Physics 362: Information about exam.

There will be an exam on Thursday, Feb. 27, 2003 from noon to 1:00 pm in LL511. NOTE that this time is NOT the regular class time. The class will also meet at the regular time on Feb. 27, 9:20–10:35 am. The exam will be closed book and closed notes. Any physical constants and integrals you will need will be given on the exam. You should bring a calculator.

The exam will cover the following sections of the book:

- Chapter 5: all
- Chapter 6: all
- Chapter 7: sections 1–6
- Chapter 16: pages 555–559 [through Eq. (16-5)]
- Appendices H, I, M, and N provide additional information about some of the material we covered in class, but there will not be questions on the details of the derivations.

The emphasis of the exam will be the material we have covered in class or that has been on the homework. The following is a list of topics and questions you should be familiar with. This list is not necessarily complete but is representative.

- de Broglie waves: Know the dispersion relations (relations between momentum and wavelength, and between energy and frequency). What is the de Broglie wavelength of a particle with a given energy?
- What is the wavelength of a photon that has a given energy? What is the energy of a photon emitted when a system makes a transition between states?
- What is the wave function? How do you normalize it? How do you find the probability a particle is between x and $x + dx$; how do you the find average value and standard deviation of measurements?
- Be able to write down the time-dependent and time-independent Schroedinger equations.
- What are the operators corresponding to momentum, position, and energy? How do we use them to determine the average values of physical observables from the wave function?
- Know the eigenenergies of the one dimensional infinite square well and harmonic oscillator potentials.
- If a potential $V(x)$ for a particle in one dimension satisfies $V(x) = V(-x)$, what can we say about the eigenfunctions?
- What is the boundary condition for the wave function at an infinite barrier?
- Know how to estimate the probability that a particle tunnels through a barrier where the potential is constant.
- Know how to calculate the wave function for the simple situations we considered involving piecewise constant potentials. Know what form the solution takes in each region where the potential is constant.
- What is the method of separation of variables?
- What is the central force problem? What is the point of solving this problem in the center of mass frame?
- What does the classical distribution function look like for the harmonic oscillator? How does it compare to the absolute square of the quantum mechanical wave function?
- What are the reflection and transmission coefficents at a barrier? How do these differ in the classical and quantum cases?
- Know the transformation between Cartesian coordinates and spherical polar coordinates.