The Schrödinger equation for an N-particle system can be written in the form:

\[ \left[ -\frac{1}{2}\Delta + V(x) - E \right] \psi(x) = 0 \]  \hspace{1cm} (9-1)

where \( \Delta \) is the generalized Laplacian operator, and where

\[ x = (x_1, x_2, \ldots, x_d) \]  \hspace{1cm} (9-2)

is a d-dimensional vector representing the mass-weighted coordinates of the system, with d = 3N. If \( \psi^t(k) \) represents the Fourier transform of the wave function, (equation (5-43)), then \( \psi^t(k) \) obeys the reciprocal-space Schrödinger equation, (5-45):

\[ (k^2 + k_0^2) \psi^t(k) = -\frac{2}{(2\pi)^d} \int dk' \nabla^t(k-k') \psi^t(k') \]  \hspace{1cm} (9-3)

where \( k_0^2 = -2E \). From the generalized Fourier convolution theorem (equation (4-48)) we can see that (9-3) can be rewritten in the form:
Dividing equation (9-4) by $k^2 + k_0^2$ and taking the Fourier transform of both sides, we obtain:

$$
\psi(x) = -\frac{2}{(2\pi)^d} \int dx' \int dk \frac{e^{i k \cdot (x' - x)}}{k^2 + k_0^2} V(x') \psi(x')
$$

which can be rewritten in the form:

$$
\psi(x) = -\int dx' G(x-x') V(x') \psi(x')
$$

where

$$
G(x-x') = \frac{2}{(2\pi)^d} \int dk \frac{e^{i k \cdot (x' - x)}}{k^2 + k_0^2}
$$

We can use the expansion of a plane wave in terms of Gegenbauer polynomials and hyperspherical Bessel functions (4-27) to rewrite the kernel of (9-6) in the form:

$$
G(x-x') = \frac{2}{(2\pi)^d} \left[ (d-4) \right]^2 \sum_{\lambda} \sum_{\lambda'} i^{\lambda - \lambda'} (d+2\lambda-2)(d+2\lambda'-2)
$$

$$
\times \int_0^\infty dk \frac{d-1}{k^2 + k_0^2} j_0^d(kr') j_0^d(kr) \int d\Omega_k c_\lambda^\alpha(u_k \cdot u_k) c_\lambda^\alpha(u' \cdot u_k)
$$

$$
(9-8)
$$