**90944M**

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SUPERVISOR'S USE ONLY

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

# Pūtaiao, Kaupae 1, 2015

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

9.30 i te ata Rātū 10 Whiringa-ā-rangi 2015
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 Puka Rauemi 90944MR i waenga o tēnei pukapuka.

Mēnā ka hiahia whārangi atu anō koe mō ō tuhinga, 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 2–19 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.**

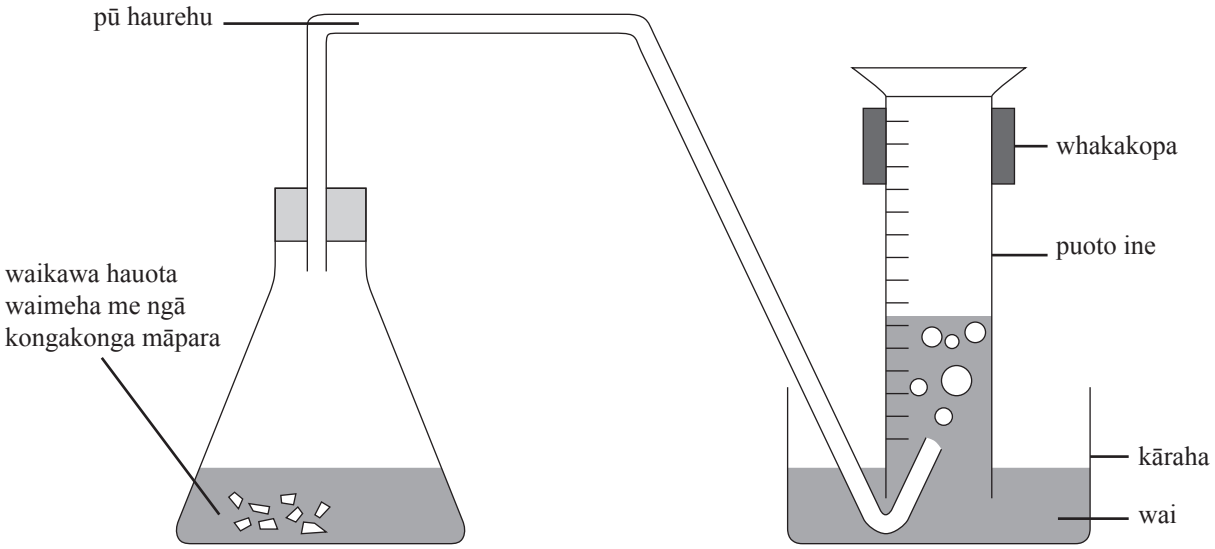
**TAPEKE**

MĀ TE KAIMĀKA ANAKE

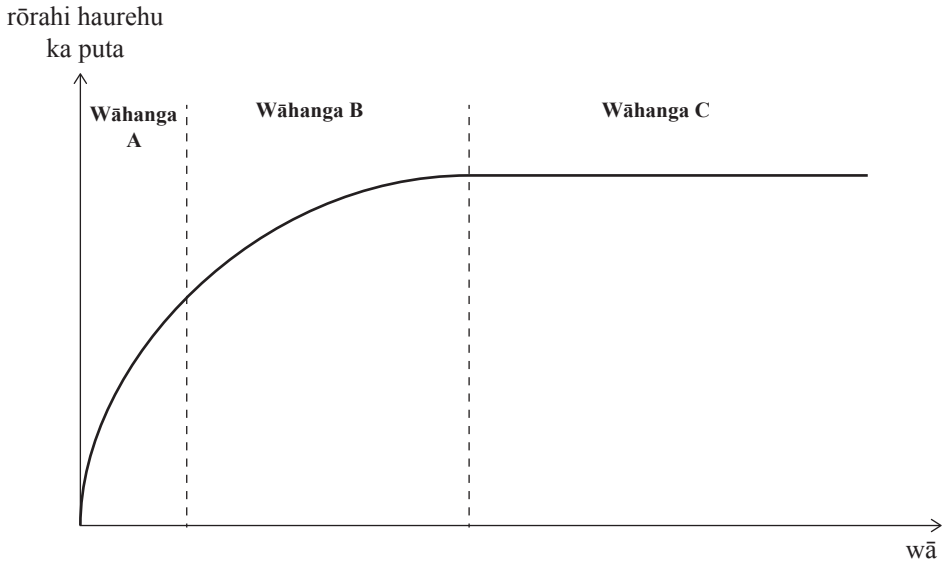
## TŪMAHI TUATAHI

MĀ TE KAIMĀKA ANAKE

Ka raua atu he kongakonga māpara (konupūmā pākawa waro) ki te waikawa hauota i roto i tētahi puoto koeko. Ko te paemahana o te waikawa he 50°C. I tūhonotia te puoto ki tētahi puoto ine kōaro i tētahi kāraha wai, hei ine i te rōrahi o te haurehu ka whakaputaina, e ai ki te whakaaturanga i te hoahoa i raro nei.




E whakaatu ana te kauwhata i raro nei i te rōrahi o te haurehu ka whakaputaina, ki te wā.




(a) Whakamāramahia mai kei te aha, e ai ki ngā tukinga korakora me te tere o te tauhohenga i **ia wāhanga** o te kauwhata.

Wāhanga A: _____

Wāhanga B:

Wāhanga C:

MĀ TE KAIMĀKA ANAKE

(b) I whakahaerehia anō te tauhohenga ēngari i tēnei wā ki te 20°C. I ōrite te papatipu me te rahi o ngā kongakonga māpara, me te kukūtanga me te rōrahi o te waikawa hauota i whakamahia.

(i) Tātuhia he raina ki te kauwhata e tohu ana i te tauhohenga i te 20°C.

(ii) Whakamāramahia mai te take i tātuhia e koe tēnei raina ki taua wāhi, me te whakamārama anō mēnā he pōturi ake, he ōrite, he tere ake rānei te tere o te tauhohenga.

I tō tuhinga me

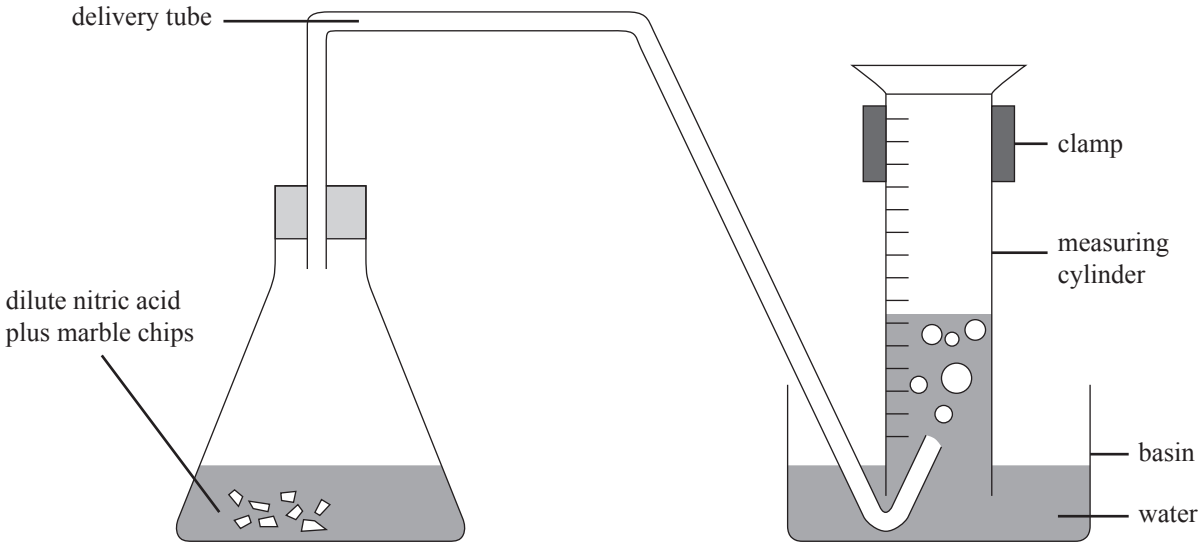
- matapaki he aha koe i tātuhi ai i te rōnaki ki tō raina, ā, me te take i whakamutua e koe te raina ki taua pūwāhi
- whakamārama i te pānga o te paemahana ki te tere o te tauhohenga, e ai ki ngā tukinga kongakonga.

**He wāhi anō mō tō tuhinga mō tēnei tūmahi kei te whārangi 6.**

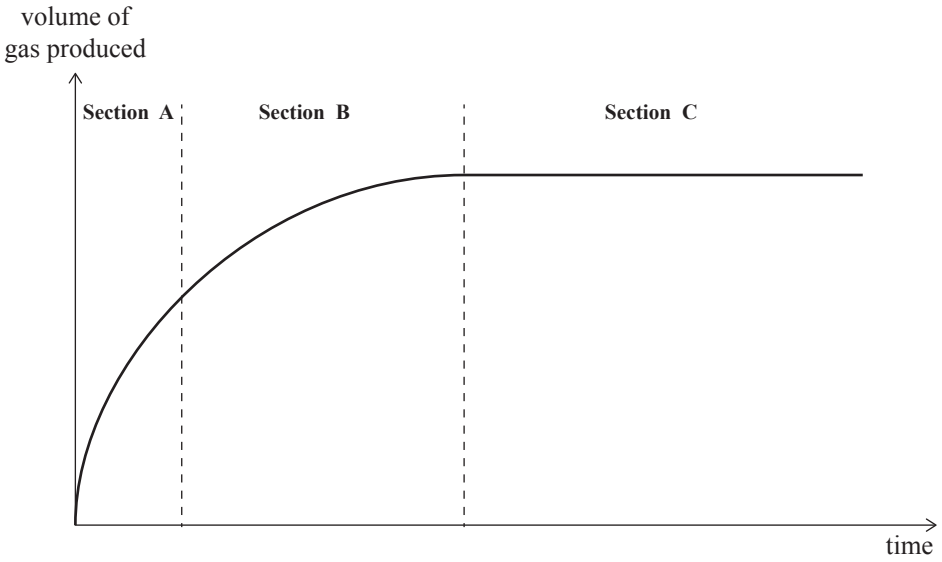
## QUESTION ONE

ASSESSOR'S USE ONLY

Marble chips (calcium carbonate) were added to nitric acid in a conical flask. The temperature of the acid was 50°C. The flask was connected to an inverted measuring cylinder in a basin of water to measure the volume of gas produced, as shown in the diagram below.




The graph below shows the volume of gas produced against time.




(a) Explain what is happening in terms of particle collisions and rate of reaction in **each section** of the graph.

Section A: _____

ASSESSOR'S USE ONLY

Section B:

Section C:

(b) The reaction was carried out again but this time at 20°C. The mass and size of the marble chips, and the concentration and volume of nitric acid used were kept the same.

(i) Draw a line on the graph that represents the reaction at 20°C.

(ii) Explain why you drew this line where you did, and explain if this means that the rate of reaction is slower, the same, or faster.

In your answer you should

- discuss why you drew your line with the slope that you did, and why you stopped the line at the point that you did
- explain the effect of temperature on reaction rate, in terms of particle collisions.

**There is more space for your answer to this question on page 7.**

MĀ TE KAIMĀKA ANAKE

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

Whārite kupu:

Whārite tohu taurite:

ASSESSOR'S USE ONLY

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

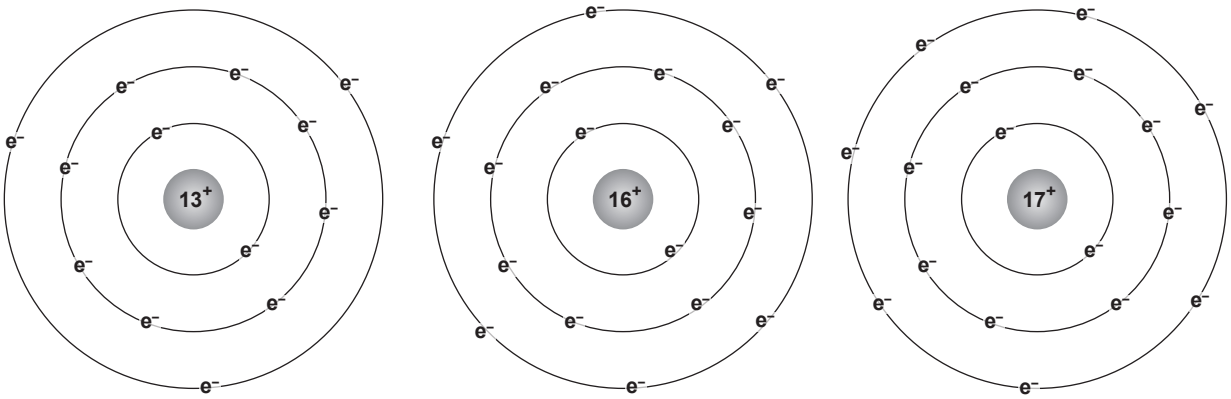
| Word equation: |
| --- |

| Balanced symbol equation: |
| --- |

## TŪMAHI TUARUA

MĀ TE KAIMĀKA ANAKE

E whakaatu ana ngā hoahoa i raro nei i ngā tauira o ngā ngota rerekē e toru.




Konumohe Pūngāwhā Haumāota

(a) Ka tāea e ia ngota nei te puta hei katote, e ai ki raro nei.

- Whakamāramahia te take i whiwhi ai i ngā **katote** aua hihiko, e ai ki te whakanahatanga irahiko me te maha o ngā iraoho.
- He ngota hihiko ngā katote. Whakamāramahia mai he pēhea te whiwhi o ia katote i raro i te hihiko e whakaaturia ana.

  Me kōrero koe mō ngā korakora i whiwhi, i ngaro rānei i aua ngota, ā, me ngā pūtake i pēnei ai.

Katote konumohe, $Al^{3+}$: _____

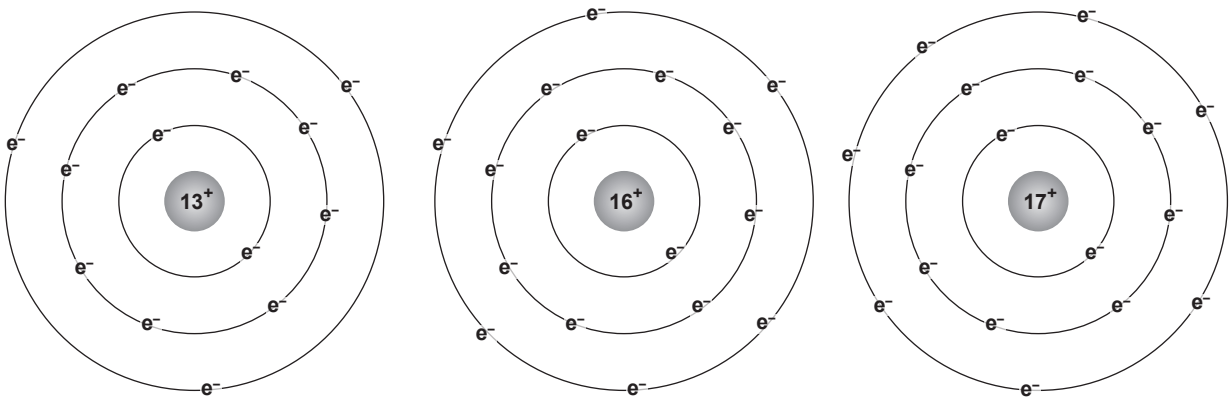
Katote pūngāwhā, $S^{2-}$: _____

Katote pūhaumāota, $Cl^{-}$: _____

## QUESTION TWO

ASSESSOR'S USE ONLY

The diagrams below show models of three different atoms.




Aluminium Sulfur Chlorine

(a) Each of these atoms can form ions, as listed below.

- Explain why each of the **ions** has the charge it does, in terms of electron arrangement and number of protons.
- Ions are charged atoms. Explain how each of the ions below reached the charge shown.

  You should discuss particles gained or lost by the atoms involved, and the reasons for this.

Aluminium ion, $Al^{3+}$:

Sulfide ion, $S^{2-}$:

Chloride ion, $Cl^{-}$:

(b) Whakamāramahia mai te take e **kore** tētahi hononga katote e oti i waenga i tētahi katote pūngāwhā me tētahi katote pūhaumāota.

I tō tuhinga me:

- whakaahua mai tētahi hononga katote
- kōrero mō ngā hihiko me ngā whakanahatanga irahiko o aua katote.

MĀ TE KAIMĀKA ANAKE

(c) Whakatauhia te ture tātai katote o te pūhui ka puta ina tūhono te konumohe ki te haumāota, Ā, ina tūhono te konumohe ki te pūngāwhā.

I tō tuhinga me:

- whai whakaaro ki te ōwehenga o ngā katote kei ia ture tātai me te whakamārama anō i te hononga o te ōwehenga ki te hihiko ki ngā katote
- whakahāngai te ōwehenga o ngā katote i roto i ia ture tātai ki te maha o ngā irahiko ka ngaro, ka whiwhi rānei i ia ngota ina whakaputa katote ana.

Konumohe me te haumāota: _____

ASSESSOR'S USE ONLY

(b) Explain why an ionic bond would **not** form between a sulfide ion and a chloride ion.

In your answer you should:

- describe an ionic bond
- refer to charges and electron arrangements of the ions involved.

(c) Determine the ionic formulae of the compound that forms when aluminium combines with chlorine, AND when aluminium combines with sulfur.

In your answer you should:

- consider the ratio of ions in each formula, and explain how the ratio is related to the charge on the ions
- relate the ratio of ions in each formula to the number of electrons lost or gained by each atom when forming ions.

Aluminium and chlorine:

Konumohe me te pūngāwhā:

MĀ TE KAIMĀKA ANAKE

Aluminium and sulfur: _____

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## TŪMAHI TUATORU

MĀ TE KAIMĀKA ANAKE

E whakaatu ana te whārite matū i raro nei i te tauhohenga i waenga i te waikawa pūhaumāota me te konutai waihā:

$$HCl + NaOH \rightarrow NaCl + H_2O$$

(a) Whakaotia te tūtohi i raro nei hei whakaatu i te pH āwhiwhi mō ia mehanga o ngā mea e toru.

| | **Tae ina tāpiritia te Ranunga Taetohu** | **pH** |
|---|---|---|
| **HCl** | whero | |
| **NaOH** | waiporoporo | |
| **$H_2O$** | kākāriki | |

(b) Ka puta he wai i roto i te tauhohenga i runga ake.

Whakamāramahia ko ēhea ngā katote i whakaputa ai i te wai i roto i tēnei tauhohenga, ka mutu ka ahu mai i hea.

*Ka tāea e koe te whakamahi tētahi whārite ēngari kāore tēnei i te hiahiatia.*

(c) Ka āta tāpirihia haerehia te NaOH ki tētahi mehanga HCI me te ranunga taetohu i roto, kia kore atu ngā huringa tae.

Matapikitia he aha e pā mai ana i roto i te ipurau i ia pH e whakaaturia ana, ina tāpirihia ana te NaOH.

I tō tuhinga, me whakapuaki kōrero mō:

- ngā tae ka puta i ia pH
- ngā rahinga o ngā hauwai me ngā waihā i ia pH e whakaaturia ana.

pH = 1 (i mua i te tāpirihanga i te NaOH):

pH = 4: _____

pH = 7: _____

pH = 10: _____

pH = 13: _____

MĀ TE KAIMĀKA ANAKE

(d) I roto i tētahi tauhohenga matū rerekē, ka hohe te waikawa pūhaumāota me te konupora waihā.

Tuhia he whārite kupu me tētahi whārite matū taurite mō tēnei tauhohenga i roto i ngā pouaka i raro.

| Whārite kupu: |
| --- |

| Whārite tohu taurite: |
| --- |

## QUESTION THREE

ASSESSOR'S USE ONLY

The chemical equation below represents the reaction between hydrochloric acid and sodium hydroxide:

$$HCl + NaOH \rightarrow NaCl + H_2O$$

(a) Complete the table below to show the approximate pH for each of the three solutions.

| | **Colour when UI is added** | **pH** |
|---|---|---|
| **HCl** | red | |
| **NaOH** | purple | |
| **$H_2O$** | green | |

(b) Water is formed in the reaction above.

Explain what ions form water in this reaction, and where they come from.

*You may use an equation but this is not required.*

(c) NaOH is gradually added to a solution of HCl with universal indicator present, until no further colour change occurs.

Discuss what is occurring in the beaker at each of the pH's shown, as the NaOH is added.

In your answer you should refer to:

- the colours that would occur at each pH
- the relative amounts of hydrogen and hydroxide present at each of the pH's shown.

pH = 1 (before any NaOH is added):

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pH = 4:

pH = 7:

pH = 10:

pH = 13:

(d) In a different chemical reaction, hydrochloric acid reacts with magnesium hydroxide.

Write a word equation and a balanced chemical equation for this reaction in the boxes below.

| Word equation: |
| --- |

| Balanced symbol equation: |
| --- |

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

TAU TŪMAHI

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 1 Science, 2015

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

9.30 a.m. Tuesday 10 November 2015
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 90944MR 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 2–19 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.**