

F12T1 1. Schulaufgabe Physik am 15.11.16

$$1.0 \text{ Geg: } m_1 = 2 \cdot 80,0 \text{ kg} + 70,0 \text{ kg} = 230 \text{ kg}; v_1 = 7,00 \frac{\text{km}}{\text{h}} = 1,94 \frac{\text{m}}{\text{s}}$$

$$1.1 \text{ Geg: } u_1 = -1,60 \frac{\text{m}}{\text{s}}; \bar{a} = -2,5 \cdot g = -24,5 \text{ m/s}^2$$

$$\Delta p = F \cdot \Delta t \Leftrightarrow \Delta t = \frac{\Delta p}{F} = \frac{m \Delta v}{m \cdot \bar{a}} = \frac{\Delta v}{\bar{a}} = \frac{u_1 - v_1}{-25g}$$

$$\Delta t = \frac{-1,60 \text{ m/s} - 1,94 \text{ m/s}}{-24,5 \text{ m/s}^2} \Rightarrow \underline{\Delta t = 0,145 \text{ s}}$$

$$1.2 \text{ Geg: } m_2 = 70,0 \text{ kg}; v_2 = 0; \text{ voll elast.}$$

$$u_1 = \frac{m_1 v_1 + m_2 (2v_2 - v_1)}{m_1 + m_2} = \frac{m_1 v_1 - m_2 v_1}{m_1 + m_2}$$

$$u_1 = \frac{230 \text{ kg} \cdot 1,94 \text{ m/s} - 70,0 \text{ kg} \cdot 1,94 \text{ m/s}}{230 \text{ kg} + 70,0 \text{ kg}} \Rightarrow u_1 = 1,04 \frac{\text{m}}{\text{s}}$$

$$\Delta v = u_1 - v_1 \Rightarrow \Delta v = 1,04 \frac{\text{m}}{\text{s}} - 1,94 \frac{\text{m}}{\text{s}} \Rightarrow \underline{\Delta v = -0,90 \frac{\text{m}}{\text{s}}}$$

$$1.3 \text{ Geg } u = 1,34 \text{ m/s}; \text{ voll unelast. Stoß}$$

$$m_1 v_1 = m_1 u + m_2 u \Leftrightarrow m_2 u = m_1 v_1 - m_1 u \Rightarrow$$

$$m_2 = \frac{m_1 v_1 - m_1 u}{u} \Rightarrow m_2 = \frac{230 \text{ kg} \cdot (1,94 \frac{\text{m}}{\text{s}} - 1,34 \frac{\text{m}}{\text{s}})}{1,34 \text{ m/s}}$$

$$\underline{m_2 = 103 \text{ kg}}$$

$$1.4 \text{ Stoß muss voll elastisch erfolgen; } v_2 = 0$$

$$u_2 = \frac{m_2 v_2 + m_1 (2v_1 - v_2)}{m_1 + m_2} = \frac{2m_1 v_1}{m_1 + m_2}$$

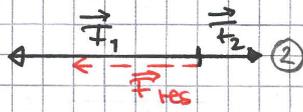
Masse des Balls $m_2 \rightarrow 0$

$$\text{Also } u_{2, \text{max}} = \lim_{m_2 \rightarrow 0} \frac{2m_1 v_1}{m_1 + m_2} = \frac{2m_1 v_1}{m_1} = 2v_1$$

$$u_{2, \text{max}} = 2v_1 = 2 \cdot 1,94 \frac{\text{m}}{\text{s}} \Rightarrow \underline{u_{2, \text{max}} = 3,88 \frac{\text{m}}{\text{s}} = 14,0 \frac{\text{km}}{\text{h}}}$$

2.0 Geg: $D_0 = 2,9 \text{ N/m}$; $l = 0,20 \text{ m}$; $T = 1,2 \text{ s}$

2.1 $F_{\text{RES}} = -F_1 + F_2$ ①
 ⑥ $= -D_0 \Delta s_1 + D_0 \Delta s_2$
 $= -D_0(l+x) + D_0(l-x) = -D_0 l - D_0 x + D_0 l - D_0 x$
 $F_{\text{RES}} = -2D_0 x$: lin. Kraftges. \Rightarrow harm. Schw.

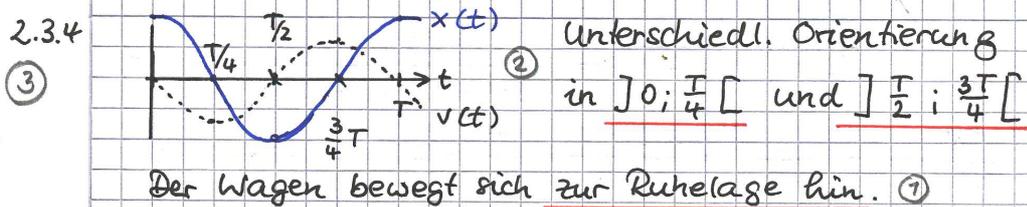


2.2 ① $T = 2\pi \sqrt{\frac{m}{D}} \Leftrightarrow m = \frac{T^2 \cdot 2D_0}{4\pi^2} = \frac{(1,2 \text{ s})^2 \cdot 2,9 \text{ N/m}}{2\pi^2} = 0,21 \text{ kg}$ ①
 ④

2.3.1 Geg: $x(t_1) = x_1 = 4,0 \text{ cm}$; $\omega = \frac{2\pi}{T} = \frac{2\pi}{1,2 \text{ s}} = \frac{5}{3} \pi \text{ s}^{-1} = 5,2 \text{ s}^{-1}$
 ④ $x_1 = A \cdot \cos\left(\frac{2\pi}{T} \cdot t_1\right) \Leftrightarrow A = \frac{x_1}{\cos\left(\frac{2\pi}{T} \cdot t_1\right)}$
 $A = \frac{4,0 \text{ cm}}{\cos\left(\frac{2\pi}{1,2 \text{ s}} \cdot 0,24 \text{ s}\right)} \Rightarrow \underline{A = 13 \text{ cm}}$ ①

2.3.2 ② $a_{\text{max}} = A\omega^2 = A \cdot \left(\frac{2\pi}{T}\right)^2 = 0,13 \text{ m} \cdot \left(\frac{2\pi}{1,2 \text{ s}}\right)^2 \Rightarrow \underline{a_{\text{max}} = 3,6 \frac{\text{m}}{\text{s}^2}}$

2.3.3 $v(t) = -A\omega \cdot \sin(\omega t)$ $|v(t)| = 0,70 \cdot v_{\text{max}} = 0,70 A \omega$
 ⑤ $\sin(\omega t) = 0,70 \Rightarrow t_{\text{TR}} = \frac{\sin^{-1}(0,70)}{2\pi/1,2 \text{ s}} \Rightarrow t_{\text{TR}} = 0,15 \text{ s}$
 $t_2 = \frac{T}{2} - t_{\text{TR}} = 0,60 \text{ s} - 0,15 \text{ s} \Rightarrow \underline{t_2 = 0,45 \text{ s}}$ ①



$\Sigma = 39 \text{ BE}$

39...	37,5 : 15	27...	25,5 : 9	15,5..	13 : 3
	35,5 : 14	...	23,5 : 8	14,5..	10,5 : 2
	33,5 : 13	..	21,5 : 7	..	8 : 1
	31,5 : 12		20 : 6		
	29,5 : 11		18 : 5	7,5..	0 : 0
	27,5 : 10		16 : 4		