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See back cover for an English translation of this cover.

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92047M

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Tuhia he (☒) ki te pouaka mēnā kāore koe i tuhi kōrero ki tēnei puka

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Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Te Pūtaiao ā-Ahupūngao, ā-Nuku, ā-Tuarangi, Kaupae 1, 2024

92047M Te whakaatu māramatanga ki tētahi pūnaha ōkiko mā te whakamahi huatau pūngao

Ngā whiwhinga: E rima

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki tētahi pūnaha ōkiko mā te whakamahi huatau pūngao.	Te whakamārama i tētahi pūnaha ōkiko mā te whakamahi huatau pūngao.	Te tātari i tētahi pūnaha ōkiko mā te whakamahi huatau pūngao.

Tirohia kia kitea ai 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 Pukapuka Rauemi 92047MR mai i te puku o tēnei pukapuka.

Whakaaturia ngā whiriwhiringa KATOA.

Ki te hiahia wāhi atu anō koe mō ō tuhinga, whakamahia ngā whārangi kei muri o tēnei pukapuka.

Tirohia kia kitea ai e tika ana te raupapa o ngā whārangi 2–19, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

Kaua e tuhi ki tētahi wāhi e kitea ai te kauruku whakahāngai (⁄⁄⁄). Ka poroa taua wāhanga ka mākahia ana te pukapuka.

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

TE TŪMAHI TUATAHI: NGĀ PANONITANGA PŪNGAO

Ka taka i a Janet tētahi pōro tēnehi mai i runga o tētahi whare.

(a) Whakaahuatia ngā panonitanga pūngao (te whakawhitinga) ka kitea i te takanga iho o te pōro.

(b) Ko te 0.0585 kg te papatipu o te pōro tēnehi. Ko te 14.7m te roa o te takanga o te pōro tēnehi.

Whakaaturia ko te pūngao tō ā-papa moe ka puta i te pōro i te takanga ki te papa, ko te 8.6 J.

(c) Tātaihia te tere e tuki ai te pōro ki te papa.

(d) I te ao motuhenga, ka tuki ana te pōro ki te papa, kāore tōna tere e ōrite ki tērā i tātaihia rā i te wāhanga (c) i runga ake nei.

Whakamāramatia te take mō tēnei rerekētanga, tae atu ki tētahi tauākī e pā ana ki te tere ake, ki te pōturi iho rānei i tērā i tātaihia rā i runga ake nei.

QUESTION ONE: ENERGY CHANGES

Janet drops a tennis ball from the top of a building.

(a) Describe the energy changes (transfer) that take place as the ball falls down.

(b) The mass of the tennis ball is 0.0585 kg. The tennis ball falls through a height of 14.7 m.

Show that the gravitational potential energy the ball loses as it falls to the ground is 8.6 J.

(c) Calculate the speed with which the ball hits the ground.

(d) In reality, the speed of the ball when it hits the ground is not the same as what was calculated in part (c) above.

Explain the reason for this difference, including a statement whether the speed was more or less than what was calculated above.

(e) Ka tiki te hoa o Janet, a Maya, i te pōro mai i te papa, ka oma ake ai i ngā wehenga arapiki e rua, ā, 15 m te tapeke o te teitei o tāna pikinga. E 48 kg te papatipu o Maya, ā, e 34.2 hēkona te roa e tae atu ai ia ki runga.

Tātaihia te kaha.

- Me tīmata tō tuhinga ki te whakaahuatanga o te tikanga o te kaha me tōna pānga ki te oma ake a Maya i ngā arapiki.
- Tuhia ngā whakapae ka puta i a koe.
- Whakaurua he waeine ki tō tuhinga.

(e) Janet's friend Maya retrieves the ball from the ground and runs up two flights of stairs, covering a total height of 15 m. Maya has a mass of 48 kg and she takes 34.2 seconds to reach the top.

Calculate the power.

- Begin your answer by describing the meaning of power and how it relates to Maya running up the stairs.
- State any assumptions you make.
- Include a unit with your answer.

TE TŪMAHI TUARUA: TE PŪNGAO PŌKĀKĀ

E hiahia ana a Oliver kia mātao tonu tana wai mō te roanga o te rā i a ia i te kura. Tuatahi ake, ka whakatio ia i tētahi pātara wai hei kawe atu ki te kura. I te roanga o te rā, ka kite a Oliver i te roa o te wā i mua i te rewa o te tio. Ka rewa ana te tio, ka tere tonu te pikinga o te wai ki te paemahana o te rūma.

Te kītanga pōkākā whāiti o te wai	$= 4200 \text{ J kg}^{-1}$
Te pōkākā torohū o te honokarihi	$= 334\,000 \text{ J kg}^{-1}$
Te papatipu o te wai i roto i te pātara	$= 0.750$ kg (750 mL)

(a) Ko te aha te tikanga o ‘te pōkākā torohū o te honokarihi’?

(b) Tātaihia te pūngao pōkākā me puta, e huri ai te hanga o te 0.750 kg o te wai e totoka ana hei wē.

QUESTION TWO: THERMAL ENERGY

Oliver wants to be able to keep his water cool the whole day while he is at school. Firstly, he tries freezing a bottle of water to take to school. Over the day, Oliver finds that it takes a long time for the ice to melt. Once the ice has melted, the water gets to room temperature quite quickly.

The specific heat capacity of water = 4200 J kg^{-1}
The latent heat of fusion = 334 000 J kg^{-1}
Mass of water in the bottle = 0.750 kg (750 mL)

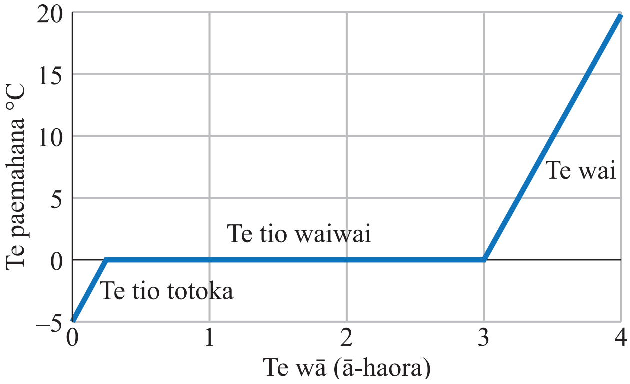
(a) What does the term 'latent heat of fusion' mean?

(b) Calculate the heat energy required for 0.750 kg of water to change state from solid to liquid.

(c) E whakaaturia ana i te kauwhata o te paemahana me te wā i raro nei te pēheatanga o te tio ka tangohia ana i te pākatio.

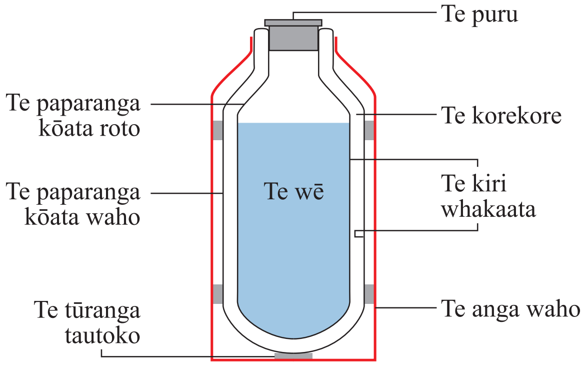
Whakamahia ngā kōrero kei te whārangi 10 me te kauwhata i raro nei hei whakaahua i te take ka roa ake te wā e rewa katoa ai te tio, ā, ka poto noa ake te wā e piki ai te mahana o te wai kua rewa ki te paemahana o te rūma.

Te kauwhata o te paemahana me te wā mō te tio ka waiho ki waho



(d) Kātahi a Oliver ka whakatau kia whakamahia tētahi Takawai e ōrite ana te rōrahi o te wai ka puritia ki tērā o tana pātara o mua. Ko tētahi anō kārangaranga mō te puoto Takawai, ko te puoto korekore. He puoto kōata, e rua ngā paparanga, kua hoahoatia kia whakahekea te whakawhitinga pōkākā e wera tonu ai ngā mea wera, e mātao ai ngā mea mātao.

Whakaahuatia ētahi āhuatanga matua e RUA o tētahi Takawai ka whakaheke i te whakawhitinga pōkākā, ā, whakamāramatia te momo whakawhitinga pōkākā ka whakahekea e ia āhuatanga.



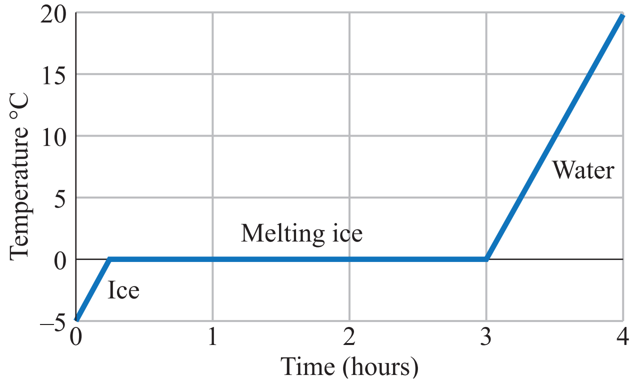
1.

2.

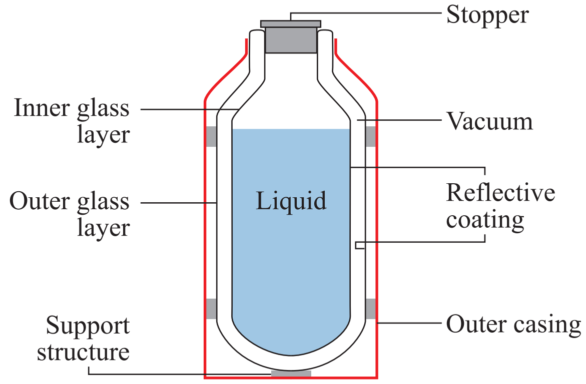
(c) The temperature against time graph below shows what happens to ice when taken out of the freezer.

Use the information provided on page 11 and the graph below to describe the reason why it takes a longer time for the ice to completely melt, and a much shorter time for the melted water to get to room temperature.

Temperature against time graph for ice left outside



(d) Oliver next decides to try using a Thermos that holds the same volume of water as his earlier bottle. The Thermos flask is also known as a vacuum flask. It is a double-walled glass vessel that is designed to minimise heat transfer by keeping hot things hot, and cold things cold.



Describe TWO key features of a Thermos that reduce heat transfer, and explain the type of heat transfer each feature is designed to reduce.

1.

2.

(e) Ka whakatau a Oliver kia whakamātauria tana Takawai, ā, ka kite ia, ko te 5 °C te paemahana o te wai i te tīmatanga o te rā. I muri i ngā haora e rima, ka kite ia kua piki te paemahana ki te 12 °C.

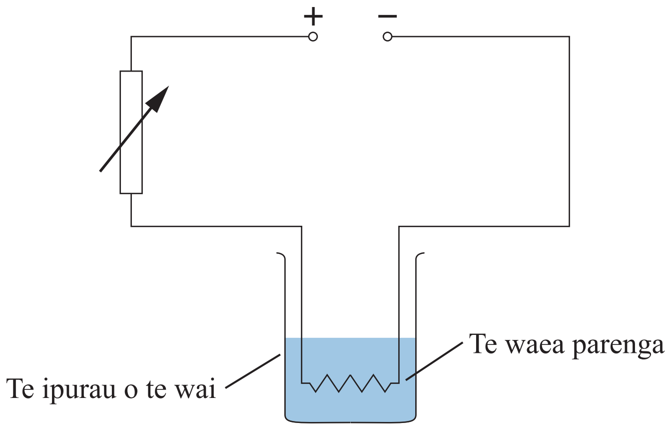
Whakaaturia ko te pāpātanga toharite o te miti pūngao pōkākā a te wai i roto i te Takawai puta noa i ngā haora e rima, ko tōna 1.2 W.

(e) Oliver decides to test his Thermos, and finds that at the start of the day, the temperature of the water is 5 °C. Five hours later, he finds the temperature has risen to 12 °C.

Show that the average rate of thermal energy absorption of the water in the Thermos over the five hours is approximately 1.2 W.

TE TŪMAHI TUATORU: TE HIKO

Kei te mātai a Tane i te pānga i waenganui i te iahiko, i te ngaohiko, me te parenga. Ka whakamahi ia i tētahi pūtuku hiko, i tētahi parenga whakatina, me tētahi wāhanga waea parenga kua kōurua ki tētahi ipurau o te wai. Ka pēnei tana honohono i ngā waehanga:

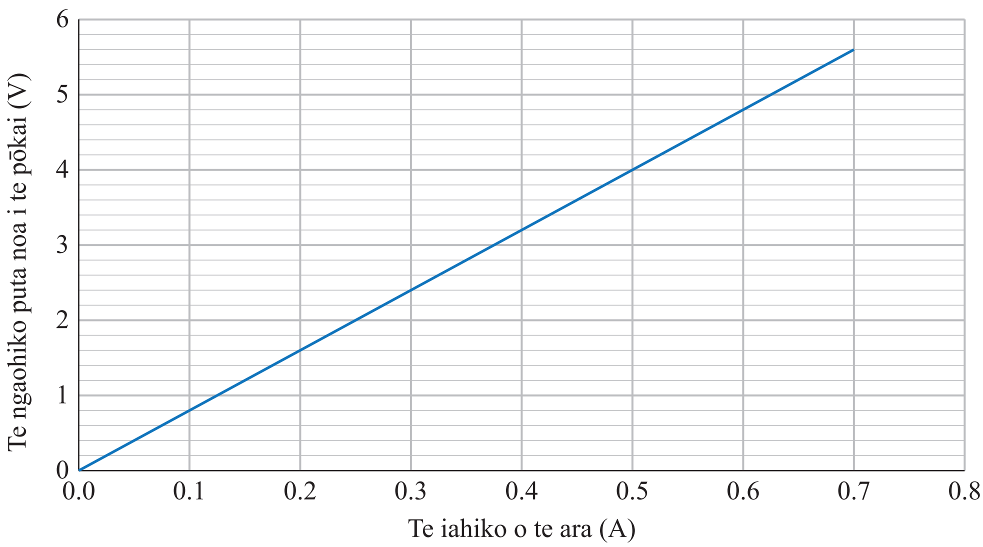


(a) I te hoahoa i runga nei, whakaurua he ine-iahiko hei ine i te iahiko o te ara me tētahi ine-ngaohiko hei ine i te ngaohiko puta noa i te pōkai waea.

(b) E whakaaturia ana i te kauwhata e whai ake nei te pānga i waenganui i te ngaohiko me te iahiko.

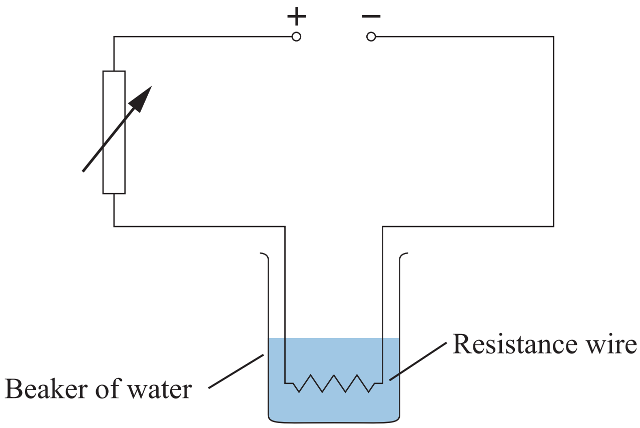
Mā te whakamahi i ngā kōrero i te kauwhata, tātaihia te parenga o te pōkai, ā, me whakauru he waeine e whai tikanga ana.

Whakaatuhia ō whiriwhiringa kia mārama.



QUESTION THREE: ELECTRICITY

Tane is studying the relationship between current, voltage, and resistance. He uses a power supply, a variable resistor, and a piece of resistance wire submerged in a beaker of water. He connects the components as follows:

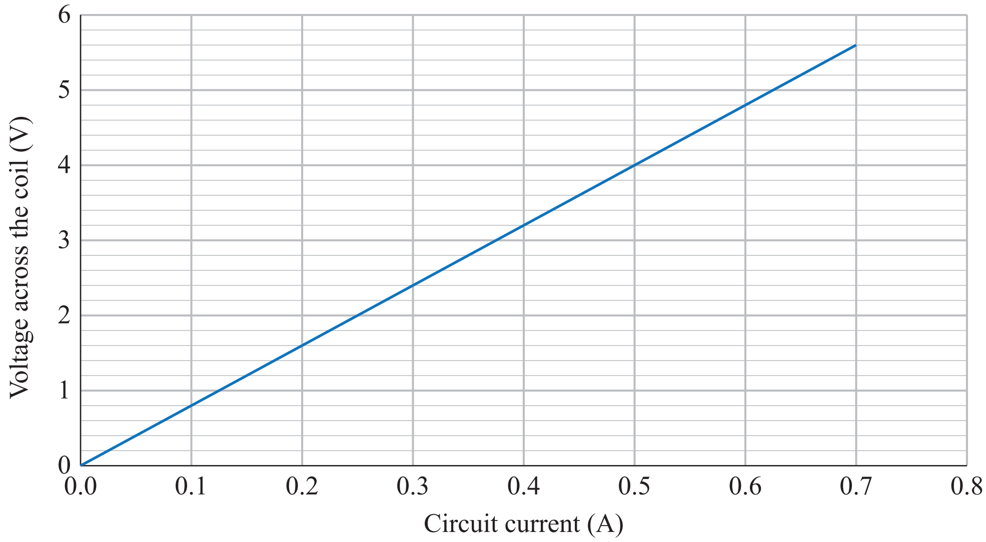


(a) In the above diagram, include an ammeter to measure the circuit current and a voltmeter to measure the voltage across the coil of wire.

(b) The following graph shows the relationship between voltage and current.

Using information from the graph, calculate the resistance of the coil and include an appropriate unit.

Show your working clearly.



(c) Homai tētahi take e kōurua ana te waea ki te wai i te wā o te whakamātau.

(d) Mā te whakamahi i ngā raraunga mai i te kauwhata, he aha te pāpātanga mōrahi o te pūngao hiko moe e whakamahia ana?

Whakaurua ngā waeine ki tō tuhinga.

E rere tonu ana te Tūmahi Tuatoru i te whārangi e whai ake ana.

(c) Give a reason why the wire is submerged in water during the experiment.

(d) Using the data from the graph, what is the maximum rate of electrical potential energy being used?

Include units with your answer.

Question Three continues on the following page.

(e) He parenga whakatina tētahi o ngā waehanga i te ara.

https://stock.adobe.com/nz/search?k=%22variable%20resistor%22

Whakamāramahia mai te āhua o te whakamahinga o te parenga whakatina, ā, tātaritia te pānga ki te iahiko me te ngaohiko mō ngā waehanga i te ara, ka whakapiki haeretia ana te parenga.

(e) One of the components in the circuit is a variable resistor.

https://stock.adobe.com/nz/search?k=%22variable%20resistor%22

Explain how the variable resistor is used, and analyse the effect it has on both the current and the voltage for components in the circuit, as the resistance is increased.

He whārangi anō ki te hiahiatia.
Tuhia te tau tūmahi mēnā e hāngai ana.

TE TAU TŪMAHI

Extra space if required.
Write the question number(s) if applicable.

QUESTION NUMBER

English translation of the wording on the front cover

Level 1 Physics, Earth and Space Science 2024

92047M Demonstrate understanding of a physical system using energy concepts

Credits: Five

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of a physical system using energy concepts.	Explain a physical system using energy concepts.	Analyse a physical system using energy concepts.

92047M

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 92047MR from the centre of this booklet.

Show ALL working.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–19 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (). This area will be cut off when the booklet is marked.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.