

awp 99/1

$$R_M = 1,7 \cdot 10^6 \text{ m}$$

$$M_M = 7,4 \cdot 10^{22} \text{ kg}$$

$$g_M = ?$$

$$P_M = F_M$$

$$m \cdot g_M = \gamma \cdot \frac{m \cdot M_M}{R_M^2}$$

$$g_M = \frac{6,67 \cdot 10^{-11} \cdot 7,4 \cdot 10^{22}}{(1,7 \cdot 10^6)^2}$$

$$g_M = \frac{6,67 \cdot 7,4 \cdot 10^{11}}{2,89 \cdot 10^{12}} = 17,07 \cdot 10^{-1} = 1,7 \text{ m/s}^2$$

Qwp 99/2

$M_c = ?$

$$R_{sz} = 1,5 \cdot 10^{11} \text{ m}$$

$$T_{z-s} = 365 \text{ dem} = 365 \cdot 86400 \text{ s}$$

$$4\pi^2 K = \chi^p M_s$$

$$M_s = \frac{4\pi^2 K}{\chi^p} = \frac{4\pi^2 R^3}{\chi^p T^2} = \frac{4 \cdot 3,14^2 \cdot (1,5 \cdot 10^{11})^3}{6,67 \cdot 10^{-11} \cdot (86400 \cdot 365)^2}$$

$$M_s = \frac{4 \cdot 9,86 \cdot 10^{33} \cdot 3,375}{6,67 \cdot (365 \cdot 86400)^2 \cdot 10^{-11}} = \frac{133,11 \cdot 10^{33}}{6,67 \cdot 10^{-11} \cdot 9,94 \cdot 10^{14}}$$

$$M_s = \frac{133,11 \cdot 10^{33}}{66,3 \cdot 10^3} = 2,007 \cdot 10^{30} \text{ kg}$$

$$\frac{M_s}{M_z} = \frac{2 \cdot 10^{30}}{6 \cdot 10^{24}} = \frac{1}{3} \cdot 10^6 = 3,3 \cdot 10^5$$

auf 99/3

$$R_z = 6400 \text{ km} = 64 \cdot 10^5 \text{ m}$$

$$R_{z-s} = 1,5 \cdot 10^{11} \text{ m}$$

$$\rho_z = 5,6 \text{ g/cm}^3 = \frac{5,6 \cdot 10^{-3}}{(10^{-2})^3} = 5,6 \cdot 10^3 \text{ kg/m}^3$$

$$T = 365 \text{ dem} = 365 \cdot 24 \cdot 3600 = 32 \cdot 10^7 \text{ s}$$

F = ?

$$F = \frac{M_s \cdot M_z}{R_{z-s}^2} = \frac{4\pi^2 R_{z-s}^3 \cdot m_z}{T^2 \cdot R_{z-s}^2} = \frac{4\pi^2 R_{z-s} \cdot \frac{4}{3} R_z^3 \rho_z}{T^2 R_{z-s}}$$

$$m_z = \rho_z \cdot V = \frac{4}{3} R_z^3 \rho_z$$

$$M_s = 4\pi^2 K$$
$$M_s = \frac{4\pi^2 R_{z-s}^3}{T^2}$$

$$F = \frac{4\pi^2 R_{z-s} \cdot \frac{4}{3} R_z^3 \rho_z}{T^2}$$

$$F = \frac{16 \pi^3 R_{z-s} R_z^3 \rho_z}{3 T^2}$$

$$F = \frac{16 \cdot (3,14 \cdot 64 \cdot 10^5)^3 \cdot 1,5 \cdot 10^{11} \cdot 5,6 \cdot 10^3}{3 \cdot 9,94 \cdot 10^{14}}$$

$$F = \frac{16 \cdot 8 \cdot 10^6 \cdot 10^{15} \cdot 1,5 \cdot 10^{11} \cdot 5,6 \cdot 10^3}{29,82 \cdot 10^{14}}$$

$$F = \frac{1075,2 \cdot 10^{35}}{29,82 \cdot 10^{14}} \Rightarrow F = 36,05 \cdot 10^{21} \text{ N}$$

$$F \approx 4 \cdot 10^{22} \text{ N}$$

cup 99/4

$$m_1 = 5 \text{ kg}$$

$$m_2 = 10 \text{ g} = 10 \cdot 10^{-3} \text{ kg}$$

$$R = 7 \text{ cm} = 7 \cdot 10^{-2} \text{ m}$$

$$F = 6,13 \cdot 10^{-7} \text{ N}$$

$$\lambda = ?$$

$$F = \lambda \frac{m_1 m_2}{R^2}$$

$$\lambda = \frac{F \cdot R^2}{m_1 m_2}$$

$$\lambda = \frac{6,13 \cdot 10^{-7} \cdot 49 \cdot 10^{-4}}{5 \cdot 10^{-2}} = \frac{6,13 \cdot 49}{5}$$

$$\frac{10}{10^{-2}} = 10^1$$

$$\lambda = 60,172 \cdot 10^{-9} \frac{\text{N m}^2}{\text{kg}}$$

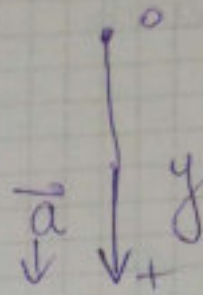
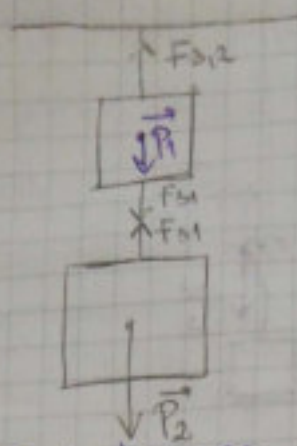
auf 102/1

$$m_1 = 1 \text{ kg}$$

$$m_2 = 2 \text{ kg}$$

$$F_{23} = ?$$

$$F_{13} = 9,8 \text{ N}$$



$F_{3,1} < m_2 g \Rightarrow$ Auftrieb ist größer als Gewichtskraft

$$\text{3A I Teil } \vec{P}_1 + \vec{F}_{3,2} + \vec{F}_{3,1} = m_1 \cdot \vec{a}$$

$$\text{3A II Teil } \vec{P}_2 + \vec{F}_{3,1} = m_2 \cdot \vec{a}$$

$$\begin{cases} P_1 - F_{3,2} + F_{3,1} = m_1 a \\ P_2 - F_{3,1} = m_2 a \end{cases}$$

$$m_1 g + F_{3,1} - m_1 a = F_{3,2}$$

$$\frac{m_2 g - F_{3,1}}{m_2} = a$$

$$m_1 g + F_{3,1} - m_1 \frac{m_2 g - F_{3,1}}{m_2} = F_{3,2}$$

$$F_{3,2} = \frac{m_1 m_2 g + F_{3,1} m_2 - m_1 m_2 g + m_1 F_{3,1}}{m_2}$$

$$F_{3,2} = F_{3,1} + \frac{m_1 F_{3,1}}{m_2} = 9,8 + \frac{1}{2} \cdot 9,8 \text{ N}$$

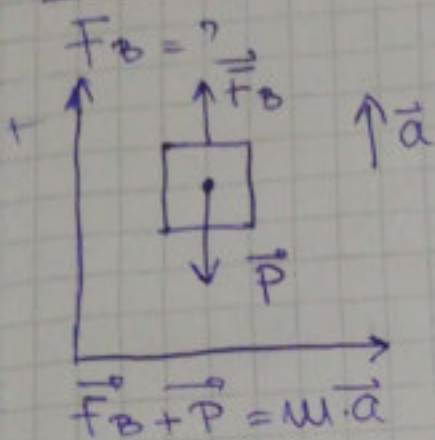
$$F_{3,2} = \frac{19,6 + 9,8}{2} = \frac{29,4}{2} = 14,7 \text{ N}$$

u1p 102, (2)

$$m = 10t = 10 \cdot 10^3 = 10^4 \text{ kg}$$

$$t = 10 \text{ s}$$

$$h = 3 \text{ km} = 3 \cdot 10^3 \text{ m}$$



$$v = ?$$

$$h = \frac{at^2}{2}$$

$$a = \frac{2h}{t^2}$$

$$a = \frac{2 \cdot 3 \cdot 10^3}{10^2}$$

$$a = 60 \text{ m/s}^2$$

$$v = at = 600 \frac{\text{m}}{\text{s}}$$

$$K = \frac{E_{\text{kin}}}{E_{\text{pot}}}$$

$$K = \frac{mgh}{m(a+g)}$$

$$K = \frac{10}{70}$$

$$K = \frac{1}{7}$$

$$y: F_B - mg = m \cdot a$$

$$F_B = m(a+g)$$

$$F_B = 10^4 (a+10)$$

$$F_B = 10^4 \cdot 70$$

$$F_B = 70 \cdot 10^4 = 0,7 \cdot 10^6 \text{ N}$$

$$F_B = 0,7 \text{ MN}$$

ausp 104/30g ②

$$T = 24h = 86400s$$

$$M_2 = 6 \cdot 10^{24} \text{ kg}$$

$$G = 6,67 \cdot 10^{-11} \frac{\text{N} \cdot \text{m}^2}{\text{kg}^2}$$

a) $R = ?$ b) $v = ?$

a) $F_{\text{CP}} = F_m$

$$\frac{M_2 \cdot m}{R^2} = m \omega^2 R$$

$$R^3 = \frac{M_2}{\omega^2} = \frac{M_2 \cdot T^2}{(2\pi)^2}$$

$$\omega = 2\pi/T$$

$$R = \sqrt[3]{\frac{M_2 T^2}{4\pi^2}} = \sqrt[3]{\frac{6,67 \cdot 6 \cdot 10^{24} \cdot 10^{-11} \cdot (86400)^2}{4 \cdot 3,14^2}}$$

$$R = \sqrt[3]{\frac{2,98 \cdot 10^{24}}{39,43}} = \sqrt[3]{0,07556 \cdot 10^{24}} = 0,423 \cdot 10^8 \text{ m} = 42,3 \cdot 10^6 \text{ m}$$

$$R = 6370 + h$$

$$h = 42300 - 6370 = 35930 \text{ m}$$

$$h = 35930 \text{ m}$$

b) $v = \omega R$

$$v = \frac{2\pi}{T} \cdot R$$

$$v = \frac{2 \cdot 3,14 \cdot 42,3 \cdot 10^6}{86400}$$

$$v = 3,07 \cdot 10^3 \text{ m/s}$$

cup 105/①

$$h = 1700 \text{ km} = 17 \cdot 10^5 \text{ m}$$

$$R_z = 6400 \text{ m} = 64 \cdot 10^5 \text{ m}$$

$$g = 10 \text{ m/s}^2$$

$$v = ?$$

$$F_g = F_n$$

$$\frac{M_z m}{(R+h)^2} = \frac{m v^2}{R+h}$$

$$v^2 = \frac{M_z}{R+h}$$

$$v = \sqrt{\frac{M_z}{R+h}} = \sqrt{\frac{6,67 \cdot 10^{-11} \cdot 6 \cdot 10^{24}}{81 \cdot 10^5}}$$

$$v = \sqrt{0,494 \cdot 10^8} = 0,7029 \cdot 10^4 \text{ m/s}$$

$$v = 0,7029 \cdot 10^4 \text{ m/s}$$

$$\textcircled{2} G_e = G_n / \omega p 105 / \textcircled{2}$$

$$T = 1 \text{ h } 25,5 \text{ min} = 5130 \text{ s}$$

$$\chi = \frac{6,67 \cdot 10^{-11} \text{ N} \cdot \text{m}^2}{\text{kg}^2}$$

$$G_n = 2 G_e$$

$$\chi \frac{M m}{R^2} = 2 m \omega^2 R$$

$$M = \frac{2 \omega^2 R^3}{\chi}$$

$$\rho \cdot V = \frac{2 \omega^2 R^3}{\chi}$$

$$\rho \cdot \frac{4}{3} R^3 \pi = \frac{2 (2\pi)^2 R^3}{\chi T^2}$$

$$\rho \cdot \frac{4}{3} \pi = \frac{2 \cdot 4\pi^2}{\chi T^2}$$

$$\rho = \frac{6 \cdot \pi}{\chi T^2} = \frac{6 \cdot 3,14}{6,67 \cdot 10^{-11} \cdot 5130^2}$$

$$\rho = \frac{18,84}{1,76 \cdot 10^{-5}}$$

$$\rho = 10,705 \cdot 10^3 \text{ kg/m}^3$$