

CHEM 102-70 HYBRID COURSE SYLLABUS Fall 2017

COURSE TITLE: INTRODUCTION TO ORGANIC CHEMISTRY

UNITS: 4

This class meets Wed in CYN 104 from 10:00am – 12:45 pm

[Campus Map](#)

INSTRUCTOR: Kelly Boebinger **OFFICE LOCATION:** CYN 227

Office Hours: MTW 7:00a-7:30a, M 9:45a-10:30a

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PREREQUISITE: CHEM 101 or CHEM 150

COURSE DESCRIPTION:

Introduction to college organic chemistry with an emphasis on the fundamental principles of organic compounds. Topics include structure, nomenclature, properties, reactions, synthesis and biochemistry. Laboratory component is both qualitative and quantitative in scope. Critical thinking, writing, measurement, identification and analysis skills are emphasized.

REQUIRED TEXT AND MATERIALS:

- ☐ An access code must be purchased by the student to use Mastering Chemistry. All textbook reading quizzes and homework questions will be administered through Mastering Chemistry online.
- ☐ Textbook & Mastering Chemistry (MC): **Fundamentals of General, Organic, and Biochemistry**, McMurry, 8th Edition, Pearson Pub. (Package ISBN 9780134033099 **with Mastering Chemistry**)
- ☐ **A textbook (or eText) & Mastering Chemistry Access Code are REQUIRED for course:** *The homework assignments and quizzes will be administered on this website.*
<http://www.masteringchemistry.com> **MC COURSE ID: CHEM102SEC70FALL17**
- ☐ Molecular Model Set at bookstore (alternate kit: Prentice Hall – ISBN 0-205-08136-3)
- ☐ Lecture Notes and Laboratory Experiments: *Chemistry 102 Lecture Notes and Laboratory Experiments*, K. Boebinger (Handed out to students on first day).
- ☐ Safety Goggles or Safety Glasses
- ☐ Template (hexagon shape needed), Periodic Table, Calculator (All available at CHC bookstore)

METHOD OF INSTRUCTION: THIS IS A HYBRID COURSE:

Students are expected to spend time for this class; an average of 10-20 hours online + 3 hours face-to-face each week in addition to regular study time. Students are responsible to attend the face-to-face weekly scheduled lab or exam days. All exams will be taken on campus and proctored, no online exams will be allowed. All lab experiments will be performed on campus.

All lecture material is presented online through the course [Canvas website](#) and lecture videos are posted on YouTube. It is the responsibility of the student to go through all the information posted for the course and other material in the time permitted. A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations. Methodology will be selected to best meet student needs. A discussion board for questions about this class is on Canvas for students to ask other students questions. Use this for questions and answers regarding this class so you have an opportunity to help and learn from your fellow students.

TECHNICAL REQUIREMENTS:

Access to: a computer, tablet or similar device with internet connectivity and Canvas capability.

[Canvas Course Website](#): A Canvas online site has been set up for this course. Assignments and other important course materials will be available on this site. **Your Canvas username and password will be the same as your WebAdvisor login.** Here is a [Student Resource Video](#) to get familiar with Canvas.

If you need technical assistance: For Canvas Help, STUDENTS can DURING BUSINESS HOURS M-F 8am-5pm: SUBMIT A TICKET directly in the Course, by

- Clicking on the Help icon on the left side
- Clicking on REPORT A PROBLEM and filling out the information.

Or for the District help desk, twenty-four hour/seven days a week (24/7), please contact the SBCCD Help Desk at <http://stac.sbccd.org> or call 1-(877) 241-1756

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CHEM 102-70 Hybrid				
<ul style="list-style-type: none"> All Mastering Chemistry (MC) assignments are due by 11:59 pm including Quizzes (Q) and Homework (HW). These are completed online, outside of class. See MC website or Canvas for due dates. All lab reports are completed outside of class and are due by 10:00 am on the due date. They are turned into the lab room in the bin. Be sure to staple pages together, we may be out of staples. All exams reviews are due by 10:00 am on the morning of the exam, they are turned into a separate bin from reports. Be sure to staple pages together, we may be out of staples. Late work is never accepted. If you are late to lab, you may not be permitted to complete the lab. 				
C H E M 1 0 2 -70 Laboratory and Exam Schedule FALL 2017				
Week	Date (Wed)	Exp. #	Topic	What's Due?
1	Aug 16		Introduction, Safety, Check-in	Explore Canvas and see what is posted for this course. Check-in sheet & Safety Contract
2	Aug 23	1	Melting Point: Single Compound & Mixed, Identification of Unknown Compound	Functional Groups Worksheet
3	Aug 30	2	Distillation: Single Compounds & Mixtures using Simple & Fractional Distillation	Exp 1 Report
4	Sept 6	3	Molecular Models: Alkane, Alkene, Alkyne & Cyclic Compounds Properties, Synthesis and Reactions	Exp 2 Report
5	Sept 13		Exam 1	Exp 3 Report & Exam 1 Review
6	Sept 20		Class Does not meet	Nothing
7	Sept 27	4	Synthesis and Purification: Electrophilic Aromatic Substitution, Nitration of a Meta Director	Nothing
8	Oct 4	5	Reactions and Properties of Alcohols and Phenols	Exp 4 Report
9	Oct 11		Exam 2	Exp 5 Report & Exam 2 Review
10	Oct 18	6	Chromatography: Partition and Adsorption	Nothing
11	Oct 25	9*	Synthesis of Soap, Properties of Soaps and Detergents * Yes out of order & we will not do exp. 7	Exp 6 Report
12	Nov 1		Exam 3	Exp 9 Report & Exam 3 Review
13	Nov 8	8	Reactions and Properties of Aldehydes and Ketones	Nothing
14	Nov 15		~ Help Day ~ 10:00 – 11:00am	Nothing
15	Nov 22		Exam 4	Exp 8 Report & Exam 4 Review
16	Nov 29	10	Isolation of Milk Protein & Identification of Amino Acids & Check-out	Exp 10 Report due at end of lab & Completed Check-out sheet
17	Dec 6		~ Help Day ~ 10:00 – 11:00am	Nothing
18	TBF: Final: Wednesday Dec 13 @ 10:00 am			Nothing

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To be Successful in This CHEM 102 Course ~ Students are expected to:

- ☐ **Read the syllabus.** Log into Canvas to see what is posted in for this course.
- ☐ **Check your CHC email OFTEN.** This is the primary way I get information to you outside of class and Canvas.
- ☐ **Make a calendar of assignments and due dates. Give yourself reminders and alerts.**
- ☐ **Keep track of assignments and your scores** on the Assignment Due Dates, Completed and Points List.
- ☐ **In Canvas:** Go to the Module for Each Exam tab and see what is posted, print out materials.

- ☐ **Prepare before attending the lecture:**
 - Preview all the Instructor lecture PowerPoint (PPT) slides to see what is material will be on the exam and to get an idea of how the material is presented.
 - Preview the Exam Review and worksheets to get an idea of what needs to be addressed.
 - View the videos on YouTube. Fill-in the Student Version (SV) of the PPT slides. (Write additional notes notes).
 - Log onto **Mastering Chemistry (MC):** Read chapters (if you have a hard copy of the text – READ it), go to the Study Area tab, try the practice quizzes. Work on problems within each chapter.
 - Complete the MC Quizzes and Homework on time. Check for due dates and time!

- ☐ **Get your CHEM 102 lecture notes out. Then,**
 - Fill-in the lecture notes: Find them in the Modules area for each Exam.
 - First fill in the notes using the slide presentation mode of PowerPoint (PPT).
 - After your notes are filled in, watch the YouTube Videos of the lecture. They are broken in multiple parts to make them more manageable. Follow along with your lecture notes, add any additional notes to make them more complete.
 - Rewrite your lecture notes.
 - View the lecture videos multiple times.

- ☐ **Additional Ideas:**
 - Compile information for each exam: Go through the PPT slides with the focus of just looking for Nomenclature, write notes, and make flashcards. Then another go through time with the focus of just looking for Reactions, write notes, and make flashcards.
 - Rewrite your notes, make worksheets, practice with flashcards
 - View the lecture videos multiple times.

- ☐ **Exam Reviews** - What can be included in your review:
 - Completed Exam Review questions.
 - Summary page of nomenclature and functional groups for each exam.
 - Summary page of reactions for each exam.
 - Complete any worksheets and/or reviews posted in Canvas.
 - Turn in all the above stapled together on time before the exam.

- ☐ **Attend class regularly,** and participate in the course assignments.
 - Excused absences must be true verifiable emergencies (Doctor's note), and only 1 emergency is allowed per semester. More than one emergency will need to be discussed with me and I will evaluate the individual situation and decide if an exception may be made. There are very few true emergencies. Sick friends, vacations, friends having babies, auto not starting; alarms not waking you, etc. are not emergencies.
 - Absences for an exam (excluding the final), will result in that exam being considered your lowest exam score to be dropped. You must take the final exam in order to pass the course; you cannot be excused from the final.
 - Unexcused absences from lab will result in no credit given for the experiment missed, and reports that were due will not be accepted, unless another student can turn it in for you on time.

- ☐ **Be on time to all classes, NO LATE work accepted.** If you are late,
 - You will not be able to take an exam or quiz that is being administered.
 - You will not be able to turn in reports, exam reviews or any assignments that were due.
 - If you are late to lab, then you will not be able to do the experiment.
 - You may not leave an experiment early, or leave for an extended period of time, you must complete the lab in order for the report to be graded.

- ☐ **Before you come to lab: Read the entire experiment** with an understanding of the experiment and what you need to do. **Read the entire experiment** with an understanding of the experiment and what you need to do **before you come to lab.** Be prepared to bring Lecture Notes and Experiments to every meeting and a calculator to lab.
Check to see what is posted in Canvas for the experiment.
 - For some experiments there may be documents to help you or videos for you to watch for techniques.
 - I will not tell you how to do the experiment step by step.
 - Prepare the prelab material before you come to lab; see lab section for details.

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GRADING:

Your final course grade is based on the cumulative points earned from examinations, laboratory, homework and quizzes. *You must have a passing grade in the laboratory in order to receive a passing grade for the course.*

	Points Possible
3 Exams @ 100 points each	300
Final Exam	200
Quizzes & Homework	40 - 140
Laboratory	180 - 200
Total	720 - 840

Course Grade based on:	
100 – 90 %	A
89 – 80 %	B
79 – 70 %	C
69 – 60 %	D
Below 60 %	F

HOMEWORK:

Lecture Text: Problems will be assigned from your textbook using the online Mastering Chemistry program that is included with your access code. Some of these online homework assignments and quizzes will be graded and you will earn a score, and others may be available for you to practice, without receiving a score. You need to do as many problems from each chapter as you see necessary to master the material. There are problems in the back of each chapter that do not require you to go online. You should work the problems for each chapter as the chapter is covered in lecture. Please note that the more problems you do, the easier the questions on the exam will seem.

For the semester, in Mastering Chemistry (MC), I have assignment approximately 135 reading quiz and homework questions. You may attempt each question up to five times. You can earn up to a maximum of 100 points to go towards your homework score. Sometimes it is difficult to input answers in the Mastering Chemistry program or for it to understand what you meant, and I know this, it is unfortunate part of online learning of OCHEM. That is why I have 135 attempts to earn 100 points. The maximum amount of points that you can apply from MC towards homework is 100, even if you earn more than that in MC. You can review your scores in MC in the Scores tab in MC.

Needless to say, the ability to do problems on exams will depend mostly upon having a thorough understanding of the material and problems as a result of dealing with them actively yourself, not as a passive spectator in the lecture or a group study session.

EXAMINATIONS:

- ☐ There will be four examinations and a *comprehensive* final exam during the semester. All exams must be taken on campus during the scheduled time, no exam will be given online. Exams will have a **time limit of 50 minutes**. **The lowest exam will be dropped (except the final exam)**. There will not be any make-ups allowed for any missed exams. If you miss an exam, that exam will be considered the lowest score. Academic dishonesty removes the benefit of a dropped exam.
- ☐ On examinations and the final, you will be responsible for anything covered in the reading assignments in the lecture notes, textbook, Mastering Chemistry assignments, anything discussed in lecture and/or videos, and anything covered in the laboratory portion of the course.
- ☐ The final exam is scheduled by the administration of the college and is not subject to change.
- ☐ Please arrange your end of the semester travel plans for **after** the final exam.
- ☐ ***You are required to take the Final to receive a passing grade.***

THE LABORATORY AND LABORATORY REPORT:

Some experiments may require a little more time than others, the time for lab to start may be earlier than the scheduled time. Be sure you are prepared for lab before **lab** starts, have reports ready to turn in and have that day's experiment read with an understanding of what you need to accomplish during lab. Each experiment done correctly and handed in on time will be graded on a 20-point basis. Lab reports are due before the next lab or the exam starts. ***Late reports will not be accepted for any reason.*** If you know you cannot attend, then you may have a student turn in the report in on time for you. See lab syllabus for more details.

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The Lab Report must include the following:

- 1) Report sheet(s) from the lab text or handout. This must include data and answered questions.
- 2) Purpose / Conclusion / Sources of error page, it may be hand written or typed. Attach (staple) this page to the back of the report sheet with the following information, clearly label each section.
 - a) **Purpose:** A brief introduction to the experiment. This should include the objective or purpose of the experiment and a summary of what is expected in the experiment. Approximately one paragraph.
 - b) **Conclusion:** This should include a summary of your observations and repeat the results of your experiment.
 - c) **Sources of error:** Briefly describe the sources of error for the experiment. In this part I want you to think about the experiment any list anything that would have caused the experiment not to go 100% perfect.

COURSE OUTLINE: Upon successful completion of this course the student will be able to:

- A. Discuss the fundamental principles of organic chemistry including structure, physical properties, nomenclature, synthesis and reactions.
- B. Perform laboratory techniques and measurements including melting point and boiling point determination, distillation, separation, isolation, recrystallization, synthesis and reactions.
- C. Demonstrate knowledge of selected topics in biochemistry including molecular structure, nomenclature, synthesis and reactions.

STUDENT LEARNING OUTCOMES (SLOs):

Upon successful completion of Introduction to Organic Chemistry, students will acquire:

1. The ability to distinguish, construct and compare organic compounds utilizing structure, physical properties, nomenclature, synthesis and reactions.
2. Comprehension and use of laboratory skills in synthetic, quantitative and instrumental methods as scientific approaches to gathering and verifying knowledge.
3. Critical thinking in chemistry including interpretation, evaluation, explanation and critical inquiry; how to ask appropriate questions, gather relevant information efficiently and creatively, sort through this information, reason logically from this information and come to reliable and trustworthy conclusions.
4. The ability to collect, analyze, and articulate results clearly and effectively in speech and in writing in an acceptable style of presentation. The ability to follow directions given both in written and oral form.

ASSESSMENT OF SLOs:

Student assessment is evaluated by means of classroom participation, exams, quizzes, homework, laboratory reports, and a comprehensive final.

CLASSROOM CONDUCT: *All students need to turn off cell phone ringers while in class. No Texting in Lecture or Lab. No use of phones during an exam.*

ATTENDANCE: For this course is in the form of actively participating in the online assignments and the weekly face-to-face campus meetings. If the instructor deems the student is not actively participating in the course, the student may be dropped. If a student misses day one or misses 2 or more on campus meetings, the student may be

dropped. Arriving late or leaving early will count an absence. However, it is your responsibility to verify the drop should you stop attending, if you do not officially drop, you may receive an "F" for the course.

LATE WORK/MAKE-UP POLICY: All work must be turned in by their due dates for credit. NO late work will be accepted except under documented extreme emergency situations that are communicated to the instructor *prior* to the due date. You are responsible for starting your work early and completing them by their deadlines.

SUPPORT: Support is available from your instructor by email, online discussion board, office hours, & voice mail. If you need technical or Canvas assistance SBCCD provides twenty-four hour/seven days a week (24/7), please contact the SBCCD Help Desk at <http://stac.sbccd.org> or call 1-(877) 241-1756

Crafton Hills College complies with the Americans with Disabilities Act. If you need accommodations due to a documented disability, please contact Disabled Student Services (DSPS): [Website Link](#), Location on campus in CCR-101 [Campus Map](#), or phone: 909.389.3325, TTY Number: 909-794-4105, or Email: chc_dsps@craftonhills.edu

Requests for DSPS special arrangements for exams must be properly documented and submitted to the instructor 7 business days prior to the exam. Submitted documents are good for the rest of the semester; students must resubmit documentation each semester.

DROPPING THE COURSE:

If you should decide to drop the course during the semester, you contact the admissions and records office and officially drop. In addition, you must also contact the laboratory technician and arrange to;

- Check out of your laboratory drawer or you may be assessed a fine and a hold may be placed on your transcripts and registration until the fine has been paid.

*Any student who has 2 unexcused absences in CHEMISTRY **may** be dropped from the course, arriving late or leaving early will count an absence. However, it is your responsibility to verify the drop should you stop attending, if you do not officially drop, you may receive an "F" for the course.*

WHEN THERE ARE PROBLEMS:

When you are having difficulties with understanding the course work, see the instructor during office hours. Do this right away before you get behind. I want to talk to you if you need help. I will maintain office hours during which you can expect to find help for any problem related to Chemistry 102. IF YOU NEED HELP ON ANY ASPECT OF THE COURSE, DON'T PUT OFF GETTING HELP UNTIL IT IS TOO LATE - MAKE USE OF YOUR INSTRUCTOR.

Problems do arise - students and instructors become ill, or family problems occur, and so on. IF YOU HAVE AN INDIVIDUAL PROBLEM, LET THE ME KNOW ABOUT IT AS SOON AS POSSIBLE. Instructors in general are sympathetic about a problem that is reported; however, instructors are unlikely to be sympathetic about an excuse for something that happened three weeks previously.

Academic Dishonesty: If the instructor deems a student has shown any level of academic dishonesty in either lecture or lab, then the student is no longer eligible for any benefits such as, but not limited to: excused assignments for lecture or lab, excused missed exam or lab, or a dropped exam. The loss of benefits will be retroactive to the start of the semester. *Cheating forfeits all privileges.*

SOME ADVICE ON HOW TO SUCCEED IN CHEMISTRY:

My goal is that everyone in Chemistry 102 performs to the best of his or her ability. However, you should be aware that the primary responsibility for your performance is YOURS. "Chemistry is not a spectator sport." You need to be an active participant by attending all lectures and labs, taking notes, reading the applicable textbook chapters, working all homework problems in a timely fashion, and asking questions. A considerable amount of effort is made to provide you with the opportunity for individual attention, guidance and assistance. It is your responsibility to take advantage of these opportunities. *Furthermore, no one is going to nag you to work problems, prepare for laboratory, or study for exams.*

1. Ask questions if you do not understand the direction or main points in lecture. The odds are good that what you don't understand wasn't clear to at least half the other students, either. Thoughtful discussion in class of errors or original ideas is encouraged.

2. Practice working chemistry problems EVERY DAY. The only way to become familiar and comfortable with the concepts, language, and methods used in chemistry is to practice. Chemistry is similar to learning a foreign language.

You cannot become fluent unless you practice. A good method is to work 2-3 chemistry homework problems or suggested problems each day.

3. Read ahead before each lecture to gain a preliminary understanding of material coming up in the lecture; use the lecture to solidify your understanding, to clear up the things you were uncertain about, and to help you outline the most important things to know. Practice the material as it comes up in the lectures, using all the problems and exercises you need for thorough understanding.

4. A number of studies have shown that careful note-taking is a major key to understanding lecture material and doing well in college-level courses. Instructors tend to lecture on what they feel is most important and/or not covered well in the textbook. To have an adequate set of notes, it is probably sufficient to copy down everything written on the whiteboard or shown on transparencies. Needless to say, the material said (but not written on the

whiteboard) should also be understood. An excellent study habit involves rewriting your notes and outlining the chapters as soon after class as possible. Try it; it comes highly recommended.

5. It is often useful to work with other people, and there is no question that discussion is an excellent way to clarify material. However, if you work a problem with someone else, or if you just look at someone else's answer, don't fool yourself into thinking that you understand the subject or will be able to solve the next problem. My very strong advice in this context is the following: For every problem you work with someone else, work another similar problem on your own. Work problems with the goal of thoroughly understanding what is involved, not just to get an answer.

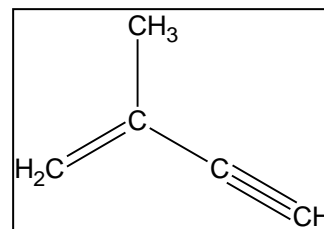
6. The major cause of difficulty for first year college students is the failure to budget time. Quality time is of the essence, long hours spinning your wheels is a very poor investment. Please allow us to put you on track by early attendance at office hours.

7. Do not cram for examinations. It is very difficult to cram for a chemistry exam and do well. In order to succeed in chemistry you must be adept in solving problems. The only way to become skilled in this area is to practice. One night of cramming will not make you a skilled problem solver. Only weeks of dedicated practice will allow you to achieve your goal.

This syllabus is subject to change at the discretion of the instructor. Material included is intended to provide an outline of the course and rules that the instructor will adhere to in evaluating the student's progress. However, this syllabus is not intended to be a legal contract. Questions regarding the syllabus are welcome any time.

CHEM 102 Exam 1 Review (Exam not limited to only information on this page). *This is your Homework: Write your work on a separate page, (keep this page) turn in your work before exam for credit.*

1. Complete a review of all reactions, and functional groups.
2. Draw and label the complete laboratory set-up for all experiments since the last exam.
3. State Markovnikov's Rule and give write an example reaction
4. Three test tubes contain organic solids labeled as X, Y, and Z, each melts at 129-130 °C. A 50-50 mixture of X and Z melts at 112-120 °C. A 50-50 mixture of X and Y melts at 129-130 °C. In what range would a 50-50 mixture of Y and Z melt? Are the solids X, Y or Z the same or different as each other?
5. Draw orbital picture and label bond types (σ and π) for a) ethane b) ethene c) ethyne
6. Draw and label the four carbocations possible in the order of decreasing stability. (Put the most stable first and the least stable last).
7. Label all carbons on the structure to the right with the hybridization (sp , sp^2 , sp^3) and the carbon type (1° , 2° , 3° , or 4°)
8. Draw the boat and chair conformations of cyclohexane and clearly label the hydrogen bonds on the chair as axial and equatorial.
9. Draw and label all five of the Newman projections for butane.
10. Draw and name all of the isomers for:
 - a. C_4H_{10}
 - b. C_5H_{12}
 - c. C_6H_{14}
11. Organic nomenclature: Prepare to provide IUPAC names and draw structures. Turn in a few examples.



CHEM 102 Exam 2 Review (Exam not limited to only information on this page).

This is your Homework: Write your work on a separate page, (keep this page) turn in your work before exam for credit.

1. Complete a review of all reactions, and functional groups.
2. Draw and label the complete laboratory set-up for all experiments since the last exam
3. Label the alcohols as 1°, 2°, or 3° (Hint: Draw them out for help.)

a. 2-butanol
b. 1-hexanol
c. cyclohexanol

d. phenol
e. 3-methyl-3-heptanol

4. Write the following reactions:

- a. Oxidation of 1-propanol
- b. Strong oxidation of 1-butanol
- c. Oxidation of 2-pentanol
- d. Oxidation of 2-methyl-2-butanol
- e. Dehydration of 2-methyl-2-butanol (Label major and minor products)
- f. Chlorination of benzene
- g. Nitration of benzene
- h. Sulfonation of benzene
- i. Synthesis of toluene from benzene

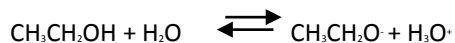
5. List the meta directors

6. List the ortho-para directors

7. Devise a synthesis for the following starting from benzene:

a. o-nitrotoluene b. m-nitrotoluene c. p-bromonitrobenzene d. m-bromonitrobenzene

8. Write the equilibrium expression (K_a) for the dissociation reaction



9. Draw the general formula for;

a. aldehyde b. ketone c. carboxylic acid

10. Draw and name all of the alcohol isomers for

a. $\text{C}_3\text{H}_7\text{OH}$ b. $\text{C}_4\text{H}_9\text{OH}$ c. $\text{C}_5\text{H}_{11}\text{OH}$

11. Organic nomenclature: Prepare to provide IUPAC names and draw structures. Turn in a few examples.

CHEM 102 Exam 3 Review (Exam not limited to only information on this page).

This is your Homework: Write your work on a separate page, (keep this page) turn in your work before exam for credit.

1. Complete a review of all reactions, and functional groups.
2. Draw and label the complete laboratory set-up for all experiments since the last exam. **Notes:** Microscale column chromatography (Show packed column by itself and also in the flask) Which color came out first? Second? Paper chromatography Which color traveled the most? The least?
3. Classify the amines are either 1°, 2°, or 3° (Hint: Draw structures)

dimethylamine

pyridine

pyrrole

piperidine

triethylamine

isopropylamine

N,N-diethylmethanamine

phenylamine

4. Write the dissociation reaction and equilibrium (K_b) expression for
 - a. methanamine and water
 - b. ethylamine and water
5. Show the hydrogen bonding in amines with a drawing of the following. Be sure to include lone pairs and indicate polarity. (Use R to represent primary features)
 - a. two primary amines
 - b. two secondary amines
 - c. two tertiary amines

6. Draw the general formula for the following (You may use the symbol R)

ether

sulfide

thiol

1° amine

2° amine

3° amine

quaternary ammonium salt

7. Write the Williamson ether synthesis of

- a. 1-methoxybutane
- b. 2-methoxybutane
- c. ethoxycyclohexane

8. Organic nomenclature: Prepare to provide IUPAC names and draw structures. Turn in a few examples.

CHEM 102 Exam 4 Review (Exam not limited to only information on this page).

This is your Homework: Write your work on a separate page, (keep this page) turn in your work before exam for credit.

1. Complete a review of all reactions, and functional groups.
2. Draw and label the complete laboratory set-up for all experiments since the last exam.
3. Show the three step reaction for the preparation of an acid anhydride.
4. Show the hydrogen bonding in a dimer of
 - a. ethanoic acid
 - b. propanoic acid
 - c. butanoic acid
5. Draw the structures and indicate the hybridization of the carbon and oxygen atoms in
 - a. ethanal
 - b. dimethyl ketone
 - c. pentanoic acid
6. Explain the effect (if any) of hydrogen bonding on boiling points for aldehydes, ketones and carboxylic acids.
7. What is the best method to prepare an aldehyde? Give an example reaction.
8. Write the general oxidation reaction for aldehydes and ketones, and then write an example reaction.
9. Write the dissociation reaction and equilibrium (K_A) expression for the following;
 - a. ethanoic acid
 - b. propanoic acid
 - c. butanoic acid
10. Look at one of the equilibrium expressions you wrote for the previous question. Explain the relationship of K_A in terms of when it is a stronger or weaker acid. For example is the acid weaker or stronger as K_A increases.
11. Show the preparation of the Grignard reagent and then the synthesis reaction for
 - a. propanoic acid
 - b. butanoic acid.
12. Write the general reaction for Tollens Reagent. What is Tollens Reagent a qualitative test for? What is the evidence of reaction observed when the test is positive? Write the reaction of the following with Tollens Reagent;
 - a. ethanal
 - b. propanal
 - c. acetone
 - d. diethyl ketone
13. Write the general reaction for Benedicts Reagent. What is Benedicts Reagent a qualitative test for? What is the evidence of reaction observed when the test is positive?
14. Organic nomenclature: Prepare to provide IUPAC names and draw structures. Turn in a few examples.

CHEM 102 Final Exam Review (Exam not limited to only information on this page).
You will **not** turn this in as homework, this is for your benefit only.

1. Nomenclature: alkanes, alkenes, alcohols, amines, carboxylic acids, aldehydes, ketones, ethers.
2. Identify and know structure for functional groups: alkane, alkene, alkyne, benzene, aromatic, alcohol, phenol, ether, thiol, sulfide, amine, aldehyde, ketone, carboxylic acid, acid halide, acid anhydride, ester, amide, and nitrile.
3. Identify and know structure of amino acids. Name and location of the 2 functional groups that make them up. Determine number of peptides (N!) possible for a specific number of amino acids.
4. Classify or identify; carbons, alcohols, amines as 1°, 2°, 3°, 4°.
5. Understand and predict products of oxidation reactions of alcohols, aldehydes.
6. List names of addition reactions. (E.g. bromination, etc...).
7. Predict the product formed in an addition reaction where Markovnikov's rule applies.
8. Dissociation reaction of a carboxylic acid.
9. Molecular formula, structural formula, condensed structural formula.
10. Understand the term chiral; identify what is chiral or achiral.
11. State the cause of cis-trans isomerism.
12. Describe what makes up the 1°, 2°, 3°, 4° structure of proteins, and what happens to them if the protein is denatured. Identify the building blocks of proteins. List the two names for the bond that holds amino acids together in a protein.
13. Write the complete reaction of amine and acid
14. Identify a Fischer esterification reaction and predict products.
15. Describe Tollens reagent reactions.
16. Define enantiomers & diastereomers.
17. Predict the product formed in a dehydration reaction where Zaitsev's rule applies.
18. Understand hydrogen bonding and how it affects properties of molecules; know which organic compounds are likely to form hydrogen bonding.
19. Describe the relationship of the isoelectric point and pH when the amino acid is cationic, anionic, or neutral.