

1 Präsenzaufgabe von Theo 4 vom Montag, den 18.4.2011

1.1 Präsenzaufgabe

$$\begin{aligned}F_z &= \frac{mv^2}{r}, & F_c &= -\frac{1}{4\pi\epsilon_0} \frac{e^2}{r^2}, & V &= \frac{e^2}{4\pi\epsilon_0} \frac{1}{r} \\ \lambda &= \frac{h}{p} = \frac{h}{mv} \Rightarrow 2\pi r = \frac{nh}{mv} \Rightarrow rmv = \frac{nh}{2\pi} \\ \Rightarrow \frac{mv^2}{r} &= \frac{1}{4\pi\epsilon_0} \frac{e^2}{r^2} \Rightarrow \frac{nh}{2\pi} r = \frac{e^2}{4\pi\epsilon_0} \\ \Rightarrow v &= \frac{1}{2n\epsilon_0} \frac{e^2}{r}, & r &= \frac{n\lambda}{2\pi} = \frac{nh}{2\pi mv} = \frac{n^2 h^2 \epsilon_0}{\pi m e^2} \\ E_n &= \frac{1}{2} mv^2 - \frac{1}{4\pi\epsilon_0} \frac{e^2}{r} = \frac{me^4}{8h^2\epsilon_0^2} - \frac{me^4}{4h^2\epsilon_0^2} = -\frac{1}{8} \frac{me^4}{h^2\epsilon_0^2} \frac{1}{n^2} \\ \Delta E &= |E_2 - E_1| = -\frac{1}{8} \frac{me^4}{h^2\epsilon_0^2} \left(\frac{1}{n_2^2} - \frac{1}{n_1^2} \right) = \frac{hc}{\lambda} \Rightarrow \frac{1}{\lambda} = -\underbrace{\frac{1}{8} \frac{me^4}{h^3\epsilon_0^2 c}}_{R_\infty} \left(\frac{1}{n_2^2} - \frac{1}{n_1^2} \right)\end{aligned}$$

1.2 Präsenzaufgabe

1) $f(x) = Ae^{-\lambda x}$

2) $f(x) = A_1 e^{ikx} + A_2 e^{-ikx} = B_1 \cos(kx) + B_2 \sin(kx)$