Fall 2017 Student Course Information
CHEM*1040 General Chemistry I
Department of Chemistry
University of Guelph

Course Description: CHEM*1040 General Chemistry I F,W (3-3) [0.50]

This course introduces concepts of chemistry, the central link between the physical and biological sciences. Principles discussed include chemical bonding, simple reactions and stoichiometry, chemical equilibria and solution equilibria (acids, bases, and buffers), and introductory organic chemistry.

Prerequisite(s): 4U Chemistry, (or equivalent grade 12 chemistry) or CHEM*1060

Course Co-ordinator: L. Jones (lojones@uoguelph.ca; SSC 2503; Ext. 56123)

Instructors:

Lecture	Section 01: MACN 105	MWF	16:30 – 17:20	J. Prokipcak (SSC 2506)
	Section 02: ROZH 104	TTh	13:00 – 14:20	A. Schwan (SSC 3244)
	Section 03: WMEM 103	TTh	11:30 – 12:50	A. Houmam (MACN 123)
	Section 04: ROZH 104	MWF	11:30 – 12:20	J. Prokipcak (SSC 2506)
	Section 05: WMEM 103	MW	17:30 – 18:50	R. Reed (SSC 3114)

Laboratory: Times and locations are listed on WebAdvisor (http://webadvisor.uoguelph.ca/).
A Teaching Assistant (TA) list is posted on CourseLink, under Content > *"Wet" Lab Resources*

1. COURSE MATERIALS

(a) **Textbook:** D. Ebbing and S. Gammon, General Chemistry. Students can use the 10th, 9th or 8th ed. (and for CHEM*1050 next semester). The publisher provides a 10th ed. textbook package including the Student Solutions Manual. This package can be purchased from one of the campus bookstores.
Note: 10th edition copies of text and solutions manual are on Library Course Reserve.

(b) **CHEM*1040 Laboratory Manual & Organic Chemistry Notes** are only purchased from the Chemistry Dep't. Sales run Sept. 7, 8, 11, 12 and 13, 9:30 AM – 3:30 PM in SSC 2106.

(c) **Safety Goggles** (not safety glasses) and a **Lab coat** are both **required**.
Goggles can be purchased from the Chem. Department or University Bookstore.
A lab coat can be purchased from the Chem & Biochem Club in SSC 2111 for $20 (cash sales only; Sept. 7, 8, 11 & 12, 9 AM – 4 PM or until sold out) or from the University Bookstore.

(d) **Scientific calculator** with ln, e^x, $\log_{10}$ and 10^x functions is required. Calculators or notebook computers capable of storing text information are **NOT** allowed in examinations, e.g., graphing calculators. It is your responsibility to bring a properly working calculator to exams.

(e) **Organic/Inorganic Molecular Model Kit** will assist in visualising molecular shapes, organic chemistry structures and Dry Lab D exercises. A kit can be purchased from one of the bookstores.

(f) **MasteringChemistry** (optional) – to complete the optional online homework assignments one must purchase access to a MasteringChemistry account. There is a grace period on payment of two weeks, so one can explore the site prior to paying. A 36-month access card can be purchased in person at one of the campus bookstores, online through the University Bookstore (h*ttp://bookstore.uoguelph.ca/t-digitalsearch.aspx* for $80.25) using a credit card or online through the MasteringChemistry site using either a credit card or PayPal account ($66). W'18 CHEM*1050 will offer optional homework, so your access covers both courses. To set-up an account, follow the registration instructions provided on CourseLink under *Content >> Course Resources*.

2. "WET" LABORATORY – Begins Monday, Sept. 25!

The laboratory is a required component of CHEM*1040. A schedule is provided on the next page. Students attend their labs according to their lab section number. For example, CHEM*1040*0234 has the section number 0234, where the last two numbers represent the lab section (*i.e.*, 34 = Wed. 7:00 PM). If your lab section ends with an **odd** number (*i.e.*, 1, 3, 5, 7 or 9), you follow the "**Week Acid Schedule**". If it ends in an even number (*i.e.*, 2, 4, 6, 8 or 0), you follow the "Week Base Schedule".

(a) **Mandatory Online Lab Safety Course**: Complete the CourseLink course entitled "*Student Science Safety*" with a grade of 90% or better, before you can undertake any labs. It takes 2-3 hours to complete. You have unlimited attempts to obtain the passing grade. Upon successful completion, you receive an electronic badge that you need to show your T.A. (print or electronic form), as proof of completion, prior to being allowed to participate in the labs.

(b) **Mandatory 1st Lab Meetings – Sept. 25 to 29 Bring your lab manual.**

Students must attend their first lab to receive mandatory safety training required by law. This safety lab is a pre-requisite for all subsequent labs. Bring your lab manual. As proof of your registration, you must bring a computer print-out dated **Sept. 01, 2017 or later** of WebAdvisor's "*My Class Schedule*" or a device that can display it electronically. You do not need a lab coat or googles for this first lab meeting, but you do need your CHEM*1040 lab manual.

(c) **Online "Wet" Pre-lab Quizzes – CHEM*1040 CourseLink – Starts Sept. 28**

Pre-lab quizzes are worth 3% of your final grade and are based on the "wet" lab activities that you are about to perform **– refer to the Lab Schedule**. To prepare for these quizzes, review the material in your lab manual. Pre-lab quizzes open the Thursday before your particular "wet" lab week and closes 60 minutes prior to the start of your lab period. You have two attempts at each quiz. If a quiz is not attempted, a grade of zero is assigned. To access, go to *Content >> Links to Pre-Lab Quizzes*. NOTE: Each quiz is available for review after the last deadline and for a two week period, *e.g.*, Quiz#1 can be reviewed Oct. 6 noon – Oct. 20 midnight.

(d) **Laboratory Reports – submitted electronically online**

Lab reports are submitted through Chemistry's online General Lab Marker System (ULab). During your lab period, you collect your data and submit a copy to your TA before leaving the lab. You then complete your lab report and submit it online for grading. Lab reports are normally due one week after your lab period and by 11:55 PM. Marks are deducted for lateness. Further info and the link to the site are provided on CourseLink, under *Content >> "Wet" Lab Resources*. Additional information can be found in the Introduction section of your lab manual.

(e) **Missed Laboratory:** Refer to "*Purple Page for Lab Absences in First-Year Chemistry*" posted on CourseLink, under *Content >> "Wet" Lab Resources*. Applications to be excused from a missed lab are due one week after the missed lab.

(f) **Week 12 (Last Week of Classes)**

To help you prepare for the final exam, a Final Exam Preparation Problems Lab is provided. The Problems Lab questions will be posted on CourseLink under *Content >> "Wet" Lab Resources*. Attempt the questions prior to your lab period to gain the most benefit. Answers are only provided during the lab sessions. Students registered in a Thursday or Friday lab can attend any one of the Problems Labs offered. Lab exempt students (see g) are also encouraged to attend a Problems Labs. Refer to WebAdvisor for possible times/locations. Note: Sessions are 90 minutes.

(g) **Laboratory Exemptions for students who are repeating CHEM*1040**

DEADLINE: TUESDAY, SEPTEMBER 12 → *www.chemistry.uoguelph.ca/labexemption*

Students who obtained a "wet" lab grade of **at least 60%,** but who failed the course as a whole, may apply for a lab exemption. The lab must have been completed in W'16, F'16 or W'17, and only one of the experiments can have been excused. Students granted an exemption **must** still complete the online "dry" labs.

FALL 2017 CHEM*1040 LABORATORY SCHEDULE

DATE	"WEEK ACID" Schedule (Sections ending with **ODD** number)	Activity	"WEEK BASE" Schedule (Sections ending with **EVEN** number)	Activity
Week 1 Sept. 11 – 15	**Do not go to lab room this week.** *Online Computer Lab: Dry Lab A: Atomic Spectroscopy*	*Dry Lab A Marking Module*	**Do not go to lab room this week.** *Online Computer Lab: Dry Lab A: Atomic Spectroscopy*	*Dry Lab A Marking Module*
Week 2 Sept. 18 – 22	**Do not go to lab room this week.** *Online Computer Lab: Dry Lab B: Volumetric Analysis*	*Dry Lab B Marking Module*	**Do not go to lab room this week.** *Online Computer Lab: Dry Lab B: Volumetric Analysis*	*Dry Lab B Marking Module*
Atomic Spectroscopy Marking Module DEADLINE: Sunday, September 24, 11:55 PM				
Week 3 Sept. 25 – 29	**Arrive for regular starting time.** Sign-in & safety training. Safety training is mandatory and a legal requirement.	Bring Class Schedule & Lab Manual (no lab coat & goggles)	**Arrive 90 min after regular starting time** (*i.e.*, for 10 AM, 4 PM or 8:30 PM)**.** Sign-in & safety training. Safety training is mandatory and a legal requirement.	Bring Class Schedule & Lab Manual (no lab coat & goggles)
Volumetric Analysis Marking Module DEADLINE: Sunday, October 1, 11:55 PM				
Week 4 Oct. 2 – 6	**Arrive for regular starting time.** Experiment 1: Introduction to Laboratory Equipment	**Pre-lab Quiz on Exp't 1 & safety**	**Arrive 90 min after regular starting time.** Experiment 1: Introduction to Laboratory Equipment	**Pre-lab Quiz on Exp't 1 & safety**
Week 5 Oct. 11 – 13 (No classes Oct. 9 or 10)	**No Lab. Independent Study.**	**No pre-lab quiz**	**No Lab. Independent Study.**	**No pre-lab quiz**
Week 6 Oct. 16 – 20	**Arrive for regular starting time.** Experiment 2: Chemical Reactions in Aqueous Solution	**Pre-lab quiz on Exp't 2**	**Arrive 90 min after regular starting time.** Experiment 2: Chemical Reactions in Aqueous Solution	**Pre-lab quiz on Exp't 2**
Week 7 Oct. 23 – 27	**Arrive for regular starting time.** Experiment 3: Standardization of Sodium Hydroxide	**Pre-lab Quiz on Exp't 3**	**Do not go to lab room this week.** *Online Dry Lab C: Gaseous Equilibria*	*Dry Lab C Marking Module*
Week 8 Oct. 30 – Nov. 3	**Do not go to lab room this week.** *Online Dry Lab C: Gaseous Equilibria*	*Dry Lab C Marking Module*	**Arrive at regular starting time.** Experiment 3: Standardization of Sodium Hydroxide	**Pre-lab Quiz on Exp't 3**
Gaseous Equilibria Marking Module DEADLINE: Sunday, November 5, 11:55 PM				
Week 9 Nov. 6 – 10	**Arrive at regular starting time.** **Experiment 5:** Buffers, Titration Curves and Indicators	**Pre-lab Quiz on Exp't 5**	**Do not go to lab room this week.** *Online Dry Lab D: Aspects of Organic Chemistry*	*Dry Lab D Marking Module*
Week 10 Nov. 13 – 17	**Do not go to lab room this week.** *Online Dry Lab D: Aspects of Organic Chemistry*	*Dry Lab D Marking Module*	**Arrive at regular starting time.** **Experiment 5:** Buffers, Titration Curves and Indicators	**Pre-lab Quiz on Exp't 5**
Week 11 Nov. 20 – 24	**Arrive at regular starting time.** Experiment 4: Synthesis of Aspirin **Online report due 11:55 PM NEXT day.**	**Pre-lab Quiz on Exp't 4**	**Arrive 90 min after regular time.** Experiment 4: Synthesis of Aspirin **Online report due 11:55 PM NEXT day.**	**Pre-lab Quiz on Exp't 4**
Aspects of Organic Chemistry Marking Module DEADLINE: Sunday, November 26, 11:55 PM				
Week 12 Nov. 27 – 29 (No labs Nov. 30 or Dec.1)	**Arrive at regular starting time.** Clean-up & Final Exam Problems Lab (Thursday, Friday and exempt students may attend any other lab this week)	Attempt problems (posted on CourseLink) ***prior*** to lab.	**Arrive 90 min after regular starting time.** Clean-up & Final Exam Problems Lab (Thursday, Friday and exempt students may attend any other lab this week)	Attempt problems (posted on CourseLink) ***prior*** to lab.
	Any remaining lab excuses must be submitted online by **Friday Dec. 1**, else a grade of zero is assigned.			

Note: laboratory schedule may be subject to change.

3. EVALUATION

(a) Your final course grade will be based on the scheme that produces the higher grade:

Course Components	*Scheme #1:*	*Scheme #2:*
Optional Online Homework (MasteringChemistry)	10%	0%
Online "Wet" Pre-lab Quizzes (CourseLink)	3%	3%
Online "Dry" Lab Work (CourseLink)	10%	10%
"Wet" Lab Reports (General Lab Marker System)	12%	12%
Midterm Examination (Saturday, Oct. 14, 10:00 AM)	28%	33%
Final Examination (Thursday, Dec. 14, 2:30 PM)	37%	42%

Note: A final course grade of 50% is required to pass the course and receive credit.

(b) **Optional Online Homework (MasteringChemistry)**

Chemistry is not a subject that can be easily learned by simply reading a book. To consolidate your understanding, one must work with the course concepts on a regular basis. Interactive homework is a way to keep up and test your understanding. Access is purchased through one of the campus bookstores and can be used in W'18 CHEM*1050. Follow the instructions provided on CourseLink under Content >> Course Resources to set-up an account. Complete "Introduction to MasteringChemistry" first to familiarize yourself with the system. There are 11 graded assignments. Each is comprised of a quiz (weighted 40%; 2 attempts/question) and adaptive follow-up questions (60%; multiple attempts), generated once the quiz questions have been attempted. If you receive 95.0% or higher on the quiz, you are exempted from its adaptive follow-up questions. Your worst assignment will be dropped prior to calculating your final grade out of 10. Quizzes are due **Fridays 11:55 PM, starting Sept. 22**, and adaptive follow-ups are due the following **Tuesday 11:55 PM**. If an assignment is not attempted, a grade of zero is assigned.

(c) **Practice Online Quizzes** – not for credit (see *CourseLink >> Content*)

A *Self-Assessment Quiz* is available until Sept. 17, 11:55 PM and can be accessed twice. Find out what you know! There are also topic specific practice quizzes, and a Midterm Prep Quiz, posted under Week #'s. These quizzes can be attempted multiple times, to test your knowledge throughout the semester.

(d) **Online "Dry" Labs** (see *CourseLink >> Content*)

Each online lab consists of 2 parts: *experiment* and *marking module*. Both are delivered through CourseLink. Background info and worksheets are provided in your lab manual. Experiments can be done as many times as you wish, however, some labs assign a new "unknown" number with each attempt. Make sure to record this number for grading purposes. Once you have completed all calculations, **only then** open the marking module to evaluate your work. You have only one attempt and 60 minutes to enter your answers. If a marking module is not attempted, a grade of zero is assigned. The Lab Schedule includes suggested dates and deadlines for these activities.

1. *Dry Lab A: Atomic Spectroscopy* – explore energy levels in atoms & "fireworks" colours. Results submitted through Marking Module by **Sunday, Sept. 24, 11:55 PM**, else a zero grade is assigned.
2. *Dry Lab B: Volumetric Analysis* – test your understanding of stoichiometric concepts and analyses skills. Marking Module due before **Sun., Oct. 1, 11:55 PM**, else a zero is assigned.
3. *Dry Lab C: Gaseous Equilibria* – study factors that influence chemical equilibria. Marking Module due before **Sunday, Nov. 5, 11:55 PM**, else a grade of zero is assigned.
4. *Dry Lab D: Aspects of Organic Chemistry* – investigate the molecular structure of organic molecules. Marking Module due before **Sun., Nov. 26, 11:55 PM**, else a grade of zero is assigned.

NOTE: Results are made available for review only after the class deadline and for two weeks.

(f) **Midterm Examination**: **Saturday, October 14, 10:00 – 11:30 AM,** locations TBA

Room assignments are posted on CourseLink a few days prior to the midterm. This exam includes material up to and including week five lectures, corresponding text references and laboratories, and will consist of multiple choice questions. Sample midterms are provided on under Content >> Course Resources.

Midterm Conflict: If you have a conflict, request to write the alternate midterm through *www.chemistry.uoguelph.ca/alternateexam.* Return to the site to see if your request has been approved.
Deadline to apply: Fri., Oct. 6. Alternate midterm: Thurs., Oct. 12, 5:30 – 7:00 PM, location TBA

(g) **Final Examination: Thursday, December 14, 2:30 – 4:30 PM, locations TBA**
For room assignments, refer to *www.uoguelph.ca/registrar/scheduling/index.cfm?exam_fall* prior to the final exam period. This exam evaluates the entire course through multiple choice questions.

(h) All examinations are closed book. Notes, printed material of any kind, any communication with other students or any other aids are not permitted. Computers or calculators capable of storing text information or formulas are **not permitted**.

4. POLICY ON MISSED WORK

a) **Missed Midterm Examination:**
If you do not write the midterm, documentation must be e-mailed to the Course Co-ordinator or given to your Instructor. Doctor's notes are always acceptable, but not required. If a valid excuse is received, the percentage value of the midterm will be added to the percentage value of the final exam. Otherwise, a grade of zero will be assigned. **No make-up midterm examination will be given.**

b) **Missed Final Examination:**
If you miss a final exam, contact your Program Counsellor as soon as possible (for UAIC's list of Program Counsellors see *www.uoguelph.ca/uaic/programcounsellors*). Official documentation is required within **five working days** of the missed examination. Consult the Undergraduate Calendar: *https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml*

c) **Other Missed Work** (with the exception of missed "wet" labs – see section 2 d)
Contact Prof. Jones via your U of G e-mail account; include your full name and student ID number. If a valid excuse is received, your work will be re-evaluated. Otherwise, a grade of zero is assigned. See the Undergraduate Calendar for information on regulations and procedures for Academic Consideration: *https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml*

5. COURSE RESOURCES

(a) **CHEM*1040 Website –** access through portal *http://www.uoguelph.ca/courselink/*
Your **Username** is the part of your University of Guelph e-mail address before the "@" sign. Your **password** is the same as your University e-mail. The course website provides a wealth of resources *(i.e.,* video lessons, animations, questions of the week, and sample midterms, *etc*.), practice quizzes and a discussion board to post your course questions. Weekly announcements are posted under "*News*". It is your responsibility to check this site on a regular basis.

(b) **Your Instructor**
Your instructor will be available at certain times for consultation and assistance. Office hours will be arranged at the first class meeting and posted on CourseLink.

(c) **Chemistry Learning Centre** (3rd Floor Library – Science Commons – LIB 360)
Chemistry Graduate Teaching Assistants (TAs) are available to answer questions and assist you with the lecture and laboratory material. Hours are posted on the course website under "*News*".

(d) **Supported Learning Groups** (SLGs) – *www.lib.uoguelph.ca/get-assistance/studying/slgs*
SLGs are regularly scheduled small group study sessions. Attendance is voluntary and open to all students enrolled in the course. SLGs are facilitated by successful students who have recently completed the course. SLG leaders attend all lectures and work with faculty and staff to create study activities that integrate course content with effective approaches to learning. They are not tutors. The peer-supported group study format exposes students to various approaches to learning, problem solving, and exam preparation. Session time(s), location(s) and further information are available on the SLG website.

6. LECTURE SCHEDULE

You are expected to be respectful of your fellow classmates and your lecturer. Please refrain from making noise during lectures and turn off your cell phone. Instructors will cover basically the same material but may do so in a different order. Thus, it is important that you attend your assigned lecture section. You are responsible for all course material, whether or not it is explicitly covered in class. Topics marked with an asterisk (*) below are not covered in class but will be examined. It is best to review the appropriate sections in the text **before** lectures.

Week	Dates	Topics	CourseLink Resources (see Content tab)	Text Reference
Week 0	Sept. 7 to Sept. 8	Measurement Significant figures Atoms, molecules & ions	Self-Assessment Quiz Review Video Lessons	*Review: Ch 1, 1.4 – 1.8 Ch 2, 2.3 – 2.10
Week 1–2	Sept. 11 to Sept. 22	Atomic structure Periodic trends Lewis structures VSEPR & bonding	Periodic Tables (Week 1) Bonding & Molecular Structure Activity (Week 2) VSEPR Interactive Tutorial (Week 2) Questions of the Week (Course Resources) Atomic & Molecular Structure Practice Quiz (Week 1 or Week 2)	*Review: 7.1 – 7.4 Ch 7, 7.5 Ch 8, 8.1 – 8.7 Ch 9, 9.2 – 9.9 Ch 10, 10.1 – 10.4
Week 3–4	Sept. 25 to Oct. 6	The Mole Stoichiometry & Chemical Rxns	Reactions & Stoichiometry Video Lessons Nomenclature Practice (Week 3) Titration and Analysis Problem (Week 4) Questions of the Week (Course Resources) Stoichiometry & Rxns Practice Quiz A & B (Week 3 & Week 4)	*Review 3.1 – 3.5 Ch 3, 3.6 – 3.8 Ch 4, 4.1 – 4.4, 4.7 – 4.10 *Review 5.1 – 5.4
Week 5 (no classes Oct. 9 &10)	Oct. 11 to Oct. 13	Midterm Review	Midterm Prep Quiz (Week 5) Questions of the Week (Course Resources)	

MIDTERM EXAMINATION: Saturday, October 14, 10:00 AM – 11:30 AM

Week 6–9	Oct. 16 to Nov. 10	Equilibrium Acids and bases Salts and buffers Titration curves	Equilibrium Practice Quiz (Week 6) Acids and Bases Video Lessons (Week 7) Acids and Bases Practice Quiz (Week 7) Salts and Buffers Video Lessons (Week 8) Salts and Buffers Practice Quiz (Week 8) Titration Curve Animation (Week 9) Titration Curves Practice Quiz (Week 9) Questions of the Week (Course Resources)	Ch 14, 14.1 – 14.8 Ch 15, 15.1 – 15.8 Ch 16, 16.1 Ch 16, 16.3 – 16.7
Week 10–12 Note: Nov 30 = Tues. schedule & Dec. 1 = Mon. schedule)	Nov. 13 to Dec. 1	Organic chemistry Intermolecular forces Final exam review	Organic nomenclature quizzes (Week 10) Structural isomer tutorial (Week 10) Stereoisomers (Week 10) Organic Chemistry Practice Quizzes (Weeks 10 & 11) The Macrogalleria (Week 12) Questions of the Week (Course Resources)	Ch 11, 11.5 Ch 23, 23.1 – 23.7 Ch 24, 24.1 Organic Chemistry Notes – all questions

FINAL EXAMINATION: Thursday, December 14, 2:30 PM – 4:30 PM

7. END OF CHAPTER PROBLEMS

There is a good correlation between mastering the concepts within the course on a week-by-week basis and performance in the course as a whole. 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 the midterm and final exam. For the end of chapter problems, answers are provided at the back of your textbook. For full solutions, consult the textbook's Student Solutions Manual. Copies are available in the Chemistry Learning Centre and on Course Reserve at the library.

Work the problems in the week the material is covered in lectures. A common reason why students are unsuccessful in CHEM*1040 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. If you have difficulties, **seek help early**!

The questions within the text are organised according to categories (*e.g.*, Review, Concept and Cumulative-Skills Problems). If you find the early review questions unchallenging, move on to the other sections. Additional questions are provided under "*Resources*" on the course website as "*Questions of the Week*", which represent the types of questions that may appear on examinations.

Review:

Chapter 1: 1.35, 1.41, 1.81, 1.83, 1.127.

Chapter 2: 2.43, 2.51, 2.65, 2.67, 2.75, 2.77, 2.79, 2.83, 2.85, 2.87, 2.91, 2.93, 2.99, 2.101, 2.109, 2.111, 2.119, 2.123, 2.127.

Chapter 3: 3.37, 3.39, 3.45, 3.61, 3.65, 3.67, 3.73.

Atomic structure, periodic trends, molecular structure and bonding (Weeks 1 – 2):

Chapter 7: 7.25, 7.33, 7.37, 7.45, 7.69, 7.87, 7.97, 7.114, 7.117.

Chapter 8: 8.16, 8.21, 8.24, 8.39, 8.43, 8.49, 8.61, 8.63, 8.65, 8.81.

Chapter 9: 9.43, 9.45, 9.49, 9.57, 9.59, 9.63, 9.65, 9.69, 9.71, 9.77, 9.93, 9.97, 9.99, 9.128, 9.139.

Chapter 10: 10.27, 10.31, 10.33, 10.35, 10.39, 10.41, 10.45, 10.49, 10.53, 10.65, 10.69, 10.73, 10.100.

Stoichiometry and Reactions (Weeks 3 – 4)

Chapter 3: 3.24, 3.81, 3.83, 3.89, 3.91, 3.93, 3.97, 3.103, 3.105, 3.117, 3.119, 3.135, 3.137.

Chapter 4: 4.31, 4.35, 4.37, 4.39, 4.41, 4.43, 4.51, 4.69, 4.71, 4.77, 4.81, 4.85, 4.87, 4.89, 4.93, 4.105, 4.107, 4.109, 4.111, 4.115, 4.119, 4.123, 4.127, 4.141, 4.143, 4.151.

Chapter 5: 5.75, 5.77, 5.87, 5.119, 5.137, 5.143.

Chemical Equilibrium, Acids & Bases (Weeks 5 – 6)

Chapter 14: 14.23, 14.25, 14.35, 14.37, 14.39, 14.41, 14.43, 14.55, 14.57, 14.59, 14.61, 14.63, 14.73, 14.75, 14.83, 14.87, 14.121, 14.123.

Chapter 15: 15.27, 15.28, 15.29, 15.31, 15.33, 15.35, 15.41, 15.53, 15.57, 15.59, 15.61, 15.67, 15.71, 15.85, 15.99, 15.127.

Acid-Base Equilibria (Weeks 7 – 9)

Chapter 16:

Weak Acids/Bases: 16.1, 16.9, 16.23, 16.25, 16.35, 16.39, 16.41, 16.45, 16.51, 16.53, 16.55, 16.57, 16.59, 16.63, 16.65, 16.101, 16.111, 16.115.

Salts & Buffers: 16.27, 16.29, 16.71, 16.73, 16.75, 16.77, 16.81, 16.83, 16.113, 16.141.

Titration Curves: 16.15, 16.31, 16.85, 16.87, 16.89, 16.93, 16.107, 16.109, 16.119, 16.121, 16.135, 16.143.

Organic Chemistry & Intermolecular Forces: (Weeks 10 – 12)

Chapter 11: 11.63, 11.69, 11.71, 11.105, 11.109 b & d.

Organic Chemistry Notes for CHEM*1040: All study questions from each section.

Chapter 23: 23.14, 23.25, 23.29, 23.35, 23.39, 23.41, 23.53, 23.55, 23.65.

Chapter 24: 24.29, 24.53, 24.55.

8. CHEM*1040 EXPECTATIONS AND LEARNING OBJECTIVES

The pre-requisite for CHEM*1040 is two full high school chemistry courses (*e.g.*, 3U and 4U or grade 11 and 12 chemistry). In reviewing the course content of CHEM*1040 you may feel you know most of the material already. **Don't be misled!** The topics may be familiar, but we will be providing a deeper understanding of the fundamental concepts within chemistry. The purpose of CHEM*1040 (and CHEM*1050) is to build upon your previous exposure to the subject. You will need to move away from just memorization terms and definitions and spend more time thinking about the processes and concepts within chemistry. This will lay the foundation for more advanced courses such as analytical chemistry (*i.e.*, CHEM*2400 or CHEM*2480), biochemistry (*i.e.*, BIOC*2580), organic chemistry (*i.e.*, CHEM*2700), inorganic chemistry and physical chemistry (*i.e.*, CHEM*2060, CHEM*2880 and CHEM*2820). **Note that the course is not designed to "teach" you chemistry. It is, however, constructed to help you <u>learn</u> chemistry.**

For some of you, it may have been more than a year since you last took a chemistry course and it is not unrealistic to assume that you have forgotten some of what you have already learned. We will review some basic concepts <u>but</u> this will not be a comprehensive review. **You must review carefully the sections of the textbook that have been assigned as review on your own.**

a) What We Expect You Already Know/Understand:

- the classifications of matter and terms associated with its physical properties (e.g., temperature; density, homogeneous vs. heterogeneous mixtures). (Refer to Sections 1.4 and 1.7)
- how to report the number of significant figures in a given quantity and **how to round off the result of a calculation to the correct number of significant figures**. (Refer to section 1.5 in text as well as the introductory notes within your laboratory manual.)
- the SI base units and SI prefixes (from *tera* through to *femto*) and are able to convert between units. (Section 1.6 & 1.8)
- the basic concepts and terminology associated with atoms and atomic structure (e.g., electron, proton, neutron, atomic number, mass number, atomic mass unit, isotope, natural abundance, mole, molar mass) (Section 2.3–2.4)
- the information provided by any periodic table (e.g., atomic symbols and names, period versus group), and be familiar with the overall structure and organization of the modern periodic table. (Section 2.5)
- the names of groups 1, 2, 17 and 18; how to classify an element as a metal, non-metal or metalloid based on its position in the periodic table; the common forms of the most common non-metals: H_2, F_2, Cl_2, Br_2, I_2, N_2, O_2, P_4, S_8. (Section 2.5)
- and are familiar with the names and formulas of simple inorganic and organic compounds. Familiarise yourself with Tables 2.4 to 2.6. Sections 2.6–2.8 and pages 1–26 in the Organic Notes.
- how to write and balance simple chemical equations by inspection. (Sections 2.9–2.10)
- the concepts and calculations that involve quantities of atoms, ions or molecules, Avogadro's number, molar mass and molecular formula. (Sections 3.1–3 .2)
- to use % composition & molar mass to determine empirical and molecular weights. (Sect's 3.3–3.5)
- how to use a balanced chemical equation to relate masses and moles of reactants and products. (Sections 3.6–3.7)
- the meaning of terms such as empirical formula, molecular formula; structural formula; anion; cation; oxidation state; limiting reagent; excess reagent; actual, theoretical and percent yields; molarity (Sections 3.8, 4.7)
- the units of pressure used for gas law problems and be able to convert between them. (Section 5.1)
- the concepts and terminology associated with the ideal gas law (PV=nRT) (Sections 5.3–5.4)

- the difference between wavelength and frequency and are familiar with the electromagnetic spectra and the different regions of the spectra (X-ray, UV, visible, IR, Microwave, radio). (Section 7.1)
- the concept of a photon and how the energy of a photon is directly proportional to the frequency and inversely related to wavelength. (Section 7.2)
- when and why the Bohr Theory of the atom is useful, and as well as its limitations, and why it is not really correct. (Section 7.3)
- how to work with exponential (i.e., scientific) notation, logarithms (e.g., log & ln), exponentials (i.e., 10^x and e^x) and the quadratic formula. Practice: *www.uoguelph.ca/numeracy/repository/index.cfm*
- how to solve for an unknown within a linear equation. In some instances it may be helpful if you can solve for two unknowns using two linear equations.
- how to use a table of (x,y)-data pairs to construct a plot. For straight line plots, you will be expected to calculate slope.

b) **CHEM*1040 Learning Objectives** – the course can be subdivided into six sub-sections and the learning objectives for each are as follows:

Atomic structure and Periodic Table (Sections 7.4 – 8.7 & 9.2-9.3)

1. Understand the significance of the quantum numbers, understand how they can be used to code for the electron energy levels within atoms and know the shapes of the boundary surfaces of *s*, *p* and *d* orbitals. (Sections 7.4–7.5)
2. Understand the organization of the periodic table in terms of the types of orbitals being filled; be able to apply the Pauli Exclusion Principle and Hund's Rule. (Sections 8.1–8.2 & 8.4)
3. Predict the magnetic behaviour of an atom or ion. (Section 8.4)
4. Write ground-state electron configurations for any atom or ion using only the Periodic Table. (Sections 8.3 & 9.2)
5. Know periodic trends such as atomic dimensions and how atomic dimensions change as a function of position in the Periodic Table; compare the sizes of two atoms, two ions, or an atom and ion. (Sections 8.6 and 9.3)
6. Define ionization energy, electron affinity and electronegativity. Know how these parameters change as a function of position in the Periodic Table. (Section 8.6)

Lewis structures, VSEPR & bonding (Sections 9.4 –9. 9 & 10.1 – 4)

1. Apply the Octet Rule to the construction of Lewis structures for multi-atom, multi-element molecules. Be able to recognize violations of the rule. (Sections 9.4–9.6 and 9.8)
2. Know what resonance is and be able to draw resonance structures. (Section 9.7)
3. Show how formal charges can facilitate the generation of "better" Lewis structures. (Section 9.9)
4. Apply VSEPR Theory to Lewis structures to determine approximate molecular geometries. (Section 10.1)
5. Understand the significance of electronegativity and use it to identify polar bonds; use geometry to identify polar molecules. (Sections 9.5 & 10.2)
6. Understand the logic behind the need to invoke hybridization of atomic orbitals; use number of electron pair locations to determine hybridization used by the central atom. (Section 10.3)
7. Describe single, double or triple bonds in terms of the overlap of hybrid or pure atomic orbitals. (Section 10.4)

Stoichiometry (Sections 3.6 – 3.8, 4.1 – 4.4, 4.7 – 4.10)

1. Relate quantities in chemical equations (e.g., single & multi-stepped reactions) (Sect's 3.6–3.7)
2. Connect the concepts of limiting reagent (or reactant), theoretical yield, actual yield and percentage yield. Be able to work problems related to these concepts. (Section 3.8)
3. Perform calculations involving molarity. Be able to determine solution concentration, prepare a solution or interconvert units. (Sections 1.8 & 4.7 – 4.8, 4.10)
4. Apply the solubility rules in Table 4.1 to either compounds or reactions. (Sections 4.2–4.3)
5. Differentiate between molecular and net ionic equations. Be able to write either. (Section 4.2)
6. Write precipitation and neutralization reactions. (Section 4.3 – 4.4)
7. Understand the logic behind both gravimetric and volumetric analyses, and be able to perform stoichiometric calculations involving solids, solutions or gases. (Sections 4.9–4.10 and 5.3–5.5)

Chemical Equilibrium (Chapter 14)

1. Describe the characteristics of dynamic equilibrium. (Section 14.1)
2. Connect the dependence of K on the way the balanced equation is written. What happens to K if the reaction is reversed? (Sect. 14.2)
3. Write a K expression for homogenous or heterogeneous equilibrium. (Sect's 14.2–14.3)
4. Relate K to ***extent of reaction***, relative amount of reactant/product at equilibrium. (Sect. 14.4)
5. Relate Q value to ***direction of reaction***, forward or reverse, to reach equilibrium. (Sect. 14.5)
6. Be able to solve an equilibrium problem. (Sect. 14.6)
7. Use Le Chatelier's principle to describe the effect of a stress on equilibrium position, equilibrium constant K and equilibrium concentrations or pressures. Stresses include adding or removing a reagent, a temperature change, or a change in overall volume or pressure. (Sect. 14.7)

Acids, bases, salts, buffers and titration curves (Chapters 15 & 16):

1. Differentiate between the three definitions of acids and bases (*i.e.*, Arrhenius, Brønsted-Lowry and Lewis). Identify examples of each. (Sections 15.1–15.3)
2. Identify the six common strong acids (see Table 15.1).
3. Identify strong bases (group I and II hydroxides and oxides) (see Table 15.1)
4. Identify conjugate acid/base pairs in an acid/base reaction. (Section 15.2)
5. Write an equation for the auto-ionization of water and its K expression. (Section 15.6)
6. Recognize strong acid and base aqueous solutions, and determine the pH and equilibrium concentrations. (Sections 15.7–15.8)
7. Calculate pH from $[H^+]$ or $[H^+]$ from pH; relate $[OH^-]$ and $[H^+]$ using K_w. (Section 15.8)
8. Recognize weak acids and weak bases, write an equation for the dissociation of an acid or base in water, identify the substances acting as the acid and base on either side. (Sections 16.1 & 16.3)
9. Write the equilibrium constant expression for a weak acid or weak base dissociation, determine pH and equilibrium concentrations. (Sections 16.1 & 16.3)
10. Relate K_a and K_b using K_w. (Section 16.4)
11. Classify salts as producing neutral, acidic or basic solutions in water; determine the pH of a salt solution (Sections 16.4–16.5).

12. Recognize and determine the pH of buffer solutions; suggest a reasonable buffer solution to maintain a certain pH. (Section 16.6)
13. Understand how and why an indicator changes color (Section 15.8 & 16.7).
14. Know the difference between equivalence point (or stoichiometric point), endpoint, and midpoint (or half equivalence/half stoichiometric point).
15. Evaluate the reaction between a strong acid and strong base, a weak acid and strong base or a strong acid and weak base to determine the pH at various points including: (1) before titration, (2) before equivalence point, (3) at equivalence point & (4) after equivalence point. (Section 16.7)
16. Write an equation for an acid/base reaction and determine the direction from acid/base strengths.

Organic chemistry (Organic Notes; Sections 11.5, 23.1 – 23.7 & 24.1 – 2)

1. Identify and name the various functional groups. (Organic Notes (ON) pp. 1–22)
2. Identify and relate the different types of isomers. (ON pp. 23–30)
3. Identify types of intermolecular forces present within a molecule (Section 11.5, ON pp. 31-32)
4. Compare and contrast boiling points, melting points and water solubility based on intermolecular forces. (ON pp. 32–34)
5. Identify chemically reactive centres (electrophiles, nucleophiles and free radicals), reaction intermediates and intermediates stability. (ON pages 35–36)
6. Know the following representative organic reactions:
   (a) *Alkanes* – substitution reaction through halogenation (ON pp. 36–38)
   (b) *Alkenes* – addition of acid or hydrogen & polymerisation (ON pp. 39–42)
   (c) *Alkyl Halides* – nucleophilic substitution reactions (ON pp. 42–43)
   (d) *Alcohols* – oxidation with dichromate and acid (ON pp. 44–45)
   (e) *Aldehydes/Ketone*s – addition of H_2 & nucleophilic attach of H_2O & alcohol (ON pp. 45–47)
   (f) *Carboxylic Acids* – formation of esters and polyesters (ON pp. 47; 49–50)
   (g) *Esters* – formation of amides and polyamides(ON pp. 48, 50–52)
7. Differentiate between addition and condensation polymers (ON pp. 40–42; 49–52).
8. Recognise the acid & base properties of organic compounds and their salts. (ON pp. 52–53)

c) CHEM*1040 Learning Outcomes

On successful completion of this course, students should be able to:

1. Demonstrate knowledge and understanding of atomic structure, periodic trends, Lewis structures, VSEPR and bonding.
2. Understand and apply the concepts of chemical equilibrium, especially in associating with acids, bases, salts, buffers and titration curves.
3. Solve quantitative problems (stoichiometric) involving chemical formulas and equations which include solids, liquids, solutions or gases.
4. Demonstrate knowledge and understanding of physical and chemical aspects of organic molecules and their reactions.
5. Perform laboratory experiments demonstrating safe and proper use of standard chemical glassware and equipment.
6. Record, graph, chart and interpret data obtained from experiments through working co-operatively with others or independently.

9. ADVICE FROM STUDENTS ON HOW TO DO WELL IN CHEM*1040

- "Be sure to mark down all your deadlines."
- "Read a bit ahead in the text. The lectures make much more sense..."
- "Keep on top of the lecture material and textbook reading/question assignments... the midterm and final will not seem half as difficult!"
- "Try to understand what you are doing, not just know how to do it."
- "KNOW your material, and be able to explain it well to someone else with little difficulty."
- "Ask questions if you don't understand … it will not get better with time."
- "… read textbook, pay attention in lecture, ask questions, visit your Prof., go to SLG's, go to the Chem Learning Centre, whatever you need to do, do it. Resources are there, you just need to go get them."

10. UNIVERSITY POLICIES

a) **E-mail Communication** – As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

b) **Accessibility** – The University promotes the full participation of students who experience disabilities in their academic programs. To that end, academic accommodations are a shared responsibility between the University and the student. When accommodations are needed, students are required to register with Student Accessibility Services (SAS). Documentation to affirm a disability is required, however, interim accommodations may be possible while that process is underway. Accommodations are available for both permanent and temporary disabilities. Common illnesses, such as a cold or the flu, do not constitute a disability. Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day (Nov. 3). More information: *www.uoguelph.ca/sas*

c) **Academic Misconduct Policy** –The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. Note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor. The Academic Misconduct Policy is detailed in the Undergraduate Calendar:
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

d) **Copyright of Course Materials –** All course materials are copyrighted by the Department of Chemistry, the instructor who prepared the materials or the publisher who provided the materials. These materials can only be reproduced with permission and in conjunction with associated copyright rules.
Note: Lectures **cannot** be recorded or copied without the permission of the presenter. Material recorded with permission is restricted to personal use for that course, unless further permission is granted.

e) **Copies of out-of-class assignments –** Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

f) **Use of Personal Information –** Personal information is used by University officials to carry out their authorized academic and administrative responsibilities. The University of Guelph's policy on the Collection, Use and Disclosure of Personal Information can be found in the Undergraduate Calendar: *https://www.uoguelph.ca/registrar/calendars/undergraduate/current/intro/index.shtml*

g) **Resources** – Academic Calendars provide information about the University of Guelph's procedures, policies and regulations: *www.uoguelph.ca/registrar/calendars/index.cfm?index*

i. **Drop Date**: The last date to drop one-semester courses, without academic penalty, is **Friday, Nov. 3**. Evaluate your performance regularly and if you are not doing well, seek advice from your Instructor prior to this date. For regulations and procedures for dropping courses, see the Undergraduate Calendar:
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

ii. **Schedule of Dates**: *www.uoguelph.ca/registrar/calendars/undergraduate/current/c03/index.shtml*
e.g., Thurs., Nov. 30 – classes rescheduled from Tue., Oct. 10; Tuesday schedule in effect
Fri., Dec. 1 – classes rescheduled from Mon., Oct. 9; Monday schedule in effect.