

Physics 113 Quantum Theory Seminar

Assignment 12 April 11, April 12, 2011

This week we study Time-Dependent Perturbation Theory.

Part 1: Readings

Zettili - Chapter 10 Pages 571-597

Boccio - Chapter 11(Pages 939-975 Sections 11.1-11.4).

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. Z10-12 - Hydrogen in a crystal field
2. Z10-15 - Oscillator in harmonic perturbation
3. Boccio 11.5.1 - Square Well Perturbed by an Electric Field
4. Boccio 11.5.5 - Variational Method: Deuteron Ground State
5. Boccio 11.5.6 - Sudden Change - Don't Sneeze

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 _____

Z10-22 - ∞ square well perturbed by delta function

Boccio 11.5.2 - 3-Dimensional Oscillator in an electric field

Presentation #2 _____

Z10-24 - 3-dim box perturbed by xz potential

Boccio 11.5.21 - The Sudden Approximation

Presentation #3 _____

Boccio 11.5.4 - 2 spins in a time-dependent potential

Boccio 11.5.17 - Oscillator in electric field

Presentation #4 _____

Boccio 11.5.20 - A Novel One-Dimensional Well

Boccio 11.5.7 - Another Sudden Change - Cutting the spring

Presentation #5 _____

Boccio 11.5.8 - Another perturbed oscillator

Boccio 11.5.19 - The Driven Harmonic Oscillator

Presentation #6 _____

Boccio 11.5.12 - Instantaneous Force

Boccio 11.5.18 - Spin Dependent Transitions

Final Problem #2 - Only consult with Professor

Boccio 11.5.14 - Particle in a Delta Function and an Electric Field
(solution written up in LaTeX)