

## GENERAL CHEMISTRY II, CHEM 2100 – SPRING 2019

- Required Texts:
- *Chemistry*, P. Flowers, OpenStax, 2018  
This text is available as a free PDF at <https://openstax.org/details/books/chemistry>  
It is also available free for Kindle at <http://www.amazon.com>  
You can order a hard copy through <https://brooklyn.textbookx.com/adm/> or from <http://www.amazon.com> – but you can always print chapters from the PDF.
  - *Experiments in General Chemistry*, M. N. KobraK, Ed., **Third or Fourth** edition. Kendall/Hunt, Dubuque, IA, 2012 (2017).

### Learning Objectives for Chemistry 2100

Upon completion of this course, students should:

- Understand the basic physical principles underlying chemistry and be able to apply them both to qualitatively explaining phenomena and quantitatively predicting or interpreting outcomes.
- Be able to perform simple chemical techniques and apply chemical theory in the laboratory setting.
- Understand and be able to explain fundamental ideas in the practice of science, including the nature of scientific evidence, the scientific method, and appropriate practices with respect to record-keeping, safety, and treatment of data.
- Students should be able to apply principles of chemistry to understanding its role in other fields (e.g. biology), while understanding its underpinnings in physics and mathematics.

### Required Items:

- Scientific calculator (**Graphing calculators and internet devices are not allowed on exams**)
- Lock for lab drawer
- Safety goggles (**supplied in lab kit**); matches; dish detergent, paper towels

### Recommended Items:

- Lab coat or apron.
- Texas Instruments calculator TI-30X or similar inexpensive scientific calculator

### Online Supplements and Information:

<http://academic.brooklyn.cuny.edu/chem/howell/practice.htm> (old BC chemistry **exams**)

<http://www.brooklyn.cuny.edu/web/academics/schools/naturalsciences/undergraduate/chemistry.php>  
(Chemistry Department Homepage)

<http://www.brooklyn.cuny.edu/web/academics/honors/prehealth.php> (Pre-Health Professions website)

[http://www.brooklyn.cuny.edu/web/aca\\_honors/171219\\_Pre-health\\_Professions\\_Handbook.pdf](http://www.brooklyn.cuny.edu/web/aca_honors/171219_Pre-health_Professions_Handbook.pdf) (Pre-Health Professions handbook)

<http://www.brooklyn.cuny.edu/web/academics/centers/learning.php> Brooklyn College Learning Center (free tutoring available)

<http://userhome.brooklyn.cuny.edu/mkobraK/labvideos.html> (Lab instruction videos)

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**LECTURE TESTS:** Note that these are during common hours.

FIRST TEST: Tuesday, March 5, 12:30 – 2:00 PM,

No makeup exams given

SECOND TEST: Tuesday, April 16, 12:30 – 2:00 PM,

for missed lecture tests.

FINAL EXAM: Friday, May 17, 10:30 AM – 12:30 PM,

<b>GRADING:</b> Your final grade will be a weighted average calculated as follows: 30% Two lecture tests 20% Minimum of five recitation quizzes 18% Laboratory reports 7% Two laboratory quizzes 25% Final Exam	Final grades are not curved, but are set according to the following scale:	
	95 or higher: A+ 87-95: A 85-87: A- 82-85: B+ 82-72: B 72-70: B-	68-70: C+ 62-68: C 58-62: C- 58-50: D* Less than 50: F
*Note: If you earn a grade of D, that is the grade you will receive. Requests to change it to an F will not be honored.		

**Academic dishonesty is prohibited in the City University of New York.**

Cheating, plagiarism, internet plagiarism and obtaining unfair advantages are violations of policies of academic integrity and are punishable by penalties, failing grades, suspension and expulsion.

For more information about CUNY policy on academic integrity see

<http://web.cuny.edu/academics/info-central/policies/academic-integrity.pdf>

**Student Disability Services**

In order to receive disability-related academic accommodations students must first be registered with the Center for Student Disability Services. Students who have a documented disability or suspect they may have a disability are invited to set up an appointment with the Director of the Center for Student Disability Services, Ms. Valerie Stewart-Lovell at 718-951-5538. If you have already registered with the Center for Student Disability Services please provide your professor with the course accommodation form and discuss your specific accommodation with him/her.

**Student Bereavement Policy**

Students who experience the death of a loved one during the semester should consult the student bereavement policy here: <http://www.brooklyn.cuny.edu/web/about/initiatives/policies/bereavement.php>

**Non-Attendance Due to Religious Beliefs**

Students who are unable to attend class due to religious observations should consult the Brooklyn College Undergraduate Bulletin for the college's policy, and contact the lecturer to discuss the issue. Students must come forward with the issue in a timely manner.

**Lab Exemptions:** If you are repeating the course you may be able to obtain a lab exemption by filing a lab exemption request form in the Chemistry Department office (359 NE). Students who receive lab exemptions **MUST attend recitation and take the recitation quizzes.** Lab exempt students may choose to retake the lab quizzes for a higher grade. Speak to your assigned lab instructor to arrange this.

**Drop/Add Dates:**

<b>January 31</b>	<b>Last day to add a course or apply for a lab exemption</b>
<b>February 4</b>	Last day to file for elective course Pass/Fail
<b>February 12</b>	College Closed, no class
<b>February 14</b>	Last day to drop a course without a W grade
<b>February 15</b>	Course withdrawal period begins. A grade of "W" is assigned to students who officially withdraw from a course
<b>April 1</b>	Last Day to withdraw from a course with a grade of "W"

**To withdraw, you must withdraw using CUNYFirst (see below) and go to the stockroom to CHECK OUT from the laboratory.**

Note that first-semester freshmen (and SEEK, ESL, and Honors students) **MUST** get an adviser's permission in order to withdraw; advisers are available in the Center for Advisement and Student Success in Boylan.

For information about how to withdraw using CUNYFirst and the effect of withdrawal on financial aid, see <http://www.brooklyn.cuny.edu/web/about/administration/enrollment/financial/faq/withdrawing.php>

**Pass-Fail Option:** Details regarding taking courses on a pass/fail basis are given in the Brooklyn College bulletin. Students interested in this option should read the bulletin carefully, as they may not be eligible to do so; questions should be directed to the Registrar. However, note that the last day to submit a request to take a course on a pass/fail basis is given in the calendar above.

**Chem 2100 Assigned Reading**

Below is the assigned reading and a corresponding set of homework problems. Your lecturer will give you guidance about where you are in the text and what to do to stay current with the reading. Read the material at least once before the lecture, and spend some time on the in-chapter problems to reinforce it. Unless noted otherwise, problems listed as Homework correspond to the end-of-chapter problems for the corresponding chapter. Answers to odd-numbered problems are at the end of the text. **If you are instructed to memorize something, the test will be written assuming you have done so.**

Homework is assigned but not graded. Quiz and examination questions will mostly be similar to those given in the text. You should do as many of these as possible before recitation section, and bring any questions you have on the work to your recitation instructor. Remember: Your recitation section is your chance to get help with things you do not understand. If you have not done the homework, you will get little out of it.

Lectures	Assigned Reading and Problems
1-3	Chapter 12: Problems 1, 3, 4, 5, 6, 7, 12, 13, 15, 17, 19, 21, 23, 25, 26, 29, 31, 37, 44, 46, 47, 53, 68, 69, 70, 71, 73, 74, 76, 79, 81, 83, 85 <b>Note:</b> In Section 12.4, you are not required to be able to work problems using the 0 <sup>th</sup> order or 2 <sup>nd</sup> order integrated rate laws. You are also not required to determine the order of a reaction rate by graphing, as described in Example 12.7. However, you do need to be able to use the 1 <sup>st</sup> order integrated rate law in ways similar to that shown in Example 12.6. You should also know what the half-life of a reaction is, and how it is related to the rate constant in a first-order reaction (see the subsection of 12.4 headed, "The Half-Life of a Reaction.")
4-6	Chapter 13: Problems 1, 3, 5, 6, 7, 9, 11, 13, 15, 17, 19, 25, 29, 31, 33, 35, 37, 39, 40, 41, 45, 46, 49, 53, 55, 57, 59, 61, 65, 67, 69, 75, 77, 79, 81, 83, 93, 95
7-9	Chapter 14: 1, 3, 5, 9, 11, 15, 17, 19, 21, 25, 27, 29, 31, 35, 47, 51, 53, 57, 58, 61, 69, 77, 79, 81, 86, 87, 89, 91, 95, 97, 101, 115 <b>Memorize:</b> Table 4.2, identities of some common strong acids (not a misprint, see the table in Chapter 4).
10	Review
<b>3/5 First Midterm</b>	
11-12	Chapter 15, Sections 15.1-15.2: 1, 3, 9, 11, 13, 15, 25, 29, 31, 33, 37, 49, 55, 61, 63, 65, 67, 69, 75, 77
13-14	Chapter 16: 1, 2, 3, 13, 15, 17, 19, 20, 21, 25, 27, 30, 31, 33, 35, 37, 39, 41, 45, 55, 61, 63, 65, 67
15-17	Chapter 17, sections 17.1-17.4: 3, 5, 6, 7, 19, 21, 23, 25, 29, 31, 33 Chapter 4, Section 4.2: Oxidation/Reduction Reactions (balancing by half-reaction method): 17, 37, 39, 41
18-20	Chapter 19: 1, 2, 26, 27, 28, 29, 31, 33, 35, 37, 41, 45, 47 Supplement: Chirality in Inorganic Chemistry – Read section and do the exercise at the end of the packet (answers in packet).
21	Chapter 8: 1, 3, 7, 9, 10, 11, 12, 14, 15, 17, 23, 27, 29, 30
22	Review
<b>4/16 Second Midterm</b>	
23-24	Chapter 20: 1, 5, 6, 7, 9(a-c, e), 11c, 12(c,d), 15, 17, 22(a,c), 43 Supplement: Chirality in Organic Chemistry – Read section and do the exercises as the end of the reading (answers in packet).
25	Biochemistry Supplement: Do indicated questions in packet.
26-27	Chapter 21: 1, 3, 13, 15, 17, 21, 32, 33, 35, 41, 45, 49, 51, 53, 57
28	Review
<b>5/17 FINAL EXAM</b>	

## Chemistry 2100 Laboratory

**You must bring the lab manual to the FIRST lab meeting, since an experiment is done during that meeting.**

Before coming to laboratory, read the scheduled experiment and any other material assigned. Unless otherwise noted, page numbers refer to your laboratory manual. You must bring the lab manual to each lab class.

Brooklyn College recognizes the importance of reproductive hazard awareness and protection. During laboratory exercises students may be exposed to chemical reagents that may present specific risks to reproductive health, especially students who are pregnant. Therefore, it is strongly recommended that you do not take this course if you are pregnant. If you become pregnant during the semester, please consult with your laboratory instructor.

**NOTE: SAFETY GOGGLES MUST BE WORN IN THE LABORATORY!** The goggles must be indirectly-vented to offer splash protection. New goggles are provided in your lab kit. **If your instructor observes you violating eye protection or other safety policies, you can be removed from the laboratory and/or given a 10% (or higher) penalty on your laboratory report grade.**

Scientific data requires special treatment. It must be recorded in non-erasable **INK** in your lab book immediately after a measurement is taken; partners cannot copy each other's data at a later time. **Altering or copying data outside of the laboratory represents academic dishonesty and will be prosecuted as such if observed.** Further, you will receive no credit for any lab report that includes data that are not your own. If your data are messy, you may copy them over onto a final report, but you must include your original data when you turn in your report. You **MUST** get your instructor's initials on your data sheet **before** you begin the lab **and** when you finish the lab and are ready to leave.

Lab reports are due in lab the week after the experiment was concluded unless you obtain permission from your instructor. All lab reports not handed in will receive a grade of zero. **Late** lab reports are penalized as follows: 10% off for 1 week or less lateness; 25% off for 2 weeks late; 35% off for 3 weeks late; 45% off for 4 weeks late, etc. All lab reports not handed in will receive a grade of zero.

### **Students who miss a laboratory:**

Multiple sections of Chemistry 2100 run, and students who miss a section of their assigned laboratory may make it up in another section as soon as possible. To do this, they must obtain a make-up card from the General Chemistry stockroom. (This card does NOT have to be signed by their regular laboratory instructor.) They then go to the lab period in which they wish to make up the experiment, identify themselves to the instructor in that section, and (if given permission) perform the work. After the experiment is complete, the instructor for that section must sign and date the make-up card. The signed make-up card must be given to the regular laboratory instructor as proof that the lab was made up.

### **PREPARATION FOR LABORATORY**

To help prepare you for lab, you are **required** to hand in before each lab (except the experiment in week 1) a sheet stating (a) what quantities are to be measured and (b) what quantities are to be calculated from the measurements. For an experiment where there are no measurements, just state briefly what you are to do and what you are to observe.

If you do not hand this in, your instructor will deduct 5% from your grade for that lab report.

## **Schedule of Lab Experiments in Chemistry 2100**

Most students should be using the 4<sup>th</sup> ed. of the laboratory manual. If you have a copy of the 3<sup>rd</sup> edition, you may use it, but will need to request a handout from the stockroom containing new experiments. The handout has copies of the new experiment ordered by letter, and where the 3<sup>rd</sup> edition is missing an experiment the corresponding letter of the experiment in the handout is given below. In all other cases, experiments are identical and are numbered identically in the 3<sup>rd</sup> and 4<sup>th</sup> edition..

### **Meeting Laboratory Assignment**

Week 1 Check in, Safety, and Qualitative Analysis Part I, Experiment 13.

Week 2 Experiment 15 *Rates of Reaction* (for 3rd ed., Exp. A)

Week 3 Experiment 16 *The Equilibrium Constant of Bromothymol Blue* (for 3<sup>rd</sup> ed, Exp B)

Week 4 Experiment 14 *Qualitative Analysis II*

Week 5 *Qualitative Analysis II*

Week 6 *Qualitative Analysis II*

Week 7 Experiment 17 Buffers.

Week 8 Experiment 18 *Vitamin C Concentration by Iodometry* (for 3<sup>rd</sup> ed., Exp C)

Week 9 Experiment 20 *Synthesis and Analysis of an Amminenickel(II) Compound* (for 3<sup>rd</sup> ed., Exp D)

Week 10 *Synthesis and Analysis of an Amminenickel(II) Compound*

Week 11 *Synthesis and Analysis of an Amminenickel(II) Compound*

Week 12 Experiment 19 *Electrochemical Cells*

Week 13 Experiment 21 *Polarimetry of Sugar Solutions* (for 3<sup>rd</sup> ed., Exp E)

Week 14 Check out. NO WORK PERMITTED

## Chemistry Careers In and Out of the Laboratory

A degree in chemistry opens doors to dozens of exciting and rewarding careers. Here are just a few possibilities.

- Get involved in product development, manufacturing, or quality control for companies producing anything from chemicals to pharmaceuticals to textiles.
- Go on to obtain a MS or PhD in chemistry, biochemistry, biotechnology, bioinformatics, pharmacology, or any other biomedical field, and take a leading role in medical research. Design and test new drugs and medical devices.
- Get involved in sales and marketing for chemical and pharmaceutical firms. Companies are always looking for people with a strong technical background to market their products, and will pay top dollar for them.
- Go into the field as an environmental chemist to study and protect the natural world.
- Use your skills in interesting and challenging ways, from evaluating risk for insurance firms to restoring artwork for museums.
- Work in law enforcement, in anything from forensic investigation to health and safety regulation. Or work inside the political process at a government agency to help formulate policy on scientific, medical and environmental issues.
- Pursue a career in patent law and help bring the next great scientific breakthrough to the market. Or work in the U.S. Patent and Trademark Office to insure that inventors' rights are protected.

### Salary Information

Chemistry Degree	Median Starting Salary*	Median Base Salary (all chemists)**
BA or BS	\$39,600	\$72,000
MS	\$55,000	\$85,000
PhD	\$75,700	\$102,000

\*From *Chemical and Engineering News*, June 2, 2014, p.28.

\*\*From *Chemical and Engineering News*, September 1, 2014, p. 68.

Chemists do sometimes have to change jobs or make career choices, but their skills are always in demand. In 2009, the U.S. unemployment rate peaked at 10.1%; the rate for chemists and chemical engineers that year was 3.9%. (see S. L. Rovner, *Chemical and Engineering News*, Nov. 7, p. 34, 2011). A skilled chemist is a valuable commodity.

Salaries for chemists are high, but do not do justice to the excitement of the field. Science as it is practiced today is collaborative, and chemists have abundant opportunities to travel, to work with interesting people, and to present the results of their work in ways that have a profound influence on the world. Science will shape the world of the 21<sup>st</sup> century, and you have the chance to be part of that process.

For more information, see the department's undergraduate advisor (contact information on the first page of this syllabus).

## Medical School, the Chemistry Major, and You

**Fiction #1:** Being a chemistry major will hurt my chances for medical school, because the hard courses may lead to a lower GPA.

**Fact:** Students majoring in mathematics and the physical sciences (this includes Chemistry) have the highest medical school acceptance rate of any major:

Primary Undergraduate Major	Acceptance Rate
Mathematics and Physical Sciences (including Chemistry)	46%
Biology and Health Sciences	41%
Humanities and Social Sciences	44%
Other	40%

Based on data for the entering class of 2017, reported by the American Association of Medical Colleges

Table compiled from data available at <https://www.aamc.org/>

**Fiction #2:** Chemists have to take a lot of hard courses so they don't have time to do volunteer work, research, and other activities that help with medical school applications.

**Fact:** A student who has completed his or her requirements for medical school can obtain a chemistry degree with as few as five additional courses. This leaves plenty of time for other activities.

**Fiction #3:** If I don't get into medical school, I may be stuck working in a lab all day.

**Fact:** Chemists have enormous opportunities outside the lab. Chemical and pharmaceutical companies desperately need managers and salespeople with chemical knowledge, and will pay top dollar for them. Chemists also find work in finance, insurance, law, government and manufacturing. Take a look at the other side of this page.

### **Some other advantages of being a chemistry major:**

- Chemistry majors can receive credit for performing research work with a faculty mentor. This means the time you spend on research gets you closer to graduating and your research experience appears on your transcript.
- Chemistry majors get the skills they need to perform advanced laboratory work, so they can get better research positions, accomplish more and get stronger letters of recommendation from their mentors.
- Thanks to generous donations by alumni, the Department of Chemistry is able to give out more than \$10,000 every year in fellowships, scholarships and awards. These are an aid to both the pocketbook and the resumé.
- Brooklyn College's first Rhodes Scholar of the 21<sup>st</sup> Century is a Chemistry major.