

Ph-Ex TBM 1F, 21.12.2010

① a)  $m = 10'000 \text{ kg}$ ,  $h = 20 \text{ m}$

$$E = mgh = 2 \cdot 10^6 \text{ J} = \underline{\underline{2 \text{ MJ}}}$$

b) 1. Variante:  $v = 0.8 \text{ m/s}$ ,  $h = 20 \text{ m} \Rightarrow t = \frac{h}{v} = 25 \text{ s}$   
 $P = \frac{E}{t} = \frac{2'000'000 \text{ J}}{25 \text{ s}} = 80'000 \text{ W} = \underline{\underline{80 \text{ kW}}}$

2. Variante:  $P = F \cdot v$ ;  $F = F_G = mg$

$$P = mg \cdot v = \underline{\underline{80 \text{ kW}}}$$

② a)  $mgh = \frac{1}{2}mv^2 \Rightarrow h = \frac{v^2}{2g}$

$$\frac{(340 \text{ m/s})^2}{2 \cdot 1.62 \text{ m/s}^2} \approx 35'679 \text{ m} = \underline{\underline{35.68 \text{ km}}}$$

b)  $\frac{(340 \text{ m/s})^2}{2 \cdot 24.79 \text{ m/s}^2} \approx 2'331.6 \text{ m} = \underline{\underline{2.33 \text{ km}}}$

③  $P = 175 \text{ W}$

$$E = P \cdot t = 175 \text{ W} \cdot 24 \text{ h} \cdot 365 = 1'533 \text{ kWh}$$

$$\text{à } 0.1 \text{ Fr./kWh} = \underline{\underline{153.30 \text{ Fr.}}}$$

④ a)  $\frac{1}{2}mv^2 = \mu mgs$

$$\frac{v^2}{2\mu g} = s \approx 85.47 \text{ m}$$

b)  $v = 100 \text{ km/h}$   $v_x = \text{Bresch. nach Bremsung, } s = 50 \text{ m}$

$$\frac{1}{2}mv^2 = \mu mgs + \frac{1}{2}mv_x^2 \quad | : m$$

$$\frac{1}{2}v^2 = \mu gs + \frac{1}{2}v_x^2 \quad | \cdot 2$$

$$v^2 = 2\mu gs + v_x^2$$

$$\sqrt{v^2 - 2\mu gs} = v_x \approx 21.47 \text{ m/s} \approx \underline{\underline{77.3 \text{ km/h}}}$$



$$\textcircled{5} \quad c = 4'187 \text{ J} \cdot \text{kg}^{-1} \cdot \text{K}^{-1}$$

$$E = 4'187 \frac{\text{J}}{\text{K}} \cdot 90 \text{ K} = 376'830 \text{ J} = mgh$$

$$\Rightarrow \frac{E}{g \cdot h} = m = \underline{\underline{75.366 \text{ kg}}}$$

$$\textcircled{6} \quad x = \text{Anz. Tage}$$

$$\frac{1}{1000} \cdot 1'387 \frac{\text{W}}{\text{m}^2} \cdot \underline{100 \text{ m}^2} \cdot \underline{0.1} \cdot \underline{8 \text{ h}} \cdot x \cdot \underline{0.1} \frac{\text{Fr}}{\text{Leuch}} = 30'000$$

$$\frac{1'387}{1000} \cdot 8 \text{ h} \cdot x = 30'000$$

$$11'096 \cdot x = 30'000$$

$$\underline{\underline{x \approx 7.4 \text{ Jahre}}}$$