TBM 78, 14.9.2016

(1) $P = 1\,GW = 10^9\,W$

a) $E = P \cdot t = 10^9 \cdot 365 \cdot 24 \cdot 60^2\,Joule$

$= 3.1536 \cdot 10^{16}\,Joule$

$(1\,kWh = 3.6\,M)$ $= 8'760'000'000\,kWh$

$= \underline{\underline{8.76\,TWh}}$

8.76 TWh sind $\underline{\underline{14.6\,\%}}$ von 60 TWh

b) $E = 3.1536 \cdot 10^{16}\,J = mc^2$

$m = 0.3504\,kg$

$m_{eff} = 5m$, da $\eta = 20\,\%$

$\underline{\underline{m_{eff} = 1.752\,kg}}$

(2) $h = 45$ im freien Fall:

$$s = \frac{1}{2} g t^2 \rightarrow 45 = \frac{1}{2} \cdot 10 \cdot t^2$$

$$45 = 5 t^2$$

$$t^2 = 9$$

$$t = \pm 3\,s \qquad \text{(2P.)}$$

↳ Der freie Fall dauert 3 Sekunden

12 Meter horizontale Bewegung in 3s:

$$v = \frac{s}{t} = \frac{12\,m}{3\,s} = \underline{\underline{4\ m/s}} \qquad \text{(1P.)}$$

$$v_{vertikal} = a \cdot t = 10\ m/s^2 \cdot 3\,s = \underline{\underline{30\ m/s}} \qquad \text{(1P.)}$$

(3) 1 GW = 10^9 Watt = 10^9 Joule pro Sekunde

10^9 Joule = mgh

$$m = \frac{10^9}{gh} = 250'000\,kg$$

1 kg Wasser $\hat{=}$ 1 Liter

1 t = 1000 kg Wasser $\hat{=}$ 1 m^3 Wasser

↪ 250 m^3/s $\hat{=}$ 90 % Wirkungsgrad

277.7 m^3/s

(4) $m = 100\,kg$, $a = 6\,m/s^2$, $t = 3\,s$

$v = at = 6\,m/s^2 \cdot 3\,s = \underline{\underline{18\,m/s = v_{max}}}$

$mgh = \frac{1}{2}mv^2$

$h = \frac{v^2}{2g} = \underline{\underline{16.2\,Meter}}$

(5) $h = 113.75\,m$, $h' = 11.25\,m$

$s = \frac{1}{2}gt^2 \Rightarrow t = \sqrt{\frac{2s}{g}} = 1.5\,s$

$v = at = 10\,m/s^2 \cdot 1.5\,s = 15\,m/s$

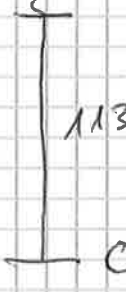
↳ v ist Abwurfgeschwindigkeit nach oben!

$s(t) = -5t^2 + 15t + 113.75$

$s(t) = -5t^2 + 15t + 113.75 = 0$

$t^2 - 3t - 22.75 = 0$

$(t - 6.5)(t + 3.5) = 0$



$\underline{\underline{t = 6.5\,s}}$

$v(t) = -10t + 15\,m/s$

$v(t = 6.5) = -65\,m/s + 15\,m/s = \underline{\underline{-50\,m/s}}$