Physics 3740 — Answers to HW N° 2 (Chapter 2)

(3) (a) $\frac{5}{4}$ (b) $0.383 \frac{MeV}{c}$ (c) $0.639\ MeV$ (d) $0.128\ MeV$

(11) $E \simeq 0.522\ MeV$, $E_k \simeq 0.011\ MeV$, $p \simeq 0.104 \frac{MeV}{c}$

(14) (a) $0.00415\ \%$ (b) $0.0027\ \%$

(18) (a) $4.5 \times 10^{-9}\ u$ (b) $7.7 \times 10^{-9}\ \%$

(21) $E_k = \dfrac{4(Mc^2)(mc^2) + (mc^2)^2}{2(Mc^2)} \simeq$ (279.7 MeV), where $Mc^2 = 938.28\ MeV$ and $mc^2 = 135\ MeV$ are the proton and pion rest energies respectively

(27) (a) $4.97 \frac{MeV}{c}$ (b) 0.995

(29) (a) $u \simeq 0.286\,c$ (b) $m \simeq 1673 \frac{MeV}{c^2}$

(45) Hint: Analyse the process in the centre-of-momentum frame of the electron-positron pair, where their total momentum is zero.

(46) $p_y' = \gamma' m u_y'$. Use Eq. (2-13) on p. 73 for γ', and see p. 22 for the u_y' formula.

You should be able to show pretty easily that $p_y' = \gamma m u_y = p_y$.

(48) (a) $u = \frac{\sqrt{3}}{2} c = 0.866\,c$

(b) $u_x' = -0.990\,c$ (velocity). The speed is $0.990\,c$.