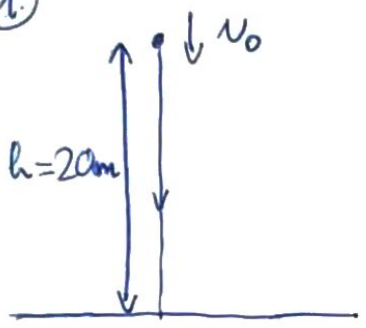
1. VIZSGA

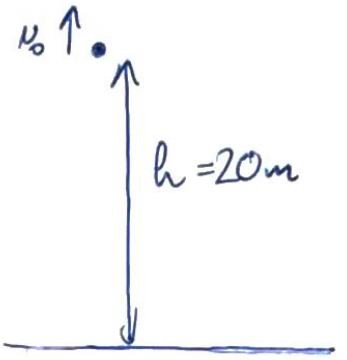
1.



$t_1 = 1{,}0\,s$

$$h = v_0 t_1 + \frac{g}{2} t_1^2$$

$$v_0 = \frac{h - \frac{g}{2} t_1^2}{t_1} = 15\,\frac{m}{s}$$



t_2

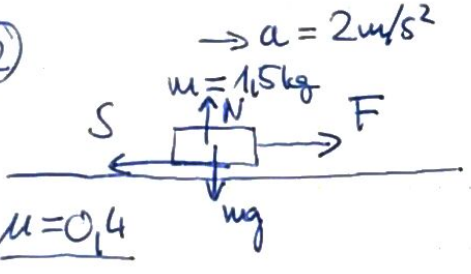
$$-h = v_0 t_2 - \frac{g}{2} t_2^2$$

$$\rightarrow \quad -20m = 15\,\frac{m}{s} \cdot t_2 - 5\,\frac{m}{s^2} \cdot t_2^2$$

$$t_2^2 - 3t_2 - 4 = 0$$

$$\underline{\underline{t_2 = 4\,s}} \Rightarrow (A)$$

2.



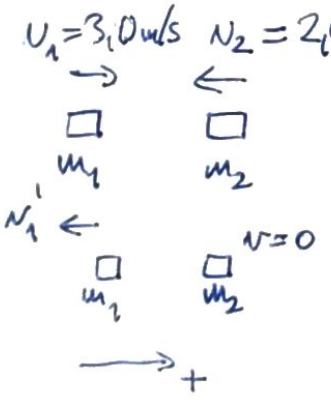
$\mu = 0{,}4$

$$F - S = ma$$

$$F - \mu mg = ma$$

$$\underline{\underline{F = m(a + \mu g) = 9N}} \Rightarrow (C)$$

3.



Lendületmegmaradás:

$$m_1 v_1 - m_2 v_2 = -m_1 v_1'$$

$$v_1' = \frac{m_2}{m_1} v_2 - v_1 \quad (1)$$

energiamegmaradás: $\frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2 = \frac{1}{2}m_1v_1'^2$

(1)-gyel:

$$v_1^2 + \frac{m_2}{m_1}v_2^2 = \left(\frac{m_2}{m_1}v_2 - v_1\right)^2$$

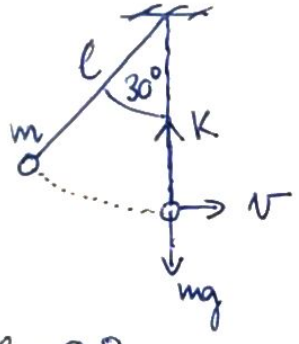
$$v_1^2 + \frac{m_2}{m_1}v_2^2 = \frac{m_2^2}{m_1^2}v_2^2 - 2\frac{m_2}{m_1}v_1v_2 + v_1^2$$

$$v_2^2\left(\frac{m_2^2}{m_1^2} - \frac{m_2}{m_1}\right) = 2\frac{m_2}{m_1}v_1v_2$$

Egyszerűsítések után:

$$v_2\left(\frac{m_2}{m_1} - 1\right) = 2v_1 \Rightarrow \underline{\underline{\frac{m_2}{m_1} = 1 + \frac{2v_1}{v_2} = 4}} \Rightarrow (D)$$

(4.)



$l = 0{,}8\,m$

$\underline{m = 0{,}25\,kg}$

energiamegmaradás:

$$mgl(1-\cos 30°) = \frac{1}{2}mv^2$$

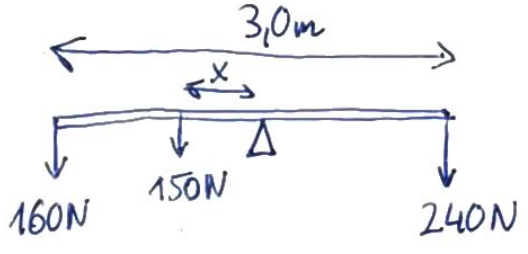
$$v^2 = 2gl(1-\cos 30°)$$

$$\underline{\underline{K - mg = m\frac{v^2}{l}}} \rightarrow K = m\left(g + \frac{v^2}{l}\right) =$$

$$= mg\left(1 + 2(1-\cos 30°)\right) =$$

$$= mg\left(3 - 2\cos 30°\right) = \underline{\underline{3{,}2\,N}} \Rightarrow (C)$$

(5)

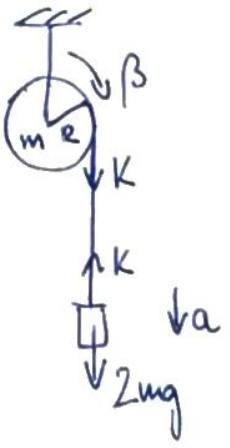


forgatónyomatékok aránya:

$$150 \cdot x + 160 \cdot \frac{3}{2} = 240 \cdot \frac{3}{2}$$

$$\underline{\underline{x = 80\,cm}} \Rightarrow (B)$$

⑥



test: $2mg - K = 2ma$

csiga: $KR = \frac{1}{2}mR^2\beta \rightarrow K = \frac{1}{2}ma$

a fonál nem csúszik meg: $a = \beta R$

$$2mg - \frac{1}{2}ma = 2ma \rightarrow a = \frac{4}{5}g \Rightarrow (D)$$

⑦

$$a_{max} = A \cdot \omega^2$$

A grafikonról leolvasható:

— periódusidő (két szomszédos maximum „távolsága"): 6 beosztás

5 beosztás 2s-ot jelent, azaz

$$T = \frac{6}{5} \cdot 2s = 2{,}4s \rightarrow \omega = \frac{2\pi}{T} = \frac{5\pi}{6}\frac{1}{s} \approx 2{,}6\frac{1}{s}$$

— amplitúdó: 3 beosztás, 2 beosztás 5 cm-nek felel meg, így (maximum magassága)

$$A = \frac{3}{2} \cdot 5\,cm = 7{,}5\,cm = 0{,}075\,m$$

Tehát:

$$a_{max} = 0{,}51\,m/s^2 \Rightarrow (C)$$

⑧

$\frac{\Delta N}{\Delta t} = 2{,}4 \cdot 10^{23}\ 1/s$

$A = 12{,}0\ cm^2$

$\langle v_x \rangle = 260\ m/s$

$M = 32\ g/mol$

$$p = \frac{\langle F \rangle}{A} = \frac{1}{A} \cdot \frac{\Delta I}{\Delta t} = \frac{1}{A} \cdot \frac{2 \cdot m \cdot \Delta N \langle v_x \rangle}{\Delta t} \approx$$

$$\approx 5{,}5\ kPa \Rightarrow (C)$$

egy molekula tömege:

$$m = \frac{M}{N_A} = 5{,}3 \cdot 10^{-23}\ g$$

(9)

$A = 5{,}0\,m^2$

$d = 0{,}12\,m$

$\Delta T = 20°C$

$K = 0{,}80\ \frac{W}{K \cdot m}$

A hővezetés egyenlete nevét:

$$P = K \cdot A \cdot \frac{\Delta T}{d} = 667\,W \Rightarrow (D)$$