

Monday, January 9, 2012

Course: CHMB21H3S, Chemical Structure and Spectroscopy

Instructor: Simon J. Fraser

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OFFICES:

UTSC: Room SW 506A

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Office Hours at UTSC: Mondays 12:00–14:30, Wednesday 12:00–14:30

Lectures: Room SW 128 Monday 15:00–17:00
Room SW 128 Wednesday 15:00–16:00

Required Text: P.W. Atkins and J. de Paula (A&P), PHYSICAL CHEMISTRY Ninth Edition (Freeman).

Marking Scheme for CHMB21H3S, 2012

Problem Sets	30%
1 Term Test	30%
Final Exam	40%
TOTAL	100%

It is desirable that you take MATB41H3. Note that you must take MATB41H3 if you are going to take a 3rd year physical chemistry course.

Calendar Course Description: Atomic structure and spectra; term symbols and their meaning; valence bond theory: LCAO-MO; molecular spectroscopies.

Course Description: This course uses *Quantum Mechanics* extensively to describe atomic and molecular structure and bonding, including valence bond and molecular orbital theory. The theory of these systems will be treated first and their spectroscopy afterwards.

- Blackbody Radiation, Wave-Particle Duality, etc.
- The Time-Dependent (TDSE) and Time-Independent (TISE) Schrödinger Equations. Stationary states; operators and observables; eigenvalues and eigenfunctions.
- Quantum mechanics of two-body systems, e.g., diatomic molecules. Reduction to a one-body problem with internal potential and center-of-mass motion.
- Quantum mechanics of simple systems, especially hydrogen-like atoms.
- Many electron atoms.
- Theories of chemical bonding: valence bond theory and molecular orbital theory (LCAO-MO description). This is done in relation to the hydrogen molecule ion H_2^+ , the hydrogen molecule, H_2 , and more complex molecules.
- Quantum mechanics of the internal motion of molecules.

- Spectroscopy of the above atomic and molecular systems.