

第十章：振动 (2003年-2017年)

① $\downarrow T = 2\pi \sqrt{\frac{l}{g}}$ \uparrow ; $g_y > g_x$
 $T = 2\pi \sqrt{\frac{l}{g}}$ \uparrow ; l 加长
 B

② $\uparrow T = 2\pi \sqrt{\frac{l}{g}}$ \downarrow
 $T = 2\pi \sqrt{\frac{l}{g-a}}$
 C

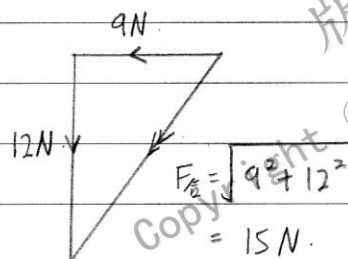
③ $\frac{1}{k} = \frac{1}{k_1} + \frac{1}{k_2}$; $k_1 = k_2$
 $\frac{1}{6} = \frac{1}{k_1} + \frac{1}{k_1}$
 $\frac{1}{6} = \frac{2}{k_1}$
 $k_1 = 12 \text{ Nm}^{-1}$

$k_{\text{total}} = k_1 + k_2$
 $= 12 + 12$
 $= 24 \text{ Nm}^{-1}$
 $T = 2\pi \sqrt{\frac{m}{k_{\text{total}}}}$
 $\frac{1}{f} = 2\pi \sqrt{\frac{0.2}{24}}$
 $f = 1.74 \text{ Hz}$

④ $k_{\text{total}} = k + k$
 $= 2k$
 $= 2 \times 3280$
 $= 6560 \text{ Nm}^{-1}$
 $T = 2\pi \sqrt{\frac{m}{k_{\text{total}}}}$
 $\frac{1}{f} = 2\pi \sqrt{\frac{0.55}{6560}}$
 $f = 17.38 \text{ Hz}$

⑤ B

⑥ $F = kx$
 $12 = k(0.04)$
 $k = 300 \text{ Nm}^{-1}$



$F = kx$
 $15 = 300x$
 $x = 0.05 \text{ m}$

⑦ $F = kx$ $T = 2\pi \sqrt{\frac{m}{k}}$
 $mg = kx$ $= 2\pi \sqrt{\frac{m}{100m}}$
 $10m = k(0.1)$ $= \frac{\pi}{5} \#$
 $k = 100m$

C

⑧ $T = 2\pi \sqrt{\frac{l}{g}}$ $y = mx + c$
 $T^2 = 4\pi^2 \frac{l}{g}$ $\downarrow \downarrow \downarrow \downarrow$
 $T^2 = \frac{4\pi^2}{g} l + c$

B

⑨ A

⑩ $F = kx$ $F = kx$
 $mg = kx$ $ma = kx$
 $10m = k(0.04)$ $ma = 250m(0.01)$
 $k = 250m$ $a = 2.5 \text{ ms}^{-2}$

A

作答题

① (i) $V_{\text{max}} = Aw$ $T = 2\pi \sqrt{\frac{l}{g}}$
 $0.3 = 2.214A$ $\frac{2\pi}{w} = 2\pi \sqrt{\frac{2}{g}}$
 $A = 0.136 \text{ m}$ $w = \sqrt{\frac{g}{2}}$
 $= 2.214 \text{ rad/s}$

(ii) $m_1 u_1 + m_2 u_2 = (m_1 + m_2) V$
 $(0.1 \times 0.3) + (0.006 \times 0) = (0.1 + 0.006) V$
 $V = 0.283 \text{ ms}^{-1}$

(iii) $V_{\text{max}} = Aw$
 $0.283 = A \times 2.214$
 $A = 0.128 \text{ m}$

(iv) 单摆碰撞前和碰撞后的周期是相同的。因为影响单摆周期的物理量是摆长和重力加速度。

② (a) (i) 看 Graph 纸

(ii) $F = kx$

$F = k(L - L_0)$

$F = kL - kL_0$

$kL = F + kL_0$

$L = \frac{1}{k}F + \frac{kL_0}{k}$

$y = mx + c$

$L_0 = 4 \text{ cm.}$

$m = \frac{y_2 - y_1}{x_2 - x_1}$
 $\frac{1}{k} = \frac{22.5 - 4}{5 - 0}$

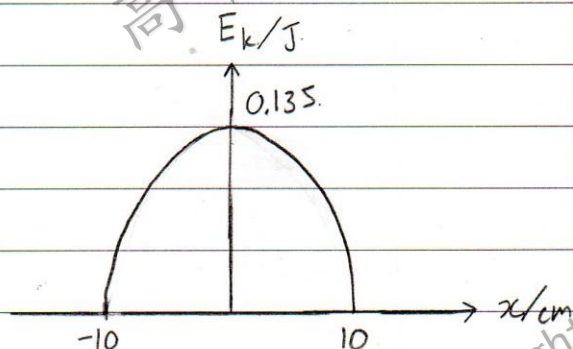
$k = 0.2703 \text{ Ncm}^{-1}$
 $27.03 \text{ Nm}^{-1} \#$

(b) (i) $E = \frac{1}{2}kA^2$

$= \frac{1}{2} \times 27.03 \times (0.1)^2$

$= 0.135 \text{ J} \#$

(ii)



L 相对 W

