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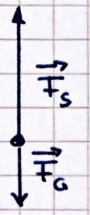
AP 1999 - AI

1.0 Geg: $t_1 = 3{,}50\,s$; $h_1 = 3{,}50\,m$; $m = 55{,}0\,kg$

1.1. Ges: a ; v_1

- $h_1 = \frac{1}{2} a t_1^2 \Leftrightarrow a = \frac{2h_1}{t_1^2} = \frac{2 \cdot 3{,}50\,m}{(3{,}50\,s)^2} = 0{,}571\,\frac{m}{s^2}$
- $v_1 = a t_1 = 0{,}571\,m s^{-2} \cdot 3{,}50\,s = 2{,}00\,m s^{-1}$

1.2 Ges: Seilkraft F_S



$F_a = F_{RES} = F_S - F_G \Leftrightarrow F_S = F_a + F_G$

$F_S = m \cdot a + mg = m(a + g)$

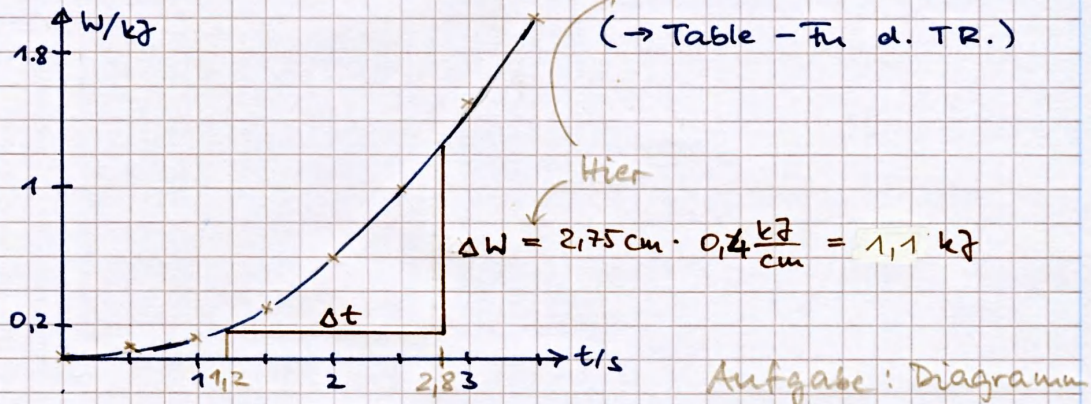
$F_S = 55{,}0\,kg\,(0{,}571\,m s^{-2} + 9{,}81\,m s^{-2}) = 571\,N$

1.3.1 $W(t) = F_S \cdot h(t)$; $h(t) = \frac{1}{2} a t^2 = \frac{1}{2} \cdot 0{,}571\,\frac{m}{s^2} \cdot t^2$

$= 571\,N \cdot \frac{1}{2} \cdot 0{,}571\,\frac{m}{s^2} \cdot t^2$

$W(t) = 163\,\frac{J}{s^2} \cdot t^2$ (GBE ???)

1.3.2 $W(3{,}50\,s) = 2.00 \cdot 10^3\,J$ (→ Höhe d. Diagr. wäre 10 cm)



Aufgabe: Diagramm

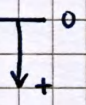
1.3.3 $P = \frac{\Delta W}{\Delta t} = \frac{1{,}1\,kJ}{1.6\,s} = 0{,}69\,kW$ (Rechnung nicht akzeptabel!)

1.3.4 $P(t) = \dot{W}(t) = 2 \cdot 163\,\frac{J}{s^2} \cdot t$

$P(2{,}5\,s) = 2 \cdot 163\,\frac{J}{s^2} \cdot 2{,}5\,s = 815\,\frac{J}{s} = 0{,}82\,kW$

1.4.1 Geg: $t_1 = 0{,}40\,s$; $F_{N1} = F_{N2} = 2{,}0\,kN$; $\mu = 0{,}30$

Ges: $s_{ges} = s_{Fall} + s_{Bremsung} = s_F + s_B$



Die Bewegung setzt sich zusammen aus:

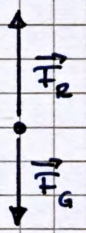
- Freier Fall für 0,40 s ⟶ s_F
- Bremsung bis zum Stillstand ($v = 0$) ⟶ s_B

- Freier Fall: ($v_0 = 0$)

$$s_F = \frac{1}{2} g t^2 = \frac{1}{2} \cdot 9{,}81\,m\,s^{-2} \cdot (0{,}40\,s)^2 = \underline{0{,}78\,m}$$

$$v_F = g t = 9{,}81\,m\,s^{-2} \cdot 0{,}40\,s = 3{,}9\,\frac{m}{s}$$

- Verzögerung: ($v_0 = v_F$)



$$-F_{RES} = -F_R = F_G - F_R = F_G - 2 \cdot \mu \cdot F_N$$

$$\Rightarrow -m \cdot a = mg - 2\mu F_N$$

$$a = -g + \frac{2\mu F_N}{m} = -9{,}81\,\frac{m}{s^2} + \frac{2 \cdot 0{,}30 \cdot 2{,}0\,kN}{55{,}0\,kg} = \underline{12\,\frac{m}{s^2}}$$

Verz.

$$v^2 - v_0^2 = -2as_B \quad ; \; v = 0 \text{ (Stillstand)}$$

$$s_B = \frac{v_0^2}{2a} = \frac{v_F^2}{2a}$$

$$s_B = \frac{(3{,}9\,m/s)^2}{2 \cdot 12\,m\,s^{-2}} = \underline{0{,}63\,m}$$

$$s_{ges} = s_F + s_B = 0{,}78\,m + 0{,}63\,m = \underline{1{,}4\,m}$$