

## Materiewellen und Wellenfunktionen

$$\Psi(x) = \begin{cases} Ax(a-x) & \text{für } 0 \leq x \leq a \\ 0 & \text{für } x < 0 \text{ und } x > a \end{cases}$$

a)

$$1 = \int_{-\infty}^{\infty} |\Psi(x)|^2 dx = \int_0^a A^2 x^2 (a-x)^2 dx = \frac{a^5 A^2}{30}$$

$$A = \underline{\underline{\sqrt{\frac{30}{a^5}}}}$$

$$\text{b) } k = \frac{2\pi}{\lambda} = \frac{mv_T}{\hbar} = \frac{p}{\hbar}; \quad \omega = \frac{2\pi v_T}{\lambda} = \frac{mv_T^2}{2\hbar} = \frac{E}{\hbar} = \frac{p^2}{2m\hbar} = \frac{k^2 \hbar}{2m}$$

$$v_g = \frac{d\omega}{dk} = \underline{\underline{\frac{k\hbar}{m} = \frac{p}{m}}}$$

$$\text{c) } a_1 = 1 \text{ m}; \quad a_2 = 0.5 \times 10^{-10} \text{ m}$$

$$\lambda_{\text{db}} = \frac{h}{mv_T}$$

$$E_{\text{ges}} = k \frac{e^2}{v_T}$$

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## Doppelspaltversuch mit Elektronen

a)

$$\text{b) } E = 10 \text{ eV}; \quad d = 3 \text{ nm}$$

c)

## Neutronen im Interferometer

a)

$$\frac{mv_f^2}{2} = \frac{mv_i^2}{2} - mgh$$
$$v_f = \sqrt{v_i^2 - 2gh}$$

b)