Phy 554: Problem Set 2

(Due: February 19, 2001)

9). Gasiorowicz, Chap. 14, Problem 14.

10). A beam of electrons is passed through a Stern-Gerlach apparatus, and provides a beam with $s_z = 1/2$ (so that the system is prepared in the state $|1/2, +1/2\rangle$). This beam is then passed through another Stern-Gerlach apparatus with its magnetic field inclined at an angle θ in the $x - z$ plane with respect to the z-axis (Note that $+\theta$ reflects a rotation towards the $+x$ axis.) What is the relative intensity of the two beams which emerge from this second apparatus?

11). Gasiorowicz, Chap. 8, Problem 5.

12). Gasiorowicz, Chap. 8, Problem 6.
What would the lowest energy of the system be were the two electrons in a spin-singlet state?

13). Gasiorowicz, Chap. 8, Problem 7.

14). Gasiorowicz, Chap. 8, Problem 8.
Suppose, instead, the two electrons were pions (or any other particle of integer spin). What would the probability as a function of separation be in this case?

15). Gasiorowicz, Chap. 9, Problem 8. Calculate the Fermi energy in MeV.
Hint: The nonrelativistic approximation is suitable as long as $\beta \ll 1$. Evaluate whether this condition is satisfied for the range of densities indicated.

16). Gasiorowicz, Chap. 15, Problem 4.

17). Gasiorowicz, Chap. 15, Problem 9.

18). Gasiorowicz, Chap. 15, Problem 10.