Short HW 1: **Units, Compton scattering**

Course: Physics 165, *Introduction to Particle Physics* (2018)
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Due by: **Thursday**, January 10

Note that this short assignment is due in class on Thursday. You have only *two days* to do it. This should be quick, I recommend doing it right after class on Tuesday.

1 Natural Units

Do everything in this problem to *one significant figure*.

1.1 The mass of a proton in kilograms

On page 4 of **the PDG**[1], find the mass of the proton. Write out the proton mass in natural units (use MeV with $c = \hbar = 1$) and in kilograms.

1.2 Human weight in protons

The average American weights 81 kg[2]. Round this to a single significant figure: 100 kg. Approximately how many protons does the average American weigh? Write this in natural units (MeV).

2 Compton Scattering in QED

Compton scattering is the process $e^-\gamma \to e^-\gamma$, where you can assume that the incoming particles have different momenta than the outgoing particles so that some interaction must have happened. Draw the Feynman diagram(s) for Compton scattering in quantum electrodynamics.

3 Read the weekly homework

Before class on Thursday, go over the weekly ("long") homework assignment due on January 16. Write out one question that you would like to have answered on Thursday. Ideally it would be about the topics of in the homework.

[1] By 'PDG' we mean the 2016 PDG Particle Physics Booklet, which was handed out to you in class. The data is also available at http://pdg.lbl.gov.

[2] "The weight of nations," http://doi.org/10.1186/1471-2458-12-439