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L3–PHYSR

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RESOURCE BOOKLET

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 neither of them is blank.

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You may find the following formulae and data useful.

91523 Demonstrate understanding of wave systems

$$d\sin\theta = n\lambda \qquad n\lambda = \frac{dx}{L} \qquad f' = f\frac{v_{\mathrm{W}}}{v_{\mathrm{W}} \pm v_{\mathrm{S}}} \qquad v = f\lambda \qquad f = \frac{1}{T}$$

91524 Demonstrate understanding of mechanical systems

$$F = ma \qquad p = mv \qquad \Delta p = F\Delta t \qquad \Delta E_{\mathrm{p}} = mg\Delta h$$

$$W = Fd \qquad E_{\mathrm{K(LIN)}} = \frac{1}{2}mv^2 \qquad x_{\mathrm{COM}} = \frac{m_1x_1 + m_2x_2}{m_1 + m_2}$$

$$d = r\theta \qquad v = r\omega \qquad a = r\alpha \qquad \omega = \frac{\Delta\theta}{\Delta t}$$

$$\alpha = \frac{\Delta\omega}{\Delta t} \qquad \omega = 2\pi f \qquad f = \frac{1}{T} \qquad E_{\mathrm{K(ROT)}} = \frac{1}{2}I\omega^2$$

$$\omega_{\mathrm{f}} = \omega_{\mathrm{i}} + \alpha t \qquad \theta = \frac{\omega_{\mathrm{f}} + \omega_{\mathrm{i}}}{2}t \qquad \omega_{\mathrm{f}}{}^2 = \omega_{\mathrm{i}}{}^2 + 2\alpha\theta \qquad \theta = \omega_{\mathrm{i}}t + \frac{1}{2}\alpha t^2$$

$$\tau = I\alpha \qquad \tau = Fr \qquad L = mvr \qquad \theta = \omega_{\mathrm{f}}t - \frac{1}{2}\alpha t^2$$

$$F_{\mathrm{g}} = \frac{\mathrm{G}Mm}{r^2} \qquad F_{\mathrm{c}} = \frac{mv^2}{r} \qquad L = I\omega$$

$$F = -ky \qquad E_{\mathrm{p}} = \frac{1}{2}ky^2 \qquad T = 2\pi\sqrt{\frac{l}{g}} \qquad T = 2\pi\sqrt{\frac{m}{k}}$$

$$y = A\sin\omega t \qquad v = A\omega\cos\omega t \qquad a = -A\omega^2\sin\omega t \qquad a = -\omega^2 y$$

$$y = A\cos\omega t \qquad v = -A\omega\sin\omega t \qquad a = -A\omega^2\cos\omega t$$

91526 Demonstrate understanding of electrical systems

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

$$C = \frac{\varepsilon_o \varepsilon_r A}{d} \qquad C_{\mathrm{T}} = C_1 + C_2 + \ldots \qquad \frac{1}{C_{\mathrm{T}}} = \frac{1}{C_1} + \frac{1}{C_2} + \ldots \qquad \tau = RC$$

$$R_{\mathrm{T}} = R_1 + R_2 + \ldots \qquad \frac{1}{R_{\mathrm{T}}} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots \qquad V = IR \qquad P = VI$$

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

$$\frac{N_{\mathrm{p}}}{N_{\mathrm{s}}} = \frac{V_{\mathrm{p}}}{V_{\mathrm{s}}} \qquad E = \frac{1}{2}LI^2 \qquad \tau = \frac{L}{R} \qquad I = I_{\mathrm{MAX}} \sin \omega t$$

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

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

Useful data

Speed of light, $c = 3.00 \times 10^8$ m s^{-1}

Charge on an electron, $q = -1.60 \times 10^{-19}$ C

Acceleration due to gravity on Earth, $g = 9.81$ m s^{-2}

Permittivity of free space, $\varepsilon_0 = 8.85 \times 10^{-12}$ F m^{-1}

Universal Gravitational Constant, $G = 6.67 \times 10^{-11}$ N m^2 kg^{-2}