

Physics 4250: Assignment #10

DUE: Thursday November 24, 2016

Problems:

1. Read chapter 13

2. Read the hand-out and summarize the important physics discussed on these pages.

3. Degenerate Energy Levels

Suppose you have a system with a weak periodic potential energy. Three energy bands are coupled together by the potential energy and the rest of the energy bands can be ignored. The modified Schrodinger equation is:

$$\begin{bmatrix} \epsilon_1 - \epsilon & \lambda_{12} & \lambda_{13} \\ \lambda_{12} & \epsilon_1 + \alpha - \epsilon & \lambda_{23} \\ \lambda_{13} & \lambda_{23} & \epsilon_3 - \epsilon \end{bmatrix} \begin{bmatrix} c_1 \\ c_2 \\ c_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \quad (1)$$

Assuming α and the λ s are small, use perturbation theory to find the eigenvalues (energies) and the eigenvectors (wave-functions) for this system.

4. Chapter 8, Problem 1, page 227

5. Chapter 8, Problem 3, page 228