Problem B. Scattering in the Born approximation

Consider two nonrelativistic particles with the same mass interacting each other through a Yukawa potential. The Hamiltonian is ($r = |\vec{r}_1 - \vec{r}_2|$):

$$H = -\frac{1}{2m}\triangle_1 - \frac{1}{2m}\triangle_2 + g\frac{e^{-\mu r}}{r}$$

Assume to be in the center of mass frame.

1) Consider the scattering amplitude in the Born approximation. Determine its dependence on the momenta of the incoming and outgoing particles, supposing that the two particles are not identical. (disregarding overall factors, like normalization constants)

2) Answer the same question 1), supposing now that the two particles are identical Fermions with the usual spin. Consider the two cases:

i) the two particles are in a spin triplet configuration.

ii) the two particles are in a spin singlet configuration.

Determine a spin configuration and a scattering angle for which the scattering amplitude is zero.