PHY466

H O M E W O R K 1

Homework should be handed in to F10 ***by 4:00 p.m. on Friday, 12 October 2018****.*

1. Imagine an experiment similar to Chadwick's experiment where alpha-particles bombarded a beryllium target and a neutral radiation was emitted. Assume that this neutral radiation consist of high-energy photons. These photons then irradiate a hydrogen target with a subsequent emission of protons with velocities up to 2.000×10^{10} cm/s (this process would be similar to Compton scattering but on protons rather than electrons). Using momentum and energy conservation laws, calculate the minimum energy required for a photon to produce a proton with a velocity of 2.000×10^{10} cm/s. How does the result change if the neutral radiation consists of neutrons, namely what are the minimum kinetic energy and the minimum momentum of the neutron to produce such a proton? What is the momentum of the neutron after collision in this case? Show your working in detail and do all calculations with the accuracy of at least 4 significant figures. Do not forget to check your answer. [10]

2. Describe the properties of the muon and the pion. Specify the differences between these particles. Explain why first observations of muons and pions led to confusion with their identification. You should consider experiments and theoretical predictions made at that time. [10]