

Παρασκευή 22.1.2021

B+2

1^ο ΓΕΛ
ΣΑΛΑΜΙΝΑΣ

$$\begin{array}{c}
 \text{Diagram showing a beam with a fixed support at the left end and a roller support at the right end. A horizontal force } P_1 \text{ acts downwards at the center.} \\
 \text{Free body diagram:} \\
 \text{Left side: } m_1, K_1, U_{1\text{left}} = 0, Q = |AK| = ? \\
 \text{Center: } m_2, K_2, U_{2\text{center}} = 0, P_1 \text{ acting downwards} \\
 \text{Right side: } m_3, K_3, U_{3\text{right}} = 0, U_{3\text{left}} = 0
 \end{array}$$

$$\begin{aligned} \vec{P}_{\text{out}} - \vec{P}_{\text{in}} = 0 &\Rightarrow \vec{P}_{\text{out}} = \vec{P}_{\text{in}} \\ \Delta x \text{ אמצע } A \Delta x & \quad \vec{P}_{\text{out}} = \vec{P}_{\text{in}} \text{ ו } \Delta x \Rightarrow \\ \vec{P}_{\text{out}(\text{exit})} = 0 &\Rightarrow \vec{P}_1 + \vec{P}_2 = 0 \Rightarrow \\ \vec{P}_2 = -\vec{P}_1 &\Rightarrow \text{zo בזע קוויזין} \end{aligned}$$

+ סופ' פירסום

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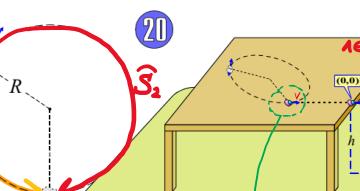
$$\text{Ans: } P_{\text{ex}} = P_1' \Rightarrow P_1 - P_2 = 0 \Rightarrow P_1 = P_2 \Rightarrow \mu U_1 = 3 \mu U_2 \Rightarrow U_2 = \frac{U_1}{3}$$

$$k_{\text{ext}} = k_1 + k_2 = \frac{1}{2} m V_1^2 + \frac{1}{2} m V_2^2 = \frac{1}{2} m V_1^2 + \frac{1}{2} m \frac{V_1^2}{\frac{1}{3}} = \frac{1}{2} m V_1^2 + \frac{1}{3} \frac{1}{2} m V_1^2 = k + \frac{1}{3} k = \frac{4}{3} k$$

$$\Delta K = k_{\text{on}}^{\text{up}} - k_{\text{on}}^{\text{down}} = 0 - \frac{4}{3}K = -\frac{4}{3}K$$

$$Q = |\Delta k| \Rightarrow Q = \frac{4}{3}k \rightarrow \textcircled{B}$$

$$\bullet \boxed{\Delta K_{\text{potenz}}} = K_{\text{on}} - K_{\text{ex}} = \frac{1}{2}(m_1 + m_2)V^2 - \left(\frac{1}{2}m_1 U_1^2 + \frac{1}{2}m_2 U_2^2 \right) = \\ = \frac{1}{2}(4+1) \cdot 4^2 - \left(\frac{1}{2} \cdot 4 \cdot 10^2 + \frac{1}{2} \cdot 1 \cdot 20^2 \right) = \\ = \frac{1}{2} \cdot 5 \cdot 16 - \frac{1}{2} \cdot 4 \cdot 100 - \frac{1}{2} \cdot 400 = \\ = 40 - 200 - 200 = \boxed{-360 \text{ Joule}}$$



The diagram shows a ball at the top of a ramp. The ramp is labeled with a height of 1.0 m and a length of 2.0 m. The ball has a mass of $m_1 = 4 \text{ kg}$ and an initial velocity of $v_1 = 10 \text{ m/s}$. It rolls on a horizontal surface for a distance of $s = 6 \text{ m}$ before stopping. A dashed blue line indicates the path of the ball's center of mass.

$$\Delta 1) \quad \vec{S}_1 + \vec{S}_2 = 2nR \Rightarrow v_1 t + v_2 t = 2nR \Rightarrow 10t + 20t = 2n \cdot 2 \Rightarrow 30t = 4n \Rightarrow t = \frac{4n}{30} \text{ sec}$$

$$\widehat{S}_1 = V_1 \cdot t = 10 \cdot \frac{2\pi}{15} = \frac{2\pi 10}{15} \Rightarrow \widehat{S}_1 =$$

W₁+W₂



$\bullet \text{ ADO: } \vec{P}_1 + \vec{P}_2 = \vec{P}_{64} \Rightarrow P_1 - P_2 = P_{64}$

$$\rightarrow W_1 - W_2 \downarrow L = (W_1 + W_2) V \Rightarrow$$

$$\Rightarrow 4 \cdot 10 - 1 \cdot 20 = (4+1) \cdot V \Rightarrow$$

$$\Rightarrow 40 - 20 = 5 \cdot V \Rightarrow 20 = 5 \cdot V \Rightarrow$$

Δ3) AΔME: $K + U = K' + U' \Rightarrow$

$$\Rightarrow \frac{1}{2}(m_1 + m_2)v^2 + (m_1 + m_2)gh = \frac{1}{2}(m_1 + m_2)v'^2 \Rightarrow$$

$$\Rightarrow \frac{1}{2} \cdot 4^2 + 10 \cdot h = \frac{1}{2} \cdot 6^2 \Rightarrow 8 + 10h = 18 \Rightarrow$$

$$\Rightarrow 10h = 10 \Rightarrow h = 1 \text{ m}$$

Δ4)

Diagram illustrating projectile motion. A curve labeled V starts at $(0,0)$. A right-angled triangle is shown below the curve with hypotenuse V , vertical leg u_y , and horizontal leg u_x . Angles ϕ and θ are marked. A coordinate system (x, y) is shown with the origin at $(0,0)$.

$\because \phi = \frac{u_y}{V} \Rightarrow$

$$\frac{1}{2} = \frac{g t}{V} \Rightarrow$$

$$\frac{1}{2} = \frac{10t}{4} \Rightarrow 4 = 20t \Rightarrow t = \frac{4}{20} \Rightarrow$$

$$\Rightarrow t = 1/5 \text{ sec}$$

$x = V \cdot t = 4 \cdot \frac{1}{5} \Rightarrow x = 0.8 \text{ m}$
 $y = \frac{1}{2} g t^2 = \frac{1}{2} \cdot 10 \left(\frac{1}{5}\right)^2 = 5 \cdot \frac{1}{25} \Rightarrow$
 $\Rightarrow y = 0.2 \text{ m}$

$(x, y) = (0.8, 0.2)$