

(i) Tuhia te whakanahatanga irahiko o ngā katote e rua.

Katote konupūmā,  $\text{Ca}^{2+}$ : \_\_\_\_\_

Katote pūhaumāota,  $\text{Cl}^-$ : \_\_\_\_\_

(ii) Whakamāramahia mai ka pēhea te waihanga mai o ia katote,  $\text{Ca}^{2+}$  me te  $\text{Cl}^-$ .

I tō tuhinga me:

- whakamārama he aha i puta ngā katote i ēnei pūmotu
- whakamārama ngā whana kei ngā **katote** e rua e ai ki te whakanahatanga irahiko o ngā ngota me ngā katote, te maha o ngā iraho me te maha o ngā irahiko, me te whana.

Katote konupūmā,  $\text{Ca}^{2+}$ : \_\_\_\_\_

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Katote pūhaumāota,  $\text{Cl}^-$ : \_\_\_\_\_

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- (c) Ka tauhohe te konupūmā ki te haumāota, kia puta ai te pūhui katote, te konupūmā pūhaumāota,  $\text{CaCl}_2$ .

Whakamāramahia mai te ōwehenga o ngā katote konupūmā ki ngā katote pūhaumāota i roto i te  $\text{CaCl}_2$ .

I tō tuhinga me whakamārama e koe:

- he pēhea te pānga o te ōwehenga ki te whana kei ngā katote
- te maha o ngā irahiko i riro mai, i ngaro rānei mai i ia ngota i te hanganga o te pūhui katote.

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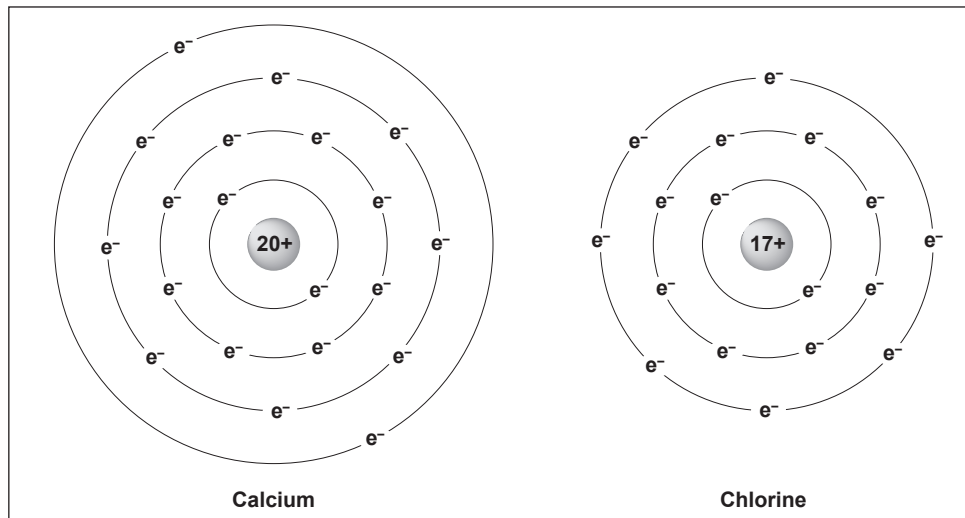
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## QUESTION TWO

The diagram shows models of two atoms.



- (a) Write the electronic arrangement of the two atoms.

Calcium atom, Ca: \_\_\_\_\_

Chlorine atom, Cl: \_\_\_\_\_

- (b) Calcium and chlorine atoms both form ions with the same **electron arrangement**.

- (i) Write the electronic arrangement of the two ions.

Calcium ion,  $\text{Ca}^{2+}$ : \_\_\_\_\_

Chloride ion,  $\text{Cl}^-$ : \_\_\_\_\_

- (ii) Explain how each ion,  $\text{Ca}^{2+}$  and  $\text{Cl}^-$ , is formed.

In your answer you should:

- explain why these elements form ions
- explain the charges on both **ions** in terms of electron arrangement of atoms and ions, number of protons and number of electrons, and charge.

Calcium ion,  $\text{Ca}^{2+}$ : \_\_\_\_\_

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Chloride ion, Cl<sup>-</sup>: \_\_\_\_\_  
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(c) Calcium reacts with chlorine, forming the ionic compound calcium chloride, CaCl<sub>2</sub>.

Explain the ratio of calcium ions to chloride ions in CaCl<sub>2</sub>.

In your answer you should explain:

- how the ratio is related to the charge on the ions
- the number of electrons gained or lost by each atom as it forms the ionic compound.

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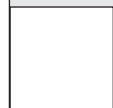
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## TŪMAHI TUATORU

(a) Ko ngā pātara tapangakore e toru e mau ana i ngā mehanga kanokore rerekē he:

- waikawa pūhaumāota, HCl
- konutai pūhaumāota, NaCl
- konutai waihā, NaOH.

Ka taea ēnei mehanga te tautohu mā te whakamahi i te pepa tohu waikawa whero me te konutai pākawa waro-rua (pēkena hōura), NaHCO<sub>3</sub>.

(i) Whakaotihia te tūtohi

Mehanga tapangakore	Kitenga (mēnā i puta)	
	pepa tohu waikawa whero	konutai pākawa waro-rua, NaHCO <sub>3</sub>
waikawa pūhaumāota, HCl		
konutai pūhaumāota, NaCl		
konutai waihā, NaOH		

(ii) Whakamāramahia mai ka pēhea tō tautohu i ia mehanga i runga i ngā kitenga, me te tuhi i ngā pūtaka mō ngā huringa, ngā tauhohenga rānei e pā mai ana.

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**QUESTION THREE**

(a) Three unlabelled bottles containing different colourless solutions are known to be:

- hydrochloric acid, HCl
- sodium chloride, NaCl
- sodium hydroxide, NaOH.

These unlabelled solutions can be identified using red litmus paper and baking soda,  $\text{NaHCO}_3$ .

(i) Complete the table

Unlabelled solution	Observation (if any)	
	with red litmus paper	with baking soda, $\text{NaHCO}_3$
hydrochloric acid, HCl		
sodium chloride, NaCl		
sodium hydroxide, NaOH		

(ii) Explain how the observations allow you to identify each solution, giving reasons for any changes or reactions occurring.

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(b) I tētahi tūhuratanga, ka taea te konukura pākawa pungatara te mahi mā te tauhohe i te konukura pākawa waro totoka ki te waikawa pungatara,  $H_2SO_4$ .

(i) Whakaingoatia te momo tauhohenga kei te puta.

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(ii) Tuhia te whārite kupu me te whārite tohu taurite mō tēnei tauhohenga.

Whārite kupu

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Whārite tohu taurite

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(iii) Whakaahuahia mai me pēhea tō waihanga i ngā tioata konukura pākawa pungatara **totoka** i roto i tētahi taiwhanga pūtaiao kura.

I tō tuhinga, me whakauru ka pēhea tō mōhio kua mutu te tauhohenga.

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(b) In an investigation, copper sulfate can be made by reacting solid copper carbonate with sulfuric acid,  $\text{H}_2\text{SO}_4$ .

(i) Name the type of reaction occurring.

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(ii) Write the word and the balanced symbol equation for this reaction.

Word equation

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Balanced symbol equation

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(iii) Describe how you could make **solid** copper sulfate crystals in a school laboratory. In your answer, include how you would know the reaction had been completed.

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**He whārangi anō ki te hiahiatia.  
Tuhia te (ngā) tau tūmahi mēnā e tika ana.**

TAU TŪMAHI

MĀ TE  
KAIMĀKA  
ANAKE



*English translation of the wording on the front cover*

## Level 1 Science, 2019

### 90944 Demonstrate understanding of aspects of acids and bases

9.30 a.m. Thursday 14 November 2019  
Credits: Four

90944M

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of aspects of acids and bases.	Demonstrate in-depth understanding of aspects of acids and bases.	Demonstrate comprehensive understanding of aspects of acids and bases.

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.**

Pull out Resource Booklet 90944R from the centre of this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–15 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.**