Wave and Motion : Answers to Objective and Subjective Questions (Typical)

A-01	(a) $\frac{mkx}{M+m}$ (b) $mg-\frac{mkx}{M+m}$ at the highest point (c) $g\frac{(M+m)}{k}$
A-02	(a) $\frac{(m_1+m_2)g\sin\theta}{k}$ (b) When spring acquires its natural length (c) $\sqrt{\frac{3}{k}(m_1+m_2)}\ g\sin\theta$
A-03	(a) 10 cm (b) 2.5 J (c) $\frac{\pi}{5}$ s (d) 20 cm (e) 4.5 J (f) 0.5 J
A-04	(a) $2\pi\sqrt{\frac{m}{k_1+k_2}}$ (b) $2\pi\sqrt{\frac{m}{k_1+k_2}}$ (c) $2\pi\sqrt{\frac{m(k_1+k_2)}{k_1k_2}}$
A-05	(a) $\frac{F}{k}$, $2\pi\sqrt{\frac{m}{k}}$ (b) $\frac{F^2}{2k}$ (c) $\frac{F^2}{2k}$
A-06	$2\pi\sqrt{\frac{m}{2k}}$
A-07	$2\pi\sqrt{\frac{2m}{3k}}$
A-08	$\frac{F(k_2+k_3)}{k_1k_2+k_2k_3+k_3k_1}$, $\frac{1}{2\pi}\sqrt{\frac{k_1k_2+k_2k_3+k_3k_1}{m(k_2+k_3)}}$
A-09	$\frac{M^2g^2}{2k_1}$, $\frac{M^2g^2}{2k_2}$, and $\frac{M^2g^2}{2k_3}$ from the above, the time period is $2\pi\sqrt{M\left(\frac{1}{k_1}+\frac{1}{k_2}+\frac{1}{k_3}\right)}$
A-10	$2\pi\sqrt{\frac{m}{k}}$
A-11	$2\pi\sqrt{\frac{\left(m+\frac{I}{r^2}\right)}{k}}$
A-12	$2\pi\sqrt{\frac{m}{2k}}$

A-13	$2\pi\sqrt{\frac{L}{g}}$
A-14	$\frac{5}{2\pi}$ Hz, 5 cm
A-15	$\pi\sqrt{\frac{m}{k}}+\frac{2L}{v}$
A-16	0.73
A-17	(a) $\frac{Mx_0}{M+m}$, $\frac{mx_0}{M+m}$, (b) $2\pi\sqrt{\frac{mM}{k(M+m)}}$
A-18	$2\pi\sqrt{\frac{l}{2\mu g}}$
A-19	1m
A-20	1m
A-21	28.8 minutes slow
A-22	9,795 m.s^{-2}
A-23	(a) $\frac{0.70}{\pi}$ (b) $\frac{1}{2\pi\sqrt{3}}$ Hz
A-24	$\cos^{-1}\left(\frac{3}{4}\right)$
A-25	$2\pi\sqrt{\frac{R}{g}}$
A-26	$2\pi\sqrt{\frac{7(R-r)}{5g}}$
A-27	1.45 s
A-28	$\frac{\pi}{2}\sqrt{\frac{R}{g}}$ in each case
A-29	(a) $\frac{GMm}{R^3}\sqrt{x^2+\frac{R^2}{4}}$ (b) $\frac{GMm}{R^3}x$, $\frac{GMm}{2R^2}$ (c) $\frac{GMm}{2R^2}$

	(d) $\frac{GMm}{R^3}x$ (e) $2\pi\sqrt{\frac{R^3}{GM}}$
A-30	(a) $2\pi\sqrt{\frac{l}{g+a_0}}$ (b) $2\pi\sqrt{\frac{l}{g-a_0}}$ (c) $2\pi\sqrt{\frac{l}{g}}$
A-31	4 feet.s^{-2} upwards
A-32	$\frac{g}{10}$
A-33	(a) ma (b) $2\pi\sqrt{\frac{l}{a}}$ where $a=\left[g^2+\frac{v^4}{r^2}\right]^{\frac{1}{2}}$
A-34	(a) 0.34 s (b) 0.30 s
A-35	(a) 1.51 s (b) $2\pi\sqrt{\frac{2r}{g}}$ (c) $2\pi\sqrt{\frac{\sqrt{8}a}{3g}}$ (d) $2\pi\sqrt{\frac{3r}{2g}}$
A-36	$\frac{2l}{3}$
A-37	$2\pi\sqrt{\frac{r\sqrt{2}}{g}}$, $\frac{r}{\sqrt{2}}$
A-38	0.89 s, it is about 4% larger than the calculated value

A-39	(a) 50 cm (b) 11 cm/s (c) 1,2 cm/s^2 towards the point of suspension (d) 34 cm/s^2 towards the mean position
A-40	$\frac{2\pi^2 mr^2}{T^2}$
A-41	$\sqrt{\frac{k^2}{L^2}\theta^4+m^2g^2}$
A-42	(a) 7.0 cm (b) 6.1 cm (c) 5.0 cm
A-43	2A
A-44	(a) -2.41 cm (b) 0.27 cm
A-45	$\sqrt{x_0^2+s_0^2+\sqrt{2}x_0s_0}$
A-46	$\frac{1}{2\pi}\sqrt{\frac{A^2p_0+AMg}{MV_0}}$
A-47	0.6 s.
A-48	$\frac{\pi}{2}\sqrt{\frac{mL}{2qE}}$ s
A-49	(a) $\tan^{-1}\frac{1}{5}$ (b) $2.5\sqrt{R}$ s.
A-50	(a) $\frac{1}{\pi}$ Hz (b) 6.3×10^{-2}m.s^{-1} (c) 4.0×10^{-4}J

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