14.69 ••• A 1.70 kg, horizontal, uniform tray is attached to a vertical ideal spring of force constant 185 N/m and a 290 g metal ball is in the tray. The spring is below the tray, so it can oscillate up and down. The tray is then pushed down to point *A*, which is 16.1 cm below the equilibrium point, and released from rest. (a) How high above point *A* will the tray be when the metal ball leaves the tray? (*Hint:* This does *not* occur when the ball and tray reach their maximum speeds.) (b) How much time elapses between releasing the system at point *A* and the ball leaving the tray? (c) How fast is the ball moving just as it leaves the tray?

14,6g.
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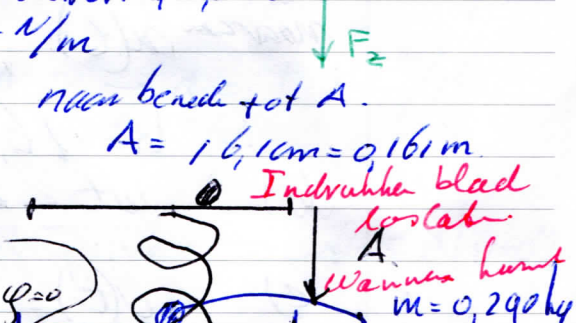
Dienblad: $m = 1{,}70\,kg$ $k = 185\,N/m$

$m_{bal} = 290\,g = 0{,}290\,kg$ naar beneden tot A.

veer is beneden het blad

$A = 16{,}1\,cm = 0{,}161\,m$

$F_{z_1} = F_{z\,blad} + F_{z\,bal}$



Boek: $F_{d\,veer} = k \cdot d$ $x = A$ en $t = 0 \rightarrow \varphi = 0$

kogel los: $\frac{k \cdot d}{m} = g$ (m: totale massa)

$d = \frac{m \cdot g}{k} = \frac{(1{,}7 + 0{,}29) \cdot 9{,}0}{185} = 10{,}54\,cm$

2.0.2

16.6g ver. Dit is voorbij het evenwichtspunt
Boven A: 10,54 + 16,1 = 26,6 cm
Moreaal: $d = \frac{m \cdot g}{m}$: m totaal nemen

als meer negatief dus g-

$\rightarrow a = g$
$F_{veer} = k \cdot d.$
$\frac{a}{m} = k \cdot d.$

16.6 b. Gev. t, wanneer de bal los hal: A = 26,6 cm

$x = A \cdot \cos(\omega t) \rightarrow \omega = \sqrt{\frac{k}{m}} = \sqrt{\frac{105}{1,99}} = \sqrt{52,96} = 9,64$ rad/sec

$10,54 = 16,1 \cdot \cos(9,64 \cdot t)$

$\cos 9,64t = \frac{-10,54}{16,1} = -0,6547 \rightarrow 9,64t = 2,2845$

$\rightarrow t = \frac{2,2845}{9,64} = 0,237$ sec.

c v_t

Op 1. $v_t = -A\omega \cdot \sin(\omega \cdot t)$

$= -0,161 \cdot 9,64 \cdot \sin(9,64 \cdot 0,237)$

$= +1,552 \cdot \sin(2,28\ldots)$

$= +1,552 \cdot 0,7558\ldots = 1,17$ m/s

Boek: $v = \sqrt{\frac{k}{m}(A^2 - x^2)} = \sqrt{\frac{185}{1,99} \cdot (0,161)^2 - (-0,1054)^2}$

a: Docent: $x(t) = 16,1 \cdot \cos(\omega \cdot t)$

$v(t) = 16,1 \sin(\omega \cdot t)$

$a(t) = -16,1 \omega^2 \cos \omega \cdot t$

→ meter en kogel komt los: $-9,81 = 0,161 \cdot 9,64^2 \cos \omega t$

$\cos \omega t = \frac{-9,81}{0,161 \cdot 9,64^2} = -0,65$

$\omega \cdot t = \cos^{-1}(-0,65) = 2,28$ rad

$x(t) = -16,1 \cdot -0,65 = 10,56$ cm

$h = 16,1 + 10,5 = 26,6$ cm.

b) $\omega t = 2,28 \rightarrow t = \frac{2,28}{9,64} = 0,245$

c) $v(t) = 16,1 \cdot 9,64 \cdot \sin(2,28) = 117$ cm/sec

$= 1,17$ m/s.

positief klopt: beweging is omhoog.