Course: CHMB21H3S, Chemical Structure and Spectroscopy

Instructor: Simon J. Fraser

E-mail Addresses
 e-mail: sfraser@chem.utoronto.ca
 e-mail: fraser@utsc.utoronto.ca

Telephone Numbers
Tel. UTSC: (416) 287-7214
Tel. St. George: (416) 987-4650

OFFICES:
Scarborough: Room SW641
St. George: Room 420C

Office Hours at UTSC: Mondays 1:00-2:30, Wednesday 1:00-5:00

Lectures: Room BV 355 Monday 3:00-5:00

Required Text: T. Engel and P. Reid, Physical Chemistry (Pearson, Toronto, 2006).

Marking Scheme for CHMB21H3S, 2006

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Sets</td>
<td>30%</td>
</tr>
<tr>
<td>1 Term Test</td>
<td>30%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>40%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100%</td>
</tr>
</tbody>
</table>

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.

Course Outline
This course will use Quantum Mechanics extensively to describe atomic structure, and molecular structure and bonding, including valence bond and molecular orbital theory. The spectra associated with atoms and molecules will also be discussed.

- Early Quantum Theory. The crucial experiments: black-body radiation, particles showing wave-like properties and waves showing particle-like properties.
- The time-dependent (TDSE) and time-independent (TISE) Schrödinger Equations. Stationary states; eigenvalue and eigenfunction; observables and complete sets of eigenfunctions.
- Quantum mechanics of simple systems, especially hydrogen-like atoms.
- Many electron atoms.
- Theories of chemical bonding: valence bond theory and molecular orbital theory. This is done in relation the the hydrogen molecule ion H⁺, the hydrogen molecule, H₂, and more complicated molecules.
- The internal motion of molecules will also be treated.