90940M

909405

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

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SUPERVISOR'S USE ONLY

Pūtaiao, Kaupae 1, 2019

90940M Te whakaatu māramatanga ki ngā āhuatanga o te pūhanga manawa

9.30 i te ata Rāpare 14 Whiringa-ā-rangi 2019
Whiwhinga: Whā

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki ngā āhuatanga o te pūhanga manawa.	Te whakaatu māramatanga hōhonu ki ngā āhuatanga o te pūhanga manawa.	Te whakaatu māramatanga matawhānui ki ngā āhuatanga o te pūhanga manawa.

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.

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 2–15 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

Tērā pea ka whai hua ēnei tikanga tātai ki a koe.

MĀ TE KAIMĀKA ANAKE

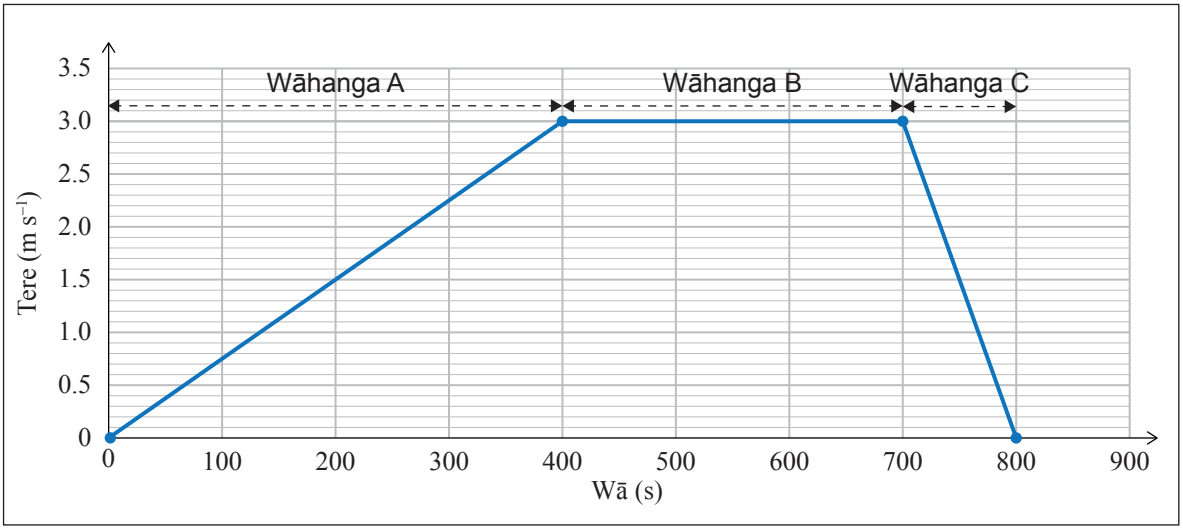
$$v = \frac{\Delta d}{\Delta t} \qquad a = \frac{\Delta v}{\Delta t} \qquad F_{net} = ma \qquad P = \frac{F}{A} \qquad \Delta E_p = mg\Delta h$$

$$E_k = \frac{1}{2}mv^2 \qquad W = Fd \qquad g = 10 \text{ N kg}^{-1} \qquad P = \frac{W}{t}$$

TŪMAHI TUATAHI

Ka tere atu tētahi poti i tētahi roto ki te tīmatanga o tētahi ara hīkoi. E whakaatu ana te kauwhata i raro i te haerenga o te poti.

Haerenga o te Poti



(a) Whakaahuahia te nekehanga o te poti i ia wāhanga o te haerenga.

Wāhanga A: _____

Wāhanga B: _____

Wāhanga C: _____

(b) Tātaitia te whakaterenga o te poti i ngā hēkona 400 tuatahi.

whakaterenga = _____ m s^{-2}

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You may find the following formulae useful.

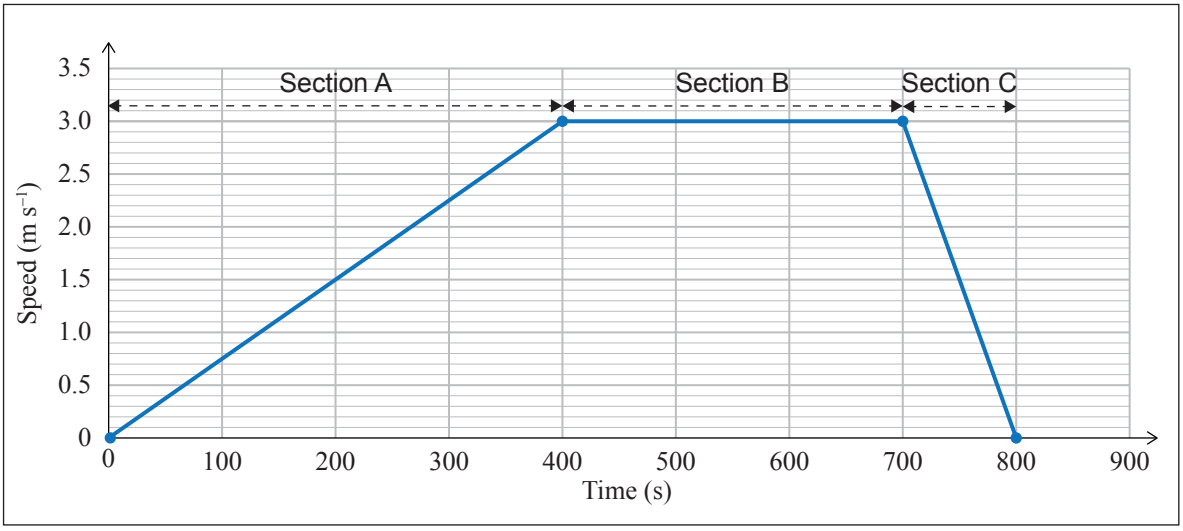
$$v = \frac{\Delta d}{\Delta t} \qquad a = \frac{\Delta v}{\Delta t} \qquad F_{net} = ma \qquad P = \frac{F}{A} \qquad \Delta E_p = mg\Delta h$$

$$E_k = \frac{1}{2}mv^2 \qquad W = Fd \qquad g = 10 \text{ N kg}^{-1} \qquad P = \frac{W}{t}$$

QUESTION ONE

A boat travels across a lake to the start of a walking track. The graph below shows the boat's journey.

Boat Journey



(a) Describe the motion of the boat during each section of the journey.

Section A: _____

Section B: _____

Section C: _____

(b) Calculate the acceleration of the boat in the first 400 seconds.

acceleration = _____ m s^{-2}

(c) Whakamāramahia te whakaterenga me te nekehanga o te poti e whakaaturia ana i te Wāhanga B o te kauwhata mā te matapaki i ngā tōpana huapae e pā ana ki te poti.

MĀ TE KAIMĀKA ANAKE

(d) Me whakaatu ko te tawhiti tapeke i haerehia e te poti he 1650 m.

(c) Explain the acceleration and motion of the boat shown in Section B of the graph by discussing the horizontal forces acting on the boat.

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(d) Show that the total distance travelled by the boat is 1650 m.

TŪMAHI TUARUA

MĀ TE KAIMĀKA ANAKE

Ka totohu ngā waewae o tētahi pakeke me tētahi tamaiti ki rō kirikiri. He ōrite te hōhonu o ngā tapuwae. He iti iho te horahanga o ngā tapuwae o te tamaiti i ō te pakeke.

(a) Ko te whakamārama mō te pēhanga ko te tōpana e ākina ana ka whakawehea ki te horahanga whakapā.

Mā te whakamahi i tēnei whakamāramatanga o te pēhanga, whakamāramahia he pēhea te pānga o tēnei ki te pakeke e tū ana i roto i te kirikiri.

Ko te horahanga mata o tētahi o ngā tapuwae o te pakeke he 200 cm^2 (0.0200 m^2), ā, ko te horahanga mata o tētahi o ngā tapuwae o te tamaiti he 150 cm^2 (0.0150 m^2). He 690 N te taumaha o te pakeke.

(b) Whakaaturia ko te pēhanga tapeke ka ākina e te pakeke ki ngā kirikiri he 17 250 Pa.

QUESTION TWO

ASSESSOR'S USE ONLY

An adult and a child's feet sink into soft sand. The footprints are the same depth. The child's footprints cover a smaller area than the adult's.

(a) Pressure is defined as the force exerted divided by the surface contact area.

Using this pressure definition, explain how it applies to the adult standing in the sand.

The surface area of one of the adult's footprints is 200 cm^2 (0.0200 m^2), and the surface area of one of the child's footprints is 150 cm^2 (0.0150 m^2). The adult has a weight of 690 N.

(b) Show the total pressure the adult exerts on the sand is 17 250 Pa.

(c) Whakamāramahia mai te take e ōrite ana te hōhonu o ngā tapuwae, ahakoa he iti iho te papatipu o te tamaiti.

Me whakauru ki tō tuhinga ko tētahi matapakinga mō te pēhanga, te horahanga mata me te papatipu.

MĀ TE KAIMĀKA ANAKE

(d) He ōrite te hōhonu o ngā tapuwae o te pakeke me te tamaiti.

Tātaihia te papatipu o te tamaiti.

(e) He 21 J te mahi a te tōpana taumaha o te pakeke ki te kirikiri.

Tātaihia te tawhiti o te totohu atu o ngā waewae o te pakeke ki ngā kirikiri.

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(c) Explain how the footprints are the same depth, although the mass of the child is smaller.
In your answer include a discussion of pressure, surface area, and mass.

(d) Both the adult's and the child's footprints are the same depth.

Calculate the mass of the child.

(e) The adult's weight force does 21 J of work on the sand.

Calculate the distance the adult's feet sink into the sand.

TŪMAHI TUATORU

MĀ TE KAIMĀKA ANAKE

https://medium.com/@rohicks/whuffo-you-jump-out-of-that-plane-14a70d0c4dc6

Ka peke tētahi kaihekerangi, he 63 kg tōna papatipu tapeke, mai i tētahi waka rererangi.

(a) Me whakaatu ko te pūngao torohū tō-ā-papa o te kaihekerangi i te wā e 3500 m te waka rererangi i runga ake i te tai moana he 2 205 000 J.

(b) He 450 m te tawhiti o te taka a te kaihekerangi i ngā hēkona 9.49 tuatahi.

Tātaihia te tere toharite o te kaihekerangi i tēnei wā.

QUESTION THREE

ASSESSOR'S USE ONLY

https://medium.com/@rohicks/whuffo-you-jump-out-of-that-plane-14a70d0c4dc6

A parachutist with total mass of 63 kg jumps from a plane.

(a) Show that the parachutist's gravitational potential energy when the plane is 3500 m above sea level is 2 205 000 J.

(b) The parachutist falls a distance of 450 m during the first 9.49 seconds.

Calculate the average speed of the parachutist during this time.

MĀ TE KAIMĀKA ANAKE

(c) Whakamāramahia te nekehanga poutū o te kaihekerangi i muri tonu mai i tana peketanga i te waka rererangi (i mua i te tuwheratanga o te hekerangi).

I tō tuhinga me:

- whakaahua te nekehanga poutū o te kaihekerangi
- whakaahua te tōpana poutū more me te kī mēnā kei te taurite, tahatahi rānei te(ngā) tōpana.
- whakamārama he pēhea te pānga o te tōpana poutū more ki te nekehanga poutū.

(d) I te wā e taka ana ki te 450 m, i heke te pūngao torohū tō-ā-papa o te kaihekerangi mā te 283 500 J.

Tātaihia te tere whakararo (poutū) o te kaihekerangi i te 450 m, ā, ko te whakapae ka pūmau te pūngao.

ASSESSOR'S USE ONLY

(c) Explain the vertical motion of the parachutist immediately after jumping out of the plane (before the parachute opens).

In your answer you should:

- describe the vertical motion of the parachutist
- describe the net vertical force, and state whether the force(s) are balanced or unbalanced
- explain how the net vertical force affects the vertical motion.

(d) During the 450 m fall, the parachutist's gravitational potential energy was reduced by 283 500 J.

Calculate the parachutist's downward speed (vertical) at 450 m, assuming energy is conserved.

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

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English translation of the wording on the front cover

Level 1 Science, 2019

90940 Demonstrate understanding of aspects of mechanics

9.30 a.m. Thursday 14 November 2019
Credits: Four

90940M

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of aspects of mechanics.	Demonstrate in-depth understanding of aspects of mechanics.	Demonstrate comprehensive understanding of aspects of mechanics.

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.

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 2–15 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.