

Physik, TBM 1E, 14.11.2013

①

$$\frac{1}{2}mv^2 = mgh \quad | \cdot 2 : m$$

$$v^2 = 2gh$$

$$v = \sqrt{2gh} = \sqrt{2 \cdot 10 \cdot 9680} = 440 \text{ m/s}$$

$$v = 440 \text{ m/s} = \underline{\underline{1584 \text{ km/h}}}$$

②

$$\frac{1}{2}mv^2 = \mu mgs$$

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

$$v = \sqrt{2\mu gs}$$

$$= \sqrt{2 \cdot 0.67 \cdot 10 \cdot 25.85}$$

$$\approx 18.61 \text{ m/s} = \underline{\underline{67 \text{ km/h}}}$$

③

a) $m = 3500 \text{ kg}$, $v = 10 \text{ m/s}$, $h = 500 \text{ m}$

$$E = mgh = 17.5 \text{ MJ}$$

$$= \underline{\underline{4.86 \text{ kWh}}}$$

b) $t = 50 \text{ s}$

$$E = mgh, \quad P = \frac{E}{t} = \frac{mgh}{t} = \frac{17.5 \text{ MJ}}{50}$$

$$= \underline{\underline{350 \text{ kW}}}$$

oder:

$$P = \frac{mgh}{t} = mg \frac{h}{t} = mgv = 350 \text{ kW}$$

$$\textcircled{4} \quad h = 700 \text{ m}$$

$$\text{a) } E = mgh = 3'600'000 \text{ J}$$
$$m = \frac{3'600'000 \text{ J}}{g \cdot h} = \underline{\underline{514.286 \text{ kg (Liter)}}$$

$$\text{b) } P = \frac{E}{t} = \frac{mgh}{t} = 10^9 \text{ W}, \quad t = 1 \text{ s}$$
$$mgh = 10^9 \text{ W} \cdot 1 \text{ s} = 10^9 \text{ J.}$$

$$m = \frac{10^9 \text{ J}}{g \cdot h} = \underline{\underline{142.857 \text{ t}}}$$

resp. 142.857 m^3

$$\textcircled{5} \quad m = 1'300 \text{ kg}$$

$$\textcircled{O} \rightarrow 180 \text{ km/h} : 0.531 \text{ kWh}$$

50 m/s

$$E = \frac{1}{2}mv^2 = 1.625 \text{ MJ} = E_{\text{Nutz}}$$

$$0.531 \text{ kWh} = 1.912 \text{ MJ} = E_{\text{Zugel.}}$$

$$\eta = \frac{E_{\text{Nutz}}}{E_{\text{Zugel.}}} = \underline{\underline{0.85 = 85\%}}$$

$$\textcircled{6} \quad m = 1'200 \text{ kg}; \quad 8 \text{ s von } 0 \rightarrow 100 \text{ km/h}$$

$$P_{\text{Nutz}} = \frac{E_{\text{kin}}}{8 \text{ s}} = \frac{\frac{1}{2}mv^2}{8 \text{ s}} \stackrel{462'962}{\approx} 57.87 \text{ kW}$$

$$\frac{P_{\text{Nutz}}}{P_{\text{Zugel}}} = 0.2 \Rightarrow P_{\text{Zugel}} = 5 \cdot E_{\text{Nutz}}$$
$$= 289.35 \text{ kW}$$