

Physics hour 13

1) Wärmetransport

$$P = \lambda \cdot \frac{A}{d} \cdot \Delta T = 0,76 \frac{\text{W}}{\text{m} \cdot \text{K}} \cdot \frac{2 \text{ m}^2}{0,01 \text{ m}} \cdot 15 \text{ K} = 2,3 \text{ kW}$$

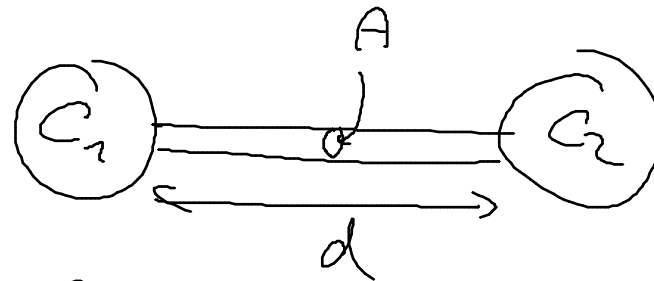
2) Doppelverglasung

$$P = \lambda \cdot \frac{A}{d} \cdot \Delta T, \quad \lambda = 0,026 \frac{\text{W}}{\text{m} \cdot \text{K}} \quad \rightarrow \quad P = 78 \text{ W}$$

3) Wärmeausgleich

$$\frac{1}{\tau} = \frac{\lambda \cdot A}{d} \cdot \frac{C_1 + C_2}{C_1 \cdot C_2}$$

$$\rightarrow \tau = \frac{d}{\lambda \cdot A} \cdot \frac{C_1 \cdot C_2}{C_1 + C_2} \stackrel{C_1 = C_2 = C}{=} \frac{d}{\lambda \cdot A} \cdot \frac{C}{2} = \frac{0,1 \text{ m}}{400 \frac{\text{W}}{\text{m} \cdot \text{K}} \cdot 5 \cdot 10^{-4} \text{ m}^2} \cdot \frac{200 \text{ J/K}}{2 \cdot 2} = 50 \text{ s}$$

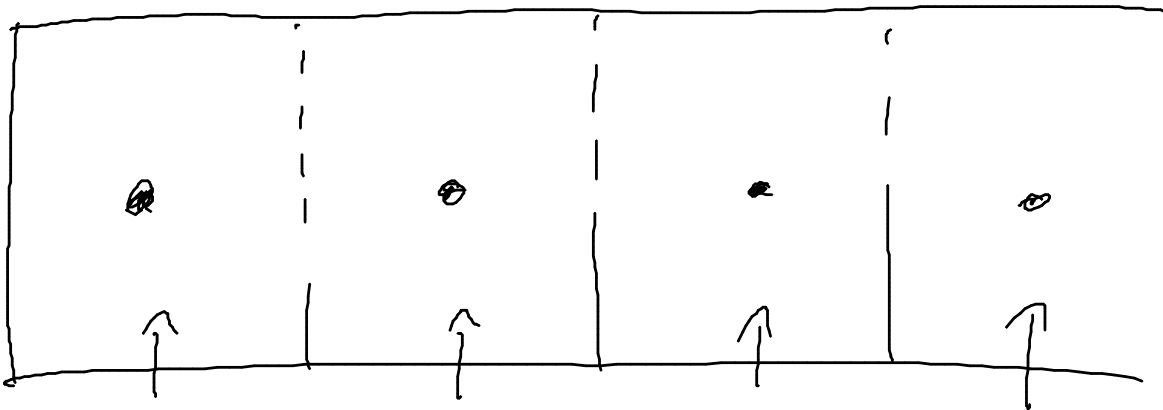
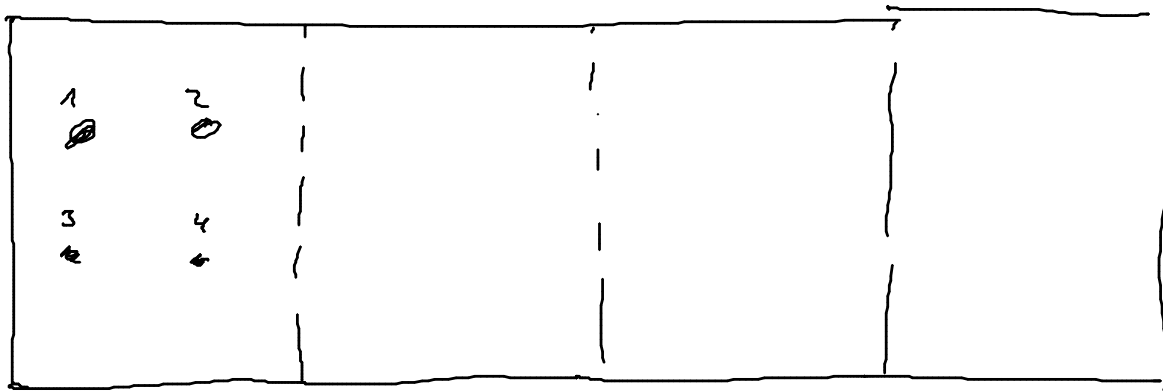


4) Erhitzen & Verdampfen 1

$$\Delta Q = C \cdot \Delta T = c \cdot m \cdot \Delta T = 4,182 \frac{\text{kJ}}{\text{kg} \cdot \text{K}} \cdot 1 \text{ kg} \cdot 100 \text{ K} = 418 \text{ kJ}$$

5) Erhitzen & Verdampfen 2

$$\Delta Q = \Delta Q_v \cdot m = 2257 \frac{\text{kJ}}{\text{kg}} \cdot 1 \text{ kg} = 2257 \text{ kJ}$$



4 . 3 . 2 . 1 = 24

1	2	3	4
1	3	2	4
1	4	3	2
1	2	4	3
:	:	:	:

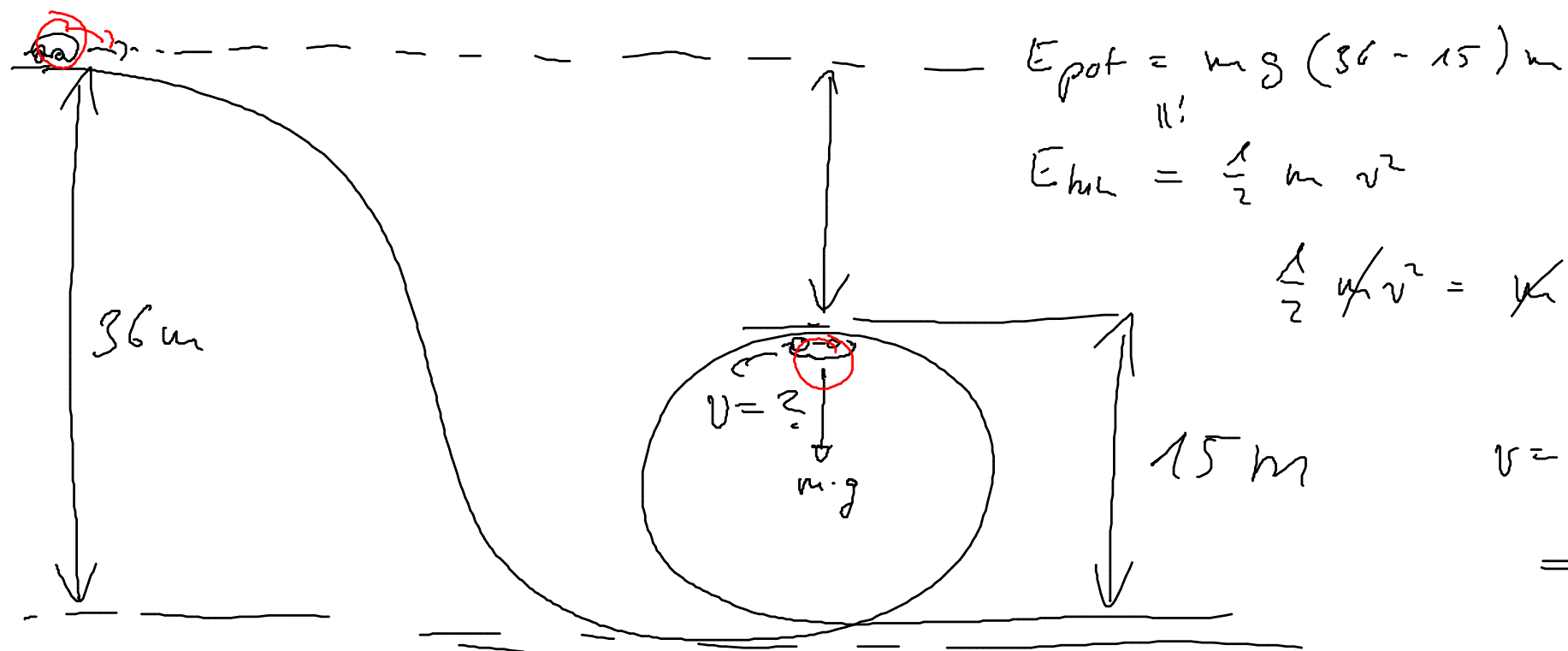
$$W = 1 \rightarrow S = k_B \ln(1) = 0$$

$$S = k_B \ln(W)$$

$$S = k_B \cdot \ln(24)$$

$$\Delta S = k_B \cdot \ln(24) = 4,4 \cdot 10^{-23} \frac{\text{J}}{\text{K}}$$

27)



$$E_{\text{pot}} = m g (36 - 15) \text{ m}$$

$$E_{\text{kin}} = \frac{1}{2} m v^2$$

$$\frac{1}{2} m v^2 = m g \cdot 21 \text{ m}$$

$$v = \sqrt{20 \frac{\text{m}}{\text{s}^2} \cdot 21 \text{ m}}$$

$$= 20,5 \text{ m/s}$$

28)

$$v_{\text{wind}} : \quad m \frac{v_{\text{wind}}^2}{r} = m g$$

$$v_{\text{wind}} = \sqrt{r \cdot g} = \sqrt{7,5 \text{ m} \cdot 10 \frac{\text{m}}{\text{s}^2}} = 8,7 \frac{\text{m}}{\text{s}}$$

$$v = \omega \cdot R ; \quad \omega = v/R$$

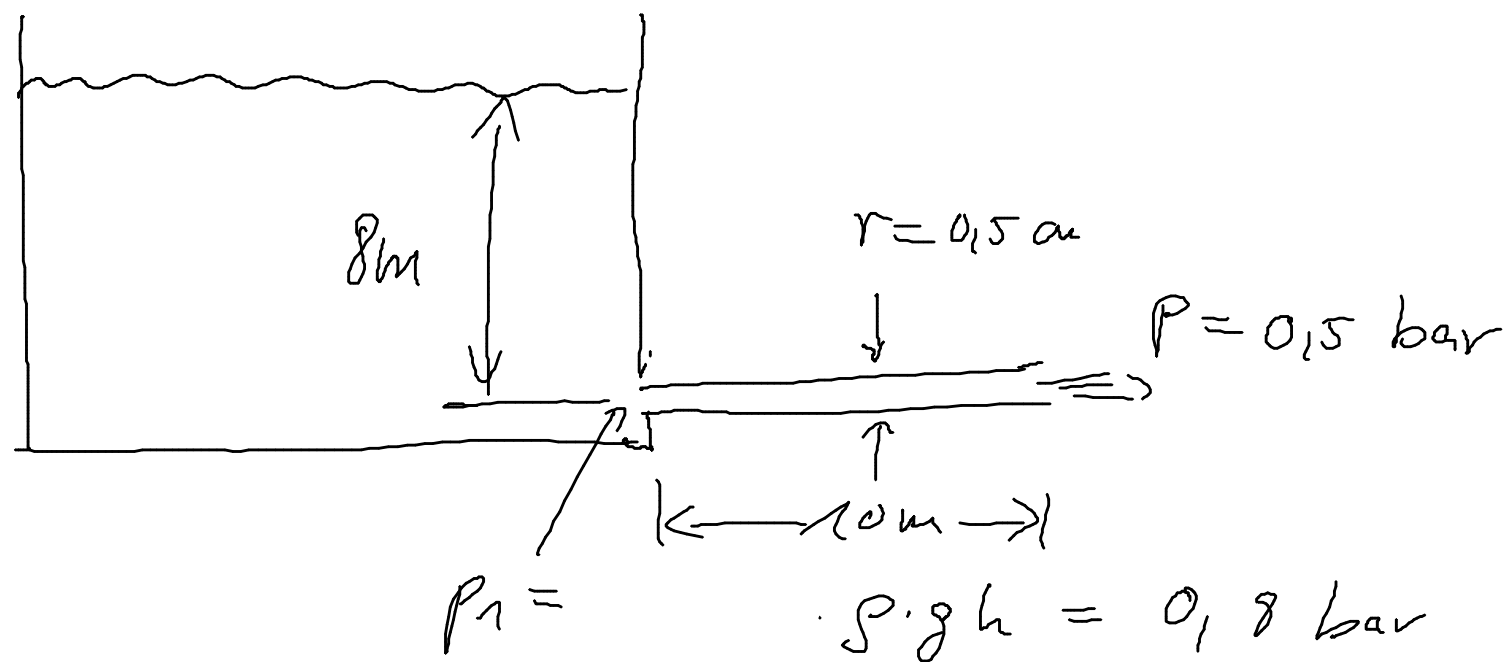
29)

$$E_{\text{pot}} = E_{\text{kin}} + E_{\text{rot}} = \frac{1}{2} m v^2 + \frac{1}{2} J \omega^2$$

$$m g h = \frac{1}{2} m v^2 + \frac{1}{2} \frac{2}{5} \cdot m R^2 \cdot \frac{v^2}{R^2} = \frac{1}{2} m v^2 + \frac{1}{5} m v^2 = \frac{7}{10} m v^2$$

$$\rightarrow v = \sqrt{\frac{10}{7} g h} = 17,3 \text{ m/s}$$

32)



$$\rho \cdot g \cdot h = 0.8 \text{ bar}$$

$$\overline{I} = \frac{\pi \cdot \Delta P}{8 \eta \cdot l} r^4 = \frac{\pi \cdot 0.3 \cdot 10^5 \text{ Pa}}{8 \cdot 10^{-3} \text{ Pa} \cdot \text{s} \cdot 10 \text{ m}} \cdot (0.005 \text{ m})^4 = 0.75 \frac{\text{kg}}{\text{s}}$$

