

L3-PHYSMR



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

Ahupūngao, Kaupae 3, 2018

2.00 i te ahiahi Rātū 20 Whiringa-ā-rangi 2018

PUKAPUKA RAUEMI
mō 91523M, 91524M me 91526M

Tirohia tēnei pukapuka hei whakatutuki i ngā tūmahi o ē Pukapuka Tūmahi, Tuhiinga hoki.

Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–3 kei roto i tēnei pukapuka, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

KA TAEA TĒNEI PUKAPUKA TE PUPURI HEI TE MUTUNGA O TE WHAKAMĀTAUTAU.

Tērā pea he āwhina kei ngā raraunga me ngā ture tātai e whai ake nei ki a koe.
You may find the following data and formulae useful.

91523M Te whakaatu māramatanga ki ngā pūnaha ngaru

91523 Demonstrate understanding of wave systems

$$d \sin \theta = n\lambda \quad n\lambda = \frac{dx}{L} \quad f' = f \frac{v_w}{v_w \pm v_s} \quad v = f\lambda \quad f = \frac{1}{T}$$

91524M Te whakaatu māramatanga ki ngā pūhanga manawa

91524 Demonstrate understanding of mechanical systems

$$\begin{array}{llll}
 F = ma & p = mv & \Delta p = F\Delta t & \Delta E_p = mg\Delta h \\
 W = Fd & E_{\text{K(LIN)}} = \frac{1}{2}mv^2 & x_{\text{COM}} = \frac{m_1x_1 + m_2x_2}{m_1 + m_2} & \\
 d = r\theta & v = r\omega & a = r\alpha & \omega = \frac{\Delta\theta}{\Delta t} \\
 \alpha = \frac{\Delta\omega}{\Delta t} & \omega = 2\pi f & f = \frac{1}{T} & E_{\text{K(ROT)}} = \frac{1}{2}I\omega^2 \\
 \omega_f = \omega_i + \alpha t & \theta = \frac{\omega_f + \omega_i}{2}t & \omega_f^2 = \omega_i^2 + 2\alpha\theta & \theta = \omega_i t + \frac{1}{2}\alpha t^2 \\
 \tau = I\alpha & \tau = Fr & L = mvr & \theta = \omega_f t - \frac{1}{2}\alpha t^2 \\
 F_g = \frac{GMm}{r^2} & F_c = \frac{mv^2}{r} & L = I\omega & \\
 F = -ky & E_p = \frac{1}{2}ky^2 & T = 2\pi\sqrt{\frac{l}{g}} & T = 2\pi\sqrt{\frac{m}{k}} \\
 y = A\sin\omega t & v = A\omega\cos\omega t & a = -A\omega^2\sin\omega t & a = -\omega^2y \\
 y = A\cos\omega t & v = -A\omega\sin\omega t & a = -A\omega^2\cos\omega t &
 \end{array}$$

91526M Te whakaatu māramatanga ki ngā pūnaha hiko

91526 Demonstrate understanding of electrical systems

$$V = Ed \qquad \Delta E = Vq \qquad E = \frac{1}{2}QV \qquad Q = CV$$

$$C = \frac{\epsilon_0 \epsilon_r A}{d} \qquad C_T = C_1 + C_2 + \dots \qquad \frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \dots \qquad \tau = RC$$

$$R_T = R_1 + R_2 + \dots \qquad \frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \dots \qquad V = IR \qquad P = VI$$

$$\phi = BA \qquad \epsilon = -L \frac{\Delta I}{\Delta t} \qquad \epsilon = -\frac{\Delta \phi}{\Delta t} \qquad f_0 = \frac{1}{2\pi\sqrt{LC}}$$

$$\frac{N_p}{N_s} = \frac{V_p}{V_s} \qquad E = \frac{1}{2}LI^2 \qquad \tau = \frac{L}{R} \qquad I = I_{\text{MAX}} \sin \omega t$$

$$V = V_{\text{MAX}} \sin \omega t \qquad I_{\text{MAX}} = \sqrt{2} I_{\text{rms}} \qquad V_{\text{MAX}} = \sqrt{2} V_{\text{rms}} \qquad X_C = \frac{1}{\omega C}$$

$$X_L = \omega L \qquad V = IZ \qquad \omega = 2\pi f \qquad f = \frac{1}{T}$$

Raraunga whitake

Te tere o te aho	$= 3.00 \times 10^8 \text{ m s}^{-1}$
Te whana kei te irahiko	$= -1.60 \times 10^{-19} \text{ C}$
Te whakaterenga nā te tō ā-papa o Papatūānuku	$= 9.81 \text{ m s}^{-2}$
Aumou hiko	$= 8.85 \times 10^{-12} \text{ F m}^{-1}$
Te tō ā-papa pūmau tukupū	$= 6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$

Useful data

Speed of light	$= 3.00 \times 10^8 \text{ m s}^{-1}$
Charge on the electron	$= -1.60 \times 10^{-19} \text{ C}$
Acceleration due to gravity on Earth	$= 9.81 \text{ m s}^{-2}$
Permittivity of free space	$= 8.85 \times 10^{-12} \text{ F m}^{-1}$
Universal gravitational constant	$= 6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$

English translation of the wording on the front cover

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Level 3 Physics, 2018

2.00 p.m. Tuesday 20 November 2018

RESOURCE BOOKLET for 91523, 91524 and 91526

Refer to this booklet to answer the questions in your Question and Answer Booklets.

Check that this booklet has pages 2–3 in the correct order and that none of these pages is blank.

YOU MAY KEEP THIS BOOKLET AT THE END OF THE EXAMINATION.