

Bài 3. CON LẮC ĐƠN

3.1. Câu D.

3.2. Câu B.

3.3. Câu C.

3.4. Câu D.

3.5. Câu C.

$$E_d = 2E_t \Rightarrow E = 3E_t$$

$$E_t = \frac{1}{3}E \Rightarrow \frac{1}{2}mgl\alpha^2 = \frac{1}{3} \cdot \frac{1}{2}mgl\alpha_0^2$$

$$\alpha = \frac{\alpha_0}{\sqrt{3}}$$

3.6. Câu B.

$$2\pi\sqrt{\frac{m}{k}} = 2\pi\sqrt{\frac{l}{g}} \Rightarrow \frac{m}{k} = \frac{l}{g} \Rightarrow m = \frac{kl}{g} = \frac{10.0490}{9,8} = 0,500 \text{ kg}$$

3.7. Câu B.

3.8. Câu D.

3.9. Câu A.

Áp dụng định luật bảo toàn cơ năng :

$$\frac{1}{2}mv^2 + mgl(1 - \cos \alpha) = mgl(1 - \cos \alpha_0)$$

3.10. Câu C.

3.11. a) $T = 2\pi\sqrt{\frac{l}{g}} = 6,283\sqrt{\frac{1,20}{9,8}} \approx 2,2 \text{ s}$

b) $\omega = \sqrt{\frac{g}{l}} = \sqrt{\frac{9,8}{1,20}} \approx 2,9 \text{ rad/s}$

$$10^\circ = 0,1745 \text{ rad}$$

$$s_0 = \alpha_0 l = 0,1745 \cdot 1,20 \approx 0,21 \text{ m}$$

$$\text{Tại } t = 0 \begin{cases} s = s_0 \cos \varphi = s_0 \\ v = -\omega s_0 \sin \varphi = 0 \end{cases} \Rightarrow \varphi = 0$$

$$s = 0,21 \cos 2,9t \text{ (m)}$$

c) $v_m = s_0 \omega = 0,21 \cdot 2,9 = 0,609 \approx 0,61 \text{ m/s}$

$$a = 0 \text{ m/s}^2.$$

$$3.12. a) \quad T = 2\pi\sqrt{\frac{l}{g}} = 6,28\sqrt{\frac{2,0}{9,8}} \approx 2,83 \approx 2,8 \text{ s}$$

$$b) \quad \frac{1}{2}mv_m^2 = mgl(1 - \cos \alpha_0)$$

$$v_m = \sqrt{2gl(1 - \cos \alpha_0)} = \sqrt{2 \cdot 9,8 \cdot 2,0 \cdot (1 - \cos 30^\circ)} \approx 2,3 \text{ m/s}$$

$$F - mg = \frac{mv_m^2}{l} \Rightarrow F = m \left(g + \frac{v_m^2}{l} \right)$$

$$F = 0,05 \left[9,8 + \frac{(2,3)^2}{2,0} \right] \approx 0,62 \text{ N.}$$

$$3.13. a) \quad s_0 = \frac{12}{2} = 6 \text{ cm}$$

$$T = 2\pi\sqrt{\frac{l}{g}} = 2\pi\sqrt{\frac{1,0}{9,8}} \Rightarrow T = 2,0 \text{ s.}$$

$$b) \text{ Tại } t = 0 : x = s_0 \cos \varphi = 0 \Rightarrow \cos \varphi = 0$$

$$v = -s_0\omega \sin \varphi > 0 \Rightarrow \sin \varphi < 0$$

$$\Rightarrow \varphi = -\frac{\pi}{2}$$

$$\omega = \frac{2\pi}{T} = \frac{2\pi}{2,0} = \pi \text{ rad/s}$$

$$s = 6 \cos \left(\pi t - \frac{\pi}{2} \right) \text{ (cm ; s)}$$

$$c) \quad v_m = \omega s_0 = 3,14 \cdot 0,06 \text{ m/s}$$

$$v_m = 0,19 \text{ m/s.}$$

$$3.14. a) \quad T = 2\pi\sqrt{\frac{l}{g}} = 2\pi\sqrt{\frac{1,0}{9,8}} = 2,0 \text{ s}$$

$$b) \quad v_m = \sqrt{2gl(1 - \cos \alpha_0)}$$

$$= \sqrt{2 \cdot 9,8 \cdot 1,00 \left(1 - \frac{\sqrt{3}}{2} \right)} \approx 0,19 \text{ m/s}$$

$$v = \sqrt{2gl(\cos \alpha - \cos \alpha_0)}$$

$$= \sqrt{2 \cdot 9,8 \cdot 1,00(\cos 10^\circ - \cos 30^\circ)} = 0,14 \text{ m/s.}$$

3.15. a) Theo định luật bảo toàn cơ năng, ta suy ra hai vị trí biên A và B phải ở cùng một độ cao (Hình 3.1G).

$$h_A = h_B$$

$$l(1 - \cos \alpha_1) = \frac{l}{2}(1 - \cos \alpha_2)$$

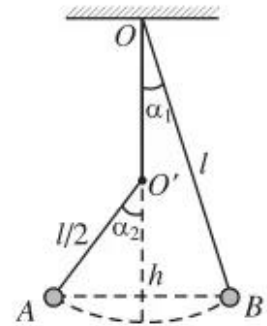
$$\Rightarrow \cos \alpha_2 = 2 \cos \alpha_1 - 1 = 2 \cdot \cos 10^\circ - 1 = 0,9696$$

$$\Rightarrow \alpha_2 = 14^\circ.$$

$$\text{b) } T = \frac{T_1 + T_2}{2}$$

$$T_1 = 2\pi\sqrt{\frac{l}{g}} ; T_2 = 2\pi\sqrt{\frac{l}{2g}}$$

$$T = \pi\sqrt{\frac{l}{g}} \left(1 + \frac{1}{\sqrt{2}}\right) = 3,14\sqrt{\frac{1,00}{9,8}} \left(1 + \frac{1}{\sqrt{2}}\right) = 1,7 \text{ s}$$



Hình 3.1G