

**Introductory Chemistry I: Structure and Bonding**  
**CHMA10H3**  
**LECTURE OUTLINE-Winter 2008**

**This document contains important course information and should be kept in a safe place where you can refer to it throughout the semester.**

**Welcome to CHMA10HS: Introductory Chemistry I: Structure and Bonding.** CHMA10 provides an introduction to the study of chemical transformations of matter, from a macroscopic and microscopic perspective, the quantitative description of gases, solids and solutions and ideas of bonding and structure in chemical compounds with a particular emphasis on organic and biological molecules. It is a prerequisite for almost all other further chemistry and biology courses at the University of Toronto at Scarborough campus. Students enrolled in CHMA10H must have previously completed senior-level chemistry in high school or have received permission from the Course Coordinator.

**Lectures:** M, F 10-11 am SW-128  
Wed 10-11 am SW-143  
January 7<sup>th</sup>-April 7<sup>th</sup> 2008

**Lecturer:** Dr. Shadi Dalili

**E-mail:** [sdalili@utsc.utoronto.ca](mailto:sdalili@utsc.utoronto.ca)

**Office Hours (SW-651):** M, W 12-2 pm and by appointment

**Course Website:** <http://www.utsc.utoronto.ca/~chma10/winter/index.html>

**Communication:** via email and Blackboard

**Blackboard Course Website:** CHMA10HS will be using Blackboard for its course communication this semester. To access the CHMA10H website, or any other Blackboard-based course website, go to the UofT portal login page at <http://portal.utoronto.ca> and log in using your UTORid and password, which can be obtained by emailing [help.desk@utoronto.ca](mailto:help.desk@utoronto.ca) or through the help desk in Robarts Library on the St. George campus. Once you have logged in to the portal, look for the **My Courses** module, where you will find the link to the CHMA10H course website along with the links to your other courses with active Blackboard sites. All course announcements, lecture notes, and test information will be posted on the CHMA10 website on Blackboard. Your lab, lab quiz, and midterm marks as well as tutorial attendance will be posted on the usual intranet site for CHMA10. The CHMA10 site on Blackboard also includes a chat and discussion board functionality which will be discussed further in the first class.

**Course coordinator:** Ann Verner; Office: SW 650

**Email:** verner@utsc.utoronto.ca

**Textbook:** "General Chemistry", Principles and Modern Applications, 9<sup>th</sup> Edition  
by Petrucci, Harwood, Herring, and Madura

**Chapters:** 1-11 and 26

**Recommended:** Study Guide and Solutions Manual (included in package with text)

**Online Homework:** MasteringChemistry by Pearson

The text, study guide and solutions manual, and Mastering Chemistry access code, will be available as a package through the UTSC bookstore.

If you already have a textbook and only need the Mastering Chemistry access material, you can buy it separately through the bookstore. If you previously purchased the Mastering Chemistry access code, it is good for 12 months from first activation.

**MasteringChemistry Online Homework schedule:** setup your account using UTSC login and password (code needed for site in textbook package)-instructions for setting up account can be found on the course website (<http://www.utsc.utoronto.ca/~chma10/winter/index.html>).

The MC Problem Sets will be released every Wednesday at 3:00 pm and they are due the following Wednesday morning at 9:00 am.

Each assignment will contain 3-5 questions. The assignments will be equally weighted and recorded as a percentage. They will cover the material discussed in class.

The percentage of available marks on an assignment will fall linearly to 0% by 10 am on the Wednesday due date.

In the final calculation for the Homework grade, the lowest mark will be dropped.

### **Laboratory Schedule:**

**Odd numbered** labs Sections **PRA0001, PRA0003** etc. (**week 1 students**) begin labs the week of **January 14, 2008**. **Even numbered** labs Sections **PRA0002, PRA0004** etc. (**week 2 students**) begin labs the week of **January 21, 2008**.

**The laboratory component of CHMA10H is compulsory. In order to pass the CHMA10H course, students must pass the lab component of the course.**

*If you are absent: report it to your TA by phone or e-mail. You may also leave a message with the Lab Coordinator Lin Teo in SW155C or by phone 287-7220. Hand in medical note in your next class or ASAP.*



The medical note should:

- verify that the student was examined on the day of the test
- if possible, state the illness and
- it **MUST** indicate the physician's professional opinion as to whether the student should receive special consideration on medical grounds.

### **Laboratory Rules**

#### **Lab Manual:**

This must be purchased **from** the UTSC Bookstore.

**Lab Notebook:** This will be given to you at your first lab.

**Lab Coats:** They are required. They may be purchased from most Hardware Stores or from the UTSC Bookstore. *Student chem/biol clubs sell them cheaper.*

**Safety Glasses:** Safety glasses must be worn at all times in the lab. Students who do wear glasses should purchase a pair of goggles which must be worn over their glasses at all times. **Contact lenses must not be worn in the laboratory. NO STUDENT WILL BE ALLOWED TO WORK IN THE LABORATORY UNLESS HE/SHE IS WEARING APPROVED EYE PROTECTION.**

**Be punctual:** The introductory explanations for the experiments and/or quizzes will begin at 10 minutes past the hour.

**Be prepared:** Each student will be expected to have a good knowledge of the assigned experiment **before** entering the laboratory. **It will be helpful to prepare a point-form pre-lab procedure before coming to the lab.**

**Be there:** Your term mark from the lab is worth a large percentage of your mark. It is based not only on the reports which you submit, but also on your ability to answer, with competence, the questions of the demonstrators and instructor.

**\* PLEASE NOTE that students will not be allowed to re-schedule or miss labs on the days of any first year term test or exam. This is a Chemistry Discipline Policy.**

#### **Tutorial Schedule:**

Tutorials are scheduled in the same time slot as your CHMA10H laboratory but in the alternate week of your assigned laboratory. Your tutorial section is linked to your lab section and is the same section number as your lab section. Check the UTSC timetable to confirm the time and room for your tutorial section. Attendance at the tutorials is compulsory. You will be allowed to miss one tutorial but after that you will lose 1% from your homework mark for each additional tutorial that you miss.

**Odd numbered** Lab sections **PRA0001 , PRA0003** etc. (**week 1 students**) have been assigned tutorial sections with the same section number **TUT0001, TUT0003** etc. and begin tutorials **the week of Jan. 21/08**

**Even numbered** Lab sections **PRA0002 , PRA0004** etc. (**week 2 students**) have been assigned tutorial sections the same section number **TUT0002, TUT0004** etc and begin tutorials **the week of Jan. 14/08**

Please check the **UTSC timetable** to confirm the time and room for your tutorial section.

**\* PLEASE NOTE** that students will not be allowed to reschedule their tutorials if they miss a tutorial. For emergency/religious reasons students are allowed to miss one tutorial without a penalty.

**E-mail policy:**

- Use UTSC account
- If Yahoo or Hotmail used follow instructions below to prevent email ending up in junk mail:
  - put CHMA10 in the subject line followed by the reason for the email
  - use a greeting of some kind - NOT "Hey"
  - sign your first and last name
  - please include your student number after your name
- Student emails will be replied to within 48 hours (M-F) provided that the above protocol is used.

**Method of Evaluation:** There are two different schemes for evaluation according to the table provided below. The scheme which gives you the higher grade at the end of the term will be used for your final grade calculation.

	Scheme A	or	Scheme B	
Term Test-NO MAKE UP	25%	or	15%	First 6 weeks
Final Exam	45%	or	55%	Entire course work



Online homework and tutorials	5%		5%	Lowest mark will be dropped from final grade
Laboratory	25%		25%	See lab manual for dates/evaluation

In accordance with the University of Toronto at Scarborough Calculator Policy, only the following specific models will be allowed in all CHMA10/CHMA11 tests and exam:

***Texas Instruments (TI-30, TI-34II Explorer Plus, TI-Explorer Plus, TI-32) Sharp (EL-531, EL-509), Casio (fx-65, fx-250, fx-260, fx-280).***

Students who have illegal calculators confiscated during the test/exam will be supplied with an allowed calculator but an **immediate penalty of 10%** will be imposed for that test/exam.

If students come to the exam without a calculator then they will certainly be allowed to borrow an allowed model but that will also cost them 10% of their mark on that test/exam.

**THERE IS NO MAKE-UP FOR THE TERM TEST.**

**Persons who miss a test or exam** are expected to contact Dr. Dalili immediately. Documentation, for approval, **must be given within one week** (e.g. Doctor's note - which should say that you were seen on the day in question, and that in the Doctor's opinion you were unable to write a test that day). If the documentation is insufficient, you may be required to obtain further, signed, paperwork.

Provided that your medical note clearly outlines the reason for your absence, the 25% for the term test will be *added* to the final exam percentage weight and the final exam will then be worth 70% of your final mark, OR in the case of a missed final exam, you will be allowed to write a deferred exam **AT THE INSTRUCTOR'S DISCRETION**. Please note that on page 373 of the 2006/2007 UTSC Calendar it states:

"You cannot petition to withdraw from a course on grounds that no work was returned to you before the last day to withdraw without academic penalty if this is the result of your having been given an extension to complete your work for reasons relating to you and not the rest of your class."

For labs and the term test you **MUST** use the UTSC medical note form that is posted on the web

**Marked Term Tests** - an announcement will be made, in lecture and/or on the intranet, when tests are marked. You will be able to check your midterm mark on the intranet.

**NOTE: Students who fail BOTH the midterm test and final exam cannot pass the course based on only laboratory and homework marks; i.e. you must pass at least one of these two supervised evaluations in order to pass the course.**

## **CHAPTERS COVERED AND SUGGESTED PROBLEMS:**

I will choose 1-2 questions from each topic in each chapter for assigned end of chapter problems.

- Answers will be given for the “black” numbered questions
- **You** are **responsible** for:
  - Reading all chapters covered in lectures from the textbook
  - The Integrative Example
  - Other similar questions to the ones assigned
  - Feature Problems
  - Self-Assessment Exercises

The assigned problems are the minimum number suggested for you to try. You should always attempt as many problems as possible, as chemistry is mainly learned by "doing". The best way to do this is to keep up with the lecture material and read ahead of class as much as possible, and get help with any problems as soon as you can. Students will likely not be successful in the course if they put off doing problems until immediately before an exam. It is probably best to try these before you try the Mastering Chemistry online homework problems.

**Chapters covered:** The following outline is a rough guideline only and may change during the course. Always check course notes and announcements for updates on content.

### **Chapter 1. Matter—Its Properties and Measurement**

- 1-1 Scientific Method
- 1-2 Properties of Matter
- 1-3 Classification of Matter
- 1-4 SI (Metric Units)
- 1-5 Density and Percent Composition: their Use in Problem Solving
- 1-6 Uncertainties in Scientific Measurements
- 1-7 Significant Figures

### **Recommended End of Chapter Problems for Chapter 1:**

9, 11, 15, 21, 31, 39, 45, 51, 57, 65

### **Chapter 2. Atoms and the Atomic Theory**

- 2-1 Atomic Theory
- 2-2 Electrons



- 2-3 Nuclear Atom
- 2-4 Chemical Elements
- 2-5 Atomic Mass
- 2-6 Introduction to the Periodic Table
- 2-7 The Concept of the Mole and the Avogadro Constant
- 2-8 Using the Mole Concept in Calculations

**Recommended End of Chapter Problems for Chapter 2:**

4 (8.870 g KCl), 11, 17, 27, 33, 43, **44**(19.9% 10B and 80.1% 11B), 47, 53, 57, 68

**Chapter 3: Chemical Compounds**

- 3-1 Types of Chemical Compounds and Their Formulas
- 3-2 The Mole Concept and Chemical Compounds
- 3-3 The Composition of Chemical Compounds
- 3-4 Oxidation States: A Useful Tool in Describing Chemical Compounds
- 3-5 Naming Compounds: Organic and Inorganic Compounds
- 3-6 Names and Formulas of Inorganic Compounds
- 3-7 Names and Formulas of Organic Compounds

**Recommended End of Chapter Problems for Chapter 3:**

7, 11, **16** (a-F, b-T, c-T, d-T), **20** (36.18%), 25, 37, 39, 45, 49, 51, 55, 57, 61, 63, 73, **80** (6.71% Pb, 9.05% Zn and 67.7% Cu), 85

**Chapter 4: Chemical Reactions**

- 4-1 Chemical Reactions and Chemical Equations
- 4-2 Chemical Equations and Stoichiometry
- 4-3 Chemical Reactions in Solution
- 4-4 Determining the Limiting Reactant
- 4-5 Other Practical Matters in Reaction Stoichiometry

**Recommended End of Chapter Problems for Chapter 4:**

5, 11, 15, **18** (135 kg HNO<sub>3</sub>), **24** (1.22 g H<sub>2</sub>), 29, **40** (1.7M), 45, 49, 53, 57, **60** (28.7 g lithopone), 63, 71

**Chapter 5: Introduction to Reactions in Aqueous Solutions**

- 5-1 The Nature of Aqueous Solutions
- 5-2 Precipitation Reactions
- 5-3 Acid-Base Reactions
- 5-4 Oxidation-Reduction: Some General Principles
- 5-5 Balancing Oxidation-Reduction Equations
- 5-6 Oxidizing and Reducing Agents
- 5-7 Stoichiometry of Reactions in Aqueous Solutions: Titrations

### **Recommended End of Chapter Problems for Chapter 5:**

1, 8 [ $\text{Al}_2(\text{SO}_4)_3$ ], 15, 17, 21, 25, 27, 31, 35, 39, 41, 47, **50** (0.08683 M), 53, 55, 63 and **66** (0.09292 M  $\text{Mn}^{2+}$ )

### **Chapter 6: Gases**

- 6-1 Properties of Gases: Gas Pressure
- 6-2 The Simple Gas Laws
- 6-3 Combining the Gas Laws:
  - The Ideal Gas Equation and
  - The General Gas Equation
- 6-4 Applications of the Ideal Gas Equation
- 6-5 Gases in Chemical Reactions
- 6-6 Mixtures of Gases
- 6-7 Kinetic Molecular Theory of Gases
- 6-8 Graham's Law
- 6-9 Real Gases

### **Recommended End of Chapter Problems for Chapter 6:**

1, **4** (3.81 m), **10** [a) 1.1 L, b) 0.75 L], 13, **16** (1/2), **18** (79.03 L), 23, 25, 29, **32** ( $6.78 \times 10^5$  Pa), 35, 37, 41, 43, **44** ( $\text{C}_4\text{H}_{10}$ ), 49, **50** (109 mL), **54** (6.1 L), 57, 59, 63, 65, 67, 71, 73, **74** (79 g/mol), 77

### **Chapter 7. Thermochemistry**

- 7-1 Getting Started: Some Terminology
- 7-2 Heat
- 7-3 Heats of Reaction and Calorimetry
- 7-4 Work
- 7-5 The First Law of Thermodynamics
- 7-6 Heats of Reaction:  $\Delta U$  and  $\Delta H$
- 7-7 The Indirect Determination of  $\Delta H$ : Hess's Law
- 7-8 Standard Enthalpies of Formation
- 7-9 Fuels as sources of energy.....omitted**

### **Recommended End of Chapter Problems for Chapter 7**

5, **8** (**32.6 °C**), **10** (**800 mL**), 13, 15, 19, **22** (**95 °C**), 27, 33, 35, 41, 43, 47, 49, 53, 57, **60** (**-818.2 kJ**), 61, **64** (**-234.2 kJ**), 67, 71, 75, **78** (**427 L**)

### **Chapter 8. Electrons in Atoms**

- 8-1 Electromagnetic Radiation
- 8-2 Atomic Spectra
- 8-3 Quantum Theory
- 8-4 The Bohr Atom
- 8-5 Two Ideas Leading to a New Quantum Mechanics



- 8-6 Wave Mechanics
- 8-7 Quantum Numbers and Electron Orbitals
- 8-8 Interpreting and Representing Orbitals of the Hydrogen Atom
- 8-9 Electron Spin
- 8-10 Multi-electron Atoms
- 8-11 Electron Configurations
- 8-12 Electron Configurations and the Periodic Table

### **Recommended End of Chapter Problems for Chapter 8**

1, 3, **6** (**b**<**c**<**a**<**d**), 11, 13, 17, 21, 29, 33, 39, **42** (**2.7 x 10<sup>-38</sup> m**), 55, 57, 59, 75, **76** (**b**), 77, 79, 81, 83, 85, 87

### **Chapter 9. The Periodic Table and some Atomic Properties**

- 9-1 Classifying the Elements: The Periodic Law and the Periodic Table
- 9-2 Metals and Nonmetals and Their Ions
- 9-3 The Sizes of Atoms and Ions
- 9-4 Ionization Energy
- 9-5 Electron Affinity
- 9-6 Magnetic Properties
- 9-7 Periodic Properties of the Elements

### **Recommended End of Chapter Problems for Chapter 9**

9, **10** (**F** and **I**-), 13, 15, 17, 19, 21, **24** (**21.6 J**), 27, **32** (**c**), 33, 35, **40** (**a**) Ba (**b**) Sr (**c**) Cl (**d**) N, **59** (**-146.8 kJ/mol**), 61

### **Chapter 10. Chemical Bonding I: Basic Concepts**

- 10-1 Lewis Theory: An Overview
- 10-2 Covalent Bonding: An Introduction
- 10-3 Polar Covalent Bonds
- 10-4 Writing Lewis Structures
- 10-5 Resonance.....omitted**
- 10-6 Exceptions to the Octet Rule
- 10-7 The Shapes of Molecules
- 10-8 Bond Order and Bond Lengths.....omitted**
- 10-9 Bond Energies.....omitted**

### **Recommended End of Chapter Problems for Chapter 10**

1, 3, 5, 9, 11, 13, 15, 17, 21, **22** (**a**)  $\text{H}_2\text{NOH}$  (**b**)  $\text{SCS}$  (**c**)  $\text{FNO}$  (**d**)  $\text{OSCl}_2$ , 25, 27, 29, 35, 47, 51, 53, **56** (**a**) linear (**b**) tetrahedral (**c**) trigonal pyramidal (**d**) T-shape (**e**) trigonal bipyramidal (**f**) bent (**g**) octahedral, 57, 61, 67, 69, **70** (**a**, **d**, **e**, and **g** are polar), 90

### **Chapter 11. Chemical Bonding II: Additional Aspects**

- 11-1 What a Bonding Theory Should Do

- 11-2 Introduction to the Valence-Bond Method
- 11-3 Hybridization of Atomic Orbitals
- 11-4 Multiple Covalent Bonds
- 11-5 Molecular Orbital Theory
- 11-6 Delocalized Electrons.....omitted**
- 11-7 Bonding in Metals.....omitted**
- 11-8 Some unresolved issues.....omitted**

**Recommended End of Chapter Problems for Chapter 11**

5, 7, 9, 11, **12 (a)  $sp$  (b)  $sp^3$  (c)  $sp^2$  (d)  $sp^2$** , 15, 17, 23, **24 (terminal C:  $sp^2$ ; central C:  $sp$ )**, 31, 33, 35, 62, 70

**Chapter 26. Organic Chemistry**

- 26-1 Organic Compounds and Structures: An Overview
- 26-2 Alkanes
- 26-3 Alkenes and Alkynes
- 26-4 Aromatic Hydrocarbons.....omitted**
- 26-5 Alcohols and Phenols
- OMIT: Sections 26-6 to 26-13**

**Recommended End of Chapter Problems for Chapter 26**

1, 3, 5, 9 (a & b), **10 (a-positional; b-structural; c-geometric)**, 17, 31, 33 (a, b, d & f), 43, **46 (a-H adds to  $CH_2$ ; b-H adds to  $CH$ ; c-H adds to  $CH$ )**, 53 (a and c), 55, 73, 101, 118a & b