$$K^2 = \frac{2mE}{\hbar^2}$$

$m = m_{neutron} = 939.5654\ MeV/c^2$

$E = 4\ MeV$

$$K^2 = \frac{2m_nE}{\hbar^2} = \frac{2(939.5654\ MeV/c^2)(4\ MeV)}{\hbar^2}$$

y $\hbar c = 197.326\ MeV \cdot fm$

$$K^2 = 8 * 939.5654 \frac{MeV^2}{\hbar^2 c^2}$$

$$K^2 = 8 * 939.5654 \frac{Me\cancel{V}^2}{(197.326\ Me\cancel{V} \cdot fm)^2}$$

$$K^2 = \frac{8 \cdot 939.5654}{(197.326)^2\ fm^2} = 0.19304\ fm^{-2}$$ #

$$K = 0.4393\ fm^{-1}$$ #

Cambios de fase "δ_l" para un potencial central

$$f(\theta) = -\frac{2m}{\hbar^2 q}\int_0^\infty r V(r)\,\mathrm{sen}(qr)\,dr \qquad q = 2k\,\mathrm{sen}\left(\frac{\theta}{2}\right)$$

$$f_l = \frac{e^{2i\delta_l} - 1}{2i} = e^{i\delta_l}\frac{\left(e^{i\delta_l} - e^{-i\delta_l}\right)}{2i} = e^{i\delta_l}\,\mathrm{sen}\,\delta_l = a_l$$

En pequeños cambios de fase, δ_l, $e^{i\delta_l}\,\mathrm{sen}\,\delta_l \simeq \delta_l$

$\mathrm{sen}\,\delta_l \simeq \delta_l$ y $e^{i\delta_l} \simeq 1$, entonces

$$a_l = e^{i\delta_l}\,\mathrm{sen}\,\delta_l = -\frac{2mk}{\hbar^2}\int_0^\infty V(r)\,j_l^2(kr)\,r^2\,dr = -\frac{\pi m}{\hbar^2}\int_0^\infty V(r)\,J_{l+1/2}^2(kr)\,r\,dr$$

$$\delta_l = -\frac{2mk}{\hbar^2}\int_0^\infty r^2 j_l^2(kr)\,V(r)\,dr$$

$$j_l(s) = \sqrt{\frac{\pi}{2s}}\,J_{l+1/2}(s)$$

$$j_l(s) \xrightarrow[s\to\infty]{} \frac{1}{s}\,\mathrm{sen}\left(s - \frac{l\pi}{2}\right)$$