

General Chemistry A (101)

Instructor: Willetta Greene Johnson, Ph. D. wgreene@luc.edu

Office: Cudahy Science Hall Room 307 8-3537

Office Hours: Wednesday 1:40 P – 2:40 P, or by appointment

Who am I: A chemical physicist interested in surface optico-physical interactions and mildly interested in (1) thermodynamics and entropy (2) cooperative systems; (3) producer, composer, orchestrator, pianist, sequencer, and conductor. I have guest conducted with the Chicago Sinfonietta on several occasions. 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 an ensemble from Milan.

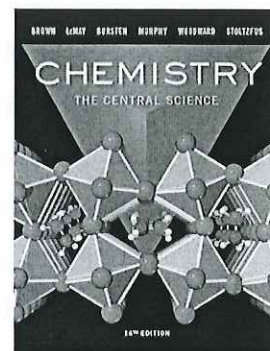
Required: Chemistry, the Central Science. 14th ed. Theodore L. Brown, *et. al.* Boston: Pearson Prentice Hall: 2011 ISBN: 978-0134414232. (The *Mastering Chemistry* asset is NOT required in my section, but *may* be required in a future Chemistry 102 section.)

Chemistry 101 Course Packet, authored by the instructor. This essential lecture packet is available online at www.universityreaders.com. 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 Flanner Hall 133 (Auditorium)
Time: 12:35 P – 1:25 P.

Discussions: 15-17 discussions will be administered over the 15 times that we meet.

Section	Instructor	Location	Day	Time
005	Dr. Greene-Johnson	DU-234	F	1:40 P – 2:30 P
006	Dr. Greene-Johnson	FH-105	F	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 Phone¹ 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, 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.

¹ 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:

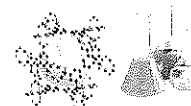
1. Understand the fundamental principles of physical chemistry
2. Acquire a knowledge base of basic terminology and classifications
3. Apply concepts creatively as well as methodically to solve multi-tiered problems
4. Know how to rank, estimate, analyze and critically evaluate a range of models
5. Gain 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, 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.

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 Topic

Week / Day	Topic	Chapter	approx. pages
8/28 – 9/1	Intro, Measurements, Reporting Accuracy Periodic Table Overview / Atomic Model	1 2	2 – 34 55 – 58 Edition 14
9/4/2017	LABOR DAY		No class
9/6 – 9/8	Molecular Representation, Atomic/Formula Weights; Avogadro #; Mole	2	42 – 45; pg 72 = alkanes 48 – 69; pg 70 = name acid
9/11 – 9/15	Empirical Formula, Stoichiometry, Combustion, Limiting Reactant; Theoretical vs. Actual Yield	3 3	82 – 98 98 – 110
9/18 – 9/22	Aqueous Rxns (1) precipitation ppt	4	120 – 128
9/25, 9/29	Aqueous Rxns (2) Acid Base Reactions	4	129 – 137
9/25	Review for Exam 1 (at least 30 min)		Student ONLY must ATTEND to obtain Rev. information. Handouts MAY or MAY NOT be disseminated.
9/27 Wednes.	EXAM 1 - Bring calculator (slip-cover off)	1 – 3	No phones or tablets (smart or otherwise) while taking exam.
10/2–10/6	(3) Redox Rxn, Molarity, Concentration, Titration	4	138 – 139
10/9, 10/10	Mic-FALL break		Hurrah!
10/11, 10/13	Redox Rxns; Stoichiometry involving molarities	4	142 – 153
10/16–10/20	Ideal Gas; Molar Mass Density /Stoichiometry; Dalton's Law /Kinetic Theory / Effusion	10 10	394 – 410 411 – 419
10/23–10/27	Thermochemical Reactions: calorimetry Hess's Law; Enthalpy of Formation	5 5	164 – 183 184 – 190 Extra: 191-200
10/27	Review for Exam 2		Optional—see disclaimer above
10/30 Monday	EXAM 2	4, 10, (5)	Obviously 5 we "got to"
11/1, 11/3	Light & Matter; Hydrogen Bohr Model	6	212 – 224
November 3	Last day to withdraw w/o penalty Spring Registration starts 11/6		Hopefully not scary!
11/6 – 11/10	Complementarity, Pauli's Exclusion Principle PEP; e^- conf'n / Quantum #'s; Hund's Bus Rule; Orbital Diagram, Paramagnetism/Diamagnetism	6 6 9	225 – 218 219 – 240 379
11/13 – 11/17	Periodic Table Trends: Anomalies (exceptions) size, EN, IP, EA; Ions, Covalent Bond/Lewis structures ² ; resonance; VSEPR; σ , π bonds	7 8 9	241-247 257-258, 260-268 272 (ions); 273 (EA), Lewis; 298-302, 305-310, 312-328
11/20	VSEPR & Molecular geometry; how to draw	9	338 – 350 formal charge p 318 ³
11/22 – 11/26	...THANKSGIVING BREAK...		Enjoy!
11-27	π bonds, resonance, hybridization, polarity		351 – 368
11/29	Review for Exam 3		Optional—see disclaimer above
12/1 Friday	EXAM 3	5 - 9*	5 - 8; *selected topics in Ch 9
12/4 – 12/8	Nuclear Structure, Stability, and Change	21	Skip 21.4; do IDEA online !!!
12/13 Wed.	REVIEW for FINAL		900-912, 917-930
12/15 Friday	FINAL 9:00 A – 11:00 A	1–11, 21	Location TBA. <i>probably (maybe) lecture room</i>

² Optional: Molecular Orbital Theory, Ch. 9, pg. 369-376

³ also appendix in lecture-notes



HOMEWORK⁴: 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	35	1-3, 6, 7, 8, 10, 11, 13, 15, 19, 21, 25 (1 cal = 4.184 J), 31, 32, 35, 39, 42, 43, 45, 47, 49, 51, 54, 55a-c, 57 (for ft ³ to cm ³ : 1 ft = 30.8 cm) 60, 61, 63, 67, 68 a,c; **79-82
2	76	1 (physics is everywhere), 3, 5—8, 11, 13, 14, 19, 23, 25, 27, 29, 31, 35, 39, 41, 45-47, 49, 50, 52, 53 (O = red, C = black, H = white), 55, 57, 59, 63, 67, 69, 71, 73, 77, 79 (some parts ↔ reactions), 99b, 100, 105, 109, 110; Ch. 7: 4, p. 290
3	112	1, 3, 7, 9, 11, 13, 15, 19, 21, 23 (formula wt = MM), 25 (a,c,e), 31, 35, 37, 39, 41, 45, 47, 49, 53, 55, 57, 61, 62, 69, 73, 75, 77, 79, 83, 85, 93, 95
4	155	1-3, 5*, 7, 15-17, 23, 25, 27, 29, 31, 33, 35, 39, 43, 45, 47, 51, 53, 59, 63, 65 (BAC = Blood Alcohol Count), 69, 73, 75, 77, 83, 87, 89 (for the truly committed. ^{5 6}), 94
10	425	3, 5-7, 9-11, 27, 28, 33, 37, 39, 41, 43a,b,d; 47-49, 51a, 55, 57, 63, 64, 69, 72 (how many moles of each?), 79, 83, 87, 89 (use 0.285); *17 & *23: ΔP = ρgh; *15 (P = F/A)
5	203	3-5, 7, 9, 11, 13, 15 (uh, ... more physics), 19, 21, 23, 25, 27, 31, 37, 39, 41, 43, 45, 47, 49, 51, 55, 57, 59, 63, 65, 69, 73, 75, 81, 91, 95, 99*, 103**; Ch. 3 (p. 116) 71.
6	250	1-5, 7, 11, 12, 15, 17, 19, 25, 29: ΔE = $\frac{1.196 \cdot 10^5 \text{ kJ} \cdot \text{nm}}{\text{mol} \cdot \lambda}$, λ in nm, 37, 41, 43, 45 (similar to 7), 47, 49, 55, 57, 62, 69, 75-76: textbook's <i>condensed electron config'n</i> is my <i>valence e⁻ config'n</i> 78, 79, 86: hc/λ = E photon; energy during CD play = (PowerΔt), 88*, 93, 100**.
7	290	2, 7b, 25, 27, 29, 35, 45-47, 55, 65 a(product = strong base) b(double exchange rxn) c(product = strong acid). d('bicarbonate formed'), 69, 77, 94, 96; 75 (history), 54** (optional)
8	330	1, 4, 9, 11ab, 13, 14, 17, 19, 31-33, 35, 37, 41, 47, 48, 51, 53, 55, 58, 59, 63-65; *45: metals found in ionic AND covalent comp'ds: some <i>metal</i> bonds can be mostly COVALENT
9	386	1, 3a-e, 4, 5, 7, 9a-c, 14-17, 21, 25, 27-30, 33a, dipole: 35, 37, 39, 41, 44; 53, 57, 59, 61, 62 (also find how many π bonds), 67, 86, 87, 102: C=C π bond energy: 614 kJ/mol. Notes: (1) my parent / orbital geometry ↔ e ⁻ domain geometry), (2) terminology <i>electron domain</i> ↔ my <i>electron pair</i> . (3) <i>electron domain geom.</i> ↔ my <i>orbital geometry</i> ⁷
21	936	1, 5, 9, 11, 13, 15, 17, 21, 29, 31, 47, 49, 55 a,b; 61 optional: 72, 76*, 80*

swap underscore for 'orbital box'

Tutoring. Help is available at the Tutoring Center (Sullivan), <http://www.luc.edu/tutoring/>⁸

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. 27, Oct. 30, Dec. 1

The 2-hour **final exam** will be administered on **Friday, Dec. 15** at 9:00 A – 11:00 A 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.**

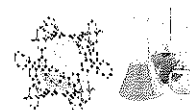
⁴ The solutions to homework problems will be placed on 2-hour reserve at the Cudahy Library.

⁵ Interpreted as needed

⁶ Subtract excess mole acid (NaOH calc'n) from mol orig'l SA = am't that reacted w/ Mg(OH)₂, assume 2 OH's released, (true for small conc'ns)

⁷ orb geom (a) thru' (f): AX₂, AX₃E, AX₄E, AX₅, AX₆, AX₄, AX₂

⁸ 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 Department Chair and the Office of the Dean. Depending on the seriousness of the violation, 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.

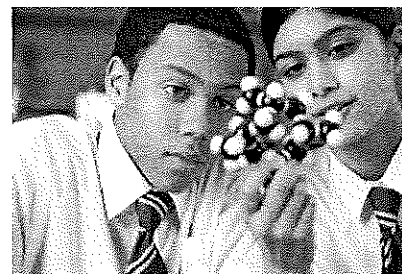
Course grade will be determined in one of two ways and by the grading scale shown:

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 after scheduled exam. For instance, for a scheduled Wednesday exam, make-up exam must occur by same start time on the following Friday, or that exam will be dropped.



Missed Exams:

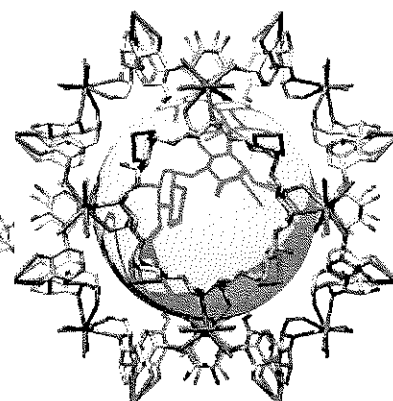
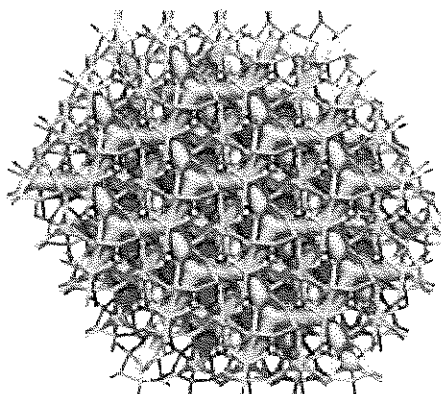
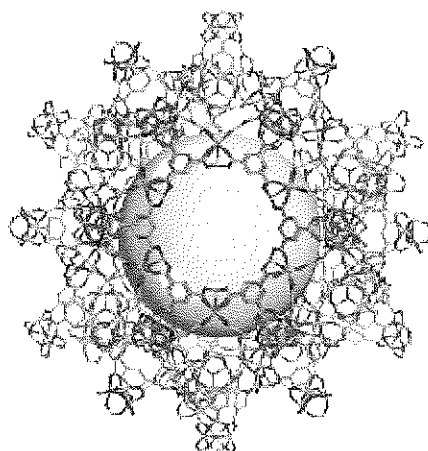
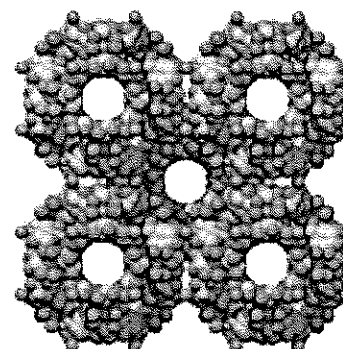
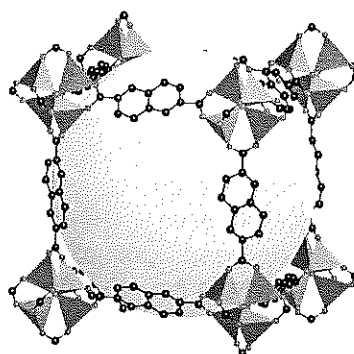
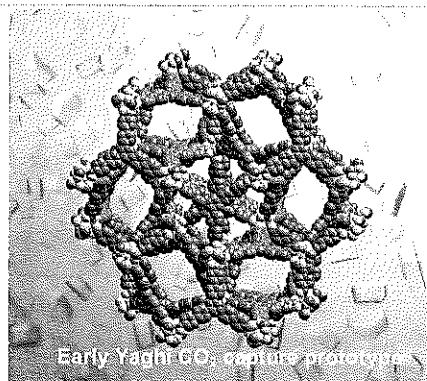
The first exam missed for any reason¹ will be dropped. For instance, say that you took exams 1 and 3 but had to miss exam 2. Then exam 2 is dropped and Method 2 grading scheme applies. If an *additional* exam date is missed for legitimate reason, that *second absence* can be made up within 48 hours (1 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 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.

¹ Exception: employed representatives of Loyola University Chicago.

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 Department bulletin opposite the wall facing the chemistry office for information, or they can contact **Dr. Angela Boerger**, the administrator of the laboratories.

ENERGY CAPACITOR, OXYGEN FILTER,...OR GORGEOUS ART?



Metal organic frameworks (MOF) are compounds with design inspired by naturally occurring zeolite (boiling stones). They are composed of two major components: a metal ion or cluster of metal ions and an organic molecule called a linker. They are often porous and the pores can filter or capture particles. The metal ion and linker choices dictate the size and shape of pores.

These porous crystals are promising for their applications to clean energy storage and generation, clean water generation and delivery, super-capacitors, thermal batteries, ion / electronic conductivity, molecular filters, oxygen or carbon capture, catalysis, and targeted drug delivery. ¹²

MOFs have been identified by the US Department of Energy as amongst the most promising next-generation technologies for carbon capture. Some sources project that the global market for carbon capture and sequestration will be worth \$221 billion by 2030.

¹⁰ Sandia National Laboratories (2017) so new that what it's made of is proprietary status.

¹¹ Stoddart <http://onlinelibrary.wiley.com/doi/10.1002/anie.201002343/abstract> (2010) organic linker = γ -cyclodextrin and metal = alkali salt.

¹² Many groups such as Yaghi (first inventor, UC Berkeley), Stoddart (Northwestern U.), Sholl (Georgia Tech), etc., actively research MOFs.

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 to grade as swiftly as is possible to maintain accuracy!

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 2017-2018 cycle: February 1, 2018.**
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 /17	Dr. WGJ	A-
Biology 210	Spring /18	Dr. Barbara Haas	B+

- e. If applying through Committee, be sure to handle the **signed waiver** with Pre-Health. Send the other items to me (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. 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 3 are fulfilled.

Just in case you need a LOR later: copy this information now and save it in a memorable location.
LOYOLA UNIVERSITY CHICAGO FALL CALENDAR 2017



August 27	Sunday	Open registration ends
August 28	Monday	Fall Semester begins
August 28	Monday	Late and change registration begins Late registration fees apply
September 1	Friday	Labor Day weekend begins Classes that begin at 4:15 p.m. or later do not meet
September 5	Tuesday	Late and change registration ends Last day to withdraw without a "W" grade
September 4	Monday	Labor Day, Classes do not meet
September 5	Tuesday	Classes resume after Labor Day
September 10	Sunday	Last day to withdraw from class(es) with a Bursar credit of 100%
September 11	Monday	Last day to convert from credit to audit or vice versa Last day to request or cancel pass/no pass option
September 24	Sunday	Last day to withdraw from class(es) with a Bursar credit of 50%
October 1	Sunday	Last day to withdraw from class(es) with a Bursar credit of 20% (zero credit thereafter)
October 1	Sunday	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 6	Friday	Last day for students to submit assignments to change an "I" grade to a letter grade from the preceding Spring and Summer Semester/Terms to a letter grade; Faculty may set earlier deadlines with students
October 9 -10	Mon. & Tues.	Mid-Semester Break: No classes
October 11	Wednesday	Classes resume after Mid-Semester Break
November 3	Friday	Last day to withdraw with a grade of "W" After this date, the penalty grade of "WF" will be assigned
November 6	Monday	Graduate, Non-GSB, Spring Registration Begins
Nov. 22 - 26	Wed - Sun.	Thanksgiving Break: No classes
November 27	Monday	Classes resume after Thanksgiving Break
December 9	Saturday	Fall Semester ends
December 13	Wednesday	Study Day: No classes
December 15	Friday	9:00 AM – 11:00 AM CHEMISTRY 101-004 Final Examination

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 Store Manager: **Mani Pillai** Email Address: luc-lsc@bkstr.com

