

List of topics for the final exam

1. Prerequisite is everything you learned in Theoretical physics III with us (the lecture with the exercises of the summer-term 2009 counts, not lectures from years before that). If you are not clear what this is then look at our old webpage: http://www.th.physik.uni-bonn.de/tp3_09/topics.pdf
2. Scattering theory:
 - Basics and fundamental definitions (Scattering amplitude, Argand diagram, Unitarity relation ...)
 - Lippmann-Schwinger equation
 - Born approximation
 - Optical theorem
 - Partial wave decomposition
 - Resonance scattering
 - Low- and high energy scattering
 - Breit-Wigner formula
 - Coulomb/Yukawa scattering
3. Group theory and applications:
 - Symmetry transformations
 - Transformation groups
 - Point groups
 - Representations of groups
 - Irreducible representations
 - Continuous groups
 - Electronical levels under a certain symmetry
 - Vibrational energy levels of molecules
4. Tensoroperators and Wigner-Eckart theorem:
 - Tensoroperators (definition and Tensoroperators with spherical components)
 - Wigner-Eckart theorem
 - Selection rules
 - Calculation of reduced Matrixelement
5. Second quantization
 - Ladder operators for fermions and bosons
 - Fourier transforms for these operators
 - Standard operators expressed in second quantization (e.g. kinetic energy, current density, density, ...).
 - Fermion and Boson coherent states
 - Grassmann variables

6. Schrödinger-, Heisenberg- and Interaction-picture:
Definition
Equation of motion

Regarding the exam:

1. The exam is on 28.01.2010 at 10:00-12:00 in HS, HISKP - we aim to start at around 10:05 (not 10:15).
2. There is no printed/written matter and no calculators required nor permitted!
3. We provide paper.
4. Most of the exam will consist of examples which are close or even similar to those of the exercises.
5. In addition we may include some theory questions where no calculation is required and quickies.
6. While 4. is true for most of the exam, we may include some 'really new' examples too (so that it is less boring for you).
7. Please check this file from time to time, as there might be still small adjustments.

GOOD LUCK!!