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, 2017

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

9.30 i te ata Rātū 28 Whiringa-ā-rangi 2017
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 Rau Rauemi L1–PHYSR.

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 mō ō tuhinga, whakamahia ngā whārangi wātea kei muri o tēnei pukapuka, ka āta tohu ai i ngā tau tūmahi.

Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–23 kei roto i tēnei pukapuka, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

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

TAPEKE

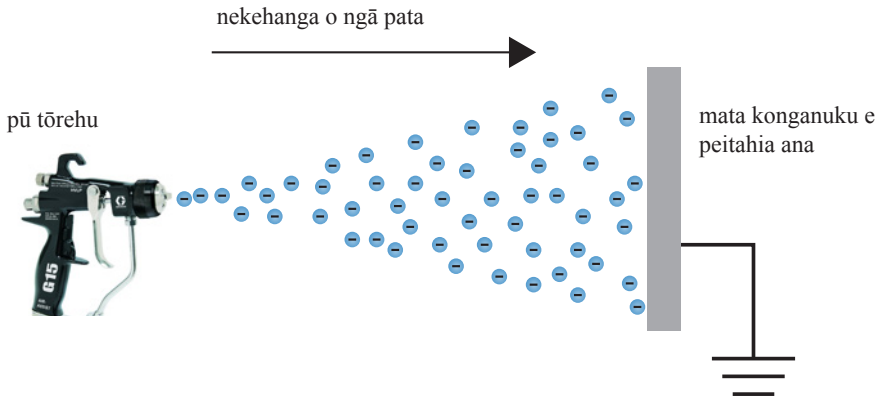
MĀ TE KAIMĀKA ANAKE

TŪMAHI TUATAHI: PEITA TŌREHU

MĀ TE KAIMĀKA ANAKE

Ka tōrehu tētahi pū peita i ngā pata peita moroiti ki tētahi mata konganuku. I te tuatahi he ngū ngā pata peita, engari ka whai whana tōraro ina wehe ana i te ngutu pū tōrehu konganuku.

http://www.zamar.it/sabbiatura-ad-umido



http://www.grapekaction.com/air_assisted_airless_airmix_type_manual_spray_guns

(a) Whakaahuahia te āhuatanga matua o te konganuku e tika ai mō te peita mā tenei tikanga.

(b) Ko tētahi take mō te whakawhana i ngā pata he whakarite kia ōrite te hora o te peita i te horahanga whānui o te mata e peitahia ana.

(i) Ina tūtata ana ētahi pata whai whana tōraro tētahi ki tētahi, ka pana tōpana hiko tētahi ki tētahi.

Ki te hoahoa i raro, tātuhia ngā pere hei whakaatu i te **tōpana** hiko e pā ana ki **ia** pata.

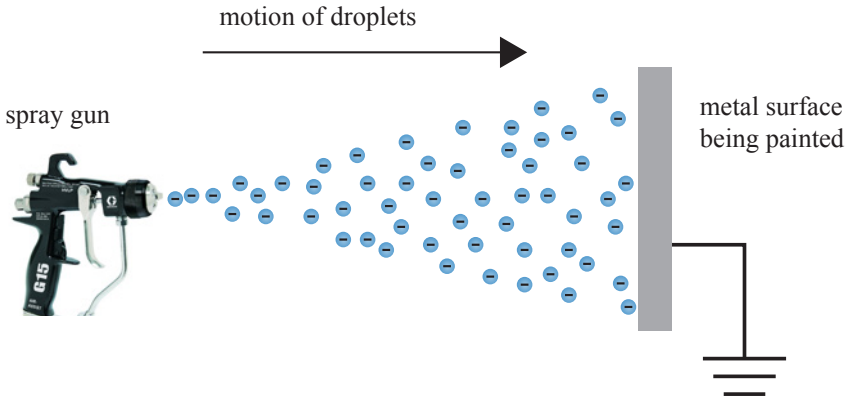
Ki te hiahia koe ki te tuhi anō i tēnei hoahoa, whakamahia te hoahoa i te whārangi 18.

QUESTION ONE: SPRAY PAINTING

ASSESSOR'S USE ONLY

A paint gun sprays tiny droplets of paint at a metal surface. Paint droplets are initially neutral, but become negatively charged as they leave the metal spray gun nozzle.

http://www.zamar.it/sabbiatura-ad-umido



http://www.grapekaction.com/air_assisted_airless_airmix_type_manual_spray_guns

(a) Describe the key property of metal that makes it suitable for painting with this technique.

(b) One reason for charging the droplets is to ensure the paint is spread evenly across a wider area of the surface being painted.

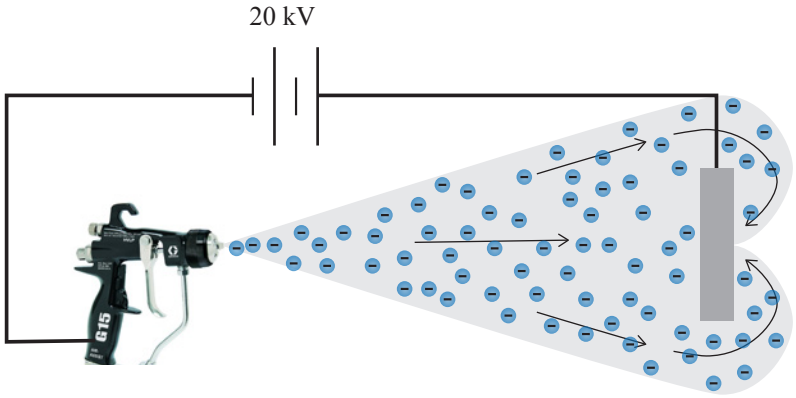
(i) When two negatively charged droplets are near each other, they exert electric forces on each other.

On the diagram below, draw arrows to show the electric **force** acting on **each** droplet.

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

(ii) Whakaahuahia mai he pēhea te āwhina a te whakawhana tōraro i ngā pata kia ōrite ai te hora peita i tētahi horahanga whānui ake.

(c) Ina tōrehu peita i ngā ahanoa konganuku, ka taea tētahi puna hiko te tūhono, e taea ai a muri o te ahanoa te peita.

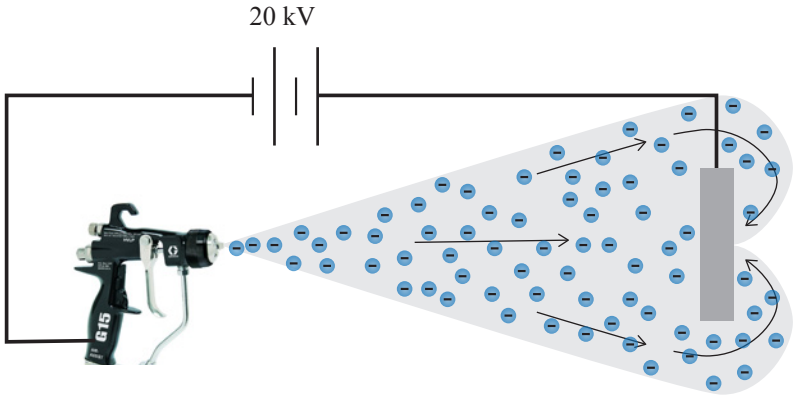


Whakamāramahia mai e ahei ana a muri o te papa konganuku te peita mā te tūhono i tētahi puna hiko ki te papa konganuku.

ASSESSOR'S USE ONLY

(ii) Explain how negatively charging the droplets helps the paint spread evenly across a wider area.

(c) When spray painting metal objects, a power supply can be connected, which allows the back of the object to be painted.



Explain how connecting a power supply to the metal sheet in this way allows the back of the metal sheet to be painted.

(d) Ko te iahiko haumaru mōrahi e taea ana te rere i te ngutu pū tōrehu he 1.0×10^{-4} A.

Ina whakamahia te pū tōrehu mō te 2.0 hēkona, e 3.8 J te pūngao ka tangohia mai i te puna hiko 20 kV.

Whakatau mēnā kei te mahi te pū tōrehu i roto i ngā tepe haumaru.

Me tīmata mā te tātai i te hiko e tangohia ana e te pū tōrehu.

MĀ TE KAIMĀKA ANAKE

(d) The maximum safe current that can flow from the spray gun nozzle is 1.0×10^{-4} A.

When the spray gun is operated for 2.0 s, it draws 3.8 J of energy from the 20 kV power supply.

Determine whether the spray gun is operating within safe limits.

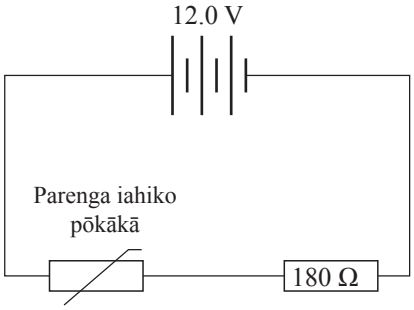
Begin by calculating the power drawn by the spray gun.

ASSESSOR'S USE ONLY

TŪMAHI TUARUA: WHAKAŪ MAHANA

MĀ TE KAIMĀKA ANAKE

He ara iahiko te whakaū mahana e whakamahia ana hei whakakā me te whakaweto utauta, e ai ki te paemahana[1]. Kei tētahi ara iahiko whakaū mahana noa ko tētahi puna hiko, tētahi parenga iahiko, me te parenga iahiko pōkākā kua tūhono hātepehia pēnei i whakaaturia i raro nei. He momo parenga iahiko motuhake te parenga iahiko pōkākā e huri ai te parenga ina huri te paemahana.



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

(a) Ka tāpiritia he ine ngaohiko ki te ara iahiko hei ine i te ngaohiko e hoatu ana ki te parenga iahiko pōkākā.

Ki te hoahoa i runga ake, tātuhia te tohu mō te ine ngaohiko kua tūhono tika atu hei whakatutuki i tēnei inenga.

(b) (i) I te paemahana o te 25°C ko te iahiko kei te ara iahiko he 0.014 A.

Whakaaturia mai ko te tapeke parenga iahiko o te ara iahiko i te 25°C he 860 Ω.

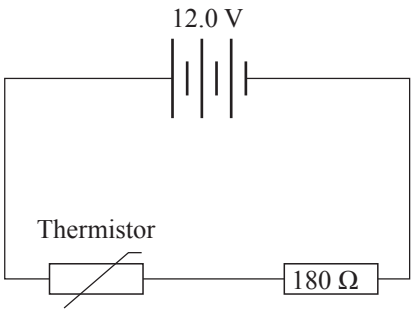
(ii) Tātaitia te parenga iahiko o te parenga iahiko pōkākā i te 25°C.

[1] pāmahana

QUESTION TWO: THERMOSTAT

ASSESSOR'S USE ONLY

A thermostat is a circuit that is used to switch equipment on and off, depending on the temperature. A simple thermostat circuit consists of a power supply, resistor, and thermistor connected in series as shown below. A thermistor is a special type of resistor that changes resistance as temperature changes.



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

(a) A voltmeter is added to the circuit to measure the voltage applied to the thermistor.

On the diagram above, draw the symbol for a voltmeter correctly connected to make this measurement.

(b) (i) At a temperature of 25°C the current in the circuit is 0.014 A.

Show that the total resistance of the circuit at 25°C is 860 Ω.

(ii) Calculate the resistance of the thermistor at 25°C.

(c) Ina heke haere te paemahana, ka piki te parenga iahiko o te parenga iahiko pōkākā.

Whakamāramahia mai he pēhea te huri o te iahiko i te ara iahiko ki te heke te paemahana.

MĀ TE KAIMĀKA ANAKE

(d) Whakamāramahia he pēhea te huri o te hiko ka pau i te parenga iahiko 180 Ω ki te heke te paemahana.

ASSESSOR'S USE ONLY

(c) As the temperature decreases, the resistance of the thermistor increases.

Explain how the current in the circuit will change if the temperature decreases.

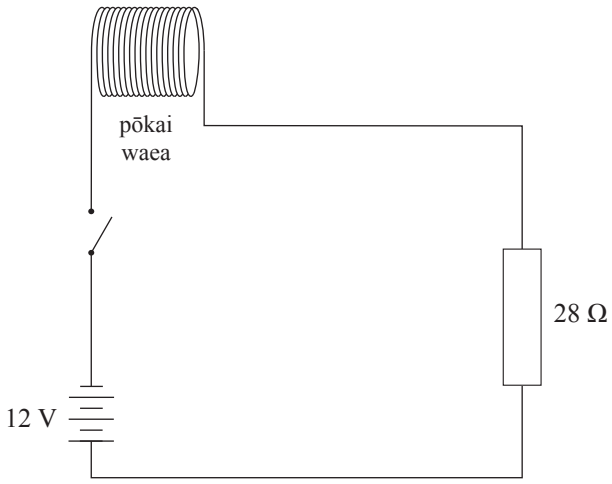
(d) Explain how the power expended in the 180 Ω resistor will change if the temperature decreases.

TŪMAHI TUATORU: RAKA KŪAHA AUTŌ

MĀ TE KAIMĀKA ANAKE

Kei tētahi raka kūaha autō ko tētahi pōkai waea e mau ana ki te tāpare kūaha me tētahi paepapa e mau ana ki te kūaha. E whakaaturia ana he hoahoa māmā o te ara iahiko pōkai waea i raro.

www.corplock.com.au/magnetic-lock-systems



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

(a) Ina katia te panahiko, ka rere ngā iahiko mā te pōkai waea, ā, ka hua ake he whaitua autō.

Ki te hoahoa i runga, tātuhia te āhua me te ahunga o te whaitua autō ka puta mai i te pōkai waea. Tapaina te pito raki me te pito tonga o te pōkai waea.

(b) Tata ki te kore noa iho te parenga o te pōkai waea i tēnei ara iahiko.

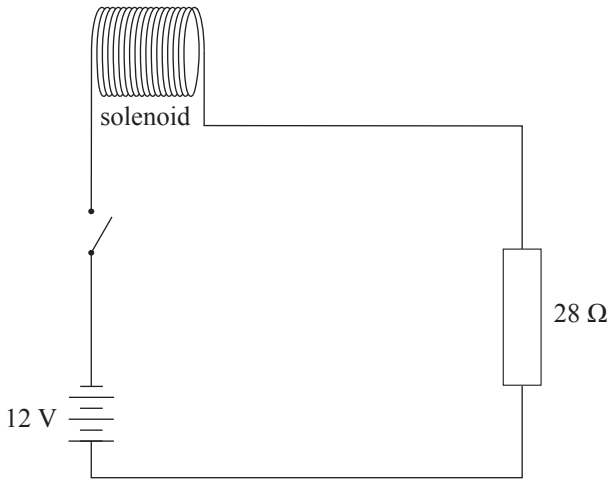
Whakaaturia mai ina kati te panahiko, ko te iahiko i roto i te ara iahiko he 0.43A.

QUESTION THREE: MAGNETIC DOOR LOCK

ASSESSOR'S USE ONLY

A magnetic door lock consists of a solenoid attached to the door frame and a plate attached to the door. A simplified diagram of the solenoid circuit is shown below.

www.corplock.com.au/magnetic-lock-systems



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

(a) When the switch is closed, current flows through the solenoid, which produces a magnetic field.

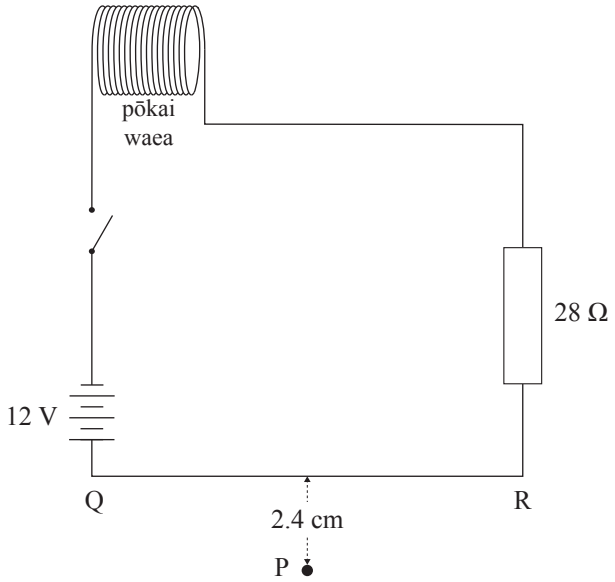
On the diagram above sketch the shape and direction of the magnetic field produced by the solenoid. Label the north and south poles of the solenoid.

(b) The resistance of the solenoid is negligible in this circuit.

Show that when the switch is closed, the current in the circuit is 0.43 A.

(c) Nā te tawhiti o te pūwāhi P i te pōkai waea he iti noa te whaitua autō o te pōkai waea. Engari he whaitua autō tonu kei reira, nā te iahiko kei te waea i waenga i Q me R.

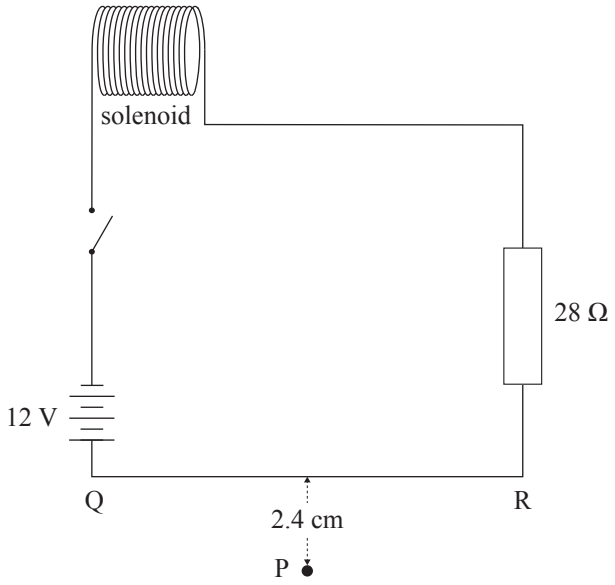
MĀ TE KAIMĀKA ANAKE



Tātaitia te rahi ka tuhi i te ahunga o te whaitua autō i te pūwāhi P, nā te iahiko kei te waea i waenga i ngā pūwāhi Q me R.

ASSESSOR'S USE ONLY

(c) Point P is far enough away from the solenoid that the magnetic field from the solenoid is insignificant. However there is still a magnetic field, due to the current along the wire between Q and R.



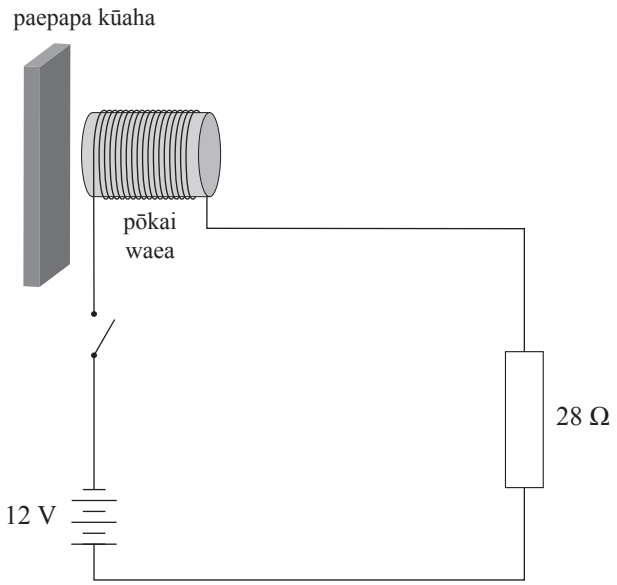
Calculate the size and state the direction of the magnetic field at point P, due to the current in the wire between points Q and R.

(d) Ina whakamahia i roto i te raka kūaha, he iho tō te pōkai waea, ā, e tata ana te paepapa kūaha ki te pito o te pōkai waea. I takea mai te paepapa me te iho o te pōkai waea i te matū kotahi.

Whakamāramahia mai ka pēhea e raka ai te kūaha mā tēnei pūnaha.

I tō tuhinga me:

- kī mai mēnā ka raka te kūaha mā te huaki, kati rānei i te panahiko
- whakaahua mai he pēhea e raka ai te kūaha mā tēnei mahi
- whakahua he matū tōtika mō te paepapa kūaha me te iho pōkai waea, ka whakamārama he aha i tōtika ai tēnei matū.



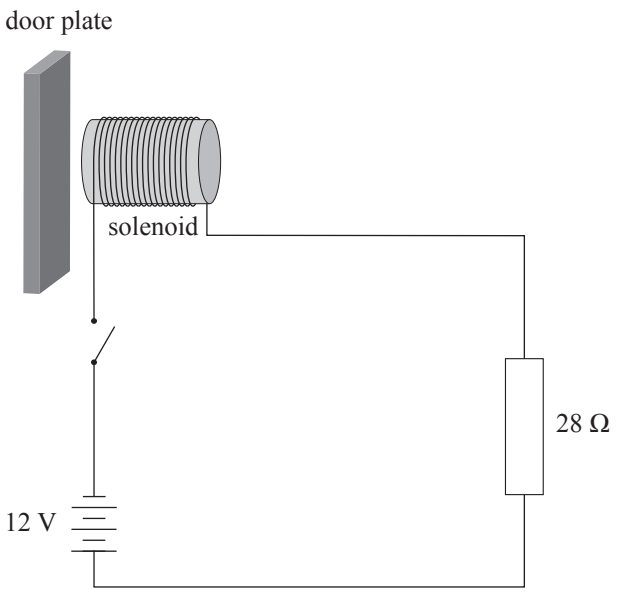
MĀ TE KAIMĀKA ANAKE

(d) When used in a door lock, the solenoid has a core and the door plate is near the end of the solenoid. The door plate and solenoid core are made of the same material.

Explain how the door can be locked using this system.

In your answer you should:

- state whether opening or closing the switch locks the door
- describe how doing this locks the door
- name a suitable material for both the door plate and solenoid core, and explain why this material is suitable.



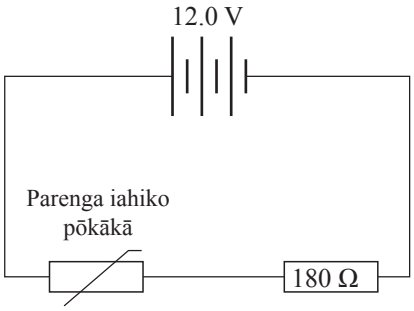
ASSESSOR'S USE ONLY

HE HOAHOA TĀPIRI

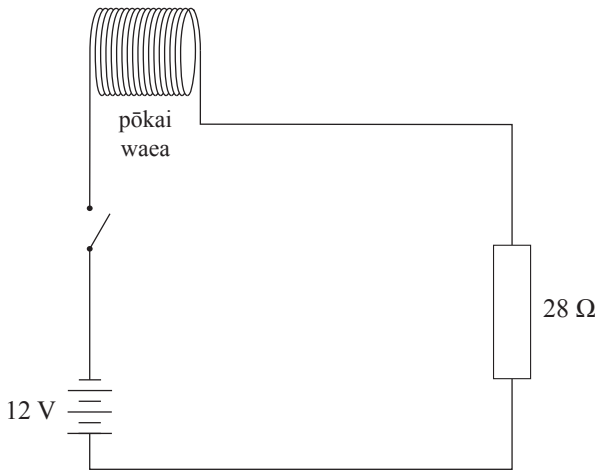
MĀ TE KAIMĀKA ANAKE

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

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



Ki te hiahia koe kia tuhia 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.

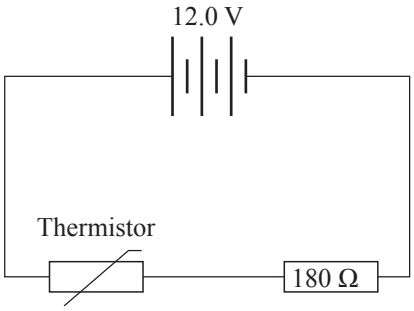


SPARE DIAGRAMS

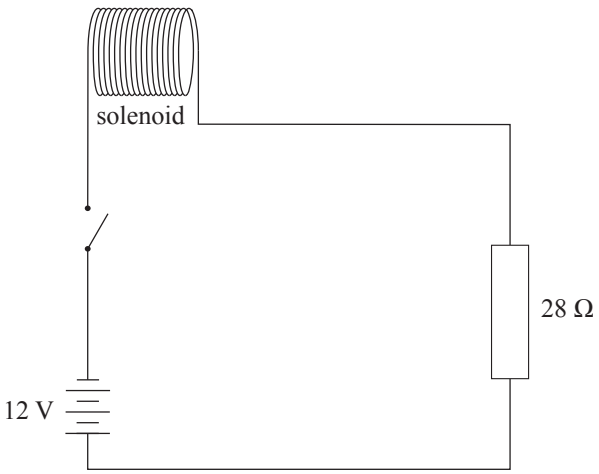
ASSESSOR'S USE ONLY

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

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



If you need to redraw your diagram from Question Three (a), 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

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, 2017

90937 Demonstrate understanding of aspects of electricity and magnetism

9.30 a.m. Tuesday 28 November 2017
Credits: Four

90937M

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.

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–PHYSR.

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 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 2–23 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.