

Phy 523
PARTICLE PHYSICS
Problem sheet VIII

12th March 2009

19th March 2009(due date)

36. Consider a massless Dirac particle. Show that $(1 + \gamma_5)v(p)$ represents an antiparticle of negative helicity. $v(p)$ is a plane wave solution $\not{p}v(p) = 0$

37. What are the helicities of $\bar{u}(p)(1 + \gamma_5)$, $\bar{u}(p)(1 - \gamma_5)$, $\bar{v}(1 + \gamma_5)$ and $\bar{v}(1 - \gamma_5)$, where the spinors are for massless particles.

38. Find the wave function of a massive Dirac particle which is its own antiparticle. (This is referred to as Majorana particle)

39. Evaluate $\bar{u}(p)\gamma^\mu u(p)$, $\bar{u}(p)\sigma^{\mu\nu}u(p)$ for a Majorana particle.

40. If we neglect the mass of the electron, what will be final helicity of the electron if its initial helicity is negative in (a) Rutherford scattering (b) Compton scattering.