FYS3500 Spring 2024 - Problem set 5

Topic: Chapter 3

Concepts of the week

Explain these concepts: Leptons, the weak interaction, Neutrino mixing, Quarks, hadrons, baryons, mesons

Make sure you have read the relevant chapters in the book and compendium before starting the exercises.

Problem 1: Conservation laws in the Weak Interaction

Martin&Shaw2019 Problem 3.1

Problem 2: Interaction of the electron neutrino

Martin&Shaw2019 Problem 3.3

Problem 3: Neutrino oscillations

Martin&Shaw2019 Problem 3.5. PS: Estimate the squared mass difference at a 1σ confidence interval. Use eq. 3.31a.

Problem 4: Neutrino mean free path

Martin&Shaw Problem 3.6. NB! Challenging exercise - you can use that mean free path is $\frac{1}{\sigma n}$ where σ is the cross section and n is the number of nuclei per unit volume.

Problem 5: Conservation laws and the strong interaction

Martin& Shaw2019 Problem 1.3