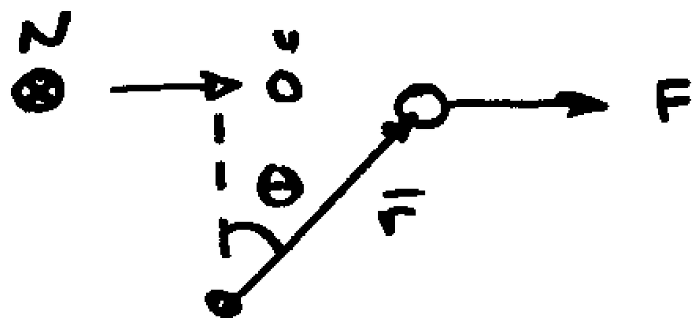
(11.5)

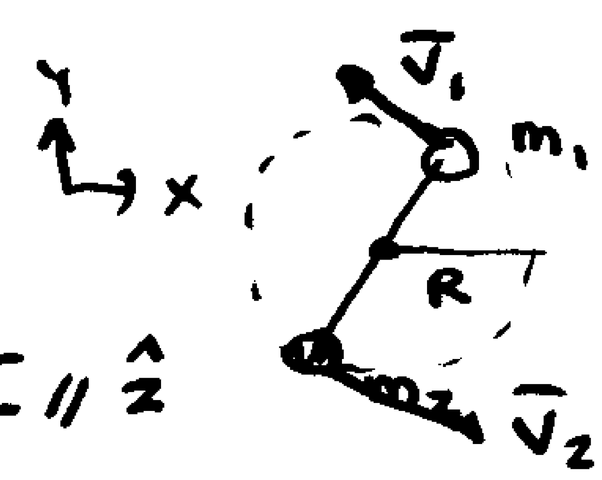



$\bar\tau = \bar r \times \bar F$

$\bar\tau$ är riktad åt norr (N)

$|\bar\tau| = rF\cdot\sin\theta = 0{,}450\cdot 0{,}785\cdot\sin 14^\circ$ Nm $=$
$= 0{,}343$ Nm

(11.11)




stångens massa $= 0$

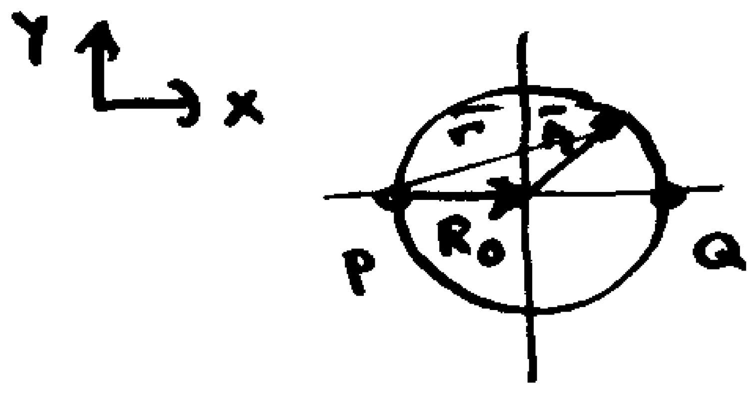
$\bar L \otimes$
dvs $\bar L \parallel \hat z$

$L = Rm_1v_1 + Rm_2v_2 = Rv(m_1+m_2) =$

$= 0{,}50\cdot 5{,}00\,(3{,}00 + 4{,}00)$ kgm²/s $=$

$= 17{,}5$ kgm²/s $\quad \therefore\ \bar L = 17{,}5\,\hat z$ kgm²/s

(11.15)




$\bar r = \bar R_0 + \bar r_1 = R\hat x + R\cos\omega t\cdot\hat x + R\sin\omega t\,\hat y$

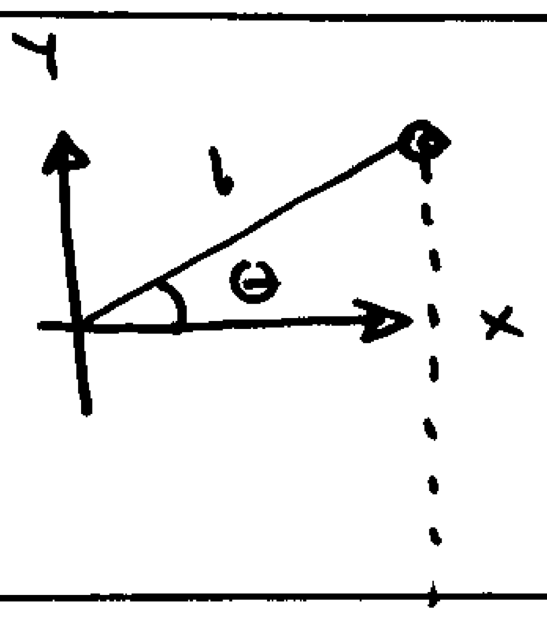
$\Rightarrow \bar v = 0 + -\omega R\sin\omega t\,\hat x + \omega R\cos\omega t\cdot\hat y$

$\bar L = \bar r \times m\bar v = mR\left[(1+\cos\omega t)\,\hat x + \sin\omega t\,\hat y\right] \times \omega R\left[-\sin\omega t\,\hat x + \cos\omega t\,\hat y\right]$

$= m\omega R^2\left[(1+\cos\omega t)\cos\omega t\,\hat z - \sin^2\omega t\,(-\hat z)\right] = m\omega R^2(1+\cos\omega t)\,\hat z$

$= mvR\left[\cos\left(\frac{vt}{R}\right) + 1\right]\hat z$

(11.19)

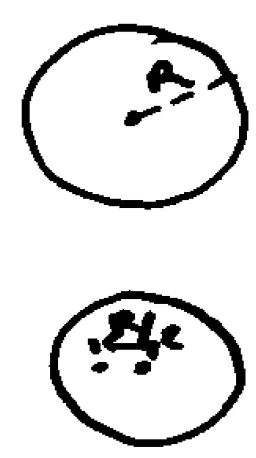



$\bar r(t) = l\cdot\cos\theta\,\hat x + (l\cdot\sin\theta - gt)\,\hat y$

$\bar v(t) = -gt\,\hat y$

$\Rightarrow\ \bar L = \bar r \times m\bar v = -l\cdot\cos\theta\, gt\,\hat z$

(11.23)



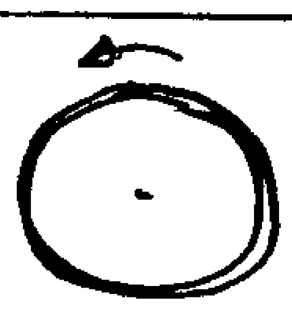

a) $I_a = \frac{1}{2}MR^2 \qquad L_a = I_a\omega = \frac{1}{2}MR^2\cdot\omega = \frac{1}{2}\,3{,}00\cdot(0{,}200)^2\cdot 6{,}0 =$
$= 0{,}360$ kgm²/s

b) $I_b = \frac{1}{2}MR^2 + M\left(\frac{R}{2}\right)^2$ [se sid 304]

$L_b = \left(\frac{1}{2}MR^2 + \frac{1}{4}MR^2\right)\omega = 0{,}540$ kgm²/s.

(11.27)

$I = MR^2$

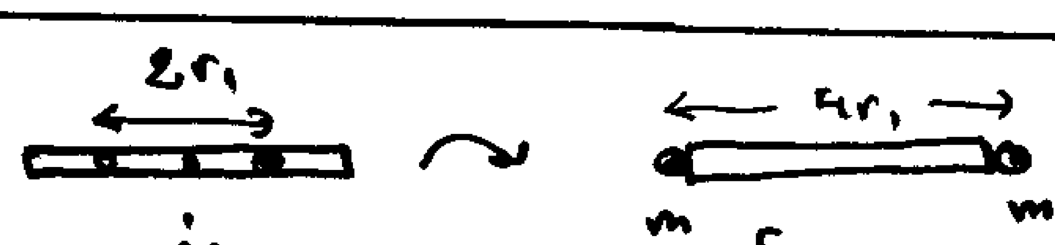


$\frac{v^2}{R} = g \Rightarrow v = \sqrt{gR} \Rightarrow \omega = \sqrt{\frac{g}{R}}$

a) $L = I\omega = MR^2\sqrt{\frac{g}{R}} = 5\cdot 10^4\cdot 100^2\cdot\sqrt{\frac{9{,}81}{100}}$ kgm²/s $= 1{,}57\cdot 10^8$ kgm²/s

b) $\left.\begin{array}{l}\Delta L = \tau\cdot\Delta t\\ \tau = F\cdot R\end{array}\right\} \Rightarrow \Delta t = \frac{MR^2\sqrt{\frac{g}{R}}}{F\cdot R} = \frac{5\cdot 10^4\cdot 100\cdot\sqrt{\frac{9{,}81}{100}}}{2\cdot 125} = 6{,}2\cdot 10^3$ s

(11.31)




$4r_1 = 0{,}50$ m $= L$

$L_i = \left[\frac{1}{12}ML^2 + 2m\left(\frac{L}{4}\right)^2\right]\cdot\omega_i$

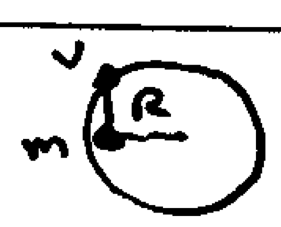
$L_f = \left[\frac{1}{12}ML^2 + 2m\left(\frac{L}{2}\right)^2\right]\omega_f$

$L_i = L_f \Rightarrow \omega_f = \frac{\frac{1}{12}ML^2 + 2m\left(\frac{L}{4}\right)^2}{\frac{1}{12}ML^2 + 2m\left(\frac{L}{2}\right)^2}\cdot\omega_i =$

$= 9{,}20$ rad/s.

När pärlorna ramlar av tappar syst. L. $\omega$ oförändrat $= \omega_f$

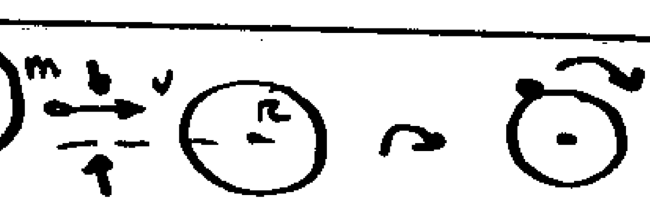
(11.33)




$L_i = 0 \quad L_f = I\omega - mvR \Rightarrow \omega = mvR/I = 0{,}360$ rad/s

$W = \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2 = 99{,}9$ J.

(11.37)

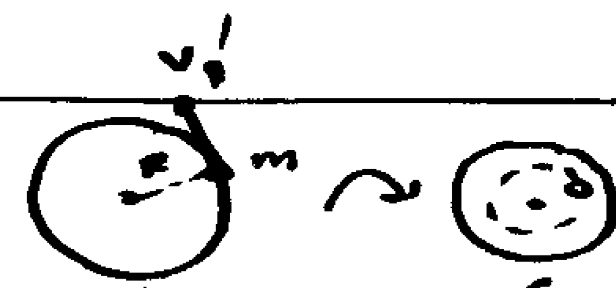



$L_i = mvd$
$L_f = \left(\frac{1}{2}MR^2 + mR^2\right)\omega$

$\Rightarrow \omega = \frac{2mvd}{(M+2m)R^2}$

En del av den mekaniska energin omvandlas till inre energi.
deformering.

(11.49)




$L_i = mv_ir_i$
$L_f = mvr$

$L_i = L_f \Rightarrow v = v_i\frac{r_i}{r}$

$T = m\frac{v^2}{r} = mv_i^2r_i^2/r^3$

$W = \frac{1}{2}mv^2 - \frac{1}{2}mv_i^2 = \frac{1}{2}mv_i^2\left[\frac{r_i^2}{r^2} - 1\right]$