

Physics 113 Quantum Theory Seminar

Assignment 10 March 28, March 29, 2011

This week we study Time-Independent Perturbation Theory.

Part 1: Readings

Zettili - Chapter 9 Sections 9.1-9.2 Pages 489-507

Boccio - Chapter 10(Pages 825-854 Sections 10.1-10.4,10.9).

All new material.

You must do the readings BEFORE attempting the problems in order to get a good grasp of the overall content of the week's material to be understood. A problem should then make you look more carefully at specific parts of the readings that are necessary for the solution of that particular problem!

Prior to discussing any problems, we will deal with any questions and/or discussion of the readings.

Part 2: Everyone Problems

Everyone must do all of these problems.

Random choice of presenter.

1. Z9-4 - Given a Hamiltonian matrix
2. Z9-8 - A perturbed oscillator energy to 2nd order
3. Z9-21 - Angular Momentum Perturbations
4. Z9-22 - Mess with Matrices
5. Boccio 10.9.4 - Perturbing the Infinite Square Well Again
6. Boccio 10.9.9 - Degenerate perturbation theory: spin=1 system

Part 3: Extra Problems - Presentations

Each seminar member has responsibility for 2 problem solutions/presentation.
Look at/try to solve other problems besides your own responsibility.
You will not understand other solutions without attempting or at least thinking about the problem before seminar.

Presentation #1 _____

Boccio 10.9.1 - Box with a "Sagging Bottom"

Boccio 10.9.10 - Perturbation Theory in 2-Dim Hilbert Space

Presentation #2 _____

Boccio 10.9.3 - Weird Perturbation of an Oscillator

Boccio 10.9.11 - Finite Spatial Extent of the Nucleus

Presentation #3 _____

Boccio 10.9.5 - Perturbing the 2-dim Infinite Square Well

Boccio 10.9.12 - Spin-Oscillator Coupling

Presentation #4 _____

Boccio 10.9.6 - Not So Simple Pendulum

Boccio 10.9.13 - Motion in spin-dependent traps

Presentation #5 _____

Boccio 10.9.7 - 1-Dimensional Anharmonic Oscillator

Boccio 10.9.14 - Perturbed Oscillator

Presentation #6 _____

Boccio 10.9.8 - Relativistic Correction for Harmonic Oscillator

Boccio 10.9.18 - Rigid rotator in a magnetic field