90937M

909375

1

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!

Ahupūngao, Kaupae 1, 2019

90937M Te whakaatu māramatanga ki ētahi āhuatanga o te hiko me te autō

2.00 i te ahiahi Rātū 19 Whiringa-ā-rangi 2019
Whiwhinga: Whā

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki ētahi āhuatanga o te hiko me te autō.	Te whakaatu māramatanga hōhonu ki ētahi āhuatanga o te hiko me te autō.	Te whakaatu māramatanga matawhānui ki ētahi āhuatanga o te hiko me te autō.

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.

Tirohia mēnā kei a koe te Puka Rauemi L1–PHYSMR.

Ki roto i ō tuhinga, whakamahia ngā whiriwhiringa tohutau mārama, ngā kupu, ngā hoahoa hoki, tētahi, ētahi rānei o ēnei, ki hea hiahiatia ai.

Me hoatu te wae tika o te Pūnaha Waeine ā-Ao (SI) ki ngā tuhinga tohutau.

Kei te Puka Rauemi ngā mōhiohio whaitake mō ngā pātai tātainga.

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 2–21 kei roto i tēnei pukapuka, ā, 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: PAPATĪRENGI

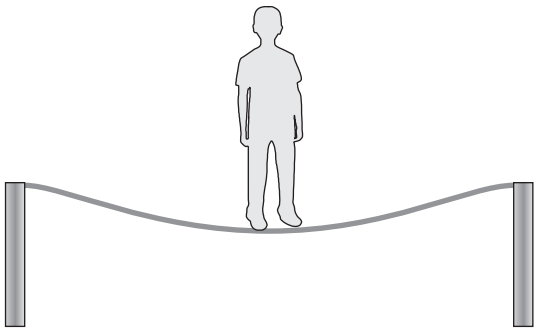
MĀ TE KAIMĀKA ANAKE

(a) Whakamāramatia te tikanga o te kīanga "hiko pateko[1]".

(b) He pai ki a Ewan te pekepeke i runga papatīrengi. Ka kite ia i ētahi wā ka taea e ia te whana pateko te whakaputa i a ia e pekepeke ana i runga papatīrengi. Mahia ai te papatīrengi mai i te polypropylene (waiwaro rua pōwarorau).

(i) Whakamāramahia mai he pēhea te whai whana tōraro a Ewan i a ia e pekepeke ana i runga i te papatīrengi.

(ii) Whakaaturia te tuari o ngā whana kei runga i a Ewan me te papatīrengi kei te hoahoa i raro i te wā e whana tōraro ana a Ewan.



Ki te hiahia koe ki te tuhi anō i tēnei hoahoa, whakamahia te hoahoa ki te whārangi 16.

(c) I te pātanga atu o Ewan ki te tāpare maitai o te papatīrengi, i rongo ia i tētahi hikotanga, ahakoa kāore ia i rongo i te hikotanga i a ia e pā ana ki te whāriki polypropylene o te papatīrengi anake.

(i) Whakamāramahia mai he aha i kore ai e hikoina a Ewan i te wā e pā anake ana ia ki te whāriki polypropylene, engari i hikoina ia i tana pānga atu ki te tāpare maitai.

[1] hikotū

(ii) Ka whakatau a Ewan ko tētahi tikanga hei ārai i te hikotanga ina pā ia ki te tāpare maitai ko te waihanga i te whāriki papatīrengi mai i tētahi papanga kawe hiko.

Whakamāramahia mai he aha te take ka ārai tēnei huringa i te pānga mai o te hiko ki a Ewan ina pā atu ia ki te tāpare maitai.

(d) I te pātanga atu o Ewan ki te tāpare maitai o te papatīrengi, i pā mai he kora iti. He 2.5×10^{-4} hēkona te roa o te kora, he 3500 V te ngaohiko, ā, he 1.25×10^{-5} J te pūngao tapeke i tukuna mai.

Tātaihia te iahiko toharite e rere ana i te wā o te kora.

QUESTION ONE: TRAMPOLINE

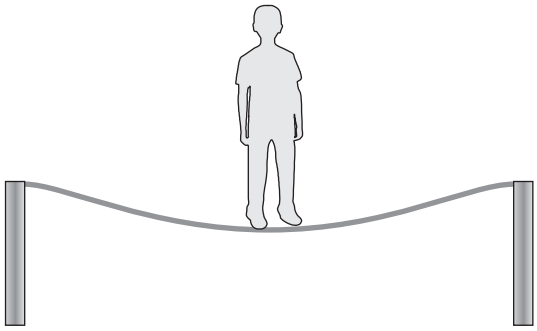
ASSESSOR'S USE ONLY

(a) What is meant by the term "static electricity"?

(b) Ewan enjoys jumping on trampolines. He notices that sometimes he can build up a static charge when jumping on a trampoline. The trampoline mat is made of polypropylene.

(i) Explain how Ewan can become negatively charged while jumping on a trampoline.

(ii) Show the distribution of the charges on Ewan and the trampoline in the diagram below when Ewan is negatively charged.



If you need to redraw this, use the diagram on page 17.

(c) When Ewan touched the metal frame of the trampoline, he felt an electric shock, even though he did not feel a shock when he was touching only the polypropylene trampoline mat.

(i) Explain why Ewan did not get a shock when he was only touching the polypropylene mat, but did when he touched the metal frame.

ASSESSOR'S USE ONLY

(ii) Ewan decides that one way to prevent getting a shock when he touched the metal frame would be to make the trampoline mat from a material that conducts electricity.

Explain why this change would prevent Ewan from experiencing a shock when he touches the metal frame.

(d) When Ewan touched the metal frame of the trampoline, there was a small spark. The spark lasted for 2.5×10^{-4} s, had a voltage of 3500 V, and released a total energy of 1.25×10^{-5} J.

Calculate the average current that flowed during the spark.

TŪMAHI TUARUA: NGĀ RAMA KIRIHIMETE

MĀ TE KAIMĀKA ANAKE

(a) I hokona mai e Nick tētahi huinga pūrama whai pūhiko mō te Kirihimete. Ka kite ia ina tangohia e ia tētahi pūrama mai i te kōhao, ka weto katoa ngā pūrama i roto i te huinga.

Nā tēnei ka mōhio a Nick kei te tūhono hātepetia ngā pūrama katoa.

Whakamāramahia mai te take he aha i weto katoa ai ngā pūrama ina tangohia mai tētahi pūrama kotahi.

(b) Ka tūhono a Nick i te pūrama i tangohia e ia mai i te huinga ki tētahi ara iahiko hei ine i te parenga iahiko. E whakamahia ana e te ara iahiko ngā waehanga ara iahiko e whai ake:

- he pūtau 1.5 V
- he pana whakakā
- he pūrama
- he ine-iahiko hei ine i te iahiko mā te pūrama
- he ine-ngaohiko hei ine i te ngaohiko o te pūrama.

Ki te wāhi i raro, tuhia he hoahoa ara iahiko o te ara iahiko i mahia e Nick.

Ki te hiahia koe ki te tuhi anō i tēnei hoahoa, whakamahia te tapawhā ki te whārangi 16.

QUESTION TWO: CHRISTMAS LIGHTS

ASSESSOR'S USE ONLY

(a) Nick buys a set of battery-powered lights for Christmas. He finds that when he removes one of the light bulbs from its socket, all of the other light bulbs in the set stop working.

Nick realises that this means all the light bulbs are connected in series.

Explain why removing one of the light bulbs causes all the others to stop working.

(b) Nick connects the light bulb he removed from the set to a circuit to measure its resistance. The circuit Nick made used the following circuit components:

- a 1.5 V cell
- a switch
- a light bulb
- an ammeter to measure the current through the light bulb
- a voltmeter to measure the voltage of the light bulb.

In the space below, draw a circuit diagram of the circuit Nick made.

If you need to redraw this, use the box on page 17.

MĀ TE KAIMĀKA ANAKE

(c) 20 ngā pūrama katoa o te huinga rama a Nick kei te tūhono hātepetia, ā, nō tētahi pūhiko 9.0 V te kaha hiko.

Tātaihia te **iahiko tapeke** kei te huinga rama mēnā he 0.40 ohms te parenga o **ia** pūrama.

(d) Ka pakaru tētahi o ngā pūrama i roto i te huinga, ā, ka whakakapia e Nick ki tētahi atu pūrama. He **iti iho te parenga iahiko** o te pūrama hou i ērā atu pūrama i roto i te huinga.

Whakamāramahia mai he aha te pānga o te whakakapi i tētahi pūrama ki tētahi he iti iho te parenga iahiko ki te tāputa hiko tapeke o te ara iahiko me te ora o te pūhiko.

ASSESSOR'S USE ONLY

(c) Nick's set of lights has a total of 20 light bulbs connected in series, and is powered by a 9.0 V battery.

Calculate the **total current** in the set of lights if the resistance of **each** bulb is 0.40 ohms.

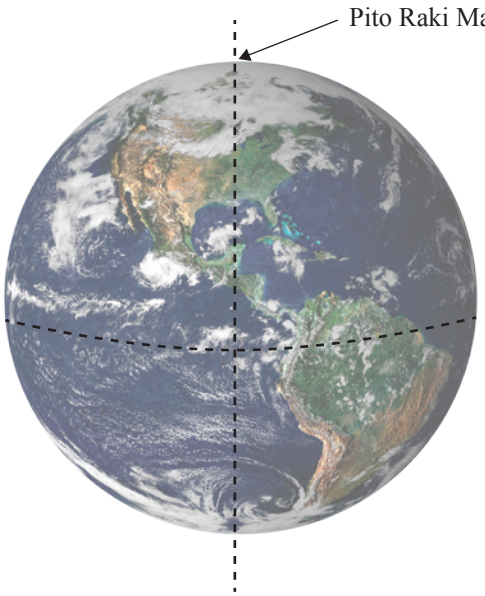
(d) One of the light bulbs in the set breaks, so Nick replaces it with another light bulb. The new light bulb has a **lower resistance** than the rest of the light bulbs in the set.

Explain how replacing one of the light bulbs with one with a lower resistance will affect the total power output of the circuit and the life of the battery.

TŪMAHI TUATORU: TE WHAITUA AUTŌ O PAPATŪĀNUKU

MĀ TE KAIMĀKA ANAKE

(a) Whakamahia te hoahoa i raro hei tātuhi i te āhua o te whaitua autō o Papatūānuku, tae atu ki ngā pere hei whakaatu i te ahunga o te whaitua autō.



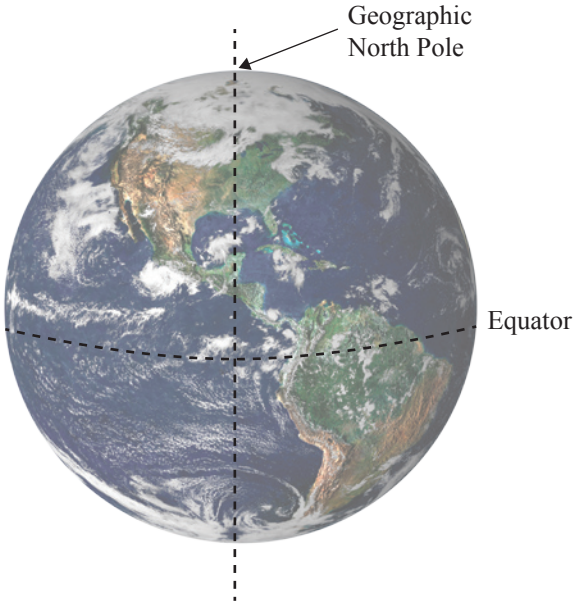
Ki te hiahia koe ki te tuhi anō i tēnei hoahoa, whakamahia te hoahoa i te whārangi 18.

(b) Whakaahuahia kia RUA ngā rerekētanga i waenga i te whaitua autō o Papatūānuku e pātata ana ki te Pito Raki Matawhenua me te whaitua autō o Papatūānuku e pātata ana ki te Weheruatanga o te Ao.

QUESTION THREE: EARTH'S MAGNETIC FIELD

ASSESSOR'S USE ONLY

(a) Use the diagram below to draw the shape of the Earth's magnetic field, including arrows to show the direction of the magnetic field.



If you need to redraw this, use the diagram on page 19.

(b) Describe TWO differences between the Earth's magnetic field near the Geographic North Pole and the Earth's magnetic field near the Equator.

MĀ TE KAIMĀKA ANAKE

(c) E whakaaturia ana i raro tētahi waea kawe iahiko, waea A. E whakaatu ana te hoahoa i raro i tētahi topenga o te waea A, me te iahiko e rere ana "ki te whārangi".

Ki te hiahia koe ki te tuhi anō i tēnei hoahoa, whakamahia te hoahoa i te whārangi 18.

(i) Whakaotihia te hoahoa hei whakaatu i te **hanga** me te **ahunga** o te whaitua autō e pātata ana ki te waea A, nā te iahiko kei roto i te waea.

(ii) He 0.20 A te iahiko aumou e rere ana i te waea A. I te pūwāhi P, he 8.0×10^{-7} T te whaitua autō nā te iahiko kei roto i te waea.

Tātaihia te tawhiti, *d*, i waenga i te pūwāhi P me te waea A.

Ka haere tonu te Tūmahi Tuatoru i te whārangi 14.

ASSESSOR'S USE ONLY

(c) A current-carrying wire, wire A, is shown below. The diagram below shows a cross-section of wire A, with current flowing "into the page".

If you need to redraw this, use the diagram on page 19.

(i) Complete the diagram to show the **shape** and **direction** of the magnetic field near wire A, due to the current in the wire.

(ii) Wire A has a constant current of 0.20 A flowing through it. At point P, the magnetic field due to the current in the wire is 8.0×10^{-7} T.

Calculate the distance, d, between point P and wire A.

Question Three continues on page 15.

(d) Kei te taha koaro tētahi waea tuarua, waea B, o te pūwāhi P, e whakaaturia ana i raro. He rerekē te iahiko e rere ana i te waea B ki tērā o te waea A.

I te pūwāhi P, ko te kaha o te whaitua autō nā te iahiko i roto i te waea A he 8.0×10^{-7} T, ā, ko te kaha o te whaitua autō nā te iahiko kei roto i te waea B he 6.5×10^{-6} T.

Tātaihia te kaha me te ahunga o te whaitua autō kua **whakakotahitia** kei te pūwāhi P.

I tō tuhinga me:

- whakataurite i te kaha me te ahunga o te whaitua autō ka puta i te waea A me te whaitua autō ka puta i te waea B, i te pūwāhi P
- whakamārama he pēhea te whakarite a ēnei whaitua autō e rua i te kaha me te ahunga o te whaitua autō kua whakakotahitia i te pūwāhi P
- tātai i te kaha, me te tuhi i te ahunga o te whaitua autō kua whakakotahitia i te pūwāhi P.

Ka taea e koe te hoahoa i raro te whakamahi hei whakaatu i ngā pahekotanga i waenga i ngā whaitua autō e rua.

Ki te hiahia koe ki te tuhi anō i tēnei hoahoa, whakamahia te hoahoa i te whārangi 18.

MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

(d) A second wire, wire B, is located on the opposite side of point P, as shown below. Wire B carries a different current to wire A.

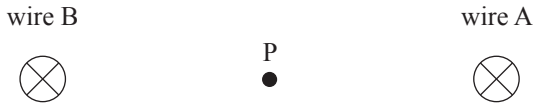
At point P, the magnetic field strength due to the current in wire A is 8.0×10^{-7} T, and the magnetic field strength due to the current in wire B is 6.5×10^{-6} T.

Calculate the strength and direction of the **combined** magnetic field at point P.

As part of your answer you should:

- compare the strength and direction of the magnetic field produced by wire A and the magnetic field produced by wire B, at point P
- explain how these two magnetic fields determine the strength and direction of the combined magnetic field at point P
- calculate the strength, and state the direction of the combined magnetic field at point P.

You may use the diagram below to show the interactions of the two magnetic fields.

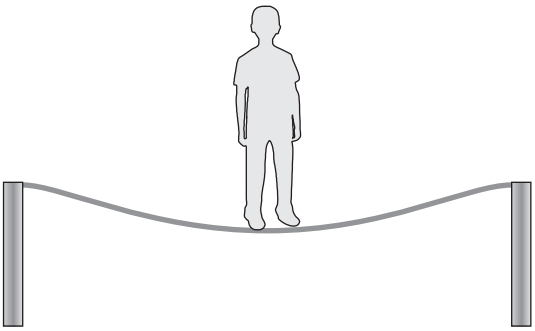


If you need to redraw this, use the diagram on page 19.

HE HOAHOA WĀTEA

MĀ TE KAIMĀKA ANAKE

Ki te hiahia koe ki te tuhi anō i tō hoahoa mai i te Tūmahi Tuatahi (b)(ii), tuhia ki raro nei. Kia mārama te tohu ko tēhea te tuhinga ka hiahia koe kia mākahia.

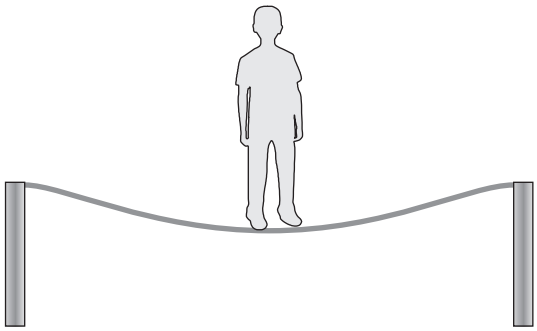


Ki te hiahia koe kia tuhi anō i tō hoahoa mai i te Tūmahi Tuarua (b), tuhia ki raro nei. Kia mārama te tohu ko tēhea te tuhinga ka hiahia koe kia mākahia.

SPARE DIAGRAMS

ASSESSOR'S USE ONLY

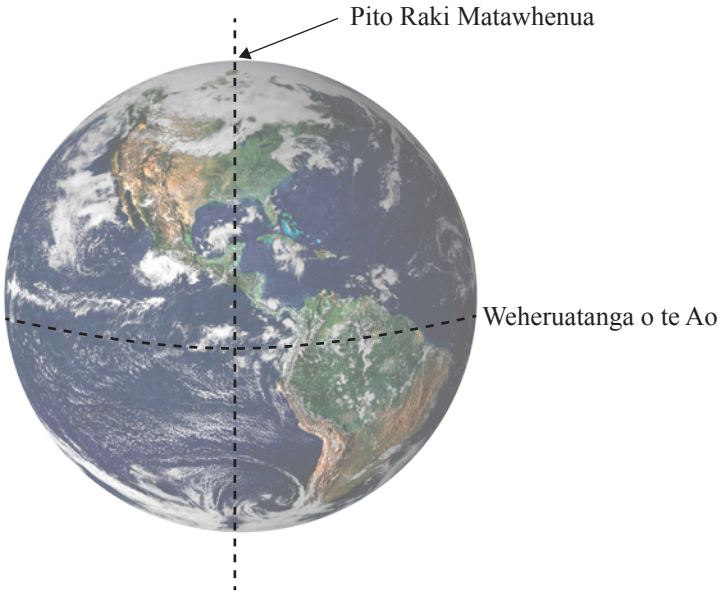
If you need to redraw your diagram from Question One (b)(ii), draw it below. Make sure it is clear which answer you want marked.



If you need to redraw your diagram from Question Two (b), draw it below. Make sure it is clear which answer you want marked.

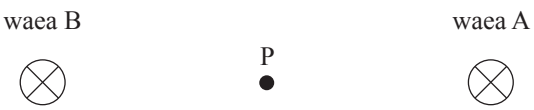
Ki te hiahia koe kia tuhi anō i tō hoahoa mai i te Tūmahi Tuatoru (a), tuhia ki raro nei. Kia mārama te tohu ko tēhea te tuhinga ka hiahia koe kia mākahia.

MĀ TE KAIMĀKA ANAKE



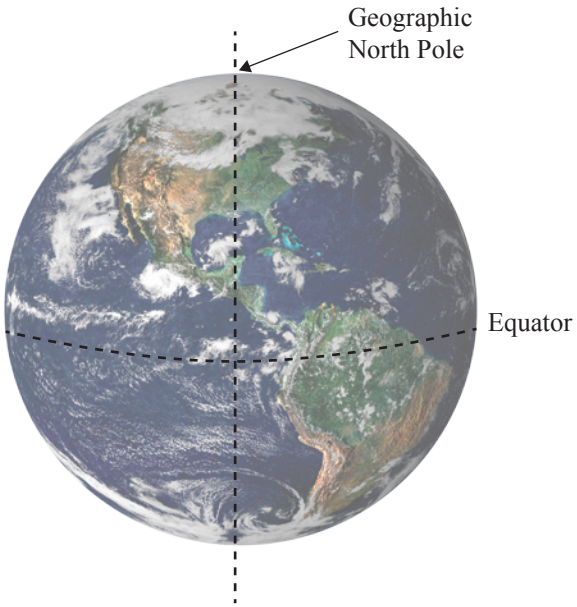
Ki te hiahia koe kia tuhi anō i tō hoahoa mai i te Tūmahi Tuatoru (c)(i), tuhia ki raro nei. Kia mārama te tohu ko tēhea te tuhinga ka hiahia koe kia mākahia.

Ki te hiahia koe kia tuhi anō i tō hoahoa mai i te Tūmahi Tuatoru (d), tuhia ki raro nei. Kia mārama te tohu ko tēhea te tuhinga ka hiahia koe kia mākahia.



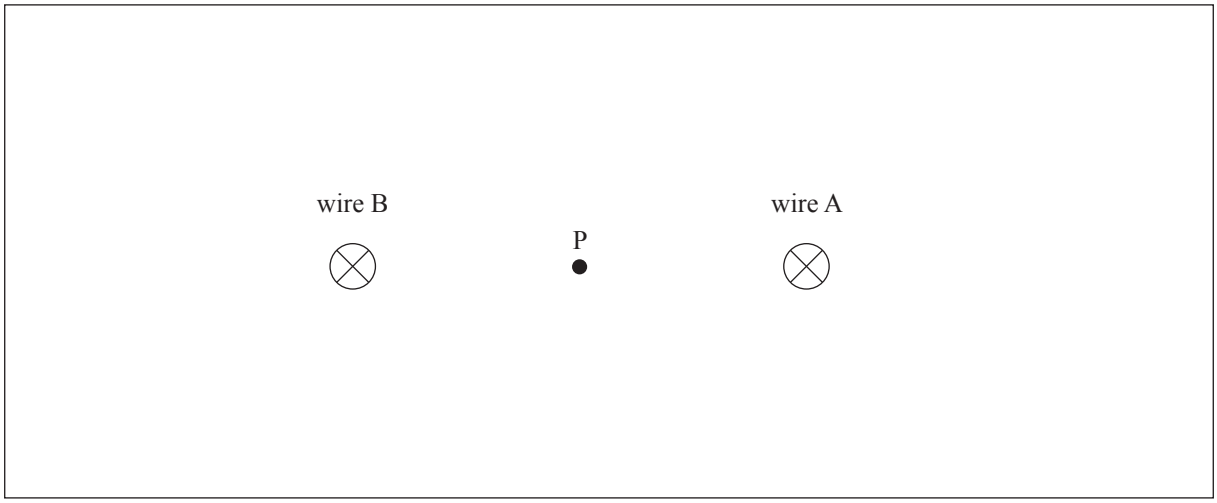
ASSESSOR'S USE ONLY

If you need to redraw your diagram from Question Three (a), draw it below. Make sure it is clear which answer you want marked.



If you need to redraw your diagram from Question Three (c)(i), draw it below. Make sure it is clear which answer you want marked.

If you need to redraw your diagram from Question Three (d), draw it below. Make sure it is clear which answer you want marked.



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 Physics, 2019

90937 Demonstrate understanding of aspects of electricity and magnetism

2.00 p.m. Tuesday 19 November 2019
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of aspects of electricity and magnetism.	Demonstrate in-depth understanding of aspects of electricity and magnetism.	Demonstrate comprehensive understanding of aspects of electricity and magnetism.

90937M

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.

Make sure that you have Resource Sheet L1–PHYSMR.

In your answers use clear numerical working, words and / or diagrams as required.

Numerical answers should be given with an appropriate SI unit.

Useful information for calculation questions is available on the Resource Sheet.

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 2–21 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.