



## General Chemistry A (101)

**Instructor:** Willetta Greene Johnson, Ph. D. [wgreene@luc.edu](mailto:wgreene@luc.edu)

**Office:** Cudahy Science Hall Room 307 8-3537

**Office Hours:** Wednesday 10:30 A – 11:15 A, or by appointment

**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 guest conducted with the Chicago Sinfonietta in 2012 and 2014. My vocal ensemble also has recorded three compact discs. One of my songs was doubly tracked on a Grammy award winning CD in 2004. Since then it has been covered by five other groups, including 2015.

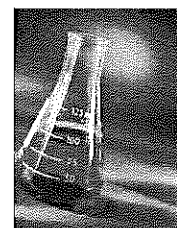
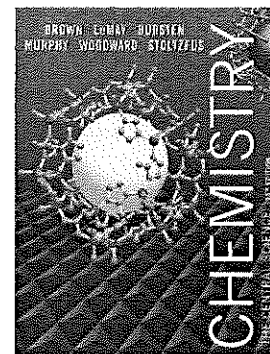
**Required:** Chemistry, the Central Science. 13<sup>th</sup> ed. Theodore L. Brown, *et. al.* Boston: Pearson Prentice Hall: 2011 ISBN: 978-0321910417. (The *Mastering Chemistry* asset is NOT required in my section, but *may* be required in a future Chemistry 102 section.)

**Chemistry 101 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 the first 10 or so pages once order is completed.

**Meetings:** Lectures are scheduled MWF in Galvin Auditorium (Sullivan Center)  
Time: 11:30 A – 12:20 P.

**Discussions:** 13-14 discussions will be administered over the 15 times that we meet.

Section	Instructor	Location	Day	Time
006	Dr. Greene-Johnson	FH-007	M	12:35 P – 1:25 P
007	Dr. Greene-Johnson	FH-007	M	1:40 P – 2:30 P
008	Dr. Greene-Johnson	FH-007	M	2:45 P – 3:35 P



Due to the large number of students / focus 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 page 5)



### 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, 1<sup>st</sup> 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.

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 101 Tentative Schedule of Topics

Week or Day	Topic	Chapter	approx. pages
8/24 – 8/28	Intro Matter, Measurements, Significant Figures, Conversions Periodic Table Overview / Atomic Model	1 1	2 – 16 17 – 32
8/31 – 9/4	Molecular Representation, Empirical Formula Atomic/Formula Masses ; Mole	2	42 - 68; pg 69 = alkanes
9-7-2015	LABOR DAY		No class
9/9 – 9/11	Stoichiometric Calculations Limiting Reactant; Theoretical vs. Actual Yield	3 3	82 - 98 98 – 111
9/14 – 9/18	Aqueous Rxns (1) precipitation ppt	4	124 –131
9/21	Review for Exam 1 (at least 30 min)		Student ONLY is responsible to ATTEND or otherwise obtain the information. Handouts MAY or MAY NOT be disseminated.
9/23 Wednesday	EXAM 1 - Bring calculator (slip-cover off)	1 – 3	No phones or tablets (smart or otherwise) while taking exam.
9/25 – 9/28, 9/30, 10/2	Aqueous Rxns (2) Acid Base Reactions (3) Redox Reactions	4	132-142; Solution stoichiometry : 133-143, 146-151
10/5, 10/6	<b>Mid-FALL break</b>		<b>Hurrah!</b>
10/7, 10/9	Redox Reactions; Stoichiometric Applications	4	151-56
10/12–10/16	Ideal Gas; Molar Mass Density /Stoichiometry; Dalton's Law /Kinetic Theory / Effusion	10 10	400 – 414 415 – 424
10/19–10/23	Thermochemical Reactions: calorimetry Enthalpy; Hess's Law;	5 5	166 – 185 187 – 201
10/23	Review for Exam 2		Optional—see disclaimer above
10/26 Monday	EXAM 2	4, 10, (5)	Obviously 5 we "got to"
10/28 , 10/30	Light & Matter; Hydrogen Bohr Model	6	214 – 229
OCT. 30 <small>Spr. Reg starts 11/2</small>	Last day to withdraw w/o penalty		Hopefully not scary!
11/2 – 11/6	Pauli's Exclusion Principle PEP; e <sup>-</sup> conf'n / Quantum #s; Hund's Bus Rule; Orbital Diagrams, Paramagnetism, electron config'n	6 6 7	214 – 218 219 – 238 258 – 268 selected reading
11/9 – 11/13	Periodic Table Trends: size, EN, IP, EA; Covalent Bond/Lewis structures; resonance; VSEPR model; $\sigma$ , $\pi$ bonds	7 8 9	241-247 298-300, 305-312; 314-317, 320-332 formal charge = p 317 also appendix in lecture-notes
11/16 – 11/18	Molecular Structures, continued	9	344 – 372
11/20	Review for Exam 3		Optional—see disclaimer above
11/23 Monday	EXAM 3	5 - 9*	5-8 * selected topics in ch 9
11/25 – 11/29	<b>...THANKSGIVING BREAK...</b>		<b>Enjoy!</b>
11/30—12/4 IDEA Instructor Evaluation online	Hierarchy of Interstitial Forces Liquid/Vapor Equilibrium / Phase Diagram; OptL: Molecular Orbital Theory	11 11 9	444 – 452 457 – 466; 373 – 375
12/4 Friday	REVIEW for FINAL		
12/7 Monday	<b>FINAL 1:00 P – 3:00 P</b>	1 - 11	Location TBA, probably (maybe) lecture room

**HOMEWORK<sup>2</sup>**: is not graded, but student is strongly encouraged to do it, and to do it well. A parallel assessment is made via weekly discussion assignments comprised of **exam representative** problems. **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 most of the discussion problems. A group of exemplary problems is listed below as "assigned" problems. There are on average 15-30 of these per chapter.

CHAPTER	PAGE	PROBLEMS
1	33	1, 5, 7, 11, 13, 15, 19, 21, 25, 27(a,c,f), 29, 33, 37, 39, 41, 45, 47, 51, 55, 57 (note: you need to convert $\text{ft}^3$ to $\text{cm}^3$ , $1 \text{ ft} = 30.8 \text{ cm}$ ) 68, 76
2	73	1 (physics is everywhere), 3, 5—9, 13, 14, 23, 25, 29, 31, 35, 39, 41, 45, 47, 49, 53 (O = red, C = black, H = white), 55, 59, 63, 67, 69, 71, 75, 79, 81, 99, 103, 105, Ch. 7: 4, p. 290
3	112	1, 3, 7, 11, 13, 17, 19, 21, 23 (formula wt = MM), 25, 31, 35, 37, 39, 41, 45, 47, 49, 53, 55, 57, 61, 63, 69, 73, 75, 77, 79, 83, 85, 93, 95
4	156	1-3, 5, 7, 13, 17, 23, 25, 27, 29, 31, 33, 35, 39, 43, 45, 47, 51, 53, 59, 63, 65, 69, 73, 75, 77, 83, 87, 89 (for the truly committed. <sup>3</sup> Subtract excess acid mole (from NaOH calc'n) from mol original SA present = amt that reacted with $\text{Mg}(\text{OH})_2$ , assume 2 OH's released, (true for small conc'ns)) 94
10	432	1, 5-7, 9, 10, 17 & 23: $\Delta P = \rho gh$ , 27, 33, 35, 39, 41, 43a-b, 49, 51, 55, 57, 59, 63 & 72 (how many moles of each?), 79, 83, 85, 89, 99, 105; *15 (optional $P = F/A$ )
5	202	3-5, 7, 9, 10, 13, 15 (kinetic energy = $\frac{1}{2} mv^2$ unit Joule (J)), 21, 25, 27, 31, 37, 39, 41, 43, 45, 49, 51, 55, 57, 61, 63, 65, 71, 73, 77, 85, 91, 95, 102, 106; 89 or 111 (thought expt)
6	248	2, 5, 7, 11, 12, 15, 19, 21, 25, 27: $\Delta E = \frac{1.196 \cdot 10^5 \text{ kJ} \cdot \text{nm}}{\lambda \text{ (nm)}}$ , $\lambda$ in nm, 29, 37, 41, 43, 45 (similar to 7), 47, 55, 57, 62, 69a, 75-76: textbook's <b>condensed electron config'n</b> is my <b>valence e<sup>-</sup> config'n</b> 78, 79, 86: $hc/\lambda$ is the energy per photon; energy during CD play = (Power $\Delta t$ ), 97.
7	290	25, 27, 29, 35, 45, 46, 54, 65 <b>a</b> (product = strong base) <b>b</b> (double exchange rxn) <b>c</b> (product = strong acid), 69, 75, 96; *7 (optional)
8	333	1, 4, 9, 11, 13, 17, 19, 31-33, 35, 41, 47, 48, 51, 53, 55, 58, 60, 63; *45: high oxdn # metal polar but <b>COVALENT</b> bond; such cations form <i>either</i> molecular compound or polyanion
9	386	1, 3a-e, 5, 6, 14, 21, 25, 28-30, 33, 35, 37, 39, 41, 47b, 55, 57, 59, 62 (also reply how many $\sigma$ bonds), 67, 116: C=C $\pi$ bond energy = 614 kJ/mol. Notes: (1) my parent / orbital geometry $\leftrightarrow$ e <sup>-</sup> domain geometry), (2) terminology <i>electron domain</i> $\leftrightarrow$ my <i>electron pair</i> . (3) <i>electron domain geom.</i> $\leftrightarrow$ my <i>orbital geometry</i> <sup>4</sup>
11	471	1, 2, 6-8, 15, 17, 19, 21, 23, 37, 41, 47, 61, 62a, 64, 84 & 85: <i>Clausius Clapeyron</i> <i>Eq'n</i> and 2 data points to find $\Delta H_{\text{vap}}$ . In problem 85 part c, you don't have to compare.

swap underscore for 'orbital box'

**Tutoring.** Help is available at the Tutoring Center (Sullivan), <http://www.luc.edu/tutoring/><sup>5</sup>

**Examinations and Academic Honesty** Three 50-minute exams and the final exam will be given on the dates below, also noted in the schedule.

**Sept. 23, Oct. 26, Nov. 23**

The 2-hour **final exam** will be administered on **Monday, Dec. 7** at 1:00 P – 3:00 P at a location to be announced (most likely same room). Your course grade will be determined from these exams by a procedure elucidated in the next section. **The exams and the final exam are cumulative; expect exams after first to include concepts that have been tested on the previous exams.**

<sup>2</sup> The solutions to homework problems will be placed on 2-hour reserve at the Cudahy Library.

<sup>3</sup> Interpreted as needed

<sup>4</sup> orb geom (a) thru' (f): AX<sub>2</sub>, AX<sub>3</sub>E, AX<sub>4</sub>E, AX<sub>6</sub>, AX<sub>4</sub>, AX<sub>2</sub>

<sup>5</sup> information from on-campus sources such as The American Chemical Society will be posted on SAKAI once that schedule is made available.



### 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/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:

The scores of the three-hour exams, a final exam and *selected problems on the discussion worksheets* will be used to determine your course grade. **IF quizzes are administered, their points will count toward the discussion grade.** If an exam/discussion is missed for any reason, other than extenuating circumstances deemed admissible by the university policy, that exam will be dropped, and/or that discussion will receive a score of 0 points. If a second exam must be missed, in order to make up the second exam (1) a communication explaining the absence must be emailed within **24 hours** after the scheduled time (2) a doctor's note and/or a letter from a guardian, supervisor, etc., must verify proof of illness (3) exam must be taken by the next class meet time, else no make-up exam can be arranged.

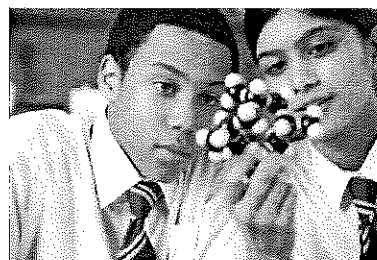
Course grade will be determined in one of two ways and by the grading scale shown:

Item	Method 1	Method 2
Exam 1	20 %	20 %
Exam 2	20	20
Exam 3	20	One dropped: Ex. 1 or 2 or 3
Discussion Worksheets/ Quizzes	10	10
Final Exam	30	50

### GRADING SCALE

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

Whichever scheme benefits the student at semester's end will be employed. **Caveat:** No make-up exam will be given after 48 business hours of the scheduled exam. For instance, for a scheduled Wednesday exam, the make-up exam must occur by the same start time on the following Friday, or that exam will be dropped.



### Missed Exams:

The first exam missed for any reason<sup>6</sup> will be dropped. For instance, say that you took exams 1 and 3 but had to miss exam 2. Then exam 2 is dropped and Method 2 grading scheme applies. If an *additional* exam date is missed for legitimate reason, that *second absence* can be made up within 48 hours (1 meet) after that scheduled exam (see two paragraphs above). Due to the size of enrollment and the volume of work in this course as well as its pace, there can be no exceptions to this policy.

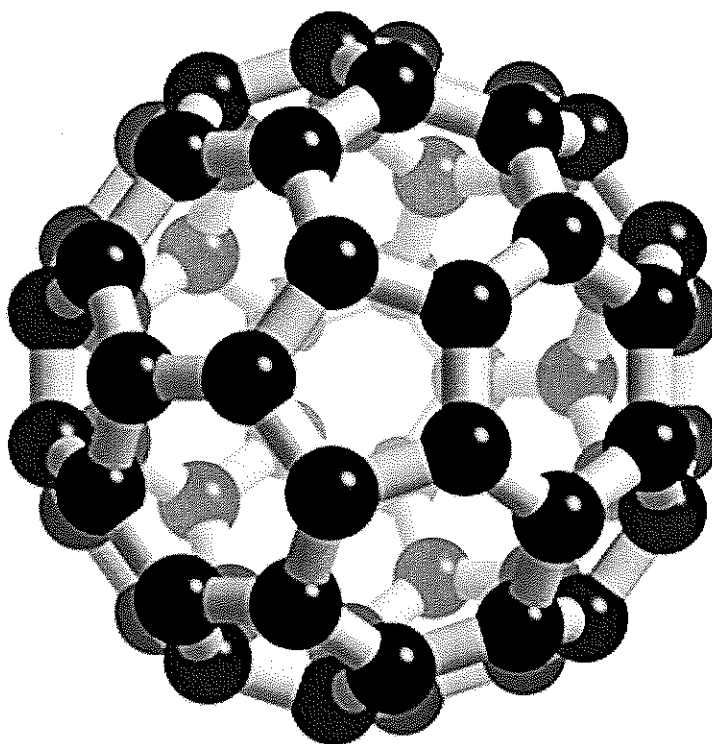
**Please make every attempt to take the final exam on time.** If the final exam is missed, the student will receive an automatic WF. If no action is taken, the WF will automatically revert to an F. The

<sup>6</sup> Except for employed representatives of Loyola University Chicago.

student must have valid documentation of why the exam was missed, and must contact the Dean's office of the college that she is registered in. **It is the student's responsibility** to coordinate the make-up exam between the dean's office and the instructor.

**Laboratory:** Chemistry 111, 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 Dept. Bulletin opposite the wall facing the chemistry office for information or they can contact **Dr. Angela Boerger**, the administrator of the laboratories.

### **Nano-football, anyone?**



Buckminster fullerene  $C_{60}$ , 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 50 minutes, 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 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.

- 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, midterm exams will be returned within two lecture meets. *Please* don't harangue the Chemistry staff (and certainly not the physics staff for a chemistry course!) As a general rule, I do not apprise them of my grading schedule. There is usually no issue, however please note that the *final examination will take the longest to grade (~6 days) because it is hand-graded*. I promise you that I will move as swiftly and as accurately as I can!

Potential Requesters:  
Please archive this  
page now so that you  
can access it later.

## Recommendations 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:

1. **Deadline for LOR (letter of recommendation) requests for 2015 cycle: February 1, 2015.**
2. Student must generally possess GPA of 3.5 or above. This is mainly due to volume of requests. However, a student might be considered if she/ he presents a **written explanation** that reveals exceptional circumstances that might account for a lower GPA.
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 101	Fall /15	Dr. WGJ	B+
Biology 210	Spring /16	Dr. Barbara Haas	A

- e. If applying through Committee, be sure to handle the **signed waiver** with Pre-Health. Send the other items to me ([wgreene@luc.edu](mailto:wgreene@luc.edu)) in one email.
  - 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. All cover forms, application packages, envelopes should be 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, s(he) should provide me a cover sheet obtained from the Office of Pre-health (Sullivan Center 262).
  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 materials to [wgreene@luc.edu](mailto:wgreene@luc.edu). Online LOR uploading protocols (AMCAS, PTCAS, Interfolio, etc.) are **STRONGLY** preferred.
  7. Due to volume of requests, your LOR won't be started until all items in step 2 are fulfilled.

**Just in case you need a LOR later: copy this information now and save it in a memorable location.**