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!

Tohua tēnei pouaka mēnā kāore he tuhituhi i roto i tēnei pukapuka

Ahupūngao, Kaupae 1, 2020

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

9.30 i te ata Rāpare 3 Hakihea 2020
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 o te Ao (SI) ki ngā whakautu tohutau.

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

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 2–23 kei roto i tēnei pukapuka, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

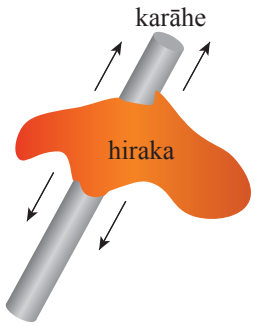
ME HOATU RAWA KOE I TĒNEI PUKAPUKA KI TE KAIWHAKAHAERE Ā TE MUTUNGA O TE WHAKAMĀTAUTAU.

TAPEKE:

MĀ TE KAIMĀKA ANAKE

TŪMAHI TUATAHI: INE-HIKOTŪ

MĀ TE KAIMĀKA ANAKE



(a) Ina mukumukua he matira karāhe ki te hiraka, ka whana tōrunga te karāhe.

He aha te ingoa o tēnei tukanga?

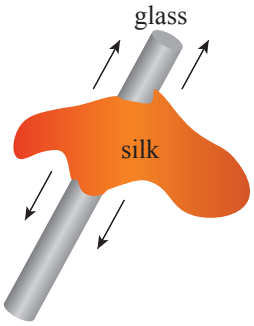
(b) Ka taea he kora te whakaputa i waenga i ngā mata e rua mēnā ka rawaka te tōpū o tetahi whanga ki tētahi mata.

Tātaihia te kaha o te kora mēnā ko te pūngao i whakawhitia he 12.5 wae pūngoimano (12.5×10^{-3} J), ā, he 1.5 hēkonamano[1] (1.5×10^{-3} s) te roa o te kora.

[1] mirihēkona

QUESTION ONE: ELECTROSCOPES

ASSESSOR'S USE ONLY



(a) When a glass rod is rubbed with silk, the glass will become positively charged.

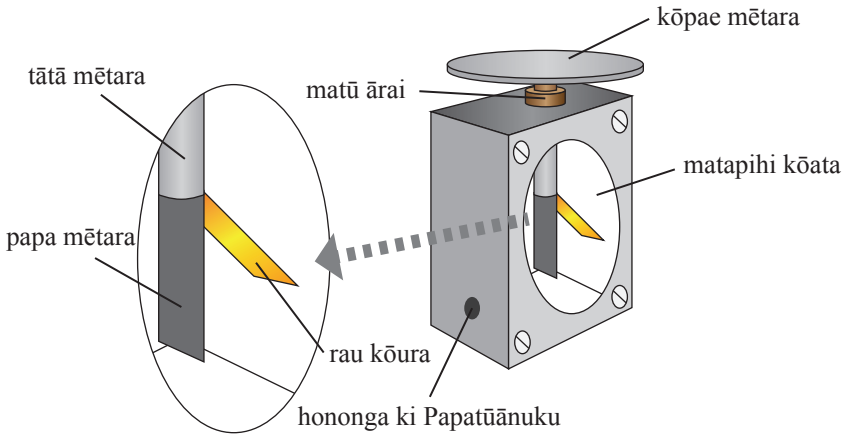
What is the name of this process?

(b) A spark can be generated between two surfaces if there is a sufficient buildup of charge on one surface.

Calculate the power of the spark if the energy transferred was 12.5 millijoules (12.5×10^{-3} J) and the spark lasted for 1.5 milliseconds (1.5×10^{-3} s).

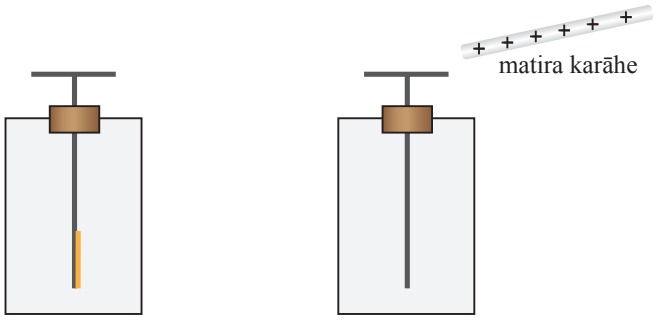
(c) Ko te ine-hikotū he taputapu pūtaiao ka whakamahia hei kimi i tētahi whana tōrunga.
E whakaatu ana te ine-hikotū i tētahi whana mā te wehe i te rau kōura kei raro o te pūrere.
I te whakatatatanga atu o te matira karāhe whana ki te kōpae mētara, ka whakatawhiti atu te rau mai i te papa mētara.

MĀ TE KAIMĀKA ANAKE



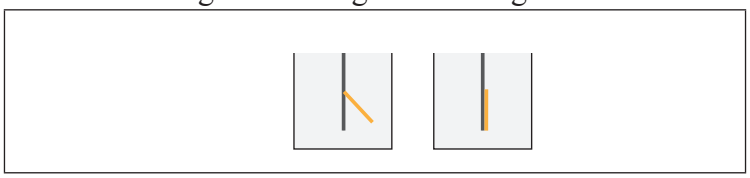
Whakamāramatia te nekehanga o te whana e whakatawhiti atu ai te rau mai i te papa mētara.

Me tīmata mā te tātuhi, ki ngā hoahoa i raro, i ngā whana kei tētahi ine-hikotū ngū (taha mauī i raro), ā, ina pātata tētahi matira karāhe whana tōrunga (taha matau i raro), me whakaatu te tūnga* o te rau kōura me ngā whana kei te ine-hikotū.



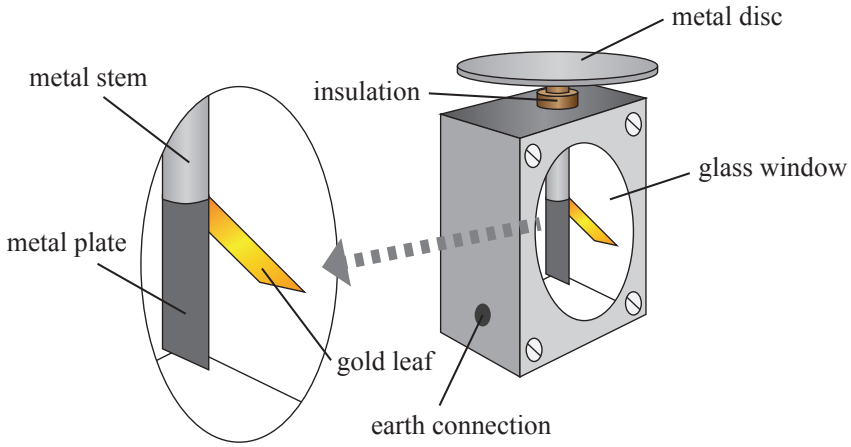
Ki te hiahia koe ki te tuhi anō i tēnei hoahoa, whakamahia te hoahoa ki te whārangi 18.

* Ngā kōwhiringa mō te tūnga rau:



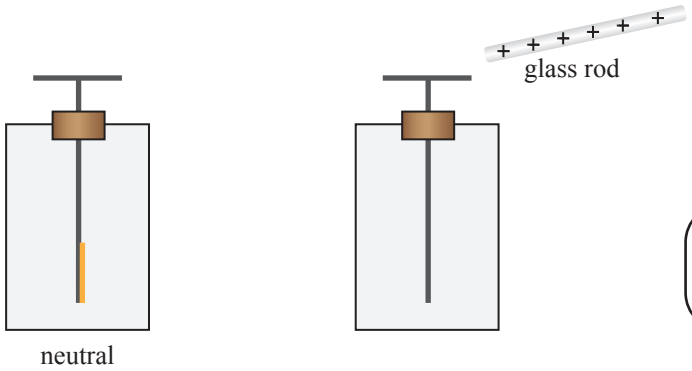
ASSESSOR'S USE ONLY

(c) An electroscope is a scientific instrument used to detect the presence of an electric charge. The electroscope shows a charge by the separation of the gold leaf at the bottom of the device. When a charged glass rod is brought close to the metal disc, the leaf moves away from the metal plate.



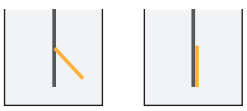
Explain the movement of charge that makes the leaf move away from the metal plate.

Start by drawing, on the diagrams below, the charges on a neutral electroscope (below left) and then, when a positive glass rod is near (below right), show the position * of the gold leaf and the charges on the electroscope.



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

* Options for leaf position:



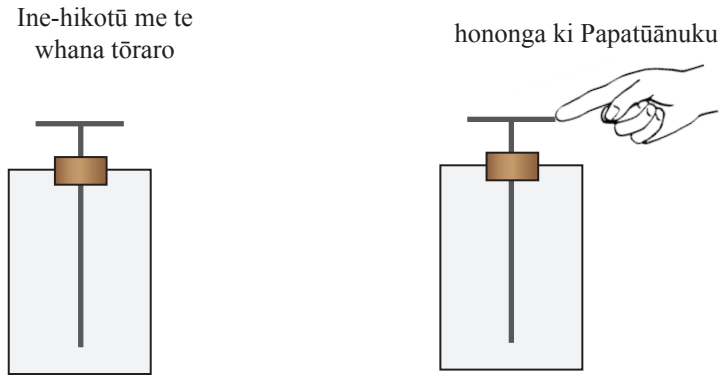
(d) Ka taea tētahi ine-hikotū whana tōraro te hono ki Papatūānuku. Ka taea tēnei ina pā te tangata ki te kōpae mētara, e taka ai te rau ki te tātā.

MĀ TE KAIMĀKA ANAKE

Whakamahia ngā hoahoa i raro, ka whakamārama he aha e taka ai te rau ki te tātā.

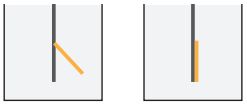
I tō tuhinga, me:

- tātuhi te tuaritanga whana kei ia hoahoa ine-hikotū i raro
- tātuhi te tūnga o te rau i tēnā hoahoa, i tēnā hoahoa hei whakaatu i te nekehanga o te whana*
- whakamārama te nekehanga o te rau nā te tuaritanga whana.



Ki te hiahia koe ki te tuhi anō i tēnei hoahoa, whakamahia te hoahoa ki te whārangi 20.

* Ngā kōwhiringa mō te tūnga rau:



ASSESSOR'S USE ONLY

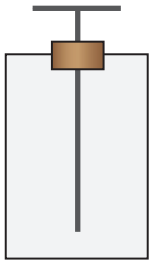
(d) A negatively charged electroscope can be grounded. This can occur when a person touches the metal disk, causing the leaf to fall against the stem.

Using the diagrams below, explain why the leaf falls against the stem.

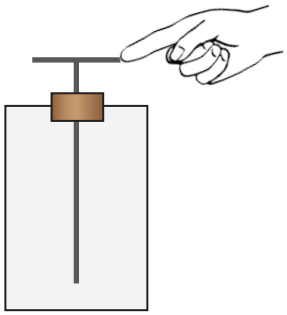
In your answer:

- draw the charge distribution on each electroscope diagram below
- draw the relative position of the leaf in each diagram to show the movement of charge*
- explain the movement of the leaf due to charge distribution.

Negatively charged electroscope

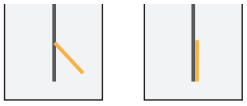


grounding / earthing



If you need to redraw this, use the diagram on page 21.

* Options for leaf position:



TŪMAHI TUARUA: ARA IAHIKO PLAY-DOH

MĀ TE KAIMĀKA ANAKE

I ako a Harrison i te kura he pūkawe hiko te poikere (Play-Doh).

(a) Whakaahuatia te rerekētanga i waenga i tētahi pūkawe hiko me tētahi ārai hiko, e ai ki te nekehanga o te whana.

(b) Ka hiahia a Harrison ki te hanga i te ara **hātepe**.

Ki te wāhi i raro, tātuhia he ara **hātepe** me ngā wae e whai ake:

- pūhiko 9 V
- pana huaki
- 2 ngā pūrama ōrite
- ine-ngaohiko whai aho hei ine i te ngaohiko pūhiko
- ine-iahiko.

Ki te hiahia koe ki te tuhi anō i tō ara iahiko, whakamahia te pouaka kei te whārangi 20.

QUESTION TWO: PLAY-DOH CIRCUITS

ASSESSOR'S USE ONLY

Harrison learned in school that Play-Doh is a conductor.

(a) Describe the difference between a conductor and an insulator, in terms of movement of charge.

(b) Harrison wants to create a **series** circuit.

In the space below, draw a **series** circuit with the following components:

- 9 V battery
- open switch
- 2 identical light bulbs
- voltmeter wired to measure the battery voltage
- ammeter.

If you need to redraw your circuit, use the box on page 21.

MĀ TE KAIMĀKA ANAKE

(c) (i) Kei te hiahia a Harrison ki te rapu e hia te pūngao e whakamahia ana e tētahi pūrama i roto i te ara hātepe mai i (b).

Tātaitia te pūngao e whakamahia ana e tētahi pūrama KOTAHI i te haora KOTAHI, mēnā ko te tapeke parenga o te ara iahiko he 150 Ω.

Me tīmata atu mā te tātai i te tapeke iahiko i roto i te ara iahiko.

(ii) Ka taea e tētahi pūhiko 9 V noa te tuku te 500 mA (500×10^{-3} A) mō te kotahi haora i mua i te "paunga".

E hia ngā haora e kā ai i a Harrison ngā pūrama i mua i te "paunga" o tana pūhiko 9 V?

ASSESSOR'S USE ONLY

(c) (i) Harrison is interested in how much energy a light bulb uses in the series circuit from (b).

Calculate the energy used by ONE light bulb in ONE hour, if the overall resistance of the circuit is 150 Ω.

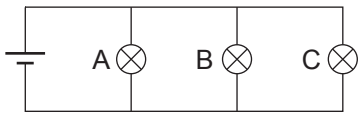
Start by calculating the total current in the circuit.

(ii) An average 9 V battery can supply 500 mA (500×10^{-3} A) for one hour before becoming "flat".

How many hours could Harrison leave the light bulbs on before his 9 V battery becomes "flat"?

(d) Ka hangaia e Harrison he **ara iahiko whakarara.** E toru ngā pūrama, A, B, me C, e whakaaturia ana ki te hoahoa i raro.

MĀ TE KAIMĀKA ANAKE



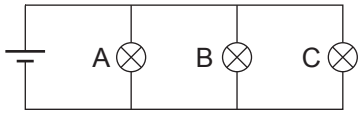
He ōrite te parenga o ngā pūrama A me B, ā, he haurua te parenga o te pūrama C.

He aha te mea ka kite a Harrison mō te tīahoaho o te pūrama C e ai ki A me B?

Homai te whakamārama.

ASSESSOR'S USE ONLY

(d) Harrison creates a **parallel circuit.** It has three light bulbs, A, B, and C, as shown in the diagram below.



Bulbs A and B have the same resistance, while bulb C has half the resistance.

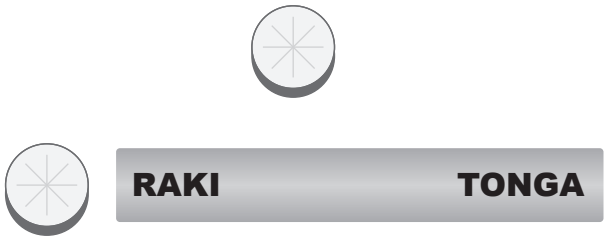
What would Harrison notice about the brightness of the light bulb C compared to A and B? Explain why.

TŪMAHI TUATORU: AUTŌHIKOTANGA

MĀ TE KAIMĀKA ANAKE

(a) Mēnā ka tata tētahi kāpehu ki tētahi autō ka neke te ngira o te kāpehu ki te ahunga o te whaitua autō.

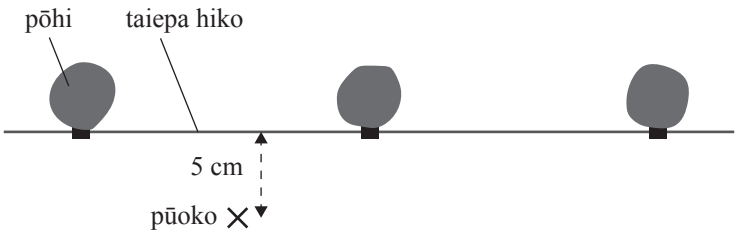
Tātuhia te ahunga o ngā kāpehu taunga me ngā pere hei tohu i te ngira o te kāpehu i ngā tūnga e whakaaturia ana i raro.



Ki te hiahia koe ki te tuhi anō i tēnei hoahoa, whakamahia te hoahoa ki te whārangi 20.

(b) E whakamahia whānuitia ana ngā taiepa hiko puta noa i Aotearoa hei pupuri i ngā kararehe ki ngā pātiki. Ka tukuna e te taiepa hiko ngā kowhera poto o te iahiko mā te waea. E herea ana te waea ki te pōhi mā tētahi rawhi kirihou, e whakaaturia ana i te whakaahua.

Ina rere ana te iahiko mā te waea, ka puta he whaitua autō. Ina raua he pūoko kia 5 cm mai i te waea, i kitea ko te kaha o te whaitua autō he 80 nanotesla (8.0×10^{-8} T).



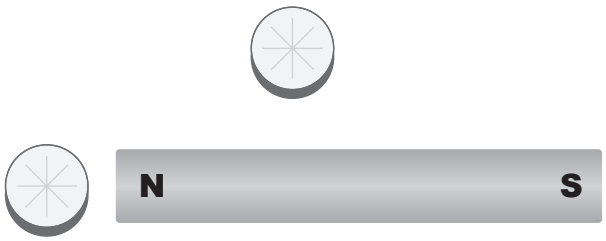
(i) Tātaihia te iahiko i roto i te waea.

QUESTION THREE: ELECTROMAGNETISM

ASSESSOR'S USE ONLY

(a) Bringing a compass close to a magnet will move the needle of the compass in the direction of the magnetic field.

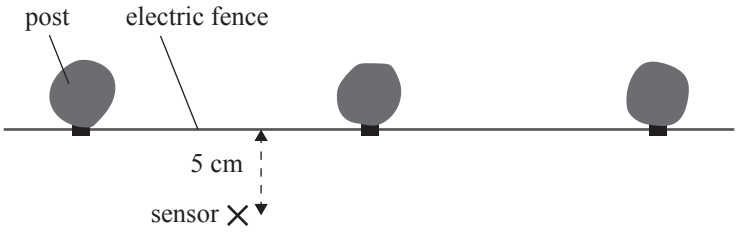
Draw the direction of the plotting compasses with arrows to represent the needle of the compass while in the positions shown below.



If you need to redraw this, use the diagram on page 21.

(b) Electric fences are used extensively around New Zealand to keep livestock in their paddocks. An electric fence sends pulses of current through the wire. The wire is attached to the post using a plastic clip, as shown.

When the current flows through a wire, it creates a magnetic field. When a sensor was placed 5 cm from the wire, it was found to have a magnetic field strength of 80 nanotesla (8.0×10^{-8} T).



(i) Calculate the current in the wire.

MĀ TE KAIMĀKA ANAKE

(ii) Kei tētahi taiepa hiko noa ko te iahiko o te 30 mA (30×10^{-3} A).

Whakamāramahia mai mēnā me whakapiki, me whakaheke, me waiho kia ōrite rānei te ngaohiko kia rite ai te iahiko ki tētahi taiepa hiko noa.

(c) Whakamāramahia te take he aha i hangaia ai te rawhi e mau ana i te waea ki te pōhi mai i te kirihou, ā, ka aha mēnā i whakamaua tonutia atu te waea ki te pōhi rākau.

E haere tonu ana te Pātai Tuatoru i te whārangi 18.

ASSESSOR'S USE ONLY

(ii) A typical electric fence has a current of 30 mA (30×10^{-3} A).

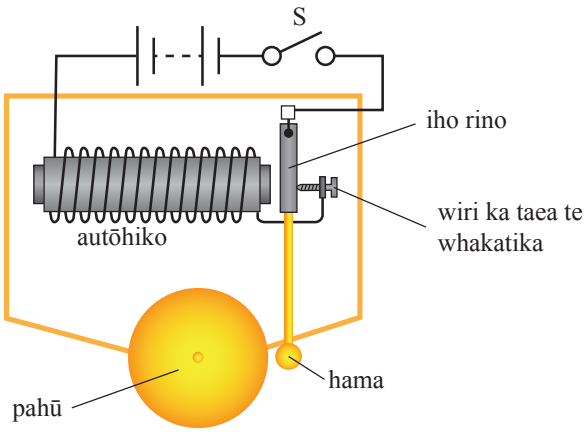
Explain whether you would need to increase, decrease, or keep the same voltage so the current is that of a typical electric fence.

(c) Explain why the clip that attaches the wire to the post is made from plastic, and what might happen if the wire was attached directly onto the wooden fence post.

Question three continues on page 19.

(d) E whakaatu ana te hoahoa māmā i te ara iahiko o tētahi pere hiko. He tāruarua te tangi a te pere hiko mā te paopao haere a te hama i te pahū.

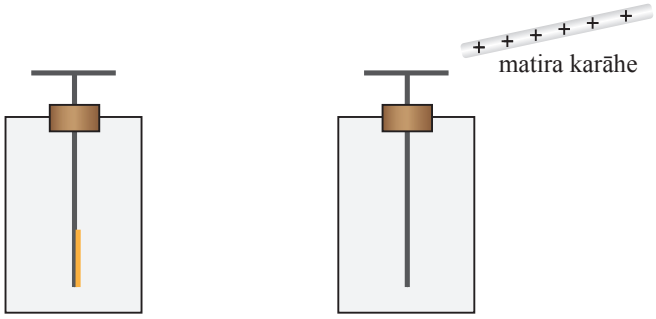
Whakamāramatia mai te tukanga e paopao haere ai te hama i te pahū ina katia te pana.



MĀ TE KAIMĀKA ANAKE

ĒTAHI HOAHOA TĀPIRI

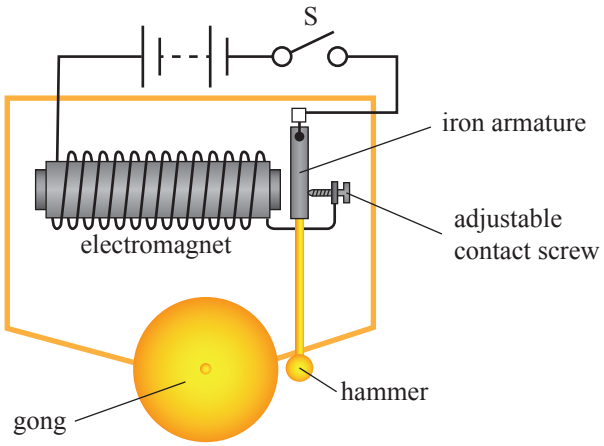
Ki te hiahia koe kia tuhia anō tō hoahoa mai i te Tūmahi Tuatahi (c), tuhia ki raro nei. Kia mārama te tohu ko tēhea te tuhinga ka hiahia koe kia mākahia.



ASSESSOR'S USE ONLY

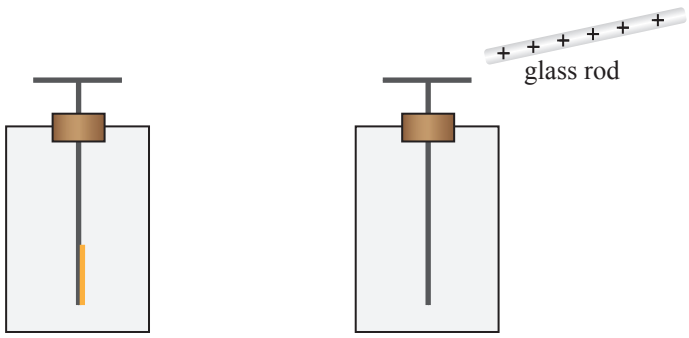
(d) The schematic diagram below shows the circuit of an electric bell. The electric bell makes a repetitive sound by the hammer continually hitting the gong.

Explain the process that causes the hammer to continually hit the gong when the switch is closed.



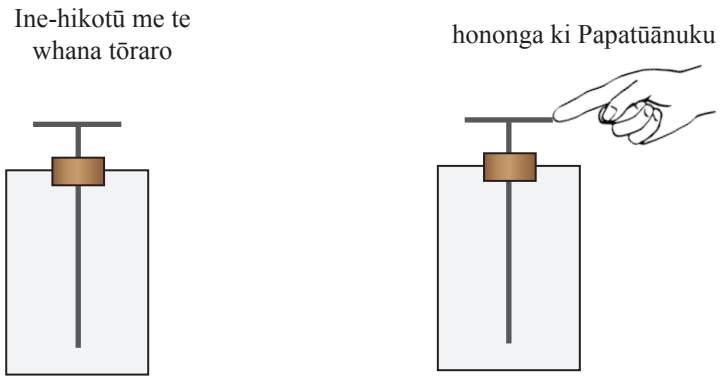
SPARE DIAGRAMS

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



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

MĀ TE KAIMĀKA ANAKE

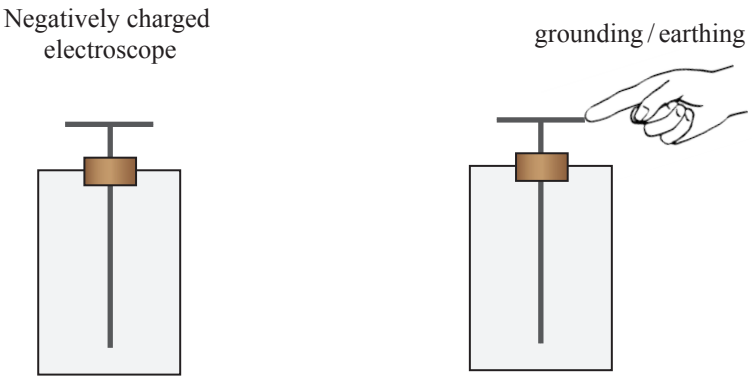


Ki te hiahia koe kia tuhia anō tō hoahoa mai i te Tūmahi Tuarua (b), tuhia ki raro nei. Kia mārama te tohu ko tēhea te tuhinga ka hiahia koe kia mākahia.

Ki te hiahia koe kia tuhia anō 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.

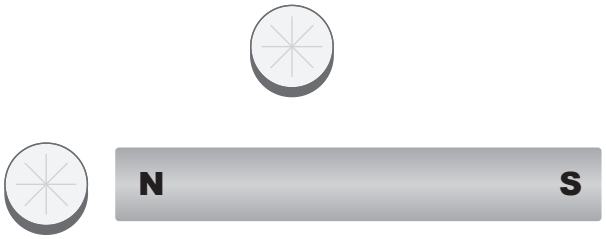
ASSESSOR'S USE ONLY

If you need to redraw your diagram from Question One (d), 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.

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

English translation of the wording on the front cover

Level 1 Physics 2020

90937 Demonstrate understanding of aspects of electricity and magnetism

9.30 a.m. Thursday 3 December 2020
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–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 2–23 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.