

## GENERAL CHEMISTRY B

**Instructor:** Willetta Greene-Johnson, Ph. D., Room 307 Cudahy Science 773-508-3537

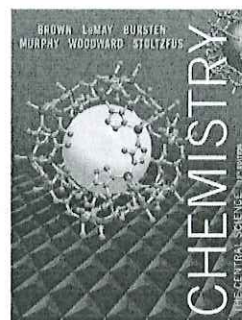
**Who am I:** A chemical physicist (Stanford University/ University of Chicago) interested in surface optico-physical interactions and mildly interested in (1) thermodynamical (2) unstable systems; (3) producer, composer, orchestrator, pianist, sequencer, and conductor. I guest conducted with the Chicago Sinfonietta two times before and again this past January 2016. One of my songs was doubly tracked on a Grammy award winning CD in 2004. Since then it has been covered by f other groups.

**Physical Office Hours:** Wednesday 11:00 A – 12:00 P CS-307 and by appointment

**Email Office Hours (ONLY):** Thursday 2:00 P – 3:00 P [wgreene@luc.edu](mailto:wgreene@luc.edu)

Required:

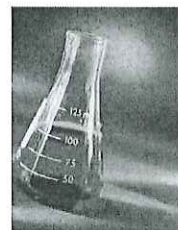
1. Required: Chemistry, the Central Science. 13<sup>th</sup> ed. Theodore L. Brown, et. al. Boston: Pearson Prentice Hall: 2014 ISBN: 978-0321910417. *Mastering Chemistry* NOT required
2. **Chemistry 102 Course Packet**, authored by the instructor. This essential lecture packet is available online at [www.universityreaders.com](http://www.universityreaders.com). The course packet will be mailed to you within a few days of ordering, but you'll have immediate online access to 20% or so once order is completed.



**Meetings:** Lectures are scheduled MWF in FH-133, at 12:35 P–1:25 P. You must also be registered in discussion section 002 or 003.

**Discussions:** meet on Fridays according to the following schedule:

Section	Instructor	Location	Time
002	Dr. Greene Johnson	DH-118	F: 1:40 P – 2:30 P
003	Dr. Greene Johnson	DH-118	F: 2:45 P – 3:35 P



Due to the large number of students / sections that are matriculated through this course yearly, there can be absolutely no alteration of this schedule.

**Course Description:** A study of chemical principles and generalizations with emphasis on the development of a scientific attitude and an understanding of the fundamental concepts of chemistry.

**Calculators:** A scientific calculator is sufficient. Calculators cannot be shared while exams are in progress and their cases/covers must be removed. Be familiar with your calculator and the status of its batteries. The student is responsible for having a working calculator in lecture and on an exam day.

**Cell Phone<sup>1</sup> Policy:** It is forbidden to video/audio record lecture (except Loyola University staff). Stills of the board may be taken after class. *During exams, cell phone, wireless devices, and unauthorized materials are strictly forbidden; subject to device confiscation and dismissal from exam.*

**SAKAI Connection:** The syllabus, homework assignments for the semester, discussions, and discussion answers will be posted at the following website: [www.luc.edu](http://www.luc.edu), look under LINKS, click on Sakai). Students possessing a Loyola email address are able to access this site.

**Additional Information:** For your convenience, test taking tips are listed on page 7 of this syllabus, as well as a protocol on page 8 regarding soliciting a recommendation from me, should you desire one and qualify (see protocol). Academic fall calendar and bookstore information is listed on page 9.

<sup>1</sup> All technology: smart phone, tablets, laptops, Google Glass, whatever. Violations will be treated as instances of academic dishonesty/see

**Objective of this course in grander detail:**

By the conclusion of this course, the student should experience the following outcomes:

1. **Understand the fundamental principles of physical chemistry**
2. **Acquire a knowledge base of terminology and classifications**
3. **Apply concepts creatively as well as methodically to solve multi-tiered problems**
4. **Know how to rank, estimate, analyze and critically evaluate a range of models**
5. **Gain a broader understanding of the role of chemistry in human endeavor**
6. **Appreciate the collaborative and global effort of the scientific enterprise**

Specifically the engaged student should improve in her or his ability to


- **Comprehend the following concepts:**
  - Kinetics, reaction rate, Arrhenius equation, rxn mechanism, rate limiting step
  - Dynamic equilibrium, Equilibrium constant
  - Titrations, Buffers, pH, Lewis and Arrhenius A/B models, Solubility product
  - Complex ions, geometry, ligand strength, and octahedral Crystal Field theory
  - Electrochemical cells (batteries, fuel cells, transduction, respiration)
  - Spontaneity vs. nonspontaneity, entropy, Gibbs energy, and cyclic processes
  - Introduction to nuclear chemistry
- **Predict chemical outcomes from identity of reagents and other quantities:**
  - Identify acids, bases, buffers, acidic/basic salts, (solubility rules Chem. 101)
  - write appropriate net ionic prototypical reactions in aqueous solution
  - be able to both accurately calculate and closely estimate pH
  - equilibrium constant K and how it indicates spontaneity status of a reaction
- **Assess outcome feasibility:** estimate energy and entropy of chemical processes
- **Work and exchange ideas with others:** cordially solve weekly group problems
- **Appreciate the impact of chemistry:** realize better how chemistry impacts life processes, technology, local, and global issues.
- **Contribute constructively:** as a science-literate, ethically responsible citizen and voter.



Later this semester, you will receive an emailed invitation to assess me via the IDEA (Individual Development and Educational Assessment). The form provides a thorough diagnostic of how successfully students think the instructor realized the objectives boxed above, as well as the value of the course and other contextual experiences. This opportunity will be available online at <http://www.luc.edu/IDEA> for a one-week time window only.


IDEA manual states: 'As student raters, please be aware that the results of your ratings for this class will be included as part of the information used to make decisions about promotion/tenure/salary increases for this instructor. Fairness to both the individual and the institution require *accurate and honest* answers.'

### Chemistry 102 Schedule of Topics

Date	Day	Topic	Chapter	Pages (approx)
8/29 AUG	M	Rate of Reactions	14	574-582
8/31	W	Integrated Rate Law	14	582-590
9/2 SEPT	F	Arrhenius Equation	14	591- 600 1 <sup>st</sup> Disc.
9/7	W	Rxn mechanisms; Rate limiting step	14	601-606
9/9	F	Catalysis	14	607-614
9/12	M	Gas phase Equil'm	15	628-637
9/14	W	Equilibrium Constant K	15	632-646
9/16	F	Equilibrium Table	15	646-650
9/19	M	Le Chateliér's Principle van't Hoff equation	16	650-657
9/21	W	Acid/base categories	16	670-679, 684-687
9/23	F	[H <sup>+</sup> ], pH, K <sub>a</sub> , K <sub>b</sub> , pK <sub>a</sub> , pK <sub>b</sub>	16	680-684; 688-695
9/26	M	Conjugates, Salts, WBS	16	696-699, 705-712
9/28	W	<b>Review 14-16</b> ~25 min		<b>OPTIONAL</b>
9/30	F	<b>Exam 1: Ch.14-16</b>	<b>IN CLASS</b>	<b>Seating: SKIP Every 3<sup>rd</sup> row!</b>
10/3 OCT	M	Buffers and Criterion	17	729-735
10/5	W	Buffers	17	735-741
10/7	F	Titration SA/SB; SA/WB; SB/WA	17	741 -747
10/10-11	M-T	<b>FALL BREAK</b>		<b>Fall.Break Worksheet</b>
10/12	W	K <sub>sp</sub> and ppt equil'm	17	748-751
10/14	F	Common Ion Effect	17	726-728, 751 -753
10/17	M	Complex Ions (Lewis Acid/Base)	23 17	1002-1006 756-758
10/19	W	Ligands, Nomenclature	23	1007-1016
10/21	F	Crystal Field Theory	23	1020-1026, 1030-3
10/24	M	Spont. And Temp. Statistical origin (physics)	19	812-818 821-828 (opt)
10/26	W	<b>Review:16,17,23</b> ~25 min	<b>16, 17, 23</b>	<b>Optional</b>
10/28	F	<b>EXAM 2: Ch.16,17,23</b>	<b>IN CLASS</b>	<b>SKIP @ 3<sup>rd</sup> row!</b>
10/31	M	Entropy, standard, 2 <sup>nd</sup> Law	19	818-821,828-831
<b>NOV. 4 (5 PM) LAST DAY  TO WITHDRAW WITH A GRADE OF W</b>				

Hopefully not scary!



Date	Day	Topic	Chapter	Pages
11/2 NOV	W	Gibb's Energy and Temp Gibbs Energy and K	19	831-838 838-841
11/4	F	Coupled Reactions Hess's Law for $\Delta G$ , $\Delta S$	19	842-844
11/7	M	Electrochemistry Redox Review Voltaic Cell $E^\circ = E_{\text{ox}}^\circ + E_{\text{red}}^\circ$	20	856-865 858-868
11/9	W	$E_{\text{red}}^\circ$ , $E_{\text{ox}}^\circ$ , Spontaneity	20	868-874
11/11	F	Work and $\Delta G$	20	876-879
11/14	M	Graphical Technique	20	In class only
11/16	W	Electrolysis Nernst Equation; how $E^\circ$ relates to equil'm const. Applications	20	880-886 886-892 893-896
11/18	F	REVIEW 19-20 (25 min)		Optional may not be handout
11/21	M	Exam 3: Ch. 19-20	IN CLASS	Seating: <b>SKIP</b> Every 3 <sup>rd</sup> row
11/23 - 11/27		<b>THANKSGIVING BREAK</b>		
11/28	M	Nuclear Rxns; Stability;	21	908-919
11/30	W	1 <sup>st</sup> order Kinetics, Geological Dating	21	920-928
12/ 2 DEC	F	Transmutation; Rxns involving $\alpha$ / $\beta$ particles	21	918-920
12/ 5	M	Einstein: mass/energy Fission/fusion	21	921- 931 932-938
12/ 7	W	Transition Metals Review of TM Properties	23	272-277
12/ 9	F	Magnetism Categories	23	998-1002
12/14	W	REVIEW for Final		Location TBA Probably FH-133
<b>12/16 DEC</b>	<b>F</b>	<b>FINAL EXAM :</b> <b>Ch. 14-17,19-21, 23</b>	<b>9:00 A - 11:00 A</b>	<b>TBA</b> <b>( FH-133 probably)</b>

### Representative Problems, End of Chapter Problems & Discussions:

Students who are making good progress in the course should be able to solve, independently, most or all of the end-of-chapter problems in the text. You should attempt to work out as many example problems and end-of-chapter problems as possible before taking exams. A group of representative problems is listed below as assigned problems. The solution manual with the worked out problems will be kept on reserve in Cudahy Library. A comprehensive review containing additional problems will be posted approximately one week before the midterm exams, which also serves for the final exam.

Discussions count 10% of grade, and should be attended. Discussion problems will be given to be attempted by groups of 3-4 students within the 50-minute discussion. Students must stay the entire period (unless otherwise instructed) and work on assigned discussion problem(s) to earn up to 10% of grade. The solutions will be posted on blackboard, discussions will be returned by the following discussion, or during the same week if a Friday exam occurs in that week. The student is strongly encouraged to attempt all suggested problems (text-book and discussion) and contribute significantly to the group discussion activity. **Student's extent of group participation will be noted** and mentioned in any recommendation letters.

### Assigned Exercises:

chapter	page	Problems (*means more involved;** means unassigned reading may be required)
14	615:	3a, 5, 7, 9, 12, 19, 21 a - c, 23, 25 (sim. to 23), 27, 29, 33, 37, 38, 41, 43, 45, 50 (glucose is C <sub>6</sub> H <sub>12</sub> O <sub>6</sub> !) 57, 61, 63*, 67, 73, 75, 91, 95, 99, 105, **117.
15	661:	1, 2, 6, 9, 13, 15, 17, 23, 25, 27, 28, 33a, 35, 37, 39, 45 find [Cl <sub>2</sub> ] <sub>eq</sub> , next PV = nRT 51, 53, 55, 57, 61, 63, 65, 67, *74, 79, *80. I don't overly emphasize K <sub>c</sub> vs K <sub>p</sub> but for practice, do #24, use formula 15.14 on page 636 % ionization = $\frac{x}{x_0} \times 100\%$ ; x <sub>0</sub> = starting concentration, unit usually M;
16	715:	1, 3, 10, 15, 19, 21, 23, 27, 29, 33, 37, 43, 45, 47, 53, 55, 57, 61, 65, 69, 71, 73, 77, 79, 81, 85, 109, 116*, 119*; 1**, 12**, 95**, 99** **compares various A/B models
17	766:	1, 6, 10, 5, 17 (% ionization ↔ [H <sup>+</sup> ]), 19, 21, 27, 29, 33, 35, 37, 41, 43, 47, 53, 55, 57, 61, 69, 73, 83; 12**, 67** note: K <sub>a</sub> , K <sub>b</sub> and K <sub>sp</sub> may be involved in some problems concurrently.
19	845:	1, 3, 7, 9, 11, 13, 15, 25, 35, 37, 41, 43, 49, 53, 59, 61, 65, 69, 71, 79b, 83, 85, 98* 1 <sup>st</sup> find ΔG° (appendix), 2 <sup>nd</sup> K: use ΔG° = -RTLnK, 3 <sup>rd</sup> : ΔG = ΔG° + RTLnQ ; 10*, 75*, 94*, 106**
20	899:	4, 6, 7, 12, 13, 15, 19, [ 23, 25 review balance redox rxn] 29a-e, 31, 37, 39, 43, 53, 55, 57, 59, 61a, 65, 67, 99, 100; 103*, 87**, 73*, 75* (longer than usual)
21	946	1, 5, 9, 11, 13, 17, 21, 29, 35, 37, 47, 49, 55, 61 <b>extra:</b> 72, 74, 63*, 80*, 31**
23	1031:	15, 16, 23, 25, 27, 35, 37, 41, 43, 47, 55, 57, 59, 61, 63; <b>extra nerdy:</b> 73, 74, 80

**Academic Honesty:**

All students are responsible for exercising the highest level of academic honesty while taking exams. They should peruse the College of Arts & Science policy on plagiarism/cheating, stated at:

<http://www.luc.edu/media/lucedu/cas/pdfs/academicintegrity.pdf>

As in the past, cheating will be SEVERELY dealt with, *minimally* costing the offender a grade of "zero" for the item that was submitted and this grade cannot be dropped. Additionally, the incident must be reported to the Chemistry Department Chair and the Office of the CAS Dean. Depending on the seriousness of the incident, additional sanctions may be imposed. Which has happened before.

**Grading Scheme:**

There are two grading schemes, and whichever one yields the higher grade will be employed after the final has been taken:

If all midterms went fairly well: 20 % midterm, 10% discussion, 30% final

If one midterm not so good: 20% the other two, 10% discussion, 50% final

**Grading Scale:**

<b>Grade Scale:</b>	<b>A</b>	<b>≥ 91</b>	<b>A-</b>	<b>88-90</b>	
<b>B+</b>	<b>85-87</b>	<b>B</b>	<b>81-84</b>	<b>B-</b>	<b>78-80</b>
<b>C+</b>	<b>75-77</b>	<b>C</b>	<b>71-74</b>	<b>C-</b>	<b>67-70</b>
<b>D+</b>	<b>64-66</b>	<b>D</b>	<b>60-63</b>	<b>F</b>	<b>&lt; 60</b>

**Examinations**

Three hour exams and the final exam will be given on **September 30, October 28, November 21, and Dec. 16**, respectively, also noted in the schedule. 90% of your course grade will be determined from these as explained further below. The other 10% will be determined from your discussion grades. The exams are cumulative, *i. e.*, may include material that has been queried on previous exams. The final exam is comprehensive and cumulative.

**Final Exam:**

Please note that **the final examination must be taken**. Failure to take the final exam will result in the grade "F". If a student has missed the final for some valid reason, she/he must present the Dean's office with reasonable proof of illness or accident, verified by a doctor's note, police report, *etc.*, in order to take the makeup final on a single date designated by the Dean's office. A fee may apply and ***there is no guarantee that content on the make-up final will correspond to / have the same weight as the scheduled final.***



### Laboratory:

Chemistry 112, the general chemistry laboratory course, should be taken concurrently with the lecture course in general chemistry. The lecture and the laboratory courses are graded independently. Students should first consult the Chemistry Department Bulletin opposite the wall facing the chemistry office for information. Then, if they still have unresolved issues, they should contact Dr. Angela Boerger, the administrator of the laboratories.

### Flanner Hall-133 Room Instructions on Exam Days

- 1) When you enter the auditorium, **go to the front** and **place your book bag there**. **Remove your calculator slipcover** and placed it in book bag.
- 2) Starting from the first row nearest the lectern, **sit quickly** in every other seat and **skip every third row**. This vacant third row provides an aisle for the proctor to walk through and address any appropriate questions that student may have during exam. Do not try to sit with friends or near one's usual area. The exam is only **50 minutes**, so excessive delays will cut into exam-taking times.
- 3) **Place your student ID conspicuously** on your desk so that attendance may be noted (during exam).
- 4) Have **several pencils/pens, eraser**, etc. and a **calculator** in good **working** order.
- 5) Proctors have been instructed to **confiscate the exams of any student** using a calculator with its slipcover in place or **whose actions are suspect**.
- 6) **Read over the entire exam**. You may find a problem in the middle, or at the end, that suits you better to start. The three or so minutes spent glancing over the entire exam will be more than compensated for by the strategy and priorities that you formulate. The recommended **order to do problems** is:
  - (1) what you **know well FIRST**
  - (2) what you're sure you **can at least start NEXT**
  - (3) what you **haven't have a clue LAST**

I have tried to arrange problems in a reasonable order, but my perception and the student's will certainly differ in some aspects. So, take a few minutes to read over the exam and **devise your own strategy**.

- 7) When you have **concluded, turn in your exam** to a proctor. Then **leave as quietly** and as expeditiously as possible as to not disturb other exam takers.
- 8) Normally exams administered on Friday will be returned no later than the following Wednesday.



## Advanced Studies Recommendation Protocol

Later in your student career, you may require a letter of recommendation (LOR) for graduate school, medical school, or the like. If I am chosen among your recommenders, the following policy ensues:

1. **Deadline for LOR (letter of recommendation) requests: JAN 15, 2017 (PREHEALTH, GRAD SCHOOL, SUMMER INTERN 2017 applications) or 6 week clearance for any other type.**
2. Student must generally possess GPA of 3.5 or above. However, a student might be considered if she or he presents a **written explanation** that reveals an exceptional circumstance accounting for a lower grade point average.
3. Student must provide attached in one email, a document listing his/her correct GPA, contact information, deadline(s), and also all chemistry, biology and physics courses and labs that the student has take—in the following format (or Committee format, if you are applying through committee):
  - a. **GPA**
  - b. reliable, current email and telephone # that student checks *regularly*
  - c. **DEADLINE**
  - d. Table with header: course taken, instructor, grade

**Example:**

Course	Semester/year	Instructor	Grade
Chemistry 102	Fall /2016	Dr. WGJ	A-
Biology 210	Spring /2017	Dr. Barbara Haas	B+

- e. If applying through Committee, *student initiates* process that culminates in a link being sent to me with which to submit LOR.
  - f. If applying "outside the Committee"—see items 5, 6 below, a list of all schools of the applicant and **ALL of their DEADLINES**.
  - g. Regarding part f: all cover forms, application packages, envelopes in one binder, folder, or otherwise secure containment, with like items paper-clipped together.
4. I'd love to read your personal statements, even in rough draft form. It tells me something about you and helps me to shape a recommendation. This article is not required, but I recommend it.
  5. **It is STRONGLY recommended that the student apply through the Loyola Pre-Health Advisory Committee.** Well-regarded by the medical /dental/ pharmaceutical community, the Committee's voice of endorsement will increase the merit of the student's application. Their method also assures that the student's personal statement is strong and well written. If the student applies via Committee, I will be contacted.
  6. **APPLICATIONS OUTSIDE COMMITTEE:** If a student who I can recommend elects to apply apart from the Pre-Health Advisory committee, she/he must perform steps 2-4 and email me at [wgreene@luc.edu](mailto:wgreene@luc.edu). Online LOR uploading protocols (AMCAS, PTCAS, Interfolio, etc.) are **STRONGLY** preferred.

Because of the number of requests, your LOR won't be started until all items in 2 are fulfilled

**LOYOLA UNIVERSITY CHICAGO FALL CALENDAR 2016**

August 28 (midnight)	Sunday	Open registration ends
August 29	Monday	Spring Semester begins Late and Change Registration begins Late registration fees apply
September 2	Monday	<b>LABOR DAY Holiday: No classes</b>
September 6	Tuesday	Late and change registration ends Last day to withdraw without a mark of "W."
September 11	Sunday	Last day to drop class(es) with a Bursar credit of 100%
September 12	Monday	Last day to convert from credit to audit or vice versa
September 26	Sunday	Last day to drop class(es) with a Bursar credit of 50%
October 1	Saturday	Application for Degree. Last day to file, for degrees being awarded at the end of the Spring Semester and the Summer Term of the following year.
October 2	Sunday	Last day to drop class(es) with a Bursar credit of 20% (zero credit thereafter)
October 7	Friday	Last day for students to submit assignments to change an "I" grade to a letter grade for preceding Summer and Spring Terms. Faculty may set earlier deadlines with students
October 10	Monday	Early alert process begins on Mon of week 7 and runs through Fri of week 9
October 10-11	Mon-Tue	Mid-Semester Break no classes
October 12	Wednesday	Classes resume after Mid-Semester Break
November 4	Friday	Last day to withdraw with a grade of "W" After this date, the penalty grade of "WF" will be assigned
November 7	Monday	Spring Registration begins
Nov. 23 – Nov. 26	Wed-Sun	<b>Thanksgiving Holiday</b>
November 28	Monday	Classes Resume
December 10	Saturday	FALL Semester classes end
<b>December 16</b>	Friday	<b>102 Chemistry Final convenes Dec 16 2016 (Friday) from 9:00 A to 11:00 A</b>

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Manager: Stephen Baine Email Address: [luc-lsc@bkst.com](mailto:luc-lsc@bkst.com)