Aufgabe 1: Wasser in Molekülwolken

$$m = 70 \ kg$$

$$V := \frac{m \cdot 50\%}{10^{-21} \frac{gm}{cm^3} \cdot \frac{1}{10^6}} = (3.5 \cdot 10^{16}) \ km^3 \qquad V = (3.5 \cdot 10^{31}) \ cm^3$$

$$rac{V}{rac{4}{3} \, \pi \cdot R_{Erde}^{3}} = 3.231 \cdot 10^4 \qquad ext{W"urfelkantenl"ange:} \qquad q \coloneqq \sqrt[3]{V} = \left(3.271 \cdot 10^8
ight) \, extit{m} \ r_{Mond} = \left(3.844 \cdot 10^8
ight) \, extit{m}$$

Aufgabe 2: Masse und Druck der Atmosphäre

a)
$$A_{Erde} \coloneqq 4 \cdot \boldsymbol{\pi} \cdot R_{Erde}^{-2} = \left(5.101 \cdot 10^{14}\right) \, \boldsymbol{m}^2$$
 $m_{Atmo} \coloneqq 10000 \, \frac{\boldsymbol{kg}}{\boldsymbol{m}^2} \cdot A_{Erde} = \left(5.101 \cdot 10^{18}\right) \, \boldsymbol{kg}$

$$\begin{split} V_{Atmo} &:= \frac{4}{3} \, \boldsymbol{\pi} \cdot \left(\left(R_{Erde} + 100 \, \, \boldsymbol{km} \right)^3 - R_{Erde}^{ 3} \right) = \left(5.181 \cdot 10^{10} \right) \, \boldsymbol{km}^3 \\ m_{Ozeane} &:= 75\% \cdot A_{Erde} \cdot 3.5 \, \, \boldsymbol{km} \cdot 1000 \, \frac{\boldsymbol{kg}}{\boldsymbol{m}^3} = \left(1.339 \cdot 10^{21} \right) \, \boldsymbol{kg} \\ p &:= \frac{m_{Ozeane}}{m_{Atmo}} \cdot 1 \, \boldsymbol{bar} = 262.5 \, \, \boldsymbol{bar} \qquad p := \frac{m_{Ozeane} \cdot \boldsymbol{g}}{A_{Erde}} = \left(2.574 \cdot 10^7 \right) \, \boldsymbol{Pa} \end{split}$$

Aufgabe 3: Doppelsternsystem $\, \alpha \,$ Cen

$$\alpha \coloneqq 17.1$$
 " $p \coloneqq 0.758$ " $T \coloneqq 80.1$ yr $a_B da_A \coloneqq 1.22$

$$D_{Erde} \coloneqq rac{1}{ an(p)} = \left(4.071 \cdot 10^{16}
ight) \, m{m} \qquad D_{Erde} = \left(2.721 \cdot 10^{5}
ight) \, m{AE} \qquad D_{Erde} = \left(1.197 \cdot 10^{-4}
ight) \, m{pc}$$

$$a := \operatorname{atan}(\alpha) \cdot D_{Erde} = (3.375 \cdot 10^{12}) \ m$$
 $a = 22.559 \ AE$ $a = (9.926 \cdot 10^{-9}) \ pc$

$$m_{A}pm_{B}\coloneqq M_{\Theta} \cdot rac{a^{3} \cdot \left(1 \hspace{1mm} oldsymbol{yr}
ight)^{2}}{T^{2} \cdot \left(1 \hspace{1mm} oldsymbol{AE}
ight)^{3}} = \left(3.559 \cdot 10^{30}
ight) \hspace{2mm} oldsymbol{kg} \hspace{2mm} a(P,M)\coloneqq \sqrt[3]{rac{P^{2} \cdot G \cdot M}{4 \hspace{1mm} oldsymbol{\pi}^{2}}}$$

$$\frac{a_A}{a_B} = ? \frac{m_B}{m_A}$$

$$m_A \left(1 + \frac{a_A}{a_B}\right) = ? \left(m_A + m_B\right)$$

$m_{A} \coloneqq \frac{m_{A}pm_{B}}{1 + \frac{1}{a_{B}da_{A}}} = \left(1.956 \cdot 10^{30}\right) \textit{kg}$ $\frac{m_{A}}{M_{\Theta}} = 0.983$		
$m_A p m_B$ (1.05 c , 10 30) h_A	m_A (1.602)	1030\ 1
$m_A = \frac{1}{1} = (1.956 \cdot 10) \kappa g$	$m_B = {a_B da_A} = (1.003 \cdot$	10) κg
$1+rac{}{a_{B}da_{A}}$		
$\frac{m_A}{2}$ -0.983	$\frac{m_B}{m_B} = 0.806$	
$\overline{M_{\Theta}}$ = 0.983	$\overline{M_{\Theta}}$ = 0.800	
alternativ: p=0.737", alpha=17,59" -> a ma+mb=3.9*10^30kg mb=1.8*10^30kg=0.95ms ma=2.1*10^30kg=1.1ms		
Aufgabe 4: Quadratbogensekunde		
$\frac{1 \ sr}{\left(1 \ " \cdot \frac{2 \ \pi}{360^{\circ}}\right)^{2}} = 4.255 \cdot 10^{10}$	$\frac{1 \text{ rad}}{1 \text{ "}} = 2.063 \cdot 10^{5}$ $\frac{1 \text{ "}}{1 \text{ rad}} = 4.848 \cdot 10^{-6}$	$\frac{1 \ rad}{1^{\circ}} = 57.296$
$(1 \cdot 1 \cdot 2 \pi)^2$	1 "	1°
$\left(\frac{1}{360^{\circ}}\right)$	$\frac{1}{1} = 4.848 \cdot 10^{-6}$	$\frac{1^{\circ}}{1 \; rad} = 0.017$
	1 rad	1 rad
Aufgabe 5: Magnitudendifferenz		
$m_{V}\!\coloneqq\!-2.5\!*\!log\!\left(\!egin{array}{c} F_{V} \ F_{0} \end{matrix}\!\right) \qquad F_{A}\!F_{B}\!\left(\!A,\!B ight)\!\coloneqq\!$	$\frac{A-B}{-2.5}$	
a) $F_A F_B (6,1) = 0.01$		
b)		
$F_A F_B \left(-26.7, -12.5\right) = 4.786 \cdot 10^5$		