Messung der Avogadro-Konstante durch radioaktiven Zerfall

a)

$$N = \underline{\underline{3\Gamma t}}$$
$$N_\mathrm{A} = \underline{\underline{\frac{NRT}{pV}}}$$

b) $p = 1\ \mathrm{atm}$; $T = 273.15\ \mathrm{K}$; $V = 14\ \mathrm{mm}^3$; $\Gamma = 7.2 * 10^{12}\ 1/\mathrm{s}$

$$N_\mathrm{A} = \frac{NRT}{pV} = \underline{\underline{6.23 * 10^{23}\ 1/\mathrm{mol}}}$$

$$\Gamma(t) = \Gamma_0 \left(\frac{1}{2}\right)^{\frac{t}{T}}$$

From the equation above one can see that the bigger the half life T of an element, the less will the activity Γ decrease with time. So an element with longer half life is better suited in this case.

Ebene Wellen und Kugelwellen

a)

$$A_1(x,t) = \underbrace{A}_{\text{Amplitute}} \cos(kx - \omega t)$$

The Amplitude of the wave, denoted A, in case of water waves this tells us how high the wave can get (in respect to still water) and in respect to sound

b)

c)

$$A_1(x,t) = A\cos(\omega t + kx) = Ae^{ikx - i\omega t}$$

Bragg-Reflexion

$$\rho = 8.91\ \mathrm{g/cm3}; \quad m = 63.5\ \mathrm{u}$$

a) $\rho = \frac{m}{a^3}$

$$a = \sqrt[3]{\frac{m}{\rho}} = \underline{\underline{2.28 * 10^{-10}\ \mathrm{m}}}$$

b) $\theta_1 = 20°; \quad d_1 = a$

$$\Delta s = 2d\sin(\theta) = k\lambda = \lambda \qquad (k = 1 \text{ for 1.Order})$$

$$\lambda = 2d\sin(\theta_1) = \underline{\underline{1.56 * 10^{-10}\ \mathrm{m}}}$$

c)

$$d_2 = \frac{a}{\sqrt{2^2+1^2+0^2}} = \frac{a}{\sqrt{5}} = \underline{\underline{1.02 * 10^{-10}\ \mathrm{m}}}$$

$$\theta_2 = \arcsin\left(\frac{\lambda}{2d_2}\right) = \underline{\underline{49.89°}}$$