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## CHEM 104

### *GENERAL, ORGANIC, and BIOCHEMISTRY II*

Spring Semester: 2022

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**Office Hours:**

Wed.: 3:00 pm – 5:00 pm  
Thurs.: 10:00 am – 12:00 noon  
Fri.: 10:00 am – 11:00 am

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#### Course Description:

- CHEM 104 is the second semester course of General, Organic, and Biochemistry (the prerequisite being CHEM 103) for non-science majors. It serves as a G2 General Education course and satisfies the Lab requirement. Students in CHEM 104 will be introduced to basic theories relevant for general and organic chemistry, including nomenclature, reactions, and problem solving. (2 hrs lecture/2 hrs lab)
- **Necessary Background**  
*Chemistry:* CHEM 103

#### Required Materials:

- Lecture Text: “*Essentials of General, Organic, and Biochemistry, 3e,*” by D. Guinn.
- Scientific calculator capable of exponential notation, square roots, and logarithmic functions
- Laboratory Procedures: Handouts *via* D2L
- Laboratory notebook
- Molecular Model Kit
- Laboratory Goggles or, Safety Glasses with side shields

#### Course Objectives:

*At the completion of CHEM 104, you should have a solid understanding of the basics of chemistry. Students actively engaged in this course should be able to:*

- Apply the fundamental ideas of bonding, molecular structure, acid-base theory, equilibrium, and thermodynamics developed in CHEM 103 to the systematic study of organic and biochemical molecules.
- Recognize, name, and represent/draw organic compounds and organic functional groups
- Describe relationships between structure, chemical reactivity, and physical properties
- Describe the role of valence electrons in chemical bonding and draw appropriate electron configurations for atoms and Lewis structures for compounds.
- Write balanced equations to describe chemical changes and do related calculations using mole and mass relationships.
- Describe and illustrate chemical and functional group changes in common organic and biochemical pathways.
- Work safely in a chemical laboratory using common laboratory equipment and materials.
- Accurately record and effectively evaluate lab experimentation and data.

**To accomplish these objectives:**

Do not try to memorize everything for the course – it doesn't work. Try to focus on the major concepts and develop some flexibility into the application of those concepts. This doesn't mean, however, that you won't have to memorize anything. There are some fundamental principles and vocabulary that you will have to remember to successfully complete this course. Like physics, general chemistry is a very mathematically oriented class. If you do well in math, you can and should do well in general chemistry. Approach this class like a math class. In math, you learn the material by working through many problems. One of the most important ways to become proficient in chemistry is to practice, practice, practice with little memorization. The more problems you do, the better you will do. Recall Confucius who probably said it best; "*I hear, and I forget. I see, and I remember. I do, and I understand.*"

**How to Succeed:**

- **Do not get behind!!!** It may be impossible to catch up!
- Read the chapter before coming to lecture.
- **Work lots of problems!!! Then do more problems.**
- Work all the problems throughout the chapter as you are reading it, as well as the problems at the back of the chapter. Avoid looking up answers in the study guide until you have worked the problem.
- **Get help when needed!!!** Do not be afraid to ask questions, or to come see me for help! Remember, if you don't understand something others probably don't either. Many students are unprepared for the cumulative nature of this class. Most everything you learn in CHEM 103, will be needed in CHEM 104.
- Plan to spend time at the **Chemistry Peer Learning** sessions:
- **Chemistry Peer Learning** is provided by the Department of Chemistry to assist you in your preparation for your chemistry courses. The hours this semester will be In-Person in Roddy 153 from 2 – 4 and 5 – 7 pm on Tuesdays, Wednesdays, and Thursdays. All sessions will be in Roddy 153 except for Wednesday 2 – 4 which will be in Caputo 212. Students can attend any of these sessions at any time with no need to sign-up. Peer learning is a place to work on chemistry where support is immediately available. Please do not wait until you feel behind in the course to begin using this resource.

The university has established a relationship with "Smarthinking". Smarthinking provides 24/7 tutoring support for introductory courses that can be accessed using your Millersville credentials via D2L. Access Smarthinking at .....

<https://wiki.millersville.edu/display/instructdocs/Smarthinking+Online+Tutoring>

- Find a group of other students to study with so you can help each other.
- Print out and read lab instructions in time to complete pre-lab questions before coming to lab.
- Record lab notes and data directly into your notebook; label all information clearly, and complete all post-lab questions and a summary.

**Lectures:**

- All lectures are on Mondays and Wednesdays, from 8:00 – 8:50 am, in 102 Brossman.

**Tentative Chem 104 Lecture Schedule**

Spring Semester, 2022

*MW, 8:00 – 8:50 am***Chapter****Topic**


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10	Introduction to Organic Chemistry: Hydrocarbon Structure
11	Alcohols, Phenols, Thiols, Ethers, and Amines
12	The Common Carbonyl-Containing Functional Groups
13	Common Organic Reactions in Biochemistry
14	Carbohydrates: Structure and Function
15	Lipids: Structure and Function
16	Proteins: Structure and Function
17	Nucleotides and Nucleic Acids

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**Final Exam (cumulative): Friday, 05/06/2022 from 2:45 – 4:45 pm**

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**Attendance Policy / Exam Make-up Policy**

Students are responsible for all notes, discussions, assignments and handouts presented in each class (whether you are present or absent). Also, students are expected to be present when any evaluation (i.e., quiz, exam, etc.) is given, as well as all laboratory sessions. If you miss an Exam for a legitimate **documented** reason (i.e., personal illness, as verified by a **valid medical excuse**, or personal emergency, as a death, or critical illness in the **immediate** family, or participation in a university sponsored activity, or jury duty, or military duty, or observed religious function), as described in the Class Attendance Policy of the Millersville University *Governance Manual, Section 3*, a make-up Exam will be given at a time mutually agreed upon by the instructor and the student. **You have 24 hours prior to the exam to notify me of your absence in order to qualify for a make-up. No excuses will be accepted if presented to me after a missed Exam.** If there is a true emergency, I will accept notification **up to and only 24 hours after the Exam.** I can be contacted by phone, or email. If I am not available, leave a message with the Department secretary. In this regard, there is no excuse for not contacting me. It is **YOUR** responsibility to verify that your message reached me! It is important to realize that Make-up exams may differ in style/questions from the original exam.

***Failure to comply with any of the above will result in a grade of zero.***

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**Special Need Students:** Please see the Office of Learning Services (Lyle Hall) ASAP if you have special needs for this class. If you have a condition that may affect your ability to perform laboratory exercises, to exit safely from the premises in an emergency, or which may cause an emergency during class, or lab, please discuss this in confidence with your instructor and someone at the Office of Student Support Services.

**Problems from the textbook:**

Work the problems at the end of the chapters. They will not necessarily be collected; however, it is to your advantage that you work as many as possible until a concept is mastered. There is a strong, direct correlation between the number of problems worked and understood and exam grades and an inverse correlation to the perceived difficulty and length of exams.

**Molecule Presentations:**

Each individual student will research a pharmaceutical molecule and give a 5-to-10-minute oral presentation during the lab sessions on **Thursday, April 21**. Information about the structure, functional groups, and biochemical impact will be assembled into a PowerPoint file. The PowerPoint presentation file is to be turned into me (email) **at least 2 hrs BEFORE the lab period that day**. Deductions will be assessed for late submissions. Detailed instructions will be made available on D2L.

**Course Evaluation:**

4 hourly exams (4 x 100 pts./exam = 400 pts.)	45 %
<b>Final comprehensive exam (100 pts.)</b>	15 %
4 quizzes (4 x 25 pts/quiz = 100 pts.)	15 %
Molecule Presentation	05 %
Laboratory: (Reports / Assignments / Problem Sets / Misc. ~ 200 pts.)	20 %
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	100 %

- **Tentative Exam Dates:** W: 02/09/22 (#1); M: 03/14/22 (#2); W: 04/06/22 (#3); W: 04/27/22 (#4)
- **Tentative Quiz Dates:** M: 01/31/22 (#1); W: 02/23/22 (#2); M: 03/28/22 (#3); M: 04/18/22 (#4)
- **Final Exam Date:** *Friday, May 06, 2022: 2:45 – 4:45 pm:*

**Grade Distribution:**

A	93.0 – 100	B <sup>-</sup>	80.0 – 82.4	D <sup>+</sup>	66.0 – 67.9
A <sup>-</sup>	90.0 – 92.9	C <sup>+</sup>	77.5 – 79.9	D	62.0 – 65.9
B <sup>+</sup>	87.5 – 89.9	C	70.0 – 77.4	D <sup>-</sup>	60.0 – 61.9
B	82.5 – 87.4	C <sup>-</sup>	68.0 – 69.9	F	< 60.0

*Last day to WITHDRAW from a course & receive a W grade: [Friday, 04/01/22, online by 4:30 pm](#)*

**Out of Class Assistance:**

If you do not understand a problem or concept, please do not hesitate to ask in class, stop by my office, or schedule an appointment to meet with me.

**Academic Honesty and Dishonesty:**

Academic honesty is a requirement for passing this class. Any student who compromises the academic integrity of this course is subject to a failing grade. The work you submit must be your own. Academic dishonesty includes but is not limited to copying answers from another student, allowing another student

to copy your answers, communicating exam answers to other students during an exam, attempting to use notes or other aids during an exam, or tampering with an exam after it has been corrected and then returning it for more credit. If you do so, you will be in violation of the Academic Honesty and Dishonesty Policies as laid out in the Student Handbook and the University's Academic Honesty and Dishonesty brochure. It is your responsibility to read and understand these policies. You need to avoid even the slightest appearance of impropriety on your exams. Note that any instance of academic dishonesty will be reported to the student's academic Dean and the Associate Provost for Academic Programs and Services for disciplinary action and is cause for a failing grade in the course.

Plagiarism is the deliberate, or even accidental representation of another's work as your own without proper reference. Although you will work together on some material and experiments, this does not mean that lab reports and assignments should be identical. Each participant uses the collective data and discussion to prepare his or her own individual report. You should be familiar with the University policy on academic honesty and dishonesty as outlined in the Student Handbook and Academic Honesty and Dishonesty brochure; the content applies to this course. If you are caught, you will be removed from the course and assigned an F for the course, and the filing of a report with the student's Dean and the Associate Provost for Academic Programs and Services!

**Classroom Etiquette: NO CELLPHONES!**

Feel free to ask questions; however, socializing and chatting during class is rude and unfair to those students interested in learning and participating. If you persist in talking during class, you will be asked to leave. Please note that I reserve the right to take disruptive behavior such as habitual tardiness, frequent or excessive talking during class, cell phone disruptions, or leaving before class is over into account when determining your final grade.

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## **CHEM 103: General, Organic, & Biochemistry II Laboratory**

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**Laboratory:**

All laboratory procedures can be found on D2L. Before coming to lab, you are expected to have diligently studied the experiment and outlined the procedure in your laboratory notebook. You should bring your laboratory notebook, and safety goggles to all labs. Laboratory experiments should be done during the assigned laboratory period. Any work outside of this period must be approved by the lab instructor; a chemistry faculty member must be available to supervise your work, and another student must be in the lab with you at all times. The pre-lab assignment should be completed but will not be handed in to the instructor.

The laboratory component of CHEM 104 is designed to give you hands-on experiences that enhance learning by application. **Students MUST prepare for, carry out, and report on ALL lab experiments or activities in CHEM 104!**

**Laboratory Objectives:**

*At the completion of CHEM 104 Laboratory, you should be able to....*

- Demonstrate the proper laboratory safety, including chemical waste disposal, when working in the lab
- Keep a neat and organized record of laboratory data in a notebook

***Tentative\* Laboratory Schedule:***


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**COURSE:** CHEM 104.01A (CRN: 9209): **WHEN:** Thursday Afternoon, 4:00 - 5:50 pm:

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<b>DATE</b>	<b>EXPERIMENT</b>
01/20	First Day/Check-In/Intro./Safety
01/27	Physical Constants
02/03	Preparation & Purification of Acetanilide
02/10	Melting Points
02/17	Alkanes & Cycloalkanes: Molecular Models
02/24	Distillation
03/03	Dehydration of an Alcohol
03/10	<b>SPRING BREAK (NO LAB)</b>
03/17	Extraction of Analgesics
03/24	Thin Layer Chromatography of Analgesics
03/31	Saponification of an Ester: Soap
04/07	Stereochemistry: Molecular Models
04/14	Aspirin Synthesis
04/21	Molecule Presentations
04/28	Check-Out

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\* *Order of experiments subject to change, as well as experiments themselves*

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***Lab Attendance:***

Attendance at each laboratory session is mandatory. Only valid excuses will be accepted in order to make up labs. In the event of an anticipated excused absence, arrangements should be made to make up work **prior** to the absence; if not, a missed lab will result in a **ZERO** for that lab missed! Students are not allowed to work by themselves when there is not a lab in session. You are expected to have read the procedure thoroughly prior to each lab and be prepared to work in the laboratory.

***Safety is very important in the laboratory:***

General safety guidelines will be presented in the laboratory and should be followed throughout the duration of the laboratory experience. Specific safety precautions for each experiment will be covered before each lab. Failure to follow safety guidelines is reason for dismissal from a lab and a grade of **zero** for the experiment. Additional laboratory guidelines including notebooks and reports are covered in the handouts.

### **The Laboratory Notebook:**

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The laboratory notebook is a permanent record of your work in the laboratory. You must have your notebook with you to work in the lab. All notebooks must be permanently bound. All entries should be in ink. Each page must be consecutively numbered. As each page is completed you should sign/initial and date the page. The procedure must be outlined in the notebook and the safety precautions listed before coming to lab. All data must be recorded in the notebook using correct significant figures and proper units. Never write data on another sheet of paper with the idea of transferring it to the notebook. Notebooks should be relatively neat and orderly; however, data should never be recopied into another notebook. If an error is made, do not obliterate the data (also do not use white out, tear out pages or tape in new pages). Draw a single line through any errors and write the correct data.

The notebook is a record of your work as it is done. The notebook should be kept in such a way that the instructor can turn to any experiment and tell exactly what you did during the experiment. All data must include the appropriate units and be labeled to identify the data. All calculations, graphs, tables and assigned questions must be included in the notebook. All lab notebooks should be reviewed and initialed by the instructor at the end of each laboratory period.

A conclusion will be required for some lab reports. The conclusion should be one paragraph. It should state the major results of the experiment. This statement of results should agree with the purpose of the experiment written at the beginning of the report. This should be followed by a statement describing whether you are confident in the results. The remainder of the conclusion should be an argument to convince the reader why you feel your results are appropriate or not. This argument can refer to the agreement between multiple trials, agreement with other student results, trends in the data such as a linear graph or other observations from the experiment.

### **TITLE IX RESPONSIBILITIES FOR FACULTY:**

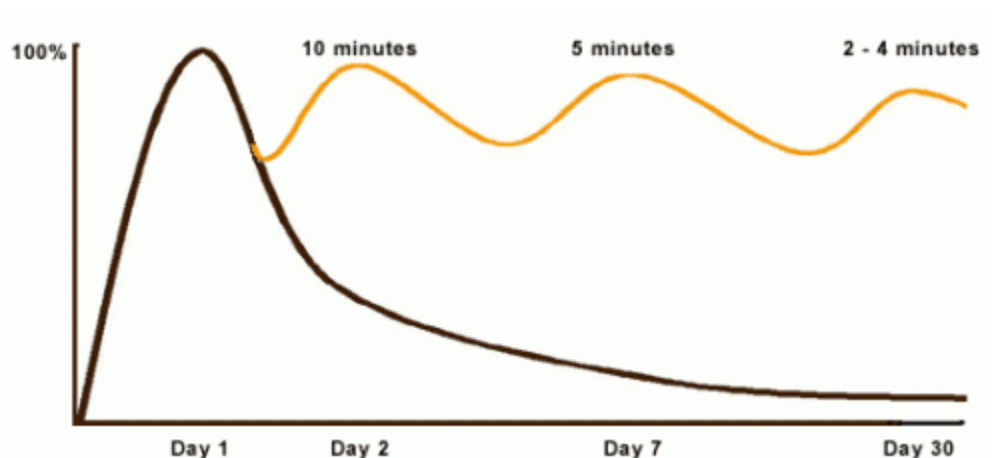
*Millersville University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to meet this commitment, comply with Title IX of the Education Amendments of 1972, 20 U.S.C. §1681, et seq., and act in accordance with guidance from the Office for Civil Rights, the University requires faculty members to report to the University's Title IX Coordinator incidents of sexual violence shared by students. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report to the person designated in the University Protection of Minors policy incidents of sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred.*

*Information regarding the reporting of sexual violence, and the resources that are available to victims of sexual violence, is available at [www.millersville.edu/titleix](http://www.millersville.edu/titleix).*

## Appendix

# Curve of Forgetting

The Curve of Forgetting describes how we retain or get rid of information that we take in. It's based on a one-hour lecture.



On day 1, at the beginning of the lecture, you go in knowing nothing, or 0%, (where the curve starts at the baseline). At the end of the lecture, you know 100% of what you know, however well you know it (where the curve rises to its highest point).

By day 2, if you have done nothing with the information you learned in that lecture, didn't think about it again, read it again, etc. you will have lost 50%-80% of what you learned. Our brains are constantly recording information on a temporary basis: scraps of conversation heard on the sidewalk, what the person in front of you is wearing. Because the information isn't necessary, and it doesn't come up again, our brains dump it all off, along with what was learned in the lecture that you actually do want to hold on to!

By day 7, we remember even less, and by day 30, we retain about 2%-3% of the original hour! This nicely coincides with midterm exams; and, may account for feeling as if you've never seen this before in your life when you're studying for exams - you may need to actually re-learn it from scratch.

You can change the shape of the curve! Reprocessing the same chunk of information sends a big signal to your brain to hold onto that data. When the same thing is repeated, your brain says, "Oh - there it is again, I better keep that." When you are exposed to the same information repeatedly, it takes less and less time to "activate" the information in your long-term memory and it becomes easier for you to retrieve the information when you need it.

Here's the formula and the case for making time to review material: within 24 hours of getting the information - spend 10 minutes reviewing and you will raise the curve almost to 100% again. A week later (day 7), it only takes 5 minutes to "reactivate" the same material, and again raise the curve. By day 30, your brain will only need 2-4 minutes to give you the feedback, "yes, I know that..."



Often students feel they can't possibly make time for a review session every day in their schedules - they have trouble keeping up as it is. However, this review is an excellent investment of time. If you don't review, you will need to spend 40-50 minutes re-learning each hour of material later - do you have that kind of time? Cramming rarely stores information in your long-term memory successfully, which makes it harder to access the material for assignments during the term and exam preparation.

Depending on the course load, the general recommendation is to spend half an hour or so every weekday, and 1.5 to 2 hours every weekend in review activity. Perhaps you only have time to review 4 or 5 days of the week, and the curve stays at about the mid-range. That's ok, it's a lot better than the 2%-3% you would have retained if you hadn't reviewed at all.

Many students are amazed at the difference reviewing regularly makes in how much they understand and how well they understand and retain material. It's worth experimenting for a couple weeks, just to see what difference it makes to you!

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<https://uwaterloo.ca/campus-wellness/curve-forgetting>