WS 2009/10

1) Beta-decay

Show that the energy spectrum of the emitted electron in the allowed beta decay is described by a $p^2(E\text{-}E_o)^2$ – dependence when the neutrino mass is taken as zero (p is the momentum and E here the kinetic energy (not the total energy) of the emitted electron, E_o total available decay energy shared by electron and neutrino). (Start from *Fermi's Golden Rule* and assume that the matrix element is constant so that only the density-of-state factor dN/dE_o has to be considered).

2) Nuclear reactions: Stripping reaction

In the reaction ^{76}Se (d,p) ^{77}Se a neutron is transferred. The single particle orbitals available in this energy range are either p1/2 or g9/2. Show that the first maximum in the angular distribution at 19° discriminates between the two possibilities. Use the relation (cosine-relation) between the wave vectors according to the sketch (E_d = 7.8 MeV, the Q-value is Q = 5.19 MeV, what is the energy of the proton?).