TENTATIVE COURSE SYLLABUS
Chemistry 50—Second Half of the Semester Accelerated Course
Spring Semester 2020, Beginning on March 15, 2021

Iowa State University Catalog: *0 Cr. Prereq : 1 year high school algebra. This course provides you with 3 credits toward enrollment but 0 credits toward graduation. It does not count in your GPA.*
"An in-depth active learning experience designed to impart the fundamental concepts and principles of chemistry, with an emphasis on mathematics skills and logical thinking. For students intending to enroll in general chemistry and who have not taken high school chemistry or who have not had a high school college preparatory chemistry course. Credit for Chem 50 does not count toward graduation."

A College Learning Philosophy: You are the active participant in your own learning. You are in control of whether you learn or not. You must become involved from the outset! In this course, it is you who must build the concepts of chemistry one by one to create a strong foundation for later in this course, later in other courses. Your teaching assistant and instructor can make your job a little easier, but they are not accountable – you are. If you merely sit back and watch, you will not derive maximum value from the course.

Your Chem 50 team members have planned what they hope will be a beneficial course of study for you. We hope that you will learn to appreciate a little of the wonder of chemistry that brought both of us to the field and that you will have fun along the way. Our basic strategy is to review background information and focus on helping you to build the skills that will support you in your next course.

The top 5 reasons students enroll in Chemistry 50: What are some reasons that students enroll in Chem 50?
1. As review—it has been several years since the student has taken a chemistry course.
2. To build an English vocabulary in chemistry terminology—an international student may have enrolled in a chemistry course in another country and might struggle with making the transition from the native country to America.
3. The student was enrolled in a higher-level chemistry course but struggled because of the background she or he had. With the advice of her or his original chemistry professor and advisor, the student opted to drop back to review the material in Chem 50.
4. To make up a science deficiency in her or his background.
5. The student did not take a college chemistry preparatory course during high school.

Instructor:	kathy burke
Office:	3760 Gilman Hall
Office Phone:	515-294-7718 (with voice mail)
E-Mail Address:	kbrk@iastate.edu (please ALWAYS use "Subject: 50")
Office Hours:	*T,R. 1:00 pm, Room 1761 Gilman Hall (right after class)
E-Mail Office Hours:	*M-F. 5:00-6:00 pm
	*some weeks these hours may change due to scheduling conflicts
Electronic Devices:	All electronic devices should be put away during class time. This includes laptops, cell phones, PDAs, beepers, iPads, iPods, or any texting devices. If any such devices are used during lecture, they will be placed on the front desk until class is finished. If you have an emergency for which you need such a device, please consult your instructor.
Chem 50 Meeting Times for Formal Instruction:	Monday, Wednesday, Friday: 12:05-12:55 p.m., Physics 0003 Tuesday, Thursday 12:10- 1:00 p.m., Physics 0003
Teaching Assistant:	Daphne Patten, dpatten@iastate.edu Daphne's Chemistry Help Center hour, 1761 Gilman ORWebex : 2-3 PM on Monday

1. **TEXTBOOK REQUIRED:**   "*Introductory Chemistry*" 6th ed. By N.J. Tro, ISBN: 978-0-13-430238-6.
     Be sure to get the 6th edition for your homework assignments to be correct!

2. **CALCULATOR REQUIRED:** You should borrow or purchase an inexpensive nonprogrammable *scientific* calculator to use for doing your homework and in-class practice problems. You can find one for less than $10 at the local discount chain stores. Look for a basic calculator model that features an EE or EXP key option *directly on the keyboard*. For future chemistry classes, the functions log x, e^x, 10^x, y^x may also be useful. Please ask your instructor or TA for advice about choosing a calculator if you need it.

All calculators are subject to inspection during exams and quizzes. If you are unsure about whether your calculator is acceptable, please ask your instructor or your teaching assistant.

During Chem 50, no *programmable* calculators will be needed or allowed on quizzes, hour exams, or the final exam. You may NOT use your cell phone as a calculator at any time during quizzes, hour exams, or the final exam.

3. **COVID-19 HEALTH AND SAFETY REQUIREMENTS (from Jonathan Wickert, Senior Vice President and Provost)**
Students are responsible for abiding by the university's COVID-19 health and safety expectations. All students attending this class in-person are required to…:

A. properly wear a face covering and/or face shield, covering the nose and mouth, while in classrooms, laboratories, studios, offices, and other learning spaces. It is important to remember that a face covering and/or face shield is required to be worn whenever you are on campus, in the presence of others, and unable to maintain physical distance.
B. practice physical distancing to the extent possible;
C. sit in an assigned seat (for contact tracing);
D. assist in maintaining a clean and sanitary environment;
E. not attend class if you are sick or experiencing symptoms of COVID-19;
F. not attend class if you have been told to self-isolate or quarantine by a health official.
G. follow the faculty member's guidance with respect to these requirements. Failure to comply constitutes disruptive classroom conduct. Faculty and teaching assistants have the authority to deny a non-compliant student entry into a classroom, laboratory, studio, conference room, office, or other learning space.

4. Where you will sit during lecture and recitation (from ISU Administration): You and your classmates will be provided with a seating assignment for both lecture. The "seating chart" for the room will be posted on our course website. You will be told your own personal seat location as soon as it has been determined.

PREREQUISITE SKILLS: Students in Chem 50 should have had a basic arithmetic and algebra course in preparation for the mathematics in this curriculum. Although there will be mathematics review as we progress through the course, you should have had some exposure to and a comfort level with basic mathematics prior to beginning this course. You will be doing calculations involving fractions, percent, exponents, scientific notation, writing and solving algebraic equations, and general problem-solving techniques.

CELL PHONE/TEXTING COURTESY: As outlined above, ***all electronic devices*** should be put away during class time. *Please be sure to turn off the ringer on your cell phone*. If you are waiting for an important call or message, please let your instructor/TA know. They can monitor your phone for you.

COURSE INFORMATION:
Canvas Grade Center for CHEM 50: We will post up-to-date information about assignments and quiz or examination dates on the Canvas site. You can check the Grade Center at this web site for grade information as it becomes available. Other study aids (e.g., worksheets) may also be posted there. ***Most course information for Canvas will be found under Files***.

Important Course Policy: It is your responsibility to check grades on Canvas. If you discover an error in a grade on Canvas Learn, you MUST show the graded work to your TA ***within ONE week*** of receiving the returned graded work to have the grade corrected.

EXAMINATIONS/QUIZZES:
EXAMS: There will be four bi-weekly examinations (100 points each, given at 12:05 p.m. on Fridays in 0003 Physics and a comprehensive final exam (100 points, given at ***2:15-4:15 p.m.*** on Wednesday, May 5 in 0003 Physics). The dates are listed below. ***Please note the day and time of the FINAL EXAM is already scheduled (it CANNOT be changed) and make your end-of-semester travel plans accordingly.***

Exam 1: Monday, March 22	**Exam 3**: Friday, April 16
Exam 2: Friday, April 2	**Exam 4**: Friday, April 30

     Final Exam: ***Wednesday, May 5, 2:15-4:15 p.m.***   **(This is the ONLY time this exam will be given)**

The four one-hour exams (100 points) will be given at 12:05 p.m. in 0003 Physics on the dates listed. A class meets in the room prior to our class and directly following our class. ***Please be prompt. We have only 50 minutes for the exams!***

The hour exams will be a combination of the following question types: multiple choice, fill in the blank, matching, "explain your idea", and "show your work". Although each exam is worth 100 points, the number and types of questions vary with each exam. This type of format has been chosen in order to award some portion of full credit for partially correct responses.

There will be NO make-up exams. Any unexcused absence from an exam results in a score of zero. However, please inform me (voice mail 294-7718, e-mail kbrk@iastate.edu) **PRIOR TO** a scheduled examination if you will miss the exam. **THIS IS YOUR RESPONSIBILITY.** Students who miss one of the hour exams for a reason deemed valid by the instructor will be able to make up these missing points by substituting the *percent score* that they earn on the final exam for the missing exam score. *If you do not call in advance to let us know that you will miss the exam, you will not be offered this option and your score will be a zero. ANY ADDITIONAL MISSED EXAM IS A ZERO.*

Exam Replacement: We can all have a bad day taking an exam. *If you have taken all four one-hour exams*, you have the option of replacing your *lowest* exam score with the *percent* grade you received on the final examination, if it is higher than the lowest hour exam score. If you miss one of the hour exams, you do not have this option of replacing your lowest hour exam score because you will automatically use the percent score on the final exam to replace the missing exam score.

LECTURE QUIZZES: There will be a quiz *at the end* of lecture *each* Wednesday and every Friday that you do not have an exam. *There are no make-up quizzes*. Quizzes will be representative of the material you have read, with problems similar to suggested homework problems. Each quiz will be cumulative and will cover all reading material since the last quiz or exam.

FINAL EXAM: The final exam will be a 100-point comprehensive multiple-choice examination covering ALL of the material we have studied during the course. **THE FINAL EXAM IS SCHEDULED BY THE REGISTRAR AND WILL BE GIVEN** *Wednesday, May 5, 2:15-4:15 p.m.* in 0003 Physics. There will be no possibility to take the final exam early. This is university policy. Only those with three or more final exams in one day can negotiate any change in the final exam time. *Please make your end of semester travel plans accordingly.*

Requests to change final exam day/time: A student wishing to change the day of the final exam (because of having three or more final exams on the same day) must make his/her request to the instructor *NO LATER THAN THE LAST SCHEDULED CLASS DAY BEFORE THE BEGINNING OF PREPARATION WEEK*.

******ANY STUDENT WHO MISSES THE FINAL EXAMINATION WILL FAIL THE COURSE.******

COURSE PROTOCOL:

GRADES: Your Chem 50 course grade will be based on the following components for a total possible 100% as outlined below:

Active participation during *all* class sessions	10 %	All homework set scores	15 %
4 one-hour exams at 100 points each	50 %	All quiz scores	15 %
Comprehensive final exam at 100 points	10 %		

GRADING SCALE: This is the course grading scale. It is set and will not change.

94 – 100	A	87 – 89.9	B+	76 – 79.9	C+	60 – 64.9	D+	<50	F
90 – 93.9	A-	83 – 86.9	B	69 – 75.9	C	55 – 59.9	D		
		80 – 82.9	B-	65 – 68.9	C-	50 – 54.9	D-		

Canvas calculates your grade continually: You can know your percentage grade at any time during the course.

Academic integrity: Academic integrity, based on your demonstrating Academic Misconduct in any form is in violation of ISU *Student Disciplinary Regulations* and will not be tolerated. This includes, but is not limited to: copying or sharing answers on tests or assignments, plagiarism, and having someone else do your academic work. Depending on the act, a student could receive an F grade on the test/assignment, F grade for the course, and/or could be suspended or expelled from the University. See (http://www.studentconduct.dso.iastate.edu/academic-misconduct) for more details and a full explanation of the Academic Misconduct policies.

ATTENDANCE AT LECTURE: *The ringer on all cell phones/beepers must be turned off during lecture unless cleared with the instructor prior to class. Please do not text during class.*

Attendance is required at lecture. Students are expected to be prompt and to leave only when class work is concluded.

Points will be awarded for participation.

3 points: present and actively participating   1 point: present but not participating or showing distracted behavior
2 points: present and minimally participating   0 point: absent

LEARNING OBJECTIVES FOR CHEMISTRY 50:

The following list includes our fundamental overall learning objectives for Chemistry 50. A much more detailed list of learning objectives is provided for each chapter at the end of this document. After successfully completing this course, students will understand:

1. The basic structures of atoms, ions, and molecules, and ways to quantitatively and qualitatively describe the properties of atoms and molecules in the various phases of pure matter and in mixtures.
2. The reactivity of atoms, ions, and molecules, and various qualitative and quantitative methods for describing, depicting, and balancing chemical reactions.
3, How to correlate the electronic configurations of atoms and the structures of molecules with their chemical properties.
4. How to correctly use the language of chemistry (nomenclature, terminology, and symbolic representations).
5. How to be able to use the periodic table, chemical facts, concepts, and models, as a foundation to organize further chemical knowledge and to understand the physical world.
6. How to be able to visualize the structure of matter and its reactions at the atomic and molecular level.
7. How to master qualitative problem solving skills and monitor your own thinking processes as you proceed.
8. How to be able to solve quantitative problems using basic mathematical skills.
9. How to move beyond memorizing to integrating overarching concepts.

HELP IN CHEMISTRY 50:

HELP FROM YOUR CHEM 50 INSTRUCTOR: Your Chem 50 instructor has scheduled weekly office hours as well as e-mail office hours (noted on page 1 of the syllabus). You can also schedule help time(s) by appointment.

Daphne, our course TA, has a regularly scheduled student hour on Monday 2:00-3:00 PM. This will either be in person or via Webex. We will decide closer to the time the course begins.

HELP SESSIONS: *If requested*, there will be optional scheduled study sessions at 5:30 p.m. in Room 1810 Gilman on the Wednesday evening prior to each Friday hour exam or Sunday afternoon for the sole Monday exam. These dates include:

Exam 1: Sunday, March 21   **Exam 3**: Wednesday, April 14
Exam 2: Wednesday, March 31   **Exam 4**: Wednesday, April 28

Final Exam Help Session: *TBA*

A help session will be scheduled for the final exam based on the schedules and availability of class members. Please take advantage of these help sessions or instructor/TA Webex student hours, if you have any difficulties understanding materials studied in class.

If you have any difficulties understanding materials studied in class, please take advantage of these help sessions or your TA's student hours.

COURSE WORK:

ASSIGNMENTS: In any chemistry course, it is best to keep caught up with the reading and homework! Getting behind is the number one mistake you can make—in any course! Concepts in chemistry are like building blocks. From the beginning of the course, you learn one topic at a time to build up to larger concepts. If you are not confident of a topic early in the course, your whole foundation is unsteady. To avoid this, try to keep caught up every day. It is TOO easy to get behind. Doing small amounts of work each day will save you from becoming discouraged later when it is time to complete a major problem assignment or to study for an examination.

For every hour of time spent in the classroom, please plan to spend at least an hour and a half to two hours or more studying outside of class. This means that you will spend up to eight hours or more per week actively participating in class and studying for this course. Staying caught up with your assignments will help you to learn the material. If you feel that you are getting behind, please talk with your instructor or your TA as soon as you can in order to arrange to get help.

BEFORE coming to class each day, you should skim the assignments in the textbook and attempt to work the assigned problems. During each formal "lecture" session, you will be told which problems in the text should be solved for the next class period. Because the homework problems reflect a major portion of the course content, it is essential that you become proficient in solving these problems. Any questions regarding these homework problems and assigned reading material should be directed to your instructor during the formal "lecture" session or to your teaching assistant during her help center office hour. These problems will be similar to those problems you will be asked to solve on the hour examinations or quizzes.

The homework (HW) assignments for which you are responsible will be provided chapter by chapter. The homework problems assigned are listed in the order that they will be covered during lecture. These assignments are found on the last page of your syllabus. The actual homework problems themselves are found at the end of each chapter.

Each day during lecture, your instructor will let you know which problem(s) you should complete as homework (HW). The problems will be listed right in your class notes something like this: hw: 2,5ac,9bdf. This means in the chapter you are studying, you should

complete homework problems 2, 5 only parts a and c, and 9 only parts b, d, and f. You will hand these in for grading the next day. It is important that you hand in your assignments on time. ***Only ONE late HW assignment will be accepted.*** Any other late assignments will be counted as zero points. Your instructor will have a folder into which you will place your un-graded homework. Your graded work will be returned to you within one to two class periods.

Please show your work completely for full credit. This means showing each step of how you calculated an answer, not just the numerical result. Your instructor will demonstrate for you how to do this. If you do not show your work completely (for example, you show only a number for your answer rather than how you found your answer), you will receive no partial credit. By practicing this approach while doing your homework, you will be much more comfortable working problems this way on exams or quizzes.

Assigned homework problems will be graded on the following basis:

0 points = no paper handed in	2 points = 50-64% complete	4 points = 80-89% complete
1 point = less than 50% complete	3 points = 65-79% complete	5 points = 90% or more complete

OTHER USEFUL INFORMATION:

Academic success center (ASC): The Academic Success Center, Room 1076 of the Student Services Building, 515-294-6624, provides services and programs to assist students including disability resources, presentations, workshops for study skills. Visit their web site, http://www.dso.iastate.edu/asc/

Special academic needs: Iowa State University is committed to assuring that all educational activities are free from discrimination and harassment based on disability status. Students requesting accommodations for a documented disability are required to meet with staff in Student Accessibility Services (SAS) to establish eligibility and learn about related processes. Eligible students will be provided with a Notification Letter for each course and reasonable accommodations will be arranged after timely delivery of the Notification Letter to the instructor. Students are encouraged to deliver Notification Letters as early in the semester as possible. SAS, a unit in the Dean of Students Office, is located in room 1076 Student Services Building or online at www.sas.dso.iastate.edu. Contact SAS by email at accessibility@iastate.edu or by phone at 515-294-7220 for additional information.

If you require accommodations, please contact me as soon as you can (***preferably during the first week*** you are enrolled in the course) so that we can make appropriate arrangements to meet your needs as soon as possible. **Exam or quiz accommodation requests must be made a minimum of 4 business days prior.**

Harassment and Discrimination. Iowa State University strives to maintain our campus as a place of work and study for faculty, staff, and students that is free of all forms of prohibited discrimination and harassment based upon race, ethnicity, sex (including sexual assault), pregnancy, color, religion, national origin, physical or mental disability, age, marital status, sexual orientation, gender identity, genetic information, or status as a U.S. veteran. If you have concerns about such behavior, please contact me, Student Assistance (http://www.studentassistance.dso.iastate.edu/) at 515-294-1020, or email dso-sas@iastate.edu, or the Office of Equal Opportunity and Compliance (http://www.eoc.iastate.edu/) at 515-294-7612.

Religious Accommodation. Iowa State University welcomes diversity of religious beliefs and practices, recognizing the contributions differing experiences and viewpoints can bring to the community. There may be times when an academic requirement conflicts with religious observances and practices. If that happens, students may request reasonable accommodation for religious practices. ***In all cases, you must put your request in writing***. The instructor will review the situation in an effort to provide a reasonable accommodation when possible to do so without fundamentally altering a course. For students, you should first discuss the conflict and your requested accommodation with your professor at the earliest possible time. You or your instructor may also seek assistance from the Dean of Students Office at 515-294-1020 or the Office of Equal Opportunity at 515-294-7612.

Preparation Week: This class follows the Iowa State University Preparation Week policy as noted in section 10.6.4 of the Faculty Handbook: http://www.provost.iastate.edu/resources/faculty-handbook. ***As previously noted, because this is an accelerated half-semester course, there WILL be HW assignments, a quiz, and an exam during Preparation Week.***

Contact Information: If you are experiencing, or have experienced, a problem with any of the above issues, you should email academicissues@iastate.edu.

Free Expression. Iowa State University supports and upholds the First Amendment protection of ***freedom of speech*** (https://www.studentconduct.dso.iastate.edu/know-the-code-resources/resources-for-students/harassment-and-free-speech/free-speech) and the ***principle of academic freedom*** (https://www.iowaregents.edu/plans-and-policies/board-policy-manual/39-academic-freedom) in order to foster a learning environment where open inquiry and the vigorous debate of a diversity of ideas are encouraged. Students will not be penalized for the content or viewpoints of their speech as long as student expression in a class context is germane to the subject matter of the class and conveyed in an appropriate manner.

Canvas for Students at ISU
Getting Started

1. Be sure to have an ISU NetID. If you do not, please visit Passwords and Accounts: (https://www.it.iastate.edu/services/accounts)
2. Login to Canvas with your ISU NetID and password and look for your course for this semester.

Canvas Help. General help with Canvas can be found under the Help link in the global navigation menu on the left side of your Canvas page. You will find:

- Canvas Live Chat – 24/7 live chat with Canvas specialists
- Canvas Guides-a repository of how-to's
- Ask the Canvas Community-Online support forum for canvas users. Log in using ISU credentials.
- ISU Canvas Support Line: Call 515 294 4000, press 2 and then press 1. Hours of operation.
- Go to Lynda.com and log in with your ISU credentials. Search for the desired tutorial.

Basic Troubleshooting (if Canvas is not working)

- Username/Password not working?
    - The login information (username and password) for Canvas is the same as for your ISU email account.
    - For help with Username and Password, please visit University Accounts or contact Solution Center at 515-294-4000 or solution@iastate.edu.
- If you get an error message, check for Browser and Java Issues on your computer.
- If you are unable to access course content or activities (e.g., Tests, Discussions, Assignments, etc.), contact your instructor.
- Check general Technology Support for Students

Important Dates: The ***last day for change from credit to audit:*** Friday, March 19, 2021. An audit does not count towards full-time student status.

The ***last day to drop the course:*** Friday, April 16, 2021.

The ***last day to change a second half-semester course to or from Pass/Not Pass:*** Friday, April 16, 2021.

Please see ***Ms. Pat Augustin*** in Room 1608 Chemistry to negotiate any changes in your status in the course (i.e., drops, etc.). She keeps the computer records for Chem 50.

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Homework Problems

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HOMEWORK, HW: A list of practice HW problems are provided on pages 7 – 17. They are divided into listings of those problems for which answers can be found in the back of the textbook and those problems for which there are not answers in the back of the textbook.

You should make every effort to work these homework problems. They are found ***at the end of each chapter*** in your textbook. The problems listed reflect the concepts you are expected to understand for the hour exams and quizzes. If you have difficulty with any of them, you should spend time with Daphne in the Help Center/ OR via Webex or with your instructor. The problems are to be worked for your benefit and understanding. The more problems you try, the more prepared you will be for your exams and quizzes.

Each day, **at the beginning of class**, you will hand in selected problems for grading. Those problems you will hand in for grading will be indicated during lecture the previous day. They are found in the listing of *problems with answers* in the back of the textbook.

You should show all work that you do to solve a problem. In general, just a numerical answer will not receive full points. The MORE work that you show, the more points you will receive. Daphne, your teaching assistant, will explain to you what this means along with showing you HOW to show all of your work.

Unless mentioned in the homework assignment section or during lecture, you are responsible for ALL materials in the chapters discussed during class. Although you should work all of the assigned problems, your instructor will let you know which ones will be graded.

Tentative schedule

Week	Chapter	Topic	What Pages to Read	
Wk 1	Ch. 3	Matter and Energy	3:	54-84
	Ch. 2	2.2 Scientific Notation	2:	12-13
	Ch. 4	Atoms and Elements	4:	92-116
	Ch. 2	2.5 Basic Units of Measure 2.6 Converting Units	2:	22-29
EXAM 1	**Monday March 22**	**12:05-12:55 p.m. 0003 Physics Hall**		
Wk 2/3	Ch. 4	Atoms and Elements (continued, if needed)	4:	92-116
	Ch. 2	2.3-2.4 Significant Figures	2:	14-22
Wk 2/3	Ch. 9	Electrons in Atoms and the Periodic Table	9:	284-315
Wk 3	Ch. 5	Molecules and Compounds	5:	126-153
	Ch. 2	2.7-2.10 Measurement and Problem Solving	2:	29-44
EXAM 2	**Friday April 2**	**12:05-12:55 p.m. 0003 Physics Hall**		
Wk 4	Ch. 6	Chemical Composition	6:	164-194
Wk 4/5	Ch. 7	Chemical Reactions	7:	204-238
EXAM 3	**Friday April 16**	**12:05-12:55 p.m. 0003 Physics Hall**		
Wk 6	Ch. 8	Quantities in Chemical Reactions	8:	248-271
Wk 7	Ch. 10	Chemical Bonding	10:	324-349
	Ch. 13	Solution stoichiometry 13.2-13.3 13.6-13.8	13:	448-452; 457-465
EXAM 4	**Friday April 30**	**12:05-12:55 p.m. 0003 Physics Hall**		

The comprehensive multiple choice final exam is *Wednesday, May 5, 2:15-4:15 p.m.* in 0003 Physics.

Objectives and Corresponding Homework
Listed by Chapter (Ch) and Section (Sec)
Useful to Prepare for an Exam

Ch	Sec	Topics	Objectives	HW with answers	HW without answers
2	2	Scientific notation	Given a number less than one, write that number in proper scientific notation. Given a number greater than one, write that number in proper scientific notation. Convert numbers between decimal notation and scientific notation. Add, subtract, multiply and divide using scientific notation.	29,31,33,37	30,32,34,38
	3	Significant figures	Distinguish between measured numbers and exact numbers. Understand the rationale for the use of significant figures. Given a measured number, state the number of significant figures.	39,41,43,45, 47	40,42,44,46, 48
	4	Calculations using significant figures	Use significant figures properly in addition, subtraction, multiplication, and division. Divide and/or multiply a series of numbers and write the answer to the correct number of significant figures. Learn rules for rounding.	47,51,53,57, 59	48,52,54,58, 60
	5	Metric units	Learn metric base units: gram, liter, meter. Recognize the difference between mass and weight. Learn metric prefixes, their symbols, and numerical meanings: Tera, giga, mega, kilo, centi, milli, micro, nano, pico.	Memorize: Pico, nano, micro, milli, centi, kilo, mega, giga, tera	
	6	Interconversions of metric units	Convert between metric units using dimensional analysis.	69	70
	7	Interconversions of units metric to English	Convert between metric units and English units using dimensional analysis.	71bcd,73,77, 81,121	72,74,78,82, 122
	9	Density	Recognize and use density as a conversion factor. Calculate mass from density and volume. Calculate volume from density and mass.	99,111	100,112
	10	Problem-solving strategies ("gfu")	Perform multi-step conversions using dimensional analysis.	83	84

Ch	Sec	Topics	Objectives	Homework with answers	Homework without answers
3	2	Matter	Distinguish among elements, compounds, and mixtures in terms of their atomic make-up. Distinguish between homogeneous and heterogeneous matter.	1	2
	3	Classifying states matter	Classify matter by physical state. State the shape and volume characteristics of the three physical states of matter. Classify common samples of matter according to physical state. Identify the processes by which matter changes physical state (i.e., freezing, melting, etc.).	3	4
	4	Elements, compounds, mixtures	Given the names with the symbols and/or given the symbols write the names of the elements having atomic numbers 1 through 36, in addition to Ag, Sn, I, Xe, Cs, Ba, Pt, Au, Hg, Pb, Rn, U. There are 48 of these.	13,31,33bc, 35bc,113bd	12,32,34ab, 36ac,114bc
	5	Physical/chemical properties	Differentiate between physical properties and chemical properties.	39	40
	6	Physical/chemical change	Differentiate between physical change and chemical change.	43,115	44,116
	7	Conservation matter/mass	State the Law of Conservation of Matter. Apply the Law of Conservation of Matter	47b,49	48b,50
	8	Units of energy	Define energy. Differentiate between kinetic and potential energy. Understand the Law of Conservation of Energy. Discuss energy transformation between chemical, mechanical, electrical. Convert units of energy: calorie, Calorie, and Joule	17,19,21,55 lines 1,2,4 (not kWh), 59 (if you like math)	18,20, 56 lines 1,2,3 (not kWh), 60 (if you like math)
	9	Energy endothermic, exothermic	Differentiate between endothermic and exothermic processes.	23,61 (no energy diagram),63	22,62 (no energy diagram),64
	10	Temperature	Distinguish between heat and temperature. Convert temperatures between Celsius and Kelvin.	25,65c,67,73 (lines 1,3 not °F)	30,66d,68,73 (line 3 not °F)
	11	Heat capacity	Distinguish between heat and specific heat.		
	12	Energy and heat calculations	Define each term in q=mcΔT. Use specific heat, temperature and mass to calculate heat. Given appropriate experimental data, calculate the specific heat or the mass or the change in temperature of a substance.	75,77,79,85, 105 (if you like math)	76,78,80,86, 106 (if you like math)

Ch	Sec	Topics	Objectives	Homework with answers	Homework without answers
4	3	Nuclear atom		3,31	4,32
	4	Subatomic particles	Draw a model of the atom, indicating where the nucleus is located. State the names, symbols, charges, relative masses, and locations in the atom for the three subatomic particles.		
	5	Z= atomic number= #protons	Define the term atomic number. Define the term atomic mass. Define the term mass number. Use the Periodic Table to identify the atomic number, atomic mass, and mass number for an atom of any element. From the atomic number of an atom, use the periodic table to identify what that element is. Distinguish between atomic mass and mass number. Given the atomic number and mass number, determine the number of protons, electrons, and neutrons in an atom. Given the number of protons, electrons, and neutrons in an atom, determine the atomic number, the mass number, and what the identity is of the element. Be able to represent an atom of any element with the notation $^{A}_{Z}X$, e.g., $^{34}_{16}S$. Be able to represent an atom of any element with the notation X-A, e.g., S-34. From either representation ($^{A}_{Z}X$ or X-A), determine the number of protons, electrons, and neutrons in the atom.	9,13,45,47, 51	8,12,24,26, 46,48,52
	6	Periodic law and periodic table	Using the Periodic Table, identify the following: representative elements, transition metal elements, lanthanides, actinides, metals, nonmetals, metalloids, groups, periods, alkali metals, alkaline earth metals, halogens, noble gases, inert gases.	53,55,57,59, 61, 63,67,69,71, 73c,17	54,56,58,60, 62,64,68,70, 74c, 16,18
	7	Ions	Explain how anions and cations are formed. Predict the likely formulas for the monatomic ions formed by representative elements. Determine the number of electrons a metal atom will loose to become a cation. Determine the number of electrons a nonmetal atom will gain to become an anion. Using the Periodic Table, predict the charge on an ion formed from any representative element. Given the number of protons and electrons in an ion, determine the charge on the ion. Given the symbol for an ion, including the mass number, charge and atomic number, calculate the number of protons, neutrons and electrons in the ion. Given the number of protons, neutrons and electrons in an ion, write the correct symbol for the ion, including the mass number, atomic number and charge.	19,21,75,79, 81,83,85, 109	20,76,80, 82,84,86, 110
	8	Isotopes	Given the number of protons and neutrons in two atoms, indicate whether the atoms are isotopes.	25,89,93	22,90,94

Ch	Sec	Topics	Objectives	Homework with answers	Homework without answers
5	2	Compounds constant composition	State the Law of Constant Composition (Definite Proportions). Be able to apply the Law of Constant Composition (Definite Proportions) to a calculation.	3,25,29	4,26,30
	3	Chemical formulas	Given the chemical formula for one molecule of a chemical compound, be able to provide an "inventory" of the number of atoms of each type in the compound. From an "inventory" of the number of atoms of each type in a chemical compound, provide the chemical formula for one molecule of the chemical compound.	5,31,33,37, 39,91	6,32,34,38, 40,92
	4	Molecular view elements, compounds (molecular, ionic)	List the elements that exist as diatomic (or polyatomic) molecules. Distinguish between empirical and molecular formulas.	7,9,41,43,45, 47,49,51	8,42,44,46, 48,50,52
	5	Formula writing ionic	Use the Periodic Table to give the names and formulas for common monatomic ions, both metal and nonmetal. Distinguish between metal ions that have only one possible charge and metal ions that can have more than one possible charge. Learn the names and the charges for metal ions that can have more than one charge. Distinguish between monatomic ions and polyatomic ions. Name monatomic anions. Learn the formulas (including charges) for the following polyatomic ions: ammonium, cyanide, hydrogen carbonate, hydroxide, nitrate, carbonate, sulfate, and phosphate.	53	10,54
	6,7	Naming compounds— ionic	Given a formula involving a metal (that has only one possible charge) and a nonmetal or polyatomic ion, use the ionic compound rules to name the compound. Given the name of a compound involving a metal (that has only one charge) and a nonmetal or polyatomic ion, use the ionic compound rules to give the formula. Given a formula involving a metal (that has more than one possible charge) and a nonmetal or polyatomic ion, use the ionic compound rules to name the compound. Given the name of a compound involving a metal (that has more than one possible charge) and a nonmetal or polyatomic ion, use the ionic compound rules to give the formula. Given a formula involving the ammonium ion and a nonmetal or polyatomic ion, use the ionic compound rules to name the compound. Given the name of a compound involving the ammonium ion and a nonmetal or polyatomic ion, use the ionic compound rules to give the formula.	11,15,1755,5 7,59, 61cd,65abc, 69abcdf	16,46,56,58, 60,62bcd, 66abdf,70de
	8	Naming compounds— covalent	Write (spelling correctly) the prefix associated with one=mono, two=di, three=tri, four=tetra, five=penta, six=hexa, seven=hepta, eight=octa, nine=nona, and ten=deca atoms of an element in a chemical name. Given the name, write the formula and given the formula, use the covalent compound rules to write the name for covalent compounds.	19,69,71a-d, 73	20,70de,72, 74
	9	Naming compounds— acid	Recognize binary acids and learn the system for naming binary acids. Recognize oxyacids and learn the system for naming oxyacids.	21, 77bcd, 81ab	22,78,82a
	11	Mass of molecules	Calculate the molecular mass of a covalent compound; calculate the formula mass for an ionic compound. Recognize molecular mass and formula mass as they relate to molar masses.	83ad,99abd	24,84bc, 100ab

Ch	Sec	Topics	Objectives	Homework with answers	Homework without answers
6	3	Moles of element <—>atoms Moles of element <—>grams	Using the Periodic Table, be able to determine the mass of one mole (molar mass) of any element and or compound. Use an understanding of molar mass of an element to convert grams of an element to moles of an element and reverse. Recognize that equal numbers of atoms are present in any two samples of elements if they contain an equal number of moles of the element.	21,23,31,37, 43	22,24,32,38, 44
	4	Moles of compound<—> molecules compound Moles of compound <—> grams compound	Use Avogadro's Number to convert between moles and number of molecules, formula units, ions, or atoms. Construct conversion factors for grams/mole using the Periodic Table. Construct conversion factors for units/mole using Avogadro's Number.	3,5,45,47, 49 lines 1&3,51, 53cd,	2,4,6,46,48, 50,52,54
	5	Chemical formulas as conversion factors Mass or molecules compound <—> moles compound <—> moles elements <—> atoms element	From the chemical formula of a compound, provide an inventory of the number of moles of each element present. From mass of a sample of a compound, calculate the number of atoms of each element in the compound. From the mass of each element in a sample of a compound, find the number of molecules of the compound.	7,9,57,59, 63,65,67,79, 115	6,8,10,58, 60,64,66,68, 116
	6,7	Mass percent from chemical formula	Calculate percent by mass composition for each element of a compound	11,71,79,85	12,72,80,86
	8	Empirical formula from mass percent	Given a molecular formula, determine the empirical formula Given the per cent composition of a compound, determine the empirical formula	13,87,89,93	88,90,94
	9	True formula from empirical formula	Given the empirical formula and the molar mass, determine the molecular formula of a compound	15,99 (now, compare answers from 13,15)	16,100

Ch	Sec	Topics	Objectives	Homework with answers	Homework without answers
7	2	Evidence of a chemical reaction	List five ways that you know that a chemical reaction has occurred.	1,3,29	2,30
	3	Equations	Represent reactants and products with appropriate chemical formulas and states of matter. Use appropriate symbols to represent that heat is required for a chemical reaction, that a catalyst is required for a chemical reaction, or that a reaction is reversible.	5	4
	4	Balancing equations	Balance simple equations given the formulas of the reactants and products so that there are equal numbers of atoms of each element on each side of the equation	7,41,43,45, 47,51,53,57	6,42,44,46, 48,52,54,58
	5	Solubilities, solubility rules	Using the solubility rules, predict whether a compound is soluble or insoluble. Define and recognize strong electrolytes.	9,11,13,59, 63	8,10,12,60, 64
	6	Precipitation reactions	Practice balancing multiple double replacement reactions and recognize the significance of the insolubility of some products as a driving force for the reaction. Write molecular equations, ionic equations, and net ionic equations. Identify spectator ions.	15, 67,73, 77bc,105, 107,109	14,68,74, 78bc,106, 108,110, 112b
	7	Molecular, ionic, net ionic equations	Write molecular equations, ionic equations, and net ionic equations. Identify spectator ions.	75bc	16,76bc
	8	Acid-base and gas evolution reactions	Define the term neutralization. Recognize: "acid + base —>"salt" + water" Write and balance the molecular, ionic and net ionic equation for an acid-base neutralization reaction. Identify spectator ions (i.e., the "salt"). Recognize types of compounds that undergo gas evolution reactions. Identify and write equations for gas evolution reactions.	19,81,83a	18,82,84a
	9	Oxidation-reduction reactions	Identify oxidation-reduction (redox) reactions. Identify and write equations for combustion reactions. Understand the activity series how to use it to predict the outcome of single replacement reactions. Define the terms oxidation and reduction. Define the terms oxidizing agent and reducing agent. Write and balance the net ionic equation for an oxidation-reduction reaction given the major reactants and products.	21,85,87ac, 89cd	20,86,88bc, 90abd
	10	Classifying chemical reactions	Classify a chemical reaction by inspection.	23,91,93	22,24,92,94

Ch	Sec	Topics	Objectives	Homework with answers	Homework without answers

8	3	Recipes and chemical reactions: moles of what you are given to moles of what you are trying to find	Interpret a balanced equation to represent the mole ratio of reactants and products along with the amount of heat energy either absorbed or released.
			From a balanced chemical equation , construct conversion factors based on the mole ratio.
			Use mole ratio conversion factors to predict:
			  Quantities (in moles) of any reactant or product from a
			    known quantity (in moles) of one specific reactant or
			    product.
				1,3,5, 15cd, 17ad,19cd, 25,27,29,99	2,4,16acd, 18cd,20ad, 26,28,30, 100

	4	Recipes: mass of what you are given <—> moles of what you are given <—> moles of what you want to find <—> mass of what you want to find	Use mole ratio conversion factors to predict:
			  Quantities (in grams) of any reactant or product from a
			    known quantity (in grams) of one specific reactant or
			    product.
				31,37(lines 1-4),79	32,38(lines 1-4),80

	5,6	Limiting reactant, theoretical yield, percent yield	Given quantities of two reactants (moles or mass), determine which one is the limiting reactant and which one is the reactant in excess. Use the limiting reactant to predict the quantity of product.	7,9,11,43, 45,47,49,51, 57ac, 61	6,8,10,12, 44,46,48,50, 52,58ac,62
	7	Enthalpy: Measure of heat evolved or absorbed in a chemical reaction	Differentiate between endothermic and exothermic reactions. Construct conversion factors for heat/mole of a given reactant or product Use heat/mole conversion factors to calculate the quantity of heat as a function of mass or moles of material reacting or forming.	13,69,71,73, 75	14, 70,72,74,76

Ch	Sec	Topics	Objectives	Homework with answers	Homework without answers
9	4	Electrons in orbits	Relate position on Periodic Table to energy levels in which all electrons in an atom can be found.	13,45	46
	5,6	Orbitals, electron configuration	State the relationship among orbitals, sublevels, and main energy levels. State the spin relationship between electrons in the same orbital. List the order in which atomic orbitals are filled (referring to Periodic Table).	15,19,21,47	16,18,20 (through 4p not 5s), 22,48

	7	Electron configuration, the periodic table, valence electrons	Write the electron configuration for any A group element (#1-#36):
			   Using boxes and arrows or slots and arrows.
			   Using $1s^2\ 2s^2\ 2px^2\ 2\ py^2\ 2\ pz^1$
			   Using $1s^2\ 2s^2\ 2p^5$
			State and apply Hund's Rule for writing electron configurations and determining the number of unpaired electrons in an atom.
			Explain the relationship between electron arrangement and the Periodic Table.
				23,25,49,51, 53ab,55abd, 57abc,59,61, 63,65ab, 67c,71,73,75, 95	24,50,52, 54b,56abd, 58bcd,60,62, 64,66b,68a, 72,74,76, 94,96

	8,9	Trends in size, ionization energy, metallicity (metallic-ness), reactivity	Describe the trends in size of atoms within a group and a period. Describe the trends in size of ions within a group and a period. Describe the trends in ionization energy of atoms within a group and a period. Describe the trends in reactivity of metals within a group and a period. Compare reactivity of alkali metals to alkaline earth metals in the same period. Describe the trend of nonmetallic or metallic character among elements within a group and a period. Observe flame tests on several metallic ions and relate to excited state vs. ground state. Recognize the transition metals on the Periodic Table and indicate the distinguishing electronic characteristic.	27,81ad,83, 77ad,79, 85ad,87,93	28,82ad,84, 78ac,80, 86abd,88,94

Ch	Sec	Topics	Objectives	Homework with answers	Homework without answers
10	2	Valence electrons and dot structures for atoms	Define outer energy level (valence) electrons. Give the number of outer energy level (valence) electrons in an atom of a representative element given the group number. Use the Periodic Table to write the electron dot symbol for any representative element. State the octet rule.	3,23,25,29, 31, 35	2,24,26,30, 32,36
	3	Lewis structures for ionic compounds	Describe the formation of an ionic bond. Recognize that the number of electrons lost by metal atoms must equal the number of electrons gained by nonmetal atoms in the formation of an ionic compound. Write formulas for ionic compounds given the charges on the ions or using the Periodic Table to determine the charges on the ions. Write Lewis electron dot structures for ionic compounds.	5,39,41	4,40,42
	4	Lewis structures for covalent compounds	Distinguish among single, double and triple covalent bonds and relationship to bond length and bond strength. Write the Lewis electron dot structures for covalent compounds. Write the Lewis electron dot structures for polyatomic ions.	7,9,11,45, 51,53	6,8,10,46, 52,54
	6	Resonance	Explain what resonance-contributing structures are. Draw appropriate resonance contributing structures for covalent compounds or polyatomic ions.	57ab,59ab	12,58ac, 60ab
	7	Shapes	Determine geometric shapes and bond angles for covalent compounds or polyatomic ions.	13,15,61,63, 65,67,69,	14,16,62,64, 66,68,70,
	8	Electronegativity, polarity	Describe the trends in electronegativity across a period and down a group. Differentiate among ionic, polar and nonpolar bonds based on electronegativity. Predict whether a bond will be ionic, polar or nonpolar based on the elements' placement on the Periodic Table. Use the crossed arrow to label the dipole in a polar covalent bond. Use partial charge symbolism to label the dipole in a polar covalent bond.	77ac,79,83, 85,87,91,99	78abc,80,84, 86,88,92, 100

Ch	Sec	Topics	Objectives	Homework with answers	Homework without answers
11	2	Kinetic Molecular Theory, KMT	Understand the applications of Kinetic Molecular Theory to gases Recognize the relationship of the Kinetic Molecular Theory to Boyle's Law, Charles' Law, and Dalton's Law of Partial Pressures	3	4
	3	Pressure	Convert among pressures expressed in atmospheres, torr, mm Hg.	1,5,23ad, 25ab, 29ab, 31abc	2,6,24a,26a, 30ad,32ab
	4	Boyle's law: P and V	State Boyle's Law and express it mathematically. Given a change of pressure, calculate the change of volume and the reverse. Observe the relationship between volume and pressure for a gas.	7,9,35,37	8,12836,38
	5	Charles' law: V and T	Observe the relationship between temperature and volume for a gas State Charles' Law and express it mathematically. Given a change of temperature, calculate the change of volume and the reverse. Be certain to use Kelvin temperatures.	11,43,127	10,44
	6	Combined gas law: P, V, & T	Combine application of Boyle's Law and Charles' Law; use the Combined Gas Law.	53,57	12,54,58
	7	Avogadro's law: V and n	Recognize Avogadro's Law and understand that at any given temperature and pressure, there are an equal number of moles (molecules) of any gas in an equal volume.	13,47,49	48,50
	8	Ideal gas law: p, v, T, and n	Use the Ideal Gas Law to solve for pressure, volume, number of moles, or temperature. Define standard (STP) conditions. Define the molar volume @STP. Use the density relationship to calculate molar mass (g/mole) using the Ideal Gas Law. Use molar mass and the Ideal Gas Law to calculate density of a gas at a given temperature and pressure.	15,63,65,71	14,22,64,66, 72
	9	Mixture of gases	Recognize the significance of the partial pressure of water vapor in measuring the pressure of a gas collected by displacement of water.	17,21,75,77	16,20,76,78
	10	Gases in chemical reactions	Given a balanced chemical equation, the mass of one reactant or product, and the T and P of a gaseous reactant or product, calculate the volume of the gaseous reactant or product. Given a balanced chemical equation, the volume of a gaseous reactant or product and a given T and P, calculate the mass of another reactant or product.	85cd,87ab,9 3,97,125	86cd,88c,94, 98

Ch	Sec	Topics	Objectives	Homework with answers	Homework without answers
13	2	Solutions: homogeneous mixtures	Define solute and solvent.	1,3	2
	6	Solution concentration, molarity	For a given molarity solution, calculate the mass of solute required per liter of solution For a given molarity and volume, calculate the number of moles of solute. Calculate the volume of a solution with a specified molarity to deliver a given amount of solute.	59ac,61ac, 67,69,77,79	60ac,62ac, 68,70,78,80
	7	Solution dilution	Given the molarity and volume of a concentrated solution, calculate the volume required to prepare a dilute solution of a specified molarity.	81,87	82,88
	8	Solution stoichiometry	Given the molarity and volume of a titrant, calculate the volume or molarity of a solution being titrated. Using the molarity and volume of a solution being titrated, calculate the molarity or volume of a titrant.	89c,91,95	90c,92,96

Chemistry 50 Listing of *Chapter Questions* You Should Be Able to Answer for an Exam

Chapter		Questions
2		1,2,3,5,6,7,10,11,13,14,17,19,20,21
3		2,3,9,10,12,13,14,15,16,18,20,22,23,25,27,28,30
4		5,8,9,12,13,16,17,18,19,20,21,22,24,25,26
5		3,4,5,6,7,8,9,10,11,15,17,19,20,21,22,24
6		2,3,4,5,6,7,8,9,10,12,13,15,16
7		1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17, 18,19,20,21
8		2,3,5,6,7,8,9,10,11,12,13,14
9		13,15,16,18,19,20 (4p not 5s),21,22,23,24,25,26,27,28
10		2,3,4,5,6,7,8,9,10,11,1w2,13,14,15,16,17,18,19,20,21,22
11		1,3,4,5,6,7,10,11,12,13,14,15,116,17,19,20,22
13		1,2,3,15 (molarity only)

Chemistry 50 Student Agreement — *Due Monday March 15, 2021 at the beginning of class. Please give to Daphne, your TA.*

1. I have read and understood the Chemistry 50 course syllabus.

2. I agree to abide by the Chemistry 50 policies as outlined in the syllabus.

3. I understand that my most successful learning strategy will be to skim assigned reading BEFORE going to class to learn best about chemistry concepts.

_____
  Signed Name (please sign your name)

_____
  Printed Name (please print your name)

_____
      Date