# Student Course Information

# General Chemistry I

# CHEM*1040

# Fall 2003

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**Coordinator**: Dr. R. J. Balahura, C&M 378

## 1. Required Materials

(a) "Chemistry , 3rd edition, John Olmsted III and Gregory M. Williams; Student Solutions Manual , David Robichaud; Wiley, 2002. These two books are shrink-wrapped together and may be purchased in the University Bookstore.

(b) Organic Chemistry Notes for CHEM*1040. Purchased in the Department.

(c) Laboratory Manual for CHEM*1040. Purchased in the Department.

(d) Cochrane's of Oxford Molecular Model Kit, available in the University Bookstore. This is required for some of the course material.

(e) Safety goggles and lab coat: available in the University Bookstore.

(f) Electronic calculator with ln, exp or $e^x$, $\log_{10}$ and $10^x$ functions. Calculators or notebook computers capable of storing text information are not allowed in examinations.

## 2. Laboratory

Students attend their chemistry lab every other week. In alternate weeks, there will be a dry lab delivered via WebCT on the CHEM*1040 web site. Your course section number describes the lecture section and lab section that you have been assigned. The first two numbers are the lecture section and the last two numbers the lab section. For example, if your section number is 0522, you are assigned to lecture section 05 and lab section 22. If your lab section is an odd number (e.g. 0267), then you follow the Week 1" Student Schedule and your wet labs begin in Week 1. If your lab section is an even number (e.g. 0536), then you follow the Week 2" Student Schedule and your wet labs begin in Week 2. The detailed laboratory schedule is given on page 6.

(a) Laboratory Time
You must attend your first lab in order to receive mandatory safety training. This safety laboratory is a prerequisite for all subsequent labs.

(b) Laboratory Quizzes
The quizzes count towards your laboratory grade, and will usually be based on the experiment that you are about to perform. See the Laboratory Schedule for details.

(c) Laboratory Reports
Laboratory reports are due one week after the lab before 4:30 p.m. Submit your report in the Grey Box outside your laboratory.

(d) Thanksgiving Week
All students will do the Sample Midterm, found on the CHEM*1040 web site.

(e) Laboratory Exemptions for students who are repeating CHEM*1040.
Students who obtained a laboratory grade of at least 12/20 during one of the three preceding semesters in which the course was offered may apply for a laboratory exemption. Application must be made before Tuesday, September 9 by filling in the application posted on the bulletin board, around the corner from MACN 125.

## 3. Web Site

The web site can be accessed through the portal at **http://courselink.uoguelph.ca**. Your **username** is your Central Login Account ID (that part of your assigned University of Guelph e-mail address before the @ sign) and your **password** is your Central Login Account Password. The first page is myWebCT: your name which will list all your WebCT courses including CHEM*1040. The CHEM*1040 web site is an integral part of the course and must be accessed daily. If you have any technical problems using WebCT, move the cursor to the Students link at the top of the Courselink@Guelph page (Login page) and select the appropriate link from the menu. If you do not have a Central Login Account, visit the CCS help desk located in the library computer lab on the main floor. Go to http://www.uoguelph.ca/ccs/accounts/index.html for more information.

## 4. Help

(a) Your professor will be available at certain times for consultation and help. Office hours will be arranged at the first class meeting.

(b) Lecture Help in the Chemistry Help Room (MACN 106 in the MACN foyer)

The Lecture Help schedule is posted on the web site Home page under Announcements .

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Laboratory Help in the Chemistry Help Room (MACN 106 in the MACN foyer)

Tuesday, Wednesday and Thursday from 4:00 - 5:00 p.m.

(c) Supported Learning Groups (SLG s)

SLG s are regularly scheduled small group study sessions. Attendance is voluntary and open to all students enrolled in the course. The study groups are facilitated by successful senior students who have recently taken the course. SLG leaders attend all lectures, take notes and work with faculty and staff to create study activities that integrate course content with effective approaches to learning. Students who attend SLG sessions have an opportunity to apply and demonstrate their understanding of course concepts in a peer-supported environment. The group study format exposes students to various approaches to learning, problem-solving, and exam preparation. The session times and locations will be announced during the first class meeting and are posted on the SLG web site: **http://www.learningcommons.uoguelph.ca/slg/index.htm**. These sessions have proven very helpful.

(d) Web Site

The web site contains a variety of activities to help you with the course. There are e-lectures, practice quizzes and examinations, animations on acids, bases, buffers, titration curves, and equilibrium, a VSEPR interactive tutorial, a frequently-asked-questions page, a Periodic Table with descriptive chemistry, and much more.

## 5. Evaluation

(a) The course grade will be calculated as follows:

| | |
|---|---|
| Quizzes (web site) | 10% |
| Computer Labs | 5% |
| Midterm Examination | 25% |
| Final Examination | 40% (scheduled by the registrar) |
| Laboratory | 20% |

(b) Quiz and Midterm Examination Dates

Quizzes

The quizzes are delivered on the web site. You may use the text and any notes when attempting the quizzes. The maximum benefit from the quizzes will be obtained if you do them on your own under examination conditions. The quizzes are 75 minutes in duration and will be available on the dates listed below from 1:00 a.m. Tuesday until 11:55 p.m. Thursday. Each quiz can only be accessed at these times and **no reason** for missing a quiz will be accepted. If a quiz is not attempted, a grade of zero will be assigned. Please do not leave your quiz attempt until the last day!

Quiz #1 - **Stoichiometry**, Sept. 23 - Sept. 25
Quiz #2 - **Acids, Bases and Salts**, Oct. 14 - Oct. 16
Quiz #3 - **Titrations and Buffers**, Oct. 28 - Oct. 30
Quiz #4 - **Atomic and Molecular Structure**, Nov. 11 - Nov. 13
Quiz #5 - **Organic Chemistry**, Nov. 25 - Nov. 27

Midterm Examination

Saturday, October 18, 9:30 - 11:00 a.m. Room assignments will be posted outside all laboratories and on the web site under Announcements .

**Midterm Examination Conflict**: please apply in writing, during the week of October 6 only, to write the alternate midterm examination on Thursday, October 16 at 5:30 p.m.. Include your name, ID, and reason for conflict and leave the application in the envelope on the door of C&M 378. If you are not contacted the week of the examination, your application to write the alternate midterm has been approved. The location of the alternate midterm examination will be announced by your lecturer and posted on the web site under Announcements .

(c) All examinations will be closed book, with no written or printed materials of any kind permitted. Electronic calculators may be used. Computers or calculators capable of storing text information or formulas are not allowed.

## 6. Policy on Missed Midterm Examination

A grade of zero will be assigned for a missed midterm examination except for valid medical or compassionate reasons. If you did not write the midterm examination, documentation must be given to your professor in person. Do not request that program counsellors or others mail the documentation to the Chemistry and Biochemistry Department. There is no need to consult a doctor to obtain a note.
If a valid excuse for not writing the midterm examination is received, the percentage value of the midterm will be added to the final examination percentage value. No make-up midterm examination will be given.

## 7. Lecture Schedule

Lecturers will cover the same material but may do so in a different order. Thus it is important that you attend your assigned lecture section throughout the semester. Please read the appropriate sections in the text before lectures.

| Week / Date | Lecture | Topics | Reference to Text |
|---|---|---|---|
| Weeks 1,2<br><br>Sept. 8 to Sept. 19 | 1-6 | Stoichiometry and reactions | Ch 1 & 2, review, Box 1-2, 2-1<br>Ch 2, 2.3, Box 2-2<br>Ch 3, 3.1-3.7, Box 3-1<br>Ch 4, 4.1-4.6<br>Ch 5, 5.2-5.7 |
| Weeks 3-6<br><br>Sept. 22 to Oct. 17 | 7-17 | Chemical equilibrium, acids, bases and salts | Ch 15, 15.1, 15.2, 15.4, 15.6<br>Ch 16, 16.1-16.7 |
| Week 7<br><br>Oct. 20 to Oct. 24 | 18-20 | Buffers and titration curves | Ch 17, 17.1-17.3 |
| Weeks 8-10<br><br>Oct. 27 to Nov. 10 | 21-27 | Atomic and molecular structure, periodic trends, bonding, intermolecular forces | Ch 6, 6.2-6.7<br>Ch 7, 7.1-7.4, Box 7-1, 7.6<br>Ch 8, 8.1-8.7, Box 8-2<br>Ch 9, 9.1<br>Ch 10, 10.2 |
| Weeks 10-12<br><br>Nov. 12 to Nov. 28 | 28-35 | Introduction to organic chemistry | Organic Notes for CHEM*1040<br><br>Ch 11, 11.1-11.4 |

**Midterm Examination, Saturday, Oct. 18, 9:30-11:00 a.m.**
The midterm covers lectures 1-17, corresponding problem assignments, and references to the text. This exam will be made up of multiple choice questions, short answer questions, and problems similar to the problem assignments. There is a sample midterm on the web site.

The final examination covers the entire course and is scheduled by the registrar.

**8. Laboratory Schedule** (**Bold** indicates Wet Laboratory)

| Week<br>Date | "Week 1" Student Schedule<br>(lab section number is odd) | | "Week 2" Student Schedule<br>(lab section number is even) | |
|---|---|---|---|---|
| 1<br>Sept 8 12 | **Check-In, Safety** | **No Quiz** | Assessment Test - WebCT | |
| 2<br>Sept 15 19 | Assessment Test - WebCT | | **Check-In, Safety** | **No Quiz** |
| 3<br>Sept 22 26 | **Exp't 2 - Chemical Reactions in Aqueous Solutions** | **Quiz on Safety** | Computer Lab - Chemical Analysis - WebCT | |
| 4<br>Sept 29 Oct 3 | Computer Lab - Chemical Analysis - WebCT | | **Exp't 2 - Chemical Reactions in Aqueous Solutions** | **Quiz on Safety** |
| 5<br>Oct 6 10 | **Exp't 3 - Standardization of NaOH** | **Quiz** | | |
| 6<br>Oct 14 17 | Sample Midterm - WebCT | | Sample Midterm - WebCT | |
| 7<br>Oct 20 24 | | | **Exp't 3 - Standardization of NaOH** | **Quiz** |
| 8<br>Oct 27 31 | **Exp't 5 - Buffers, Titration Curves, and Indicators** | **Quiz** | Computer Lab - Atomic Spectroscopy - WebCT | |
| 9<br>Nov 3 7 | Computer Lab - Atomic Spectroscopy - WebCT | | **Exp't 5 - Buffers, Titration Curves, and Indicators** | **Quiz** |
| 10<br>Nov 10 14 | **Exp't 4 - Synthesis of Aspirin, an Important Acid** | **Quiz** | Computer Lab - Organic Stereoisomers - WebCT | |
| 11<br>Nov 17 21 | Computer Lab - Organic Stereoisomers - WebCT | | **Exp't 4 - Synthesis of Aspirin, an Important Acid** | **Quiz** |
| 12<br>Nov 24 28 | **Complete Exp't 4; Clean-up**<br>*** Arrive at regular starting time** | **No Quiz** | *** Arrive at 1½ hours after regular starting time**<br>**Complete Exp't 4; Clean-up** | **No Quiz** |

**9. Problems**

Problems are assigned to provide reinforcement of the principles covered in lectures, to allow you to practice problem solving techniques and to check your own knowledge before examinations. Work done on these problems is not graded, but there is a good correlation between mastering the problems on a week-by-week basis and performance in the course as a whole.

**Work the problems in the week that the material is covered in lectures.** A common reason why students fail first year Chemistry is that they fall so far behind with the material that they never catch up. Lectures become harder to comprehend without the reinforcement effect of constant practice.

**Work the problems independently.** Working from the solutions is not useful for learning.

**Solutions to problems**
The detailed solutions to the problems are contained in the Student Solutions Manual which is included with the text. Several copies of the text as well as the Student Solutions Manual will be placed on 2 hour reserve in the library. If you are having difficulty with the material, see your professor or go to the Chemistry Help Room.

# PROBLEMS

## Stoichiometry and reactions: Lectures 1-6

Text, chapter 1: 1.45, 1.47, 1.85, 1.87.

Text, chapter 2: 2.21, 2.23, 2.25, 2.41, 2.55, 2.57, 2.59, 2.67, 2.81.

Text, chapter 3: 3.1, 3.13, 3.15, 3.23, 3.25, 3.27, 3.29, 3.33, 3.35, 3.37, 3.41, 3.43, 3.45, 3.47, 3.49, 3.51, 3.55, 3.57, 3.65, 3.67, 3.71, 3.75, 3.77, 3.97, 3.99, 3.101.

Text, chapter 4: 4.5, 4.13, 4.15, 4.17, 4.19, 4.23, 4.27, 4.31, 4.33, 4.39, 4.41, 4.43, 4.45, 4.47, 4.49, 4.51, 4.69, 4.77, 4.81, 4.97, 4.99, 4.101.

Text, chapter 5: 5.23, 5.29, 5.31, 5.39, 5.47, 5.50, 5.61, 5.87, 5.95, 5.99, 5.105.

## Equilibrium, acids, bases, salts, buffers and titration curves: Lectures 7-20

**A.**

Text, chapter 15: 15.1, 15.9, 15.27, 15.39, 15.45, 15.49, 15.55.

Text, chapter 16: 16.1, 16.3, 16.5, 16.13, 16.15, 16.17, 16.21, 16.23, 16.25, 16.33, 16.49, 16.57, 16.59.

Text, chapter 17: 17.1, 17.3, 17.5, 17.9, 17.13, 17.15, 17.17, 17.41, 17.45, 17.49, 17.55, 17.81, 17.83.

**B.**

No solutions for the following problems will be available. To check an answer or for help doing any of these problems, please see your professor or go to the Help Room.

1. Can large concentrations of the following ions be present simultaneously in aqueous solution? If not, write a net ionic equation for the reaction that occurs.

   (a) $H_3O^+$ and $NO_2$

   (b) $Na^+$ and $ClO_4$

   (c) $NH_4^+$ and OH

   (d) $H_3O^+$ and Br

2. For each of the following solutes, identify the major species existing in aqueous solution and classify each solution as acidic, basic, or neutral, explaining, where appropriate, by a net ionic equation.

   (a) $(CH_3)_3N$ (b) $NaNO_3$ (c) $(CH_3)_2NH_2Br$

   (d) $Na_2CO_3$ (e) $NaClO_4$ (f) $NaHCO_3$

3. Write a balanced net ionic equation and calculate the equilibrium constant for each of the following reactions in aqueous solution.

   (a) NaOH + HOCl

   (b) HCOONa + HCl

4. Write net ionic equations for the reactions that occur when HCl and NaOH are added to the following solutions and calculate the equilibrium constant in each case.

   (a) $CH_3COOH/CH_3COONa$ buffer

   (b) $C_2H_5NH_3Cl/C_2H_5NH_2$ buffer

5. Describe the contents of the following titration reactions at the stoichiometric (equivalence) point in terms of the solutes present in solution and their concentrations.

   (a) 0.100 M HCOOH(aq) + 0.100 M NaOH(aq)

   (b) 0.100 M $HClO_4$(aq) + 0.100 M $Ba(OH)_2$(aq)

   (c) 0.100 M $C_5H_5N$(aq) + 0.100 M HCl(aq)

   Choose a suitable indicator for each titration.

## Atomic and molecular structure, periodic trends, bonding, intermolecular forces: Lectures 21-27

Text, chapter 6: 6.7, 6.11, 6.17, 6.35, 6.37, 6.39, 6.89.

Text, chapter 7: 7.1, 7.3, 7.5, 7.15, 7.17, 7.27, 7.29, 7.33, 7.45, 7.57, 7.59, 7.69, 7.79.

Text, chapter 8: 8.13, 8.15, 8.19, 8.21, 8.23, 8.35, 8.39, 8.41, 8.43. 8.45, 8.53, 8.57, 8.59, 8.69, 8.73, 8.83.

Text, chapter 9: 9.1, 9.3, 9.5, 9.51, 9.53 (a), (b), 9.65, 9.67.

Text, chapter 10: 10.11, 10.15, 10.17, 10.19, 10.65.

## Organic Chemistry: Lectures 28-35

Organic Chemistry Notes for CHEM*1040: All Study Questions for each section.

Text, chapter 11: 11.1, 11.9, 11.13, 11.19, 11.21, 11.57, 11.63.