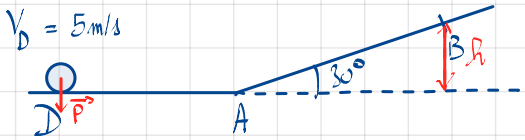
plus de bonnes notes
le soutien scolaire connecté

27/08/24.

Application : Une bille roule sur un plan horizontal



La bille roule sans frottement jusqu'au point B avant de rebrousser chemin.

Calculer la distance AB.

Le système ne subit que la force du poids. Il ne subit donc aucune force non conservative. D'après le théorème de l'énergie mécanique, on a :

$$\Delta E_m = E_m(B) - E_m(A) = \sum_{AB} W(\vec{F}_{nc})$$

$$E_m(B) - E_m(A) = 0.$$

$$E_m(B) = E_m(A).$$

$$E_c(B) + E_{pp}(B) = E_c(A) + E_{pp}(A).$$

Or $E_c(B) = 0\,J$ car $v_B = 0\,m/s$.

$E_{pp}(A) = 0\,J$ car $z_A = 0\,m$. D'où :

$g = 9,81\,N/kg$. $\quad E_{pp}(B) = E_c(A).$

$$mg z_B = \frac{1}{2} m v_A^2.$$

$$z_B = \frac{v_A^2}{2g}.$$

Or $\sin(\alpha) = \frac{z_B}{AB}$. $\quad 1 \times z_B = AB \times \sin(\alpha).$

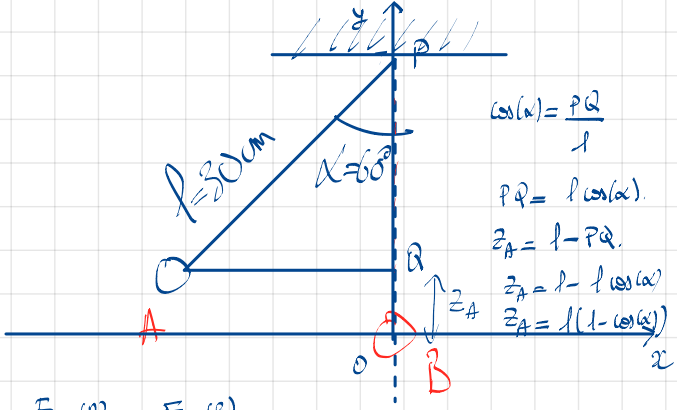
$$\frac{z_B}{\sin(\alpha)} = AB$$

$$AB = \frac{z_B}{\sin(\alpha)}$$

$$AB = \frac{\frac{v_A^2}{2g}}{\sin(\alpha)} = \frac{v_A^2}{2g} \times \frac{1}{\sin(\alpha)}$$

$$AB = \frac{v_A^2}{2g\sin(\alpha)} = \frac{5^2}{2 \times 9,81 \times \sin(30)}$$

$$AB = 2,55\,m.$$



$$E_m(A) = E_m(B).$$

$$E_c(A) + E_{pp}(A) = E_c(B) + E_{pp}(B).$$

$$\frac{1}{2} m v_A^2 + mg z_A = \frac{1}{2} m v_B^2 + mg z_B.$$

$= 0\,J$

$$g z_A = \frac{1}{2} v_B^2.$$

$$\boxed{v_B^2 = 2g z_A.}$$

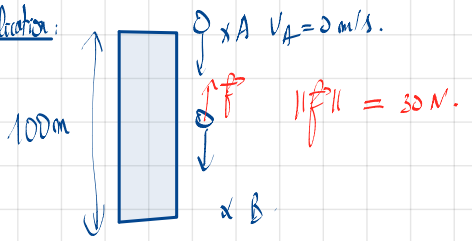
$$v_B = \sqrt{2g z_A}.$$

$$v_B = \sqrt{2g l(1 - \cos(\alpha))}$$

$$v_B = \sqrt{2 \times 9,81 \times 30 \times 10^{-2} \times (1 - \cos(60))}$$

$$\boxed{v_B = 1,72\,m/s}$$

Application :



$$E_m(B) - E_m(A) = W_{AB}(\vec{F})$$

$$\frac{1}{2} m v_B^2 + mg z_B - \left(\frac{1}{2} m v_A^2 + mg z_A\right) = -AB \times f$$

$$\frac{1}{2} m v_B^2 - mg z_A = -AB f.$$

$$\frac{1}{2} m v_B^2 = -AB f + mg z_A.$$

$$v_B = \sqrt{\frac{(-AB f + mg z_A)2}{m}}$$

$$v_B = \sqrt{\frac{(-100 \times 3 + 1 \times 9,81 \times 100)2}{1}}$$

$$\boxed{v_B = 36\,m/s.}$$