Problems (for 4 December)

1. Using the partial wave analysis derive the general expressions for the scattering phases, differential and total cross sections for the scattering on the potential:

$$V(r) = \begin{cases} V_0, r \leq d \\ 0, r > d \end{cases}$$

2. Within the Born approximation, calculate the s-wave scattering phase and the total cross section for the scattering on the potential *V(r)* from task 1. Assume the low-energy limit $kq \ll 1$.

3. Calculate the scattering length for the case of hard-sphere scattering. I.e. consider a a potential that is infinitely repulsive for *r* < *d* and is zero otherwise.