91173M

911735

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

2

SUPERVISOR'S USE ONLY

Ahupūngao, Kaupae 2, 2019

91173M Te whakaatu māramatanga ki te hiko me te autōhiko

9.30 i te ata Rāmere 8 Whiringa-ā-rangi 2019
Whiwhinga: Ono

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki te hiko me te autōhiko.	Te whakaatu māramatanga hōhonu ki te hiko me te autōhiko.	Te whakaatu māramatanga matawhānui ki te hiko me te autōhiko.

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 L2–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.

Mēnā ka hiahia whārangi atu anō koe mō ō tuhinga, whakamahia te (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 2–17 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.

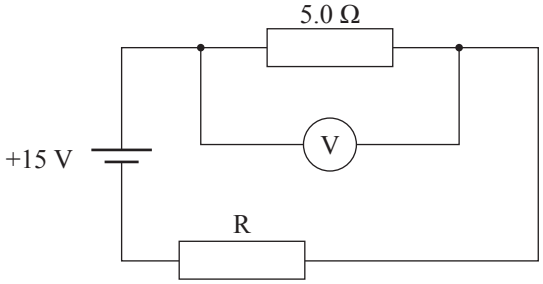
TAPEKE

MĀ TE KAIMĀKA ANAKE

TŪMAHI TUATAHI: TE RAMA PAHIKARA

MĀ TE KAIMĀKA ANAKE

Me hoko a Jason i tētahi rama mō tana pahikara. Ina wehewehea e ia tētahi rama tawhito, ka kite ia i ētahi ara iahiko. E whakaaturia ana ki raro tētahi whakaaturanga māmā o tētahi ara iahiko i kitea i roto i te rama pahikara a Jason.



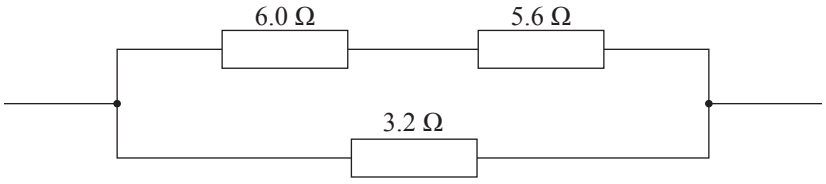
www.gearbest.com/led-flashlight/pp_425412.html

(a) He 4.0 V te ine ngaohiko.

Whakaaturia he 0.80 A te iahiko i roto i te ara iahiko.

(b) Tātaihia te pūngao pōkākā i memeha i roto i te 2 meneti nā te parenga iahiko kua tohua ko R.

(c) E whakaaturia ana ki raro tētahi atu wāhanga o tētahi ara iahiko i roto i te rama.

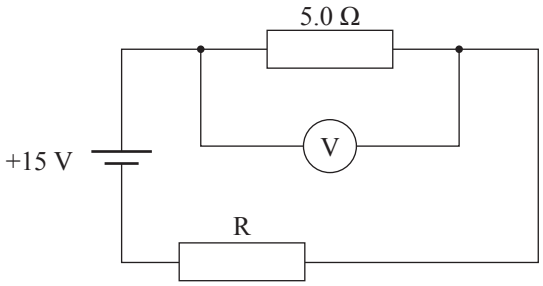


Tātaihia te parenga iahiko tapeke o tēnei ara iahiko.

QUESTION ONE: THE BICYCLE LAMP

ASSESSOR'S USE ONLY

Jason needs to buy a lamp for his bike. When he pulls apart an old lamp, he finds some circuits. A simplified version of a circuit found in Jason's bike lamp is shown below.



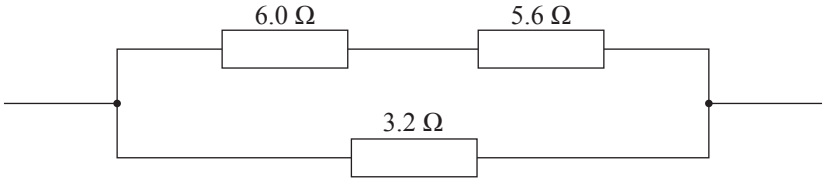
www.gearbest.com/led-flashlight/pp_425412.html

(a) The voltmeter reads 4.0 V.

Show that the circuit current is 0.80 A.

(b) Calculate the heat energy dissipated in 2 minutes by the resistor marked R.

(c) Another part of a circuit in the lamp is shown below.



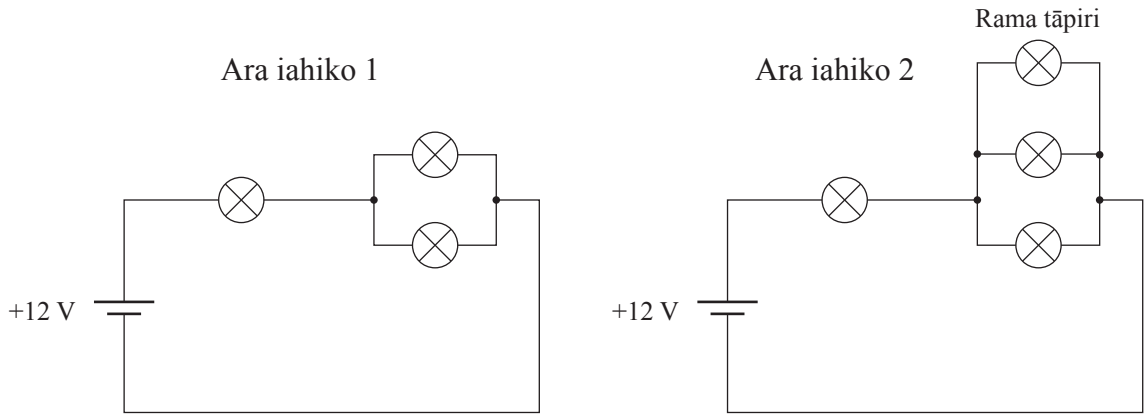
Calculate the total resistance of this circuit.

(d) Ka hoahoatia e tō Jason hoa a Deborah ngā ara iahiko rama e whai ake, ā, ka whakaaroaro a Jason ko tēhea te ara iahiko he nui rawa te whakaputa i te māramatanga.

He ōrite katoa ngā rama. He rama atu anō tō te Ara Iahiko 2.

Mā te whiriwhiri i te tīahonga tōpū o ngā rama katoa o te ara iahiko, homai he whakamāramatanga matawhānui e whakataurite ana i te tīahonga tapeke o te Ara Iahiko 1 ki te Ara Iahiko 2.

MĀ TE KAIMĀKA ANAKE



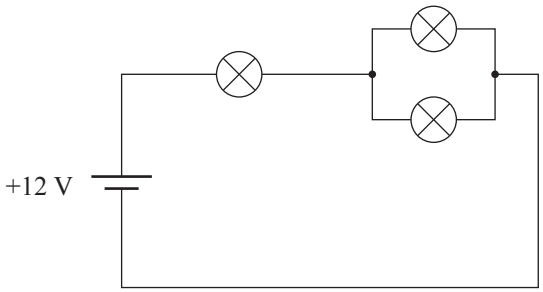
ASSESSOR'S USE ONLY

(d) Jason's friend Deborah designs the following lighting circuits, and Jason wonders which circuit would give out the most light.

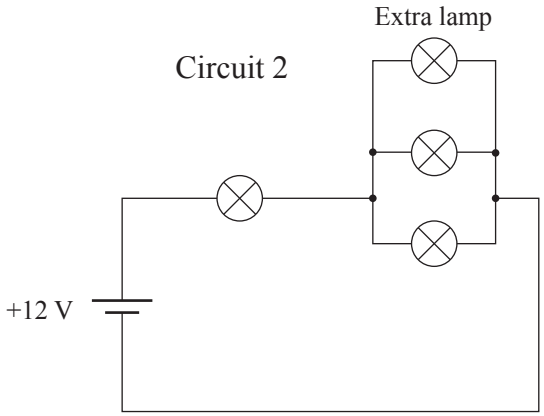
All lamps are identical. Circuit 2 has an extra lamp.

By considering the combined brightness of all the lamps in the circuit, give a comprehensive explanation comparing the total brightness of Circuit 1 to Circuit 2.

Circuit 1



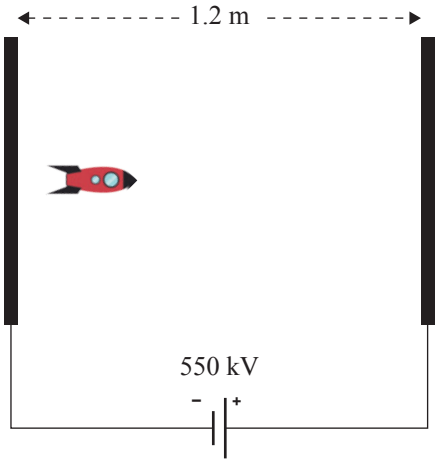
Circuit 2



TŪMAHI TUARUA: HE WAKA TĀKIRIRANGI TĀKARO

MĀ TE KAIMĀKA ANAKE

E ai ki a Manu ka taea e ia tētahi whaitua autō te whakamahi i te tuarangi hei whakapōturi i te haere a tētahi waka tākirirangi. Ka whakatauirahia e ia tana huatau mā te whakarite mai i ngā papa whakarara e rua kia 1.2 m te tawhiti tētahi i tētahi. Ka tūhonoa e ia ēnei ki te puna hiko 550 kV, ā, ka whakamahia e ia tētahi tākirirangi tākaro iti hei whakamātautau.



He 130 g te papatipu o te tākirirangi tākaro.

Neke ai te tākirirangi mai i te mauī ki te matau.

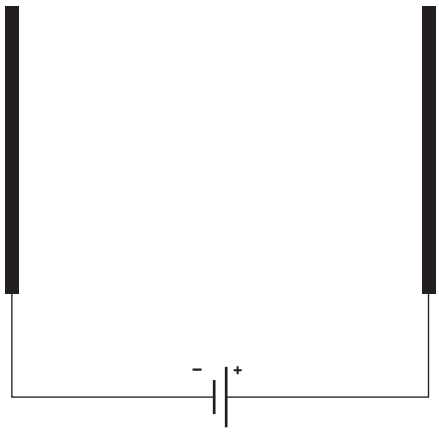
He 3.5×10^{-6} C te whana e pā ana ki te tākirirangi.

(a) Tātaihia te kaha o te whaitua autō i waenga i ngā papa.

(b) I te wā o tētahi whakamātautau, i te tuatahi he v te tere o te neke o te tākirirangi, ā, i tū i te tawhiti d.

Whakamārama hōhonutia mai ka ahatia te tawhiti o te tū mēnā i whakamātauria anō te tākirirangi kia huarua ake te tere tīmata ($2v$) me te ōrite o te whana.

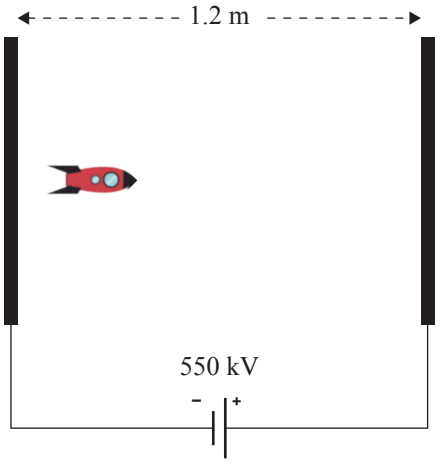
(c) Tuhia ngā rārangi whaitua i waenga i ngā papa e rua.



QUESTION TWO: A MODEL SPACE ROCKET

ASSESSOR'S USE ONLY

Manu thinks that he could use an electric field in space to slow down a rocket ship. He models his idea by setting up a pair of parallel plates 1.2 m apart. He connects them to a 550 kV supply, and uses a small toy rocket as a trial.



The mass of the toy rocket is 130 g.

The rocket moves from left to right.

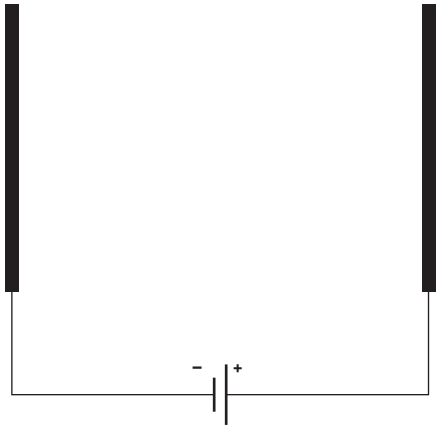
The charge on the rocket is 3.5×10^{-6} C.

(a) Calculate the strength of the electric field between the plates.

(b) During one test, the rocket was initially moving at speed v, and was stopped in a distance d.

Explain in depth what would happen to the stopping distance if the rocket was tested again at double the initial speed ($2v$) and the same charge.

(c) Draw the field lines between the two plates.



(d) Ko te tawhiti tū mōrahi mō te whakatūtanga kua whakaaturia he 1.2 m.

He aha te tere mōrahi e taea ana e tētahi tākirirangi te neke i te tīmata, ā, e taea tonu ai e tēnei taputapu te whakatū?

MĀ TE KAIMĀKA ANAKE

(d) The maximum stopping distance for the given setup is 1.2 m.

What is the maximum speed that a rocket can initially be moving and still be stopped by this apparatus?

ASSESSOR'S USE ONLY

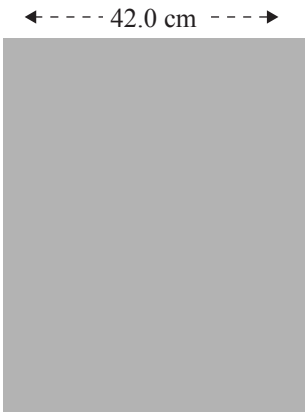
TŪMAHI TUATORU: NGĀ WHAITUA AUTŌ

MĀ TE KAIMĀKA ANAKE

Ko te Pito Raki Autō (e mōhiotia ana hoki ko te *North Dip Pole*) he pūwāhi kei te Motu o Ellesmere i te raki o Kānata. I konei ka poutū te uru o ngā rārangi o te whaitua autō o Papatūānuku ki te papa.

I inea te kaha o te whaitua autō i reira, ā, he 47.3×10^{-6} T.

Ko ngā puringa maitai o tētahi pahikara he 42.0 cm te whānui. E ekehia ana te pahikara e tētahi ākonga i runga i te motu i te papa papatahi ki te 13.5 m s^{-1} te tere.



www.kisspng.com/png
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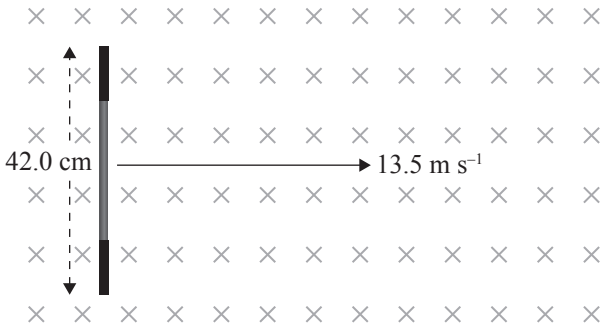
-car-shimano-cycle-998870/preview.html

Tirohanga mai i runga o ngā puringa pahikara



(a) Me whakaatu ko te ngaohiko i puta mai i ngā puringa he 2.68×10^{-4} V.

(b) Homai tētahi whakamārama hōhonu he pēhea te puta mai o te ngaohiko i ngā pito o ngā puringa.

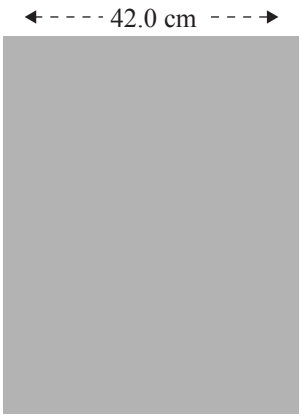
QUESTION THREE: MAGNETIC FIELDS

ASSESSOR'S USE ONLY

The Magnetic North Pole (also known as the *North Dip Pole*) is a point on Ellesmere Island in northern Canada. Here the Earth's magnetic field lines enter the ground vertically.

The strength of the magnetic field there was measured at 47.3×10^{-6} T.

A bicycle has metal handlebars that are 42.0 cm wide. A student riding the bicycle on the island rides on flat ground at 13.5 m s^{-1}.



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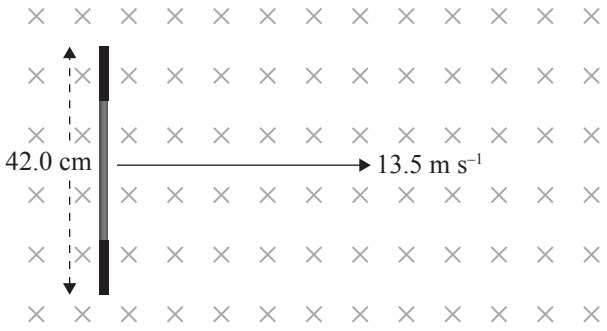
-car-shimano-cycle-998870/preview.html

Plan view of the bicycle handlebars

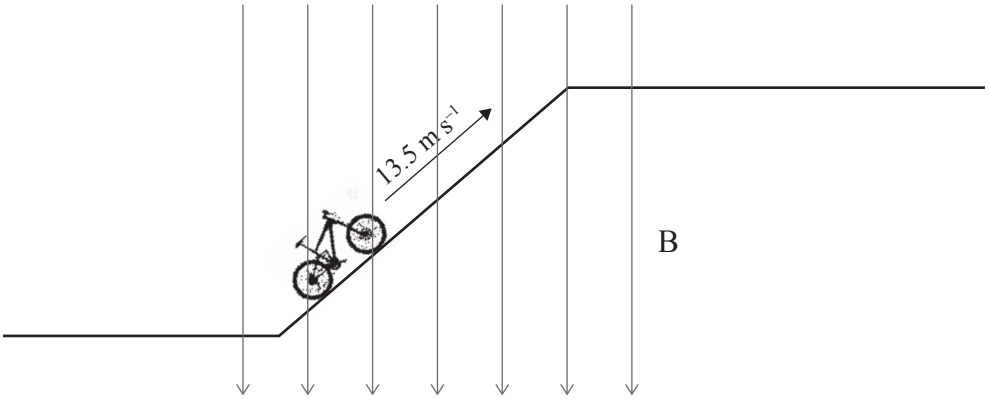


(a) Show that the voltage induced across the handlebars is 2.68×10^{-4} V.

(b) Give an in-depth explanation of how a voltage is induced across the ends of the handlebars.

(c) Kātahi ka eke pahikara te ākonga ki runga i tētahi hiwi poupou i te 13.5 m s^{-1}.

MĀ TE KAIMĀKA ANAKE



(i) He aha te pānga o te eke pahikara i tēnei hiwi ki te uara o te ngaohiko e puta mai ana?

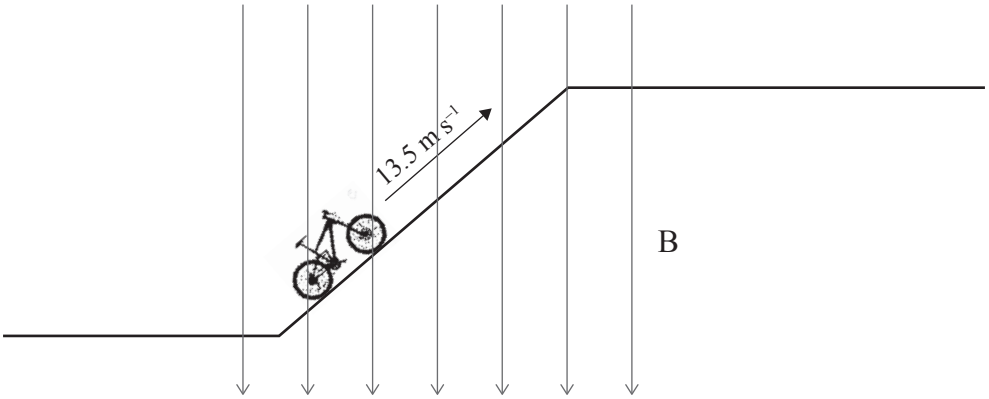
Porowhitatia tētahi:
Ko te ngaohiko **he iti iho**, **kāore i te rerekē**, **he nui ake**.

(ii) Kia whānui te whakamārama i tō whakautu i te wāhanga (i) i runga ake.

Ka haere tonu te Tūmahi Tuatoru i te whārangi 14.

ASSESSOR'S USE ONLY

(c) The student then rides up a steep hill at 13.5 m s^{-1}.



(i) What is the effect of riding up this hill on the value of the induced voltage?

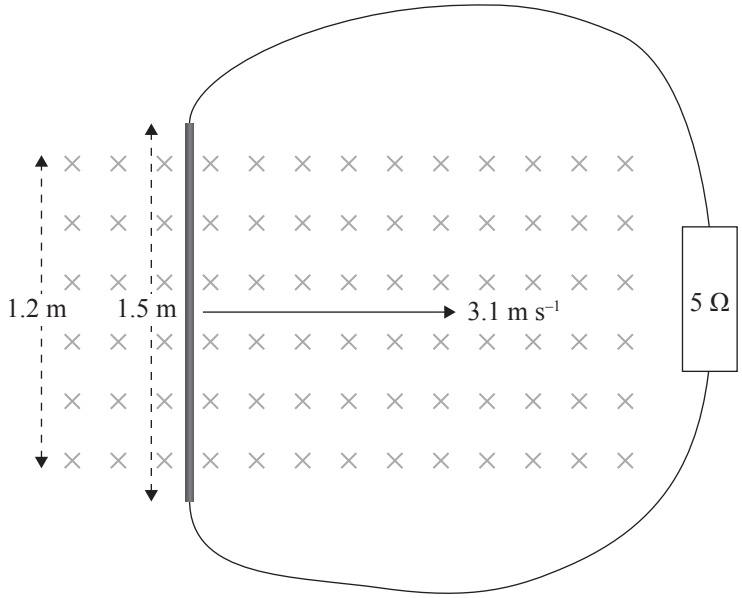
Circle one: Voltage **is less**, **is unchanged**, **is greater**.

(ii) Explain fully your answer to part (i) above.

Question Three continues on page 15.

(d) He mahi i muri i te kura tā tētahi ākonga i tētahi iari taonga haunakunaku. I a ia i reira ka nekehia e ia tētahi paipa maitai 1.5 m mā tētahi whaitua autō 0.8 T me te whānui o te 1.2 m, ki te koki hāngai ki te whaitua. E tūhono ana ngā pito o te paipa ki tētahi ara iahiko kei waho o te whaitua autō. Ko te parenga o te ara iahiko he 5 Ω.

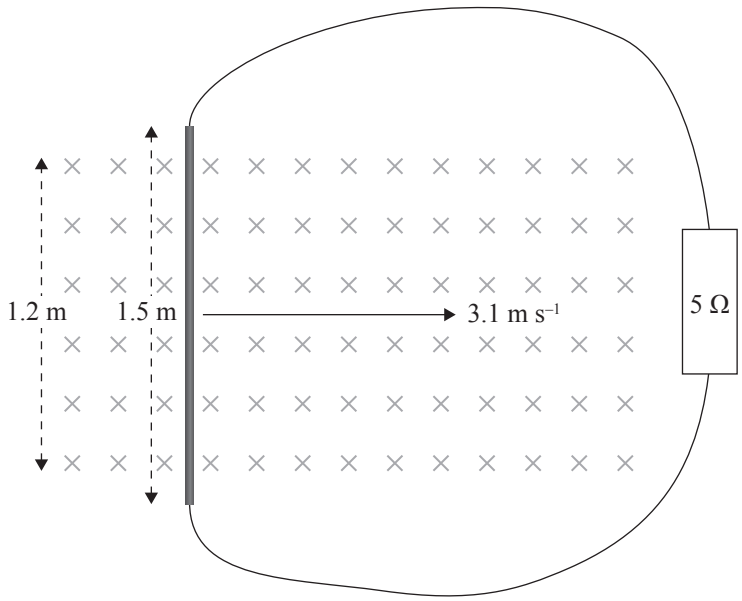
MĀ TE KAIMĀKA ANAKE



Tātaihia te tōpana me puta i te ākonga kia taea tonu e ia te paipa te neke haere i te 3.1 m s^{-1} ki te koki hāngai ki te whaitua.

ASSESSOR'S USE ONLY

(d) The student has an after-school job at a junkyard. While there they move a 1.5 m steel pipe through a 0.8 T magnetic field of width 1.2 m, at right angles to the field. The ends of the pipe are connected to a circuit that is outside the magnetic field. The circuit has resistance of 5 Ω.



Calculate the force that the student needs to exert in order to keep the pipe moving at 3.1 m s^{-1} at right angles to the field.

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 2 Physics, 2019

91173 Demonstrate understanding of electricity and electromagnetism

9.30 a.m. Friday 8 November 2019
Credits: Six

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

91173M

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 L2–PHYSMR.

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

Numerical answers should be given with an appropriate SI unit.

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 2–17 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.