Study Guide for CHEM3420 Test #1 **Fall**

Material covered: You are responsible for anything we have discussed in class as well as anything that is in the book Ch. 8 (all) and Ch. 9 through p. 285 (stop right before "d: Degeneracy"). This study sheet is a guideline to help you sort through the numerous topics that you have covered. You are also responsible for anything that has been on your assignments and your homework.

Information that you will have at your disposal:
-Periodic table, scratch paper, various integral solutions
-You may also bring a 4X6" with constants and formulas only written on both sides.

The make-up of the test: multi-match, short-answer, discussion, short and long problems

I. The history of Quantum Mechanics

A. The people of QM

You need to know who they were, what they did (in word and formulae), and how what they did contributed to QM.

Balmer
Bohr
Schrodinger
Einstein
Pauli
Heisenberg
Dulong
Petit
Dirac
Planck
Wien
deBroglie
Rydberg
Angstrom
Rayleigh

B. The events leading up to/phenomena involved in the discovery of QM

II. Math

A. Concepts that we have used

Be able to use these and manipulate them.

Complex numbers, complex conjugate
Rules of exponents
Eigenfunctions, eigenvalues
Operators
Derivatives
Integrals
Partial derivatives
Triple integrals
Coordinate systems

B. Specific things you need to know

How to take the derivative of any function
How to do simple integrals (e.g. $\int x dx$, $\int \sin(x) dx$, $\int e^x dx$), etc.
How to look up integrals in an integral table
Any math involved in any homework or quiz problem.

IV. QM concepts

These are general topics. Many of them include definitions, formulas, problems, etc. <u>You need to know it all!</u>

<u>Schrodinger's equation:</u>
1-D PIB: the Hamiltonian, the wavefunction, the energy
3-D PIB: the Hamiltonian, the wavefunction, the energy
Be able to find the energy by operating on the wavefunction with the Hamiltonian given a wavefunction.
~~Heisenberg uncertainty principle~~
Normalization of a function
Expectation values
Orthogonalization of a function
Wave-particle duality
The postulates of QM
Orthonormal complete set
Requirements for a good wavefunction

V. Suggested problems at the ends of the chapters to work.

Chapter 8
Exercises: 1b, 2b, 4b, 7b, ~~12b~~
Problems: 5 'a'. (Change 'sphere' to 'confined to move on a circle'), 8, 13 a, b, c (not d), 14, 20

Chapter 9
Exercises: 3b