

QUANTUM MECHANICS III

PHYS 518

Problem Set # 1

Distributed: Sept. 28, 2011

Due: Oct. 7, 2011

1. Repelling Barrier: A scattering barrier has width 8 (Ang.) and height 5 (eV). Compute the transmission probability for an electron in the range $0 < E < 20$ (eV). (Fig. 9.1).

2. Attracting Barrier: Repeat for a barrier of the same width but height -5 eV. (Fig. 9.2).

3. Double Barrier: Two repelling barriers of the type in Problem #1 are separated by 15 Ang. Compute the transmission probability for the range $0 < E < 10$. (Fig. 14.1).

4. Interference Problem: An electron is incident on a “50-50” beam-splitter. In one arm there is an attracting barrier as described in Problem #2. In the other arm there is an attracting barrier that is “twice as deep and half as wide.” The arms are of equal length and are terminated by a single electron detector. Compute and plot the observed electron intensity as a function of energy for the range $0 < E < 20$.