CHEMISTRY 103-01
Fall 2022 Course Schedule

Week	Topic	Units in OpenStax
	I. Matter & Measurement (Chapter 1, Appendices B and C)	
Aug 31	A. Domain and methods of chemistry	1.1-1.4
	B. Calculations: units, digits and uncertainty	1.5-1.6
	II. Atomic Structure (Chapters 2 and 6)	
	A. Early chemical laws	2.1
	B. Modern atomic structure	2.2-2.3
Sept 9	C. Atomic mass, Avogadro's number and the mole	2.4, 6.1
	D. Percent composition and empirical formula	6.2
	III. Electronic Structure and the Periodic Table (Chapter 3)	
	A. Electromagnetic radiation and quantization	3.1
Sept 12	B. The Bohr atom and atomic line spectra	3.2-3.3
	C. Quantum mechanics and hydrogen-like orbitals	3.4
	D. Periodic table and electron filling in atoms	3.5-3.6
	E. Periodic trends	3.5-3.6
	IV. Ionic Bonding (Chapters 3 and 4)	
Sept 19	A. Electronegativity and bond polarity	3.7
	B. Ions and ionic bonding	4.1
	C. Ionic nomenclature and polyatomic ions	4.3
	V. Covalent Bonding (Chapter 4)	
	A. Molecules and covalent bonding	4.2
Sept 26	B. Covalent nomenclature	4.3
	C. Lewis dot structures, resonance	4.4-4.5
	D. Valence shell electron pair repulsion model	4.6
	VI. Chemical Reaction Stoichiometry (Chapters 6 and 7)	
Oct 3	A. Chemical equations	7.1
	B. Stoichiometric calculations	7.3-7.4
	C. Solution stoichiometry	6.3
	VII. Chemical Reaction Types (Chapters 7 and 11)	
	A. Electrolytes, ions and net ionic equations	11.2, 7.1
Oct 10	B. Precipitation and acid-base reactions	7.2
	C. Oxidation-reduction reactions	7.2
Oct 17	D. Titrations and gravimetry	7.5

Week	Topic	Units in OpenStax
	VIII. Gases (Chapter 8)	
	A. Gas pressure and the kinetic molecular theory	8.1, 8.5
	B. Diffusion and effusion	8.4
	C. Gas laws	8.2-8.3
Oct 24	D. Real gases	8.6
	IX. Thermochemistry (Chapters 9 and 12)	
	A. Heat, work, energy, enthalpy, and calorimetry	9.1-9.2
	B. Standard enthalpies of formation and Hess's Law	9.3
Oct 31	C. Bond dissociation energies	9.4
	D. Entropy and free energy	12.1-12.4
	X. Liquids and Solids (Chapter 10)	
	A. Intermolecular forces	10.1
	B. Liquids	10.2
Nov 7	C. Solids	10.5-10.6
	D. Phase diagrams	10.3-10.4
	XI. Solutions (Chapters 6 and 11)	
	A. Concentration measurements and solubility	6.4, 11.1, 11.3
Nov 14	B. Henry's and Raoult's laws	11.4
	C. Boiling-point elevation and freezing-point depression	11.4
	D. Osmotic pressure	11.4
	XII. Chemical Equilibrium (Chapter 13)	
	A. Equilibrium and equilibrium constant	13.1-13.2
Nov 21	B. Le Châtelier's Principle	13.3-13.4
	XIII. Acids and Bases (Chapter 14)	
	A. Nature of acids and bases	14.1
Nov 28	B. pH scale	14.2
	C. Equilibrium calculations for weak acids and bases	14.3
Dec 5	D. Acid-base properties of salts	14.4
	E. Common ion effect and buffers	14.6

Other Important Dates

Sept 5	Labor Day – No Class
Sept 12	Add/Drop Deadline
Oct 14	Fall Break – No Class
Oct 31	Withdrawal Deadline
Nov 21	Virtual Class – asynchronous lecture on Blackboard
Nov 23	Thanksgiving Break – No Class
Nov 25	Thanksgiving Break – No Class
Dec 9	Last Class

CHEMISTRY 103-01
Fall 2022 Syllabus

Text: E. J. Neth, P. Flowers, K. Theopold, R. Langley, W. R. Robinson, *Chemistry: Atoms First*, 2nd ed., OpenStax: Houston, TX, ISBN: 9781947172630 (2019). https://openstax.org/details/books/chemistry-atoms-first

Instructor: Robert Pike, office: ISC 1039A, phone: 757-221-2555, email: rdpike@wm.edu
TA: Laurel Nicks, email: llnicks@wm.edu

Office Hours: Tuesday (in person) 9:30–11:00 a.m. and Wednesday (on Zoom) 2:30–3:30 p.m., https://cwm.zoom.us/j/93301641267

Course Goals: This course is intended for science concentrators and pre-medical students. It introduces the student to the nature of atoms and molecules, stoichiometry, states of matter, solutions, reactions, and equilibrium.

Lectures: Monday, Wednesday, Friday, 11:00−11:50 a.m., ISC 1127. All lectures are recorded and posted to Blackboard.

Examinations: Each of the three exams covers about a third of the course material and contains (i) problems requiring numerical answers similar to the problems in the problem sets, (ii) short-answer questions, and (iii) multiple-choice questions.

Grading:		**Syllabus Topics**	**Chapters in OpenStax**	**Date**
18%	First Test	I − V	1 − 4	Oct 7 (Friday)
18%	Second Test	VI − VIII	6 – 8	Nov 4 (Friday)
18%	Third Test	IX − XI	9 − 12	Dec 2 (Friday)
10%	Problem Sets	----	----	----
36%	Final Exam	Above + XII, XIII	Above + 13, 14	Dec 13 (Tues., 7:00 p.m.)

The course grading scale is somewhat flexible, but a rough 10-point scale is typical, i.e. A: 90−100%, B: 80−89%, C: 70−79%, D: 60−69%, F 0−59%. "+/−" letter grades are assigned to (approximately) the top 2% (except A & F) and bottom 2% (except F) scores in each grade range.

Exams will be taken in-person only. Once handed in, they will be graded by the instructor using *Gradescope*. Students will be automatically enrolled into *Gradescope* so that graded exams, including partial credit assignments, comments and tips on missed questions, can be returned electronically.

All students requesting testing accommodations must have a letter of accommodation sent to me by the Student Accessibility Services office (see last page) and make arrangements with me before each exam.

Weekly Help Sessions: Thursdays 5:30–6:20 p.m. in ISC 1127 (except 9/22 in Small 110).

Problem Sets (graded):

There are 13 problem set assignments for the semester available through *MacMillan Achieve* (see below). Each problem set is due by 5:00 p.m. on the day indicated and is graded automatically by *Achieve*. To help with the learning process, you are being given unlimited tries without penalty to get correct answers for each problem. Note that the homework set deadlines are firm. **No homework set will be accepted late and granting of an extension will require very compelling circumstances.** You may work in groups; however, each student is

ultimately responsible for mastering the material for him/herself. Solutions to the assigned problems will be posted on *Achieve* after the homework set is due.

Addition Practice Problems (not graded): Working problems is important for reinforcing the chemical principles emphasized in the lecture and text. There are numerous problems and exercises within and at the end of each chapter. Solutions to the odd numbered problems are found in the downloadable student solutions guide. Many of these problems are very similar to the assigned problems in the homework sets. You should practice similar text book problems if you are having difficulty with an assigned problem.

***Acheive* Homework Sets (graded)**

Problem Set #	Units	Date Available	Date Due
1	I & II	Aug. 31st (Wedn.) 8:00 a.m.	Sept. 10th (Sat.) 5:00 p.m.
2	II & III	Sept. 11th (Sun.) 8:00 a.m.	Sept. 17th (Sat.) 5:00 p.m.
3	III	Sept. 18th (Sun.) 8:00 a.m.	Sept. 24th (Sat.) 5:00 p.m.
4	IV	Sept. 25th (Sun.) 8:00 a.m.	Oct. 1st (Sat.) 5:00 p.m.
5	V & VI	Oct. 2nd (Sun.) 8:00 a.m.	Oct. 8th (Sat.) 5:00 p.m.
6	VI & VII	Oct. 9th (Sun.) 8:00 a.m.	Oct. 17th (Mon.) 5:00 p.m.
7	VIII	Oct. 16th (Sun.) 8:00 a.m.	Oct. 22nd (Sat.) 5:00 p.m.
8	IX	Oct. 23rd (Sun.) 8:00 a.m.	Oct. 29th (Sat.) 5:00 p.m.
9	IX & X	Oct. 30th (Sun.) 8:00 a.m.	Nov. 5th (Sat.) 5:00 p.m.
10	X	Nov. 6th (Sun.) 8:00 a.m.	Nov. 12th (Sat.) 5:00 p.m.
11	XI	Nov. 13th (Sun.) 8:00 a.m.	Nov. 19th (Sat.) 5:00 p.m.
12	XII & XIII	Nov. 20th (Sun.) 8:00 a.m.	Nov. 30th (Wedn.) 5:00 p.m.
13	XIII	Nov. 27th (Sun.) 8:00 a.m.	Dec. 9th (Fri.) 5:00 p.m.

Additional Practice Problems from the OpenStax Textbook (not graded)

Chapter	Problems
1	3, 9, 11, 13, 15, 17, 19, 23, 35, 37, 39, 45, 47, 49, 51, 53, 55, 59, 65, 71, 77, 81, 87, 89, 91, 93, 97
2	1, 3, 5, 7, 11, 17, 19, 25, 29, 37, 39, 41, 46, 45, 47, 49, 51, 53, 55, 57, 61
3	3, 5, 7, 9, 11, 15, 17, 19, 21, 23, 27, 33, 35, 37, 41, 45, 9, 53, 55, 57, 61, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 93, 97, 99
4	3, 5, 7, 9, 13, 15, 21, 23, 25, 27, 29, 31, 40, 46, 48, 50, 52, 66, 70, 72, 79, 85(a-e), 89, 91, 95, 99
6	3, 8, 12, 14, 18, 22, 26, 28, 30, 32, 36, 38, 40, 42, 46, 48, 52, 54
7	3, 5, 7, 9, 11, 13, 17, 19, 21, 25, 29, 31, 33, 37, 39 (a-d), 41, 43, 45, 47, 51, 57, 61, 63, 65, 71, 73, 75, 79, 81, 83, 87, 89, 93
8	5, 7, 15, 27, 29, 31, 33, 37, 39, 43, 45, 49, 51, 53, 55, 57, 61, 63, 65, 69, 75, 81, 85, 87, 89, 91, 95(a,b), 101, 103
9	7, 9, 11, 19, 21, 23, 25, 27, 31, 41, 49, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 81, 88, 91, 92, 94, 100, 104
10	5, 7, 9, 11, 15, 21, 27, 35, 37, 39, 47, 51, 53, 55, 57, 65, 69, 73, 75, 77, 85
11	5, 9, 13, 15, 23, 25, 33, 35, 39, 41, 47, 59, 65
12	3, 15, 17, 19, 21, 25, 31, 33, 37, 51
13	3, 5, 7, 9, 13, 15, 17, 33, 37, 39, 41, 45, 47, 49, 51, 53, 55, 65, 69, 73, 75, 77, 79, 81, 85
14	3, 5, 7, 9, 11, 19, 21, 25, 29, 33, 35, 47, 49, 61, 65, 67, 69(a-d), 71, 79(b-d), 87, 89, 91, 95, 97

Software to be used in the course:

MacMillan Achieve – will be used for problems sets as noted above. Please sign up at https://achieve.macmillanlearning.com/start. You will need to enroll yourself. There is a cost to the student. Course code = https://achieve.macmillanlearning.com/courses/pe6rrp

Piazza – will be used for discussions and announcements. The system, which is free to the student, is intended to provide help fast and efficient feedback and help from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on *Piazza*. If you have any problems or feedback for the developers, email team@piazza.com. You will be enrolled automatically.

Gradescope – will be used for grading of exams. *Gradescope* is free to the student. You will be enrolled automatically.

Course Policies and Resources:

Diversity & Inclusion Vision Statement: William & Mary values and actively nurtures an environment of diversity and inclusiveness where every individual, regardless of how we may differ – for example, but not limited to, with regard to race, religion, gender, ethnic origin, age, socioeconomic status, political preferences, physical abilities, or sexual orientation – is embraced, respected, and afforded the same opportunity to grow, to succeed, and to contribute to William & Mary's success.

Student Accessibility Services: William & Mary accommodates students with disabilities in accordance with federal laws and university policy. Any student who feels they may need an accommodation based on the impact of a learning, psychiatric, physical, or chronic health diagnosis should contact Student Accessibility Services staff at 757-221-2512 or at sas@wm.edu to determine if accommodations are warranted and to obtain an official letter of accommodation. For more information, please see www.wm.edu/sas.

Honor Code: All students are expected to follow the W&M Honor Code. Any suspected violation of academic integrity will be taken very seriously and pursued to the furthest extent possible.

Mental and Physical Well Being: William & Mary recognizes that students have many different responsibilities and can face challenges that make learning difficult. There are many resources available at W&M to help students. Asking for help is a sign of courage and strength. Please reach out to me if you or someone you know are facing problems inside or outside the classroom, and I will do my best to guide you to appropriate resources on campus. Those resources include:

- For psychological/emotional stress, there is the W&M Counseling Center, 240 Gooch Drive 2nd floor (757-221-3620), https://www.wm.edu/offices/wellness/counselingcenter/). Services are free and confidential.

- For physical/medical concerns, there is the W&M Health Center, 240 Gooch Drive (757-221-4386), https://www.wm.edu/offices/wellness/healthcenter/

- For other additional support or resources, please contact the Dean of Students by submitting a care report (757-221-2510) or by email at deanofstudents@wm.edu. See https://www.wm.edu/offices/deanofstudents/services/caresupportservices/index.php.