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## 1. PROBLEM SET – STANDARD MODEL OF PARTICLE PHYSICS

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to be discussed in tutorials on April 23-24

Note: to qualify for the exam, 50% of the points in the exercises are required. Solutions to the problems can be handed in in groups of at most 3 participants.

### 1 Revision notes *(optional)*

Make yourself familiar with the material provided in the Revision Notes. Solve problems 2, 3, and 4 contained in them.

### 2 Non-relativistic limit of Klein-Gordon equation *(optional)*

Show that the Schrödinger equation can be obtained as the non-relativistic approximation of the Klein-Gordon equation.

*Hint:* A convenient way is to start from the relativistic energy-momentum relation and to expand the expression for the energy  $E$  in powers of  $\frac{\mathbf{p}^2}{m^2 c^2}$ . Then the quantum operators corresponding to energy and momentum can be used.

Further information:

<https://uebungen.physik.uni-heidelberg.de/vorlesung/20241/1848>