

General Chemistry A (101)

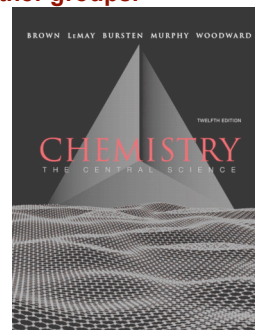
Instructor: **Willetta Greene-Johnson, Ph. D.**, Room 307 Cudahy Science Hall 773-508-3537
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Who am I: A chemical physicist interested in surface optico-physical interactions and mildly interested in (1) thermodynamical (2) unstable systems; (3) producer, composer, orchestrator, pianist, sequencer, and conductor. I was a guest conductor with the Chicago Sinfonietta in 2012 and again in 2014. My vocal ensemble also has recorded three compact discs. One of my songs was doubly tracked on a Grammy award winning choral CD in 2004. Since then it has been covered by five other groups.

Physical Office Hours: Wednesday 12:00 PM – 1:00 PM or by appointment

Required:

1. **Chemistry, the Central Science.** 12th ed. Theodore L. Brown, *et. al.* Boston: Pearson Prentice Hall: 2011 ISBN: 978-0-321-69672-4. **The *Mastering Chemistry* asset is NOT required in my section**
2. Chemistry 102 Course Packet, authored by myself. This essential lecture packet is available online 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 of it once order is completed.



Meetings: Lectures are scheduled MWF in MUND-507, at 09:00 A – 11:40 A.

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: Any scientific calculator is probably sufficient, however calculators cannot be shared while exams are in progress and their cases/covers *must* be removed. Be sure that you are familiar with your calculator and that its batteries are in good condition, especially on the day of exams. The student is responsible for having his calculator on an exam day.

SAKAI Connection: The syllabus, homework assignments for the semester, discussions, and discussion answers will be posted at the following website: www.luc.edu LINKS, pull-down menu and 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 regarding soliciting a recommendation from me, should you desire one and qualify (see protocol).



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 basic 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

- **Grasp the fundamentals of chemistry:**
 - Standard calibrations and units of measurement, Stoichiometry, Conservation rules,
 - Ideal Gas Law, 1st Law of thermodynamics, Single component P-T phase diagram
 - Proto-quantum mechanics: Bohr and Einstein relations, Pauli Exclusion Principle, Hund's rule
 - Lewis Diagrams and VSEPR theory (applied to small or otherwise simple molecules)
- **Categorize general chemical processes:**
 - Broadly classify chemical properties (metals / non-metal, acids / bases, etc.).
 - Recognize and write reactions, including double exchange, combustion, precipitation, acid-base, and redox and to predict outcomes based upon these reactions
 - Categorize relative bonding strengths between atoms, ions or molecules
 - Predict and be able to sketch geometry of small or otherwise simple molecules
- **Assess outcome feasibility:** estimate energy cost of simpler chemical processes
- **Work and exchange ideas with others:** cordially solve weekly group problems together
- **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.

At the end of term, 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 is usually available online at <http://www.luc.edu/IDEA> for a one-week time window only, so please watch for it.

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 101 Tentative Schedule of Topics

| Week or Day | Topic | Chapter | approx. pages |
|-------------|--|---------------|--|
| 5/19 | Intro Matter, Measurements Significant Figures, Conversions; Periodic Table / Atomic Model | 1 1 | 3 – 15 16 – 30 |
| 5/21 | Atomic/Formula Masses; Mole (Avogadro's Number); Stoichiometric Calculations | 2 3 | 40 - 67; pg 66 = alkanes 77 - 85; DISC 1 |
| 5/23 Friday | EXAM 1 Limiting Reactant; Theoretical/Actual Yield | 1 – 3 3 | 9:00 A -10:00 A 86 – 104 10:00 A -11:40 A |
| 5/26 | Aqueous Rxns (1) precipitation ppt | 4 | 119 – 124 |
| 5/28 | Aqueous Rxns (2) Acid Base Reactions | 4 | 119-124; 116 – 119; DISC 2 |
| 5/30 Friday | EXAM 2 | 3, 4 | 9:00 A -10:00 A |
| 6/2 | (3) Redox Reactions, Oxidation Number, Half cell method balancing redox in acid solution | 4 | 125 – 129; 130-135, |
| 6/4 | Stoichiometry in Aqueous Reactions Ideal Gas; Calc'n; Molar Mass Density/ Stoich. Dalton's Law /Kinetic Theory / Effusion | 4 10 10 | 139-148 383 – 398 399 – 414 ; DISC 3 |
| 6/6 Friday | EXAM 3 | 4, 10 | 9:00 A -10:00 A |
| 6/9 – 6/11 | Heat Capacity; Enthalpy, Hess's Law; Light & Matter; Hydrogen Bohr Model | 5 6 | 169 – 175; 181 – 188 207 – 212 |
| 6/13 Friday | EXAM 4 | 5, 6 | 9:00 A -10:00 A |
| 6/16 – 6/18 | Pauli's Exclusion Principle PEP; electron configuration / Quantum #s; Hund's Bus Rule; Orb'l Diagrams Paramagnetism, valence configuration; P.T. trends, electronegativity, etc. | 6 7 8 | 213 – 238 254 – 266 selected reading 289 – 306; Ch. 8 309 – 321 DISC 4 |
| 6/20 Friday | EXAM 5 Covalent Bonding/Lewis structures; Resonance; VSEPR model; σ , π bond | 6-8 9 8 | 9:00 A -10:00 A 332 – 344; 346 – 356 Formal charge 307 – 309 |
| 6/23 – 6/25 | Hierarchy of Interstitial Forces; Liquid / Vapor Equilibrium; Phase Diagram | 11 11, 9 | 425 – 453 ;358-372 Opt'l: Molecular Orbital Theory DISC 5 |
| 6/27 Friday | FINAL EXAM worth 20% or 35% | 1 - 11 | 9:00 A -11:00 A |

HOMEWORK¹: is not graded, but student is strongly encouraged to do it, and to do it it well.

A similar assessment is made via weekly discussion assignments. Additionally, **exam representative** problems will be distributed in discussions. **End-of-Chapter Problems**: 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 textbook, as well as a number of the problems in discussions. A group of exemplary problems is listed below as "assigned" problems. There are on average 20-25 of these per chapter.

Chapter 1, pg. 31: 1, 5, 9, 11, 13, 15, 19, 23, 25, 27(a), 31, 35, 37, 39, 43, 47, 51 (you need two conversions: g to kg and L to ft³), 55, 59, 62, 71 ;

Chapter 2, pg. 69: 1 opt'l (physics is everywhere), 3, 5-7, 9, 11, 25, 29, 31, 35, 37, 39, 43, 45, 47 (O = red, C = black, H = white), 49, 55, 57, 59, 63, 67, 73, 87, 89, 99, 101; Ch 7: 112, p. 287

Continued, next page

¹ The solutions to homework problems will be placed on 2-hour reserve at the Cudahy Library.



- Chapter 3, pg. 105: 1, 3, 9, 11, 13, 17, 19, 21, 23 a-c, 29, 33, 35, 42, 43, 45, 51, 53(a), 67, 69, 71, 75, 69, 73, 75. 81, 85, 93
- Chapter 4, pg. 150: 1-3, 7, 11, 15, 19, 21, 25, 29, 35, 39, 47, 49, 51, 59, 61, 63, 69, 77, 85, 87, 92, 96 (for the truly committed²) 94 (FYI pH: equil'm conc'n of H⁺ ions, [H⁺] = 10^{-pH})
- Chapter 10, pg. 415: 6 (hint, count the contents in each valve), 9 a-b, 25 $\Delta P = \rho gh$, 33, 35, 39b, 41, 49, 53, 57, 59a, 61, 65, 75 (how many moles of each?), 85, 89, 115, 125
- Chapter 5, pg. 196: 3-5, 8, 11, 15 (Kinetic energy = $\frac{1}{2} mv^2$ unit Joule (J)), 13, 17, 19, 23, 29, 33, 37, 41, 45, 47, 51, 53, 57, 63-65, 73, 75, 85. 89, 93, 97, 102
- Chapter 6, pg. 240: 1-3, 6, 7 (optional), 15, 17, 25, 27, 35, 37, 43, 51, 53, 55, 69, 70-72, 80 hc/λ is the energy per photon. Energy during CD play = (Power $\cdot\Delta t$), 97 **Brown's condensed electron config'n is my valence e⁻ config'n.** $\Delta E = \frac{1.196 \cdot 10^5 \text{ kJ}\cdot\text{nm}}{\text{mol}\cdot\lambda}$; λ in nm
- Chapter 7, pg. 279: 25, 27, 30, 47-50, 61, 67 a (product = strong base) and c(product = strong acid), 73, 99 (think about it. Which element has the higher electron affinity?)
- Chapter 8, pg. 322: 1, 4, 9, 11, 13, 17, 19, 33, 35, 47, 51, 53, 63, 83, 101
- Chapter 9, pg. 374: 5, 19, 27 for a-f find instead the orbital and molecular geometries³, 31, 33, 35a, 39, 43, 51 (my parent / orbital geometry is book's e- domain geometry), 63: only answer: how many σ & π bonds), 69, 89, Note that the terminology electron domain corresponds to my electron pair. And term electron domain geom. corresponds to my 'orbital geometry'.
- Chapter 11, pg. 453: 2, 7, 8, 11, 21, 25b, 33, 39, 43, 45, 57, 59, 63, 83, use **Clausius Clapeyron Eq'n** and 2 data points to find ΔH_{vap} .

Examinations and Academic Honesty Five 1 hour- exams and the 2 hour final exam will be given on the dates below, also noted in the schedule.

May 23, 30, June 6, 13, 20, 27

Your course grade will be determined from the best five of these exams by a procedure elucidated in the next section. **The exams and are cumulative; expect exams after first to include concepts that have been tested on the previous exams.**

Academic Integrity

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/cas/pdfs/CAS_Academic_Integrity_Statement_December_07.pdf

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 will 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:

The grading rule is noted on next page.

² Interpreted as needed

³ orb geom (a) thru' (f): AX₂, AX₃E, AX₄E, AX₆, AX₄, AX₂



GRADING RULE

- **Midterms** are worth **15%**.
- **Discussion Work** is worth **5%**. Discussions are counted out of 10 points
- **Final Exam** is worth either **20%** or **35%** according to which of the following schemes yields *highest* points for student:

1. Course Grade =

$$0.05*(\text{Disc. Points}) + 0.15 \times (\text{Sum of all five Hour Exams}) + 0.20 \times (\text{FINAL EXAM points})$$

OR

2. Course Grade =

$$0.05*(\text{Disc. Points}) + 0.15 \times (\text{Sum of Best Four Hour Exams}) + 0.35 \times (\text{FINAL EXAM points})$$

GRADING SCALE

| | | | |
|-----------------------|-----------------|-----------------|-----------------|
| Grading Scale: | B+ 85-87 | C+ 75-77 | D+ 64-67 |
| A ≥ 91 | B 81-84 | C 71-74 | D 60-63 |
| A- 88-90 | B- 78-80 | C- 68-70 | F < 60 |



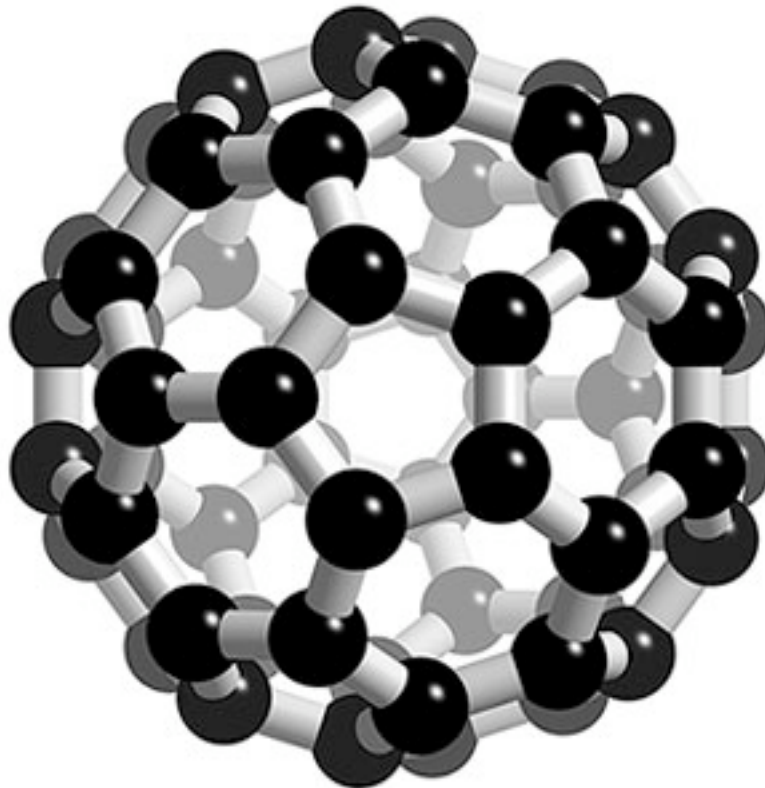
Missed Exams:

The first exam missed for any reason will be dropped. For instance, say that you took exams 1 but had to miss exam 2. Then exam 2 is dropped. If an *additional* exam date is missed for legitimate reason, that *second absence* can be made up within 48 business hours after that scheduled exam. Because of the pace of a summer course, A doctor's note, court summons, police report, or other legal document must accompany the *written* explanation. There can be no exceptions to this policy: **No make-up exam will be given after 48 business hours of the scheduled exam. For a scheduled Friday exam,**

Please make every attempt to take the final exam on time. If the final exam is missed, the student will receive an automatic **WF**. If no action is taken to address the WF, it will automatically revert to an **F**. The student must have valid documentation of why the exam was missed, and must contact the Dean's office of the college in which he/ she is registered. **It is the student's responsibility** to coordinate the make-up exam between the dean's office and the instructor.

Laboratory: CHEM 111, the general chemistry laboratory course is usually taken concurrently with the lecture course. These courses are administered and graded independently. Students should consult the Chemistry Department for information and/or contact **Dr. Angela Boerger**, who directs the laboratories.

Nano-football, anyone?



Buckminster fullerene C₆₀, is shaped like a soccer ball. It possesses 32 faces, 20 hexagons and 12 pentagons, with carbon atoms at every vertex. This allotrope of carbon was first discovered in 1985 by principle investigators Sir Harold Kroto in the UK and Richard E. Smalley and Robert F. Curl, Jr in the US. These researchers shared the 1996 Nobel prize in chemistry for their discovery.

Room Instructions on Exam Days

- 1) Find a seat as quickly as you can. Do not try to sit with friends or near one's usual area. The exam is only one hour, so excessive delays will cut into exam-taking times.
- 2) Place your student ID conspicuously on your desk so that attendance may be noted (during exam).
- 3) Have several pencils/pens, eraser, etc. and a calculator in good working order.
- 4) Proctors have been instructed to confiscate the exams of any student using a calculator with its slipcover in place.
- 5) **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 for LAST

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

- 6) When you have concluded, turn in your exam to proctor or instructor. Leave as quietly and as expeditiously as possible as to not disturb other exam takers.
- 7) Normally, exams administered on Friday will be returned at latest by the following Wednesday. **Please** don't harangue the Chemistry staff (and certainly not the physics staff for a chemistry course!) As a general rule, I do not appraise them of my grading schedule. There is normally no issue, however final examination will take the longest to grade (about 6 days) because it is hand-graded. I promise you that I will move as swiftly and as accurately as I can!



Advanced Studies Recommendation Protocol

Later in your student career, you may require recommendations for graduate school, medical school, or the like. If I am chosen among your recommenders, the following policy ensues:

Please save / archive this page NOW so you can access it later.

1. Student must generally possess GPA of 3.4 or above. However, if my time allows, 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.
2. Student must provide a Microsoft Word-formatted document listing his/her official transcript 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 101 | Fall /14 | Dr. WGJ | A- |
| Biology 210 | Spring /15 | Dr. Barbara Haas | B+ |

- e. If applying through Committee, you **MUST** include **PDF signed waiver** (2 pgs) in email with other items.
- f. If applying “outside the Committee”—see items 4,5 below, a list of all schools of the applicant and **ALL of their DEADLINES**.
- g. All cover forms, application packages, envelopes in one binder, folder, or otherwise secure containment, with like items paper-clipped together.
3. If I can do a recommendation for you, 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.
4. **It is STRONGLY recommended that the student applies 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, s(he) should provide me a cover sheet obtained from the Office of Pre-health (Sullivan Center 262).
5. **APPLICATIONS OUTSIDE COMMITTEE:** If a student who I can recommend elects to apply outside of committee (apart from the Pre-Health Advisory committee), then she/he must perform steps 1-3 and email me at wgreene@luc.edu (and one other e-address that will be provided). If certain places require accompanying documents that can be distributed via email, the student should provide those documents and email all the attachments, along with doc items request in steps 1 - 3 in one email, to myself.

Deadline for recommendation requests: February 1, 2015