CHEMISTRY 103
SUMMER 2019
Syllabus

Day	Topic	Pages in OpenStax
	I. Matter & Measurement (Chapter 1, Appendices B and C)	
May 28	A. Domain and methods of chemistry	1-29
	B. Calculations: units, digits and uncertainty	29-51, 1213-1222
	II. Atomic Structure (Chapters 2 and 6)	
May 29	A. Early chemical laws	67-78
	B. Modern atomic structure	78-86
	C. Atomic mass, Avogadro's number and the mole	307-310
May 30	D. Percent composition and empirical formula	311-318
	III. Electronic Structure and the Periodic Table (Chapter 3)	
	A. Electromagnetic radiation and quantization	115-128
May 31	B. The Bohr atom and atomic line spectra	128-134
	C. Quantum mechanics and hydrogen-like orbitals	134-148
June 3	D. Periodic table and electron filling in atoms	148-157
	E. Periodic trends	157-169
	IV. Ionic Bonding (Chapters 3 and 4)	
	A. Electronegativity and bond polarity	199-203
June 4	B. Ions and ionic bonding	169-172, 193-197
	C. Ionic nomenclature and polyatomic ions	172-177, 203-207
	V. Covalent Bonding (Chapter 4)	
	A. Molecules and covalent bonding	197-199, 236-239
	B. Covalent nomenclature	207-210
June 5	C. Lewis dot structures, resonance	210-217, 220-225
	D. Valence shell electron pair repulsion model	225-236
	VI. Chemical Reaction Stoichiometry (Chapters 6 and 7)	
June 6	A. Chemical equations	341-348
	B. Stoichiometric calculations	361-371
	C. Solution stoichiometry	318-326
	VII. Chemical Reaction Types (Chapters 7 and 11)	
June 10	A. Electrolytes, ions and net ionic equations	603-606,346-348
	B. Precipitation and acid-base reactions	348-355
June 11	C. Oxidation-reduction reactions	355-361
	D. Titrations and gravimetry	371-378

Day	Topic	Pages in OpenStax
	VIII. Gases (Chapter 8)	
	A. Gas pressure and the kinetic molecular theory	395-405, 435-440
June 12	B. Diffusion and effusion	430-435
	C. Gas laws	405-427
June 13	D. Real gases	441-444
	IX. Thermochemistry (Chapters 9, 12, and 13)	
	A. Heat, work, energy, enthalpy, and calorimetry	459-490
June 14	B. Standard enthalpies of formation and Hess's Law	491-497
	C. Bond dissociation energies	497-502
June 17	D. Entropy and free energy	653-670, 706-708
	X. Liquids and Solids (Chapter 10)	
	A. Intermolecular forces	519-532
June 18	B. Liquids	532-549
	C. Solids	556-568
June 19	D. Phase diagrams	549-556
	XI. Solutions (Chapters 6 and 11)	
	A. Concentration measurements and solubility	326-331, 597-603
	B. Henry's and Raoult's laws	606-620
June 20	C. Boiling-point elevation and freezing-point depression	620-627
	D. Osmotic pressure	627-633
	XII. Chemical Kinetics (Chapter 17)	
	A. Reaction rates	895-904
	B. Rate laws and reaction order	904-911
June 24	C. First-order reactions	911-914, 918-920
	D. Kinetics and mechanism	921-933
	E. Catalysts and temperature effects	933-938
	XIII. Chemical Equilibrium (Chapter 13)	
June 25	A. Equilibrium and equilibrium constant	679-692, 695-706
	B. Le Châtelier's Principle	692-695
	XIV. Acids and Bases (Chapter 14)	
	A. Nature of acids and bases	731-736
June 26	B. pH scale	736-741
	C. Equilibrium calculations for weak acids and bases	742-758
June 27	D. Acid-base properties of salts	760-764
	E. Common ion effect and buffers	771-779

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Text: E. J. Neth, P. Flowers, K. Theopold, R. Langley, W. R. Robinson, *Chemistry: Atoms First*, OpenStax: Houston, TX, ISBN: 9781938168154 (2016). https://openstax.org/details/books/chemistry-atoms-first

Instructor:	Office	Phone	Office Hours	E-Mail
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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, kinetics and equilibrium.

Lectures: Monday through Friday ISC 1127, 8:00–9:30 AM

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. Your weakest exam will be counted only half as much as your other two exams.

Grading:		**Syllabus Topics**	**Chapters in OpenStax**	**Date**
34%*	First Test	I − V	1 – 4	June 7 (Friday)
34%*	Second Test	VI − X	6 – 10, 12	June 21 (Friday)
34%*	Third Exam	XI – XIV	11, 13, 14, 17	June 28 (Friday)
15%	Homework Sets	(coverage and due dates on reverse side)		

*The weakest of the three exams will count only half as much (17%) as the other two (34% each).

Problem Sets: Working problems is important for reinforcing the chemical principles emphasized in the lecture and text.

Homework Sets: There are graded ten homework set assignments. The coverage and availability dates of the homework sets are listed on the reverse side of this page. These homework sets are available through *Sapling Learning*. Each set is due by 11:59 PM on the day indicated. Each set will be automatically graded through *Sapling*. To help with the learning process, you get three tries to get correct answers for each problem. The homework set deadlines are firm; no homework sets will be accepted late. You may work in small groups; however each student is ultimately responsible for mastering the material for him/herself. Solutions to the assigned problems will be posted on *Sapling* after the homework set is due.

Practice Problems: There are numerous problems and exercises within and at the end of each text chapter. Many of these problems are very similar to the assigned problems in the homework sets. You should practice these problems if you are having difficulty with an assigned problem. A suggested list for each chapter is given on the reverse side of this page.

Sapling Homework Sets (graded)

Problem Set #	Lecture Units	Date Available	Date Due
1	I, IIA	May 27th 8:00 AM	June 1st 11:59 PM
2	IIB-D, IIIA-B	May 30th 8:00 AM	June 1st 11:59 PM
3	IIIC-E, IV	June 3rd 8:00 AM	June 5th 11:59 PM
4	V, VIA-B	June 5th 8:00 AM	June 8th 11:59 PM
5	VIC, VII	June 10th 8:00 AM	June 12th 11:59 PM
6	VII	June 12th 8:00 AM	June 15th 11:59 PM
7	IX, XA	June 17th 8:00 AM	June 19th 11:59 PM
8	XB-D, XI	June 19th 8:00 AM	June 22nd 11:59 PM
9	XII, XIIIA	June 24th 8:00 AM	June 26th 11:59 PM
10	XIIIB, XIV	June 26th 8:00 AM	June 28th 11:59 PM

Additional Practice Problems (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, 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, 49, 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, 87, 95
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
17	3, 7, 13, 15, 19, 23, 25, 27, 29, 37, 45, 51, 53, 55, 63

How to access *Sapling*: Go to www.saplinglearning.com/login to log in or create an account.

- Under Enroll in a new course, you should see Courses at William & Mary. Click to expand this list and see courses arranged by subject. Click on a subject to see the terms that courses are available.
- Click on the term to expand the menu further (note that Semester 1 refers to the first course in a sequence and not necessarily the first term of the school year).
- Once the menus are fully expanded, you'll see links to specific courses. Click on the link for *The College of William and Mary - CHEM 103 - Summer19 - PIKE*.
- Review the system requirements and confirm that Flash is updated and enabled in your browser.