Partialwellenzerlegung (Drehimpulserhaltung) $\psi(r) = \phi_{\text{ein}} + \phi_{\text{gestr}}$

$$\boxed{\psi(r) = e^{ikr\cos\theta} + f(\theta)\frac{e^{ikr}}{r}} = \sum_l i^l (2l+1) j_l(kr) P_l(\cos\theta) + f(\theta)\frac{e^{ikr}}{r}$$

$$\underbrace{j_l(x) \overset{r\to\infty}{=} \frac{1}{x}\sin\left(x - l\frac{\pi}{2}\right)}_{\text{Bessel-Funktion}} \qquad \underbrace{n_l(x) \overset{r\to\infty}{=} -\frac{1}{x}\cos\left(x - l\frac{\pi}{2}\right)}_{\text{Neumann-Funktion}}$$

$$\psi(r) \overset{m=0}{=} \sum_l a_l R_{kl}(r) \cdot Y_{l0}(\theta) = \sum_l a_l R_{lk}(r) \cdot P_l(\cos\theta)$$

$$\left[\frac{\mathrm{d}^2}{\mathrm{d}r^2} + k^2\right](rR_{kl}) = 0 \to R_{kl} = A_l j_l + B_l n_l = \frac{C_l}{kr}\sin\left(kr - l\tfrac{\pi}{2} + \delta_l\right)$$

$$\boxed{f(\theta) = \sum_l f_l(\theta) = \sum_l \frac{1}{k}(2l+1)e^{i\delta_l}\sin\delta_l P_l(\cos\theta)}$$

$$\sigma = \int \frac{\mathrm{d}\sigma}{\mathrm{d}\Omega} d\Omega = \int |f(\theta)| d\Omega = \sum_l \sigma_l = \sum_{l=0} \frac{4\pi}{k^2}(2l+1)\sin^2\delta_l$$