G2d, 14.12.2011

① CHF 3.– ≙ 20 kWh = 72 GJoule

pro kWh 10 Std ⇒ <u>200 Stunden</u> = $8 + \frac{1}{3}$ Tage

② $m = 75\,kg$, $h = 10\,m$, $P = 800\,W$

$$P = \frac{E}{t} \Rightarrow E = Pt \Rightarrow t = \frac{E}{P}$$

$$E = E_{pot} = mgh$$

$$\Rightarrow t = \frac{mgh}{P} = \frac{75\,kg \cdot 9.81\,N/kg \cdot 10\,m}{800\,W} = \frac{7357.5}{800}$$

$$\approx \underline{9.2\,s}$$

③ $g = 1.62\,N/kg$, $v = 180\,km/h = 50\,m/s$

$$\frac{1}{2}mv^2 = mgh \Rightarrow h = \frac{v^2}{2g} = \frac{50^2}{2 \cdot 1.62} \approx \underline{771.6\,m}$$

Fallhöhe, damit $v = 25\,m/s$:

$$h = \frac{v^2}{2g} = \frac{25^2}{2 \cdot 1.62} = 192.9\,m$$

↳ $771.6\,m - 192.9\,m = \underline{578.7\,m}$

④ $v_1 = 120\,km/h = 33.\overline{3}\,m/s$, $f_n = 0.68$

$$E_{kin,\,120\,km/h} = E_{Bremse} + E_{kin,\,gesucht}$$

$$\frac{1}{2}mv_1^2 = fmgs + \frac{1}{2}mv_2^2 \;/ \cdot 2 : m$$

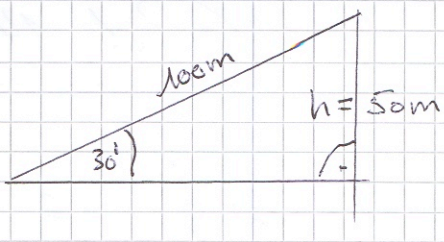
$$v_1^2 = 2fgs + v_2^2$$

$$v_2 = \sqrt{v_1^2 - 2fgs} = 21.07\,m/s$$

$$= \underline{75.86\,km/h}$$

(5) $m = 1'400\,kg$

$V = 72\,km/h = 20\,m/s$



$\sin\alpha = \frac{GK}{H} = \frac{h}{100}$

$100 \cdot \sin 30° = h = 50m$

5 sec. um 50 m Höhe zu überwinden:

$P = \frac{mgh}{t} = \frac{1400 \cdot g \cdot 50m}{5s} = \underline{137.34\,KW}$

ALT: $P = \frac{E}{t} = \frac{F \cdot s}{t} = F \cdot \frac{s}{t} = F \cdot V_\perp$

$F = mg, \quad V_\perp = V \cdot \sin\alpha$

$\Rightarrow P = mgV \cdot \sin 30° = 137.34\,kW$

(6) $57\,Mt = 57 \cdot 10^6 \cdot 10^3 kg = 5.7 \cdot 10^{10} kg$

$TNT: \quad 4.148\,MJ/kg = 4.148 \cdot 10^6\,J/kg$

$E = 5.7 \cdot 10^{10} kg \cdot 4.148 \cdot 10^6\,J/kg = mc^2$

$\Rightarrow m = \frac{2.36436 \cdot 10^{17} Joule}{(3 \cdot 10^8)^2} = \underline{2.627\,kg}$

(7) $h = \frac{v^2}{2g} = \frac{440^2}{2 \cdot 1.62} = 59'753.086m$

$\hat{=} \underline{59.753\,km}$

$E = \frac{1}{2}mv^2 = \int_{r_M}^{r_M+x} \frac{GMm}{R^2}\,dR = GmM\left[-\frac{1}{R}\right]_{r_M}^{r_M+x}$

$\frac{1}{2}v^2 = GM\left(\frac{1}{r_M} - \frac{1}{r_M+x}\right)$

$\frac{1}{r_M} - \frac{v^2}{2GM} = \frac{1}{r_M+x}$

$\left(\frac{1}{r_M} - \frac{v^2}{2GM}\right)^{-1} - r_M = x = \underline{61'736.25m}$