cl. 9a _ S 18.2 _ Rez. de pb. _ Energia mecanică și teoremele de conservare și variație. 26.01.2021.

Hristev. IX–X
pag. 35–37.

$\boxed{E_c = \frac{mv^2}{2}}$ $\boxed{E_t = E_c + E_p}$

$\begin{cases} \Delta E_t = -L_{F\,nec.} \\ \Delta E_t = E_f - E_i = -L_{F\,nec.} \end{cases}$ Leg. var. energ. cu forțe necons.

$\begin{cases} E_{pg} = E_0 + mgh \\ E_{pe} = \frac{kx^2}{2} \end{cases}$ $\begin{cases} \Delta E_c = (E_{cf} - E_{ci}) = L \\ \Delta E_p = (E_{pf} - E_{pi}) = -L \end{cases}$

$\begin{cases} \Delta E_t = (E_f - E_i) = 0 \rightarrow \boxed{E_f = E_i} \\ \text{Leg. cons. energ.} \end{cases}$

$\begin{cases} L = \vec{F} \cdot \vec{d} = F \cdot d \cos\alpha . \\ P = L/t = \vec{F} \cdot \vec{v} = F \cdot v \cos\alpha \end{cases}$; $\eta = \left(\frac{L_u}{L_c}\right)(\%) < 1.$

$L_G = \pm G \cdot h$, $L_{F_f} = -F_f \cdot d < 0$, $L_{Fe} = -\frac{kx^2}{2} = -\frac{k \cdot \Delta x^2}{2}$

1/ Un corp cu masa $m = 2 kg$ este aruncat în sus cu $v_0 = 15 m/s$. Să se determine: a) E_{c0} – energ. cinetică inițială, b) H_{max} – înălțimea maximă de urcare. c) $E_c^{1/2}$ și $E_p^{1/2}$ la $H_{max}/2$
d) h – înălțimea la care $E_p(h) = E_p(h)$. Rezolvarea energetică

$m = 2 kg$
$v_0 = 15 m/s$

a) $E_{c0} = ?$
b) $H_{max} = ?$
c) $h = H_{max}/2$
$E_c^{1/2} = ?$ $E_p^{1/2} = ?$
d). $E_c(h) = E_p(h)$
$h = ?$

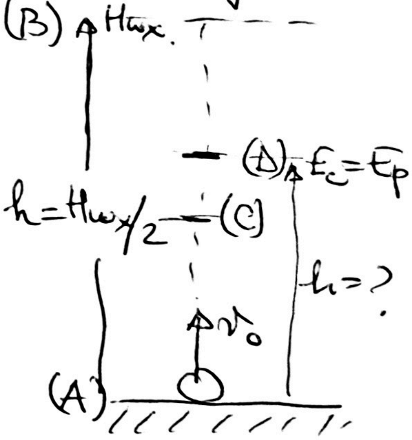
a) $E_c = \frac{mv_0^2}{2} = \frac{2 kg \cdot 15^2}{2} = 225 J$

b) $\boxed{\Delta E_c = L_G}$ (1)

$\begin{cases} \Delta E_c = E_c(B) - E_c(A) = 0 - \frac{mv_0^2}{2} \\ L_G = -G \cdot h = -G \cdot H_{max}. \end{cases}$

$\xrightarrow{(1)} -\frac{mv_0^2}{2} = -G \cdot H_{max} \,/(-1)$

$H_{max} = \frac{mv_0^2}{2 \cdot G} = \frac{mv_0^2}{2mg} = \frac{v_0^2}{2g} = \frac{15^2}{2 \cdot 10} = \frac{225}{20} = \frac{45}{4}.$



forțe conservative.

c) $h = (H_{max}/2) = \frac{45}{8} m$. $\rightarrow \boxed{E_A = E_C} \Rightarrow \boxed{\frac{mv_A^2}{2} = \left(\frac{mv_C^2}{2}\right) + mgh_C}$ (*)

$\begin{cases} E_c^{1/2}(h) = \frac{mv_C^2}{2} \overset{(*)}{=} \frac{m}{2} v_A^2 - mg\frac{H_{max}}{2} \\ E_p^{1/2}(h) = m \cdot g \frac{H_{max}}{2} \end{cases}$

$\begin{cases} E(A) = E_c(A) + E_p(A) = E_c(A) + 0 \\ E(C) = E_c(C) + E_p(C) = \frac{mv_C^2}{2} + mgh_C \end{cases}$

d) $h = ?$

$\begin{cases} E_p(h) = E_c(h) \\ \boxed{E_A = E_D} \end{cases}$ $\Rightarrow \frac{mv_D^2}{2} = mgh_D$ (*)

$\rightarrow \frac{\cancel{m}v_0^2}{2} = 2\cancel{m}gh_D \rightarrow h_D = \left(\frac{v_0^2}{4g}\right) = \frac{225}{40} = \frac{45}{8} m.$

$\begin{cases} E_A = \frac{mv_0^2}{2} + 0. \\ E_D = \frac{mv_D^2}{2} + mgh_D \overset{(*)}{=} 2mgh_D. \end{cases}$

(1.4.8/35) Pe ce adancime (h) patrunde in gheata o ranga de masa $m = 4\,kg$, daca forta medie de rezistenta a ghetii est $F_r = 400\,N$ iar viteza de lovire este $v = 2\,m/s$? (consideratii energetice)

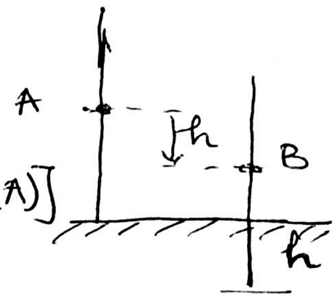
$m = 4\,kg$

$v = 2\,m/s$

$F_r = 400\,N$

$h = ?$, $(v = 0)$

$$\boxed{\Delta E = -L_{F_r}} \quad (1)$$



$$\begin{cases} E(A) = E_c(A) + E_p(A) \\ E(B) = 0 \end{cases}$$

$$\begin{cases} \Delta E = E_B - E_A = -[E_c(A) + E_p(A)] \\ L_{F_r} = -F_r \cdot h \quad (2) \end{cases}$$

deci, $\underline{E_c(A) + E_p(A) = F_r \cdot h}$

$$\begin{cases} E_c(A) = \dfrac{mv^2}{2} \\ E_p(A) = mgh \end{cases} \rightarrow \frac{mv^2}{2} + mgh = F_r \cdot h \qquad h = \frac{mv^2}{2(F_r - mg)}$$

$$\frac{mv^2}{2} = h(F_r - mg) \qquad h = \frac{4 \cdot \cancel{4}^{2}}{\cancel{2}(400 - 4 \cdot 10)} = \frac{8}{360}$$

$h = 2/90$; m

(1.4.58/39)

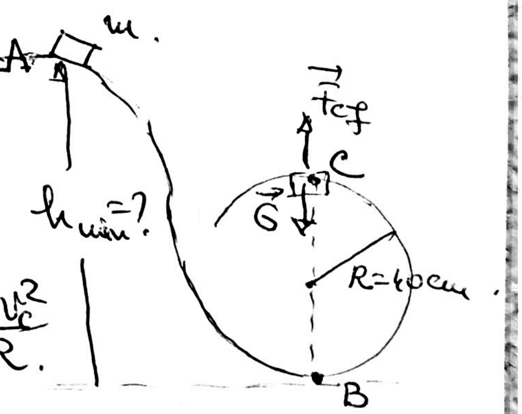
De la ce inaltime h_{min} - minima trebuie sa alunece fara frecare un corp de masa m pentru a descrie bucla de raza $R = 40\,cm$ din fig. alaturata?

m

$R = 40\,cm$

$h = ?$

Conditia de trecere prin starea C, pentru ca corpul sa nu cada este:



$$\begin{cases} \vec{R} = \vec{G} + \vec{F_{cf}} = 0 \rightarrow \boxed{G = F_{cf}} \quad (1) \\ Oy: F_{cf} - G = 0 \end{cases}$$

$G = mg$, $F_{cf} = \dfrac{mv_c^2}{R}$

deci: $\boxed{E(A) = E(C) \quad (2)}$ Leg. cons. energ.

$$\begin{cases} E(A) = E_c(A) + E_p(A) = 0 + mgh \\ E(C) = E_c(C) + E_p(C) = \dfrac{mv_c^2}{2} + mg(2R) \end{cases}$$

(2) $mgh = \underset{(*)}{\left(\dfrac{mv_c^2}{2}\right)} + 2mgR$

(1) $\boxed{mg = \dfrac{mv_c^2}{R} \Big/ \times \dfrac{1}{2}}$

$\dfrac{mg}{2} = \dfrac{mv_c^2}{2R}$

$\underset{(*)}{\rightarrow} \left(\dfrac{mv_c^2}{2}\right) = mg\dfrac{R}{2}$ (1)'

$mgh = mg\dfrac{R}{2} + 2mgR \;/ : mg$

$h = (2R + R/2) \rightarrow h = \left(\dfrac{5R}{2}\right) = \dfrac{5}{2} \cdot 0{,}4 = \dfrac{2}{2} = \underline{\underline{1\,m}}$