

**QUANTITATIVE CHEMICAL ANALYSIS (CHE310) 4 CREDIT HOURS
SYLLABUS**

Instructor: Willa M. Williams, Ph.D. **Class Meeting Location/Time:** Hederman 415 **Lab:** Hederman 415
Office Location: Hederman 411 **E-mail:** willia77@mc.edu **Phone:** 925-3425
Office Hours: 2:00 pm -5:00 pm (MW); 9:30 am -11:30 (TTh)

Required Materials: "Quantitative Analysis" 8/e Daniel C. Harris, Freeman & Co., New York
(ISBN: 978-1-4292-5436-6)
Course Companion Website: <http://bcs.whfreeman.com/qca8e>.

Lab Manual: selected experiments from course companion website

Laboratory Supplies:

Bound Notebook*(**not spiral**), use one with grids instead of lined pages for graphs.
*A separate handout will be given regarding notebooks and lab reports.
Black Sharpie for labeling glassware
Calculator (TI-89 style or a simpler model)
Scotch Tape for pasting graphs in notebook
2-3 rolls of paper towels
ANSI safety glasses or goggles
Ballpoint pen-(no liquid, rolling ball or gel pens please)
3 Ring Binder for laboratory handouts

PREREQUISITES

Prerequisites: CH 121, 122, or instructor's consent

***Disclaimer:** Although I expect to conduct the course according to the following, I reserve the right to make modifications if circumstances dictate.*

COURSE DESCRIPTION

This laboratory intensive course presents the fundamental methods of exact chemical analysis and includes an introduction to the use of chemical instrumentation. (Lecture meets two hours per week. Laboratory meets six hours per week.)

Rationale for course: Quantitative chemical analysis is one of the classic categories in chemistry. It deals with finding out the composition of matter. The branch of science called analytical chemistry involves techniques developed in the 19th century as well as techniques still being developed today. Your lab experience will include measurements made by classical gravimetric and titrimetric methods as well as more modern techniques involving spectrophotometry, electrochemistry, and chromatography.

To fully understand the successes and limitations of chemical analysis, one must have a firm grip on kinetic and equilibrium processes of samples being analyzed. Mostly in elementary quantitative analysis that means behavior in aqueous solution. We will spend at least half the course talking about chemical equilibria in aqueous solution.

Notice: **No cell phones should be powered on while in class.** Use of cell phone calculator function is not allowed, rather each student should acquire a scientific calculator which is able to handle exponential and log functions. Graphing calculators model TI89 or lower may be used. ***The memory functions of such calculators should not be used to store formulas, equations, or any information written on paper would constitute cheating.***

Attendance: Your attendance at all class meetings is expected. Please refer to the *2010-2011 Mississippi College Undergraduate Bulletin*. An accumulation of **8** absences results in an automatic **F** in this course. Attendance will be checked each day. Absences are recorded on the grade report that is submitted to the registrar's office by instructor.

**QUANTITATIVE CHEMICAL ANALYSIS (CHE310) 4 CREDIT HOURS
SYLLABUS**

If a regular class meeting is missed, it is the student's responsibility to obtain any assignments or instructions that were given by the instructor. Missing a class is **not** an excuse for not preparing for the next class meeting or not having an assignment ready on time. Don't miss a scheduled test! A grade of zero (0) will be given for a missed test except in the case of EXTREME emergency. A make-up test, if allowed, must be made up prior to the graded tests being returned to the class. **NO MAKE-UP TESTS WILL BE GIVEN AFTER THE TESTS HAVE BEEN RETURNED.** If the student cannot return to class until after the tests have been returned, the grade on the final exam may be substituted for the missing test grade. *The last day to drop this class is **Friday, October 28.***

METHODS OF INSTRUCTION: Class will consist primarily of lecture and laboratory work. Unlike most science classes, the lecture for quantitative analysis exist as a reinforcement to the laboratory rather the vice versa. Certain skills will be developed and practiced in the Hannah Computer Laboratory (H409) or on your personal computer using the online course website.

Methods of Evaluating Student Progress: Usually three tests will be given during the semester, each with a value of 100 points. Exams contain essay questions that require the student to express thoughts in a well organized manner consistent with accepted writing form. The final exam is comprehensive and is worth 200 points. The grades from the laboratory portion of the course are combined with the points earned from the lecture portion in determining the final course grade. Each chapter will have homework problems assigned from the text as well as quizzes for each chapter on the online course website. Occasionally there may be opportunities for extra credit points by attending a special seminar or a visiting lecture. The grading scale is based on the percentage of total points earned in the course.

Exams (3):	300 pts	(15September2011; 13October2011; 10November2010)
Final:	200 pts	(December 13 8:00 AM)
Laboratory:	250 pts	(due at end of each lab week)
quizzes/activities/prelabs	150 pts	
Lab Notebook:	<u>100 pts</u>	(due last weekday of each month)
Total:	1000 pts	

The grading scale for this course is based on the percentage of total points earned in the course and is as follows:

≥90-100%	A
80-89.9%	B
65-79.9%	C
50-64.9%	D
Below 50%	F

Tuition Refund: The last day to drop a class with 100% refund of tuition is September 1, 2010.

Special Accommodations: In order for a student to receive disability accommodations under Section 504 of the Americans with Disabilities Act, he or she must schedule an individual meeting with the Director of Student Counseling Services **immediately upon recognition of their disability** (if their disability is known they must come in before the semester begins or make an appointment **immediately** upon receipt of their syllabi for the new semester). The student must bring with them written documentation from a medical physician and/or licensed clinician that verifies their disability. If the student has received prior accommodations, they must bring written documentation of those accommodations (example Individualized Education Plan from the school system). Documentation must be current (**within 3 years**). The student must meet with SCS **face-to face** and also attend two (2) additional follow up meetings (one mid semester before or after midterm examinations and the last one at the end of the semester). Please note that the student may also schedule additional meetings as needed for support through SCS as they work with their professor throughout the semester. Note: Students must come in **each semester** to complete their Individualized Accommodation Plan (example: MC student completes fall semester IAP

QUANTITATIVE CHEMICAL ANALYSIS (CHE310) 4 CREDIT HOURS SYLLABUS

plan and even if student is a continuing student for the spring semester they must come in again to complete their spring semester IAP plan).

Student Counseling Services is located in Alumni Hall Room #4 or they may be contacted via email at christia@mc.edu or rward@mc.edu. You may also reach them by phone at **601-925-7790**.

Academic Integrity: University policy 2.19 clearly defines the behavior that the college considers academically dishonest (also see *2010-2011 Mississippi College Undergraduate Bulletin*), students are expected to conduct themselves as professionals. If dishonest behavior is detected, it will be reported to the appropriate administrator and the student will receive no credit for the work.

Topics Covered

- Ch. 0: Introduction
- Ch. 1: Measurements
- Ch. 2: Tools of the Trade
- Ch. 3: Experimental Error
- Ch. 26: Gravimetric Analysis
- Ch. 4: Statistics
- Ch. 5: Quality Assurance and Calibration Methods
- Ch. 6: Chemical Equilibrium
- Ch. 10: Acid-Base Titrations
- Ch. 7: Activity and Systematic Treatment of Equilibrium
- Ch. 8: Monoprotic Acids - Base Equilibria
- Ch. 9: Polyprotic Acids - Base Equilibria
- Ch. 11: EDTA Titrations
- Ch. 13: Fundamentals of Electrochemistry
- Ch. 15: Redox Titrations
- Ch. 17: Fundamentals of Spectrophotometry
- Ch. 22: Introduction to Analytical Separations

GENERAL COURSE GOALS

The following general course goals are established to meet the purposes of CH 310:

1. Provide model exercises and demonstrations that enhance the understanding of natural principles and illustrate safe laboratory techniques and practices.
2. Raise awareness of the underlying logic of the presentations and the use of inductive and deductive reasoning.

**QUANTITATIVE CHEMICAL ANALYSIS (CHE310) 4 CREDIT HOURS
SYLLABUS**

3. Develop factual report writing skills.
4. Increase scientific vocabulary and facility with common pronunciation related to the use of that vocabulary.
5. Cultivate thoughtful, probing inquiry and discussion.
6. Clarify the significance of replicated, standards or controls, measurements, data reduction and presentation analysis, and accuracy in reporting of the scientific activities.

STUDENT PERFORMANCE OF OBJECTIVES

Upon completion of Quantitative Analysis students will be able to:

1. Demonstrate and model the use of standards for controls, measurements, data reduction and presentation, analysis, and accuracy in reporting of the scientific activities.
2. Model and demonstrate the scientific method as a process in hypothesis development and testing.
3. Acquire an understanding of the proper treatment of chemical equilibria (especially acid - base equilibria) and coupled reactions
4. Understand basic electrochemistry and electroanalytical techniques.

Tools for Success:

1. Attend class!!
2. Keep up with material. Read relevant chapters before lecture and formulate questions if a concept is unclear.
3. Dedicate appropriate study time. In Chemistry, you should consider spending three (3) hours studying outside of class for every one (1) hour of lecture.
4. Review your lecture notes after every class and seek to clarify any points which are unclear.
5. Work all of the suggested homework problems. Do not look up the answer until you have given your best effort to solve the problem on your own.
6. Don't procrastinate. These concepts take time and practice to sink in, so do not leave studying until the night before an exam.
7. Form a study group. Meet regularly to solve problems together and obtain help with difficult concepts. Collect contact info for each of your study group members.

**QUANTITATIVE CHEMICAL ANALYSIS (CHE310) 4 CREDIT HOURS
SYLLABUS**

Quantitative Analysis Laboratory Grade

Quantitative or “Quant” Lab is a course in which a high emphasis is placed on the principles of statistics, equilibrium thermodynamics, solution activity and instrumentation. As such, the laboratory is calculation intensive and requires that the student is quite careful in all lab procedures. Toward this end, the student must maintain a current status in terms of reading the lecture material and other supplements. In this regard, the lecture supplements the laboratory rather than the laboratory supplementing the lecture as is the case in many other scientific laboratories. *This course requires students to develop independence so that the burden of planning the experiments ultimately rest on their shoulders. Step by step guides will not be provided.* Help is, however, always available from the instructor or the lab assistants.

Grades will be assigned on the basis of the **four general categories. Unknown determinations, lab reports, lab notebook and final exam test questions.**

Unknowns

Most laboratory experiments will have an unknown determined that is equal to one 100 point lecture exam. In general, you will practice on known standard samples first to master the methodology. Then at an appropriate time **an unknown sample** will be provided to the student for analysis. The following **grading scale applies:**

A = 0.00 to 0.55 % deviation from actual value.

B = 0.06 to 0.95 % deviation from actual value.

C = 0.96 to 1.55 % deviation from actual value.

D = 1.56 to 1.95 % deviation from actual value.

F = \geq 1.96 % deviation from actual value.

Students who score a D or F on a lab will have the opportunity to repeat the experiment during the last two weeks of lab.

General notes on Lab Notebooks (A separate guide is posted on instructor website)

1. At the beginning of a set of calculations, list what they are. Do not have pages of calculations without explanations.
2. If deviating from the handout's procedure, explain why you have done so. Do not deviate without explanation.
3. Always, always, ALWAYS use a pen with writing in a lab. Do not use a pencil, EVER.
4. Mistake's happen. Cross them off with a ~~single line~~. Do not use a swirly or use white-out in your notebook.
5. Excel makes up a lot of insignificant figures. Do not report insignificant figures!
6. The TA who is grading your results is not psychic. List your unknown prominently in your notebook and in your report.
7. Always keep notes SOLELY in your lab notebook. Do not write on a scrap of paper with the intention of transferring it neater later. This is an accurate representation of what you do. We expect to see cross-outs and spills!

**QUANTITATIVE CHEMICAL ANALYSIS (CHE310) 4 CREDIT HOURS
SYLLABUS**

8. Tape Excel spreadsheets into your notebook. Do not shove them in haphazardly. Trim the edges of the paper so that the sheets fit into the book. It is okay to leave room for graphs by skipping pages for short-term purposes.
8. Set up your notebook before coming to lab. You will come to recitation with questions and be prepared. This will help you get started with the lab faster and get done faster.

Lab Reports

Formal Laboratory reports will be written for most experiments unless noted by the instructor. Lab reports should include any relevant graphs, copies of notebook pages, along with summaries of the numerical results and statistics in both table and paragraph format. The unknown results (raw data from replicate measurements along with means \pm standard deviations when appropriate) shall be turned in on a separate sheet of paper along with the **NUMBER** of the unknown clearly indicated.

Lab Make-up: You will have the opportunity to re-do or make-up any lab during the last week of lab. The grade for the make-up lab would replace your original grade. You may submit one free re-calculation of lab results if you made a math error or calculation mistake. You must state the source of your mistake and what corrections you made. You may submit as many recalculation of lab results as needed, but all other re-calculation submissions will incur a 15% penalty to your lab grade. **A separate handout will be given to provide further details regarding lab reports.**

Tentative Schedule of Experiments

Unit A. Analytical Balance and Volumetric Glassware

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|--------|----------------------|---|
| Week 1 | Lab drawer check-in. | Lab 1: Analytical Balance |
| Week 2 | | Lab 2: Calibration of Analytical Glassware |

Unit B. Gravimetry

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|--------|--|---|
| Week 3 | | Lab 3: Gravimetric Determination of Calcium as $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ |
|--------|--|---|

Unit C. Statistics

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|--------|--|--|
| Week 4 | | Lab 4: Penny Statistics |
| Week 5 | | Lab 5: Statistical Evaluation of Acid-Base Indicators |

Unit D. Titrimetry

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|---------|--|---|
| Week 6 | | Lab 6: Preparing Standard Acid and Base |
| Week 7 | | Lab 7: Using a pH Electrode for an Acid-Base Titration |
| Week 8 | | Lab 8: Analysis of Carbonate and Bicarbonate Mixture |
| Week 9 | | Lab 9: Analysis of an Acid-Base Titration Curve: The Gran Plot |
| Week 10 | | Lab 10: Fitting a titration curve with Excel Solver |

**QUANTITATIVE CHEMICAL ANALYSIS (CHE310) 4 CREDIT HOURS
SYLLABUS**

Safety Rules

Please note: your laboratory instructor will reduce your grade or ask you to leave the lab if the safety rules are not followed!

1. NO food or drink in the lab, to avoid possible contamination.
2. Keep your hands away from your face, while working.
3. Wash your hands as often as possible, especially before leaving the lab.
4. Keep your workstation neat and clean.
5. Be well prepared before you come to the lab.
6. Know what to do in case of emergency.

Dress Code

If you come to the lab dressed inappropriately you will be asked to leave and you will receive a grade of "0" for the day's work.

1. **Wear splash-proof goggles or safety glasses at all times.** State and Federal law require the use of safety eyewear by anyone working in a chemical laboratory. The Department has approved splash-proof goggles or safety glasses with side shield for this purpose. Both types are available for sale in the MC Bookstore.
2. **Tie back long hair.** Long hair can accidentally fall into flames or chemicals. Many hair sprays, gels, mousses, etc. are flammable! Think about this! Loose, long hair can also block your vision, which can lead to accidents.
3. **Do not wear clothing which is loose enough to knock over containers on the work bench or drag or dip into flames or chemicals.**
4. **Wear clothing (shirt, blouse, or dress) which covers and protects your chest, belly, sides, back, shoulders and upper arms.** No cutouts or cutoffs, tank tops, tube tops, muscle shirts, etc. No peek-a-boo belly buttons either! The skin of your torso must not be exposed at any time in the lab. **STRICTLY ENFORCED!**
5. **Wear clothing (pants, very long skirt or very long dress) which covers and protects your body from the waist all the way down to and including your ankles.** No shorts are allowed. No short or mid-length skirts are allowed.
6. **Wear shoes which cover and protect your feet completely.** No sandals, flip-flops, open-toed shoes, or shoes with open sides or heels. And no slippers - the top of your foot must be covered!

**QUANTITATIVE CHEMICAL ANALYSIS (CHE310) 4 CREDIT HOURS
SYLLABUS**

Dress Recommendations

1. **Wear comfortable shoes.** Three hours of walking and standing on a hard tile floor can leave your feet very tired and sore if you wear uncomfortable shoes.
2. **Wear socks.** They offer added padding for your feet, and extra protection to your ankles.
3. **Wear clothing which "breathes."** The lab can get very warm. Wear cotton or another natural fiber to keep from overheating yourself in the lab.
4. **Wear clothing which you don't care too much about.** Tiny splatters or droplets of chemical are very likely to get on your clothing. You might not even know that the droplets are there. But the chemical can stain your clothes or weaken the fibers of the clothing so that the next time you do the laundry your clothes will come out of the dryer with little, fuzzy holes in them.
5. **Come prepared to change clothes.** If you do not want to spend the entire day dressed in your lab clothes, then put your lab clothes in your book bag. Before lab class begins, you can go to a nearby rest room and change from your regular clothes to your lab clothes. It is also a good idea to have some spare clothes in case of an emergency.
6. **Do not wear valuable jewelry while working in the lab.** Chemicals which are harmless to your body may be capable of damaging jewelry. Take your jewelry off and store it in your purse or book bag before beginning any experiment.

Safety Equipment and How to Use It

1. **First Aid kit.** One first aid kit is located in the chemistry office. It contains gauze squares, small, adhesive bandages and antibiotic ointment. If any injury occurs which cannot be handled with these supplies, then the student can be escorted to the Healthplex to receive treatment from the health care professionals there, or can wait in the lab for an Emergency Medical Services if the injury is severe.

Note: If you need a demonstration of the use of adhesive bandage and ointment, please see the laboratory coordinator or your instructor for individual instruction.

2. **Broom and Dust Pan.** In the Chemistry lab we use a lot of glassware. Glassware usually winds up getting broken some time during the semester. When that happens, it is unsafe to pick up the broken glass with your hands. Instead, you should use a broom and dust pan to collect the broken glass. The broken glass should then be disposed of in the specially marked container provided (White cardboard box with blue lettering). There is a little broom for sweeping the bench top, and a big broom for sweeping the floor. **Do not place paper or anything other than glass into these containers!**
3. **Fume Hoods.** The fume hoods are large cabinets which have sliding glass doors in front. Fume hoods are used to protect you from harmful fumes, gases and odors. The fume hood has an air duct in its ceiling which is attached to a powerful fan. When the fan is turned on, the air in the fume hood is pulled up through the duct, carrying away any harmful fumes or smoke. Any time your experiment will produce harmful or bad-smelling gases or smoke, you will perform the experiment in the fume hood. Our fume hoods are on at all times, and they can only be turned off by authorized personnel.

**QUANTITATIVE CHEMICAL ANALYSIS (CHE310) 4 CREDIT HOURS
SYLLABUS**

4. **Sink.** While the sink is used for cleaning glassware and many other tasks, it is also a part of our safety equipment. If you happen to get chemicals onto your hands or forearms, you must move quickly to the sink to rinse the chemicals off. The treatment for any chemicals which get on the body is to rinse the affected body area for 15 minutes under cold running water (or as long as you can stand it).

When you are in the lab, if you notice that you have a mysterious itch on your arm which just won't go away, assume that it is a chemical on your skin and wash with soap and plenty of water.

5. **Safety showers and eye wash stations.** Safety showers and eye wash stations are located in each laboratory. When you are in the lab, make sure you locate the safety showers and eye wash stations and look very carefully at them. You should know where they are and how they operate *before* an accident happens.

The treatment for any chemicals which get on the body is to rinse the affected body area for 15 minutes under cold running water (or as long as you can stand it).

If chemicals are splashed into your face they should not reach your eyes because you will be wearing safety goggles. If this sort of accident happens, *leave your goggles on* while you go to the eye-wash station located at the rear of the laboratory near the board. There you should wash your face with the goggles still on until you are reasonably sure most of the chemical is gone from your face. Then you should remove your goggles and wash again.

If chemicals get into your eyes, you should call out for help. If you cannot see, someone will guide you to the eye wash station, where you should wash out your eyes thoroughly. You should blink continuously and rapidly while washing your eyes to aid the flushing action of the water.

If chemicals get onto your body, you should quickly remove any contaminated clothing and rinse yourself off in a safety shower.

6. **Fire extinguishers.** Fire extinguishers are in each laboratory. While you are in the laboratory, please look carefully at the fire extinguishers. Notice how they are attached to the wall, and what you would have to do to get them off of the wall. Read the instructions on the side of the fire extinguisher so you will be familiar with their use. If you ever need to use a fire extinguisher, remember the following (A) pull the pin, (B) aim to the side at first, (C) depress the handle, (D) sweep the spray from side to side across the BASE of the fire (where the fire meets the fuel), not just at the flames! When the fire is out, clean up the area!

Note: Never spray a person with a fire extinguisher. The chemicals in the fire extinguisher can be harmful.

7. **Fire alarm: If a fire alarm sounds you must evacuate the building!** There are alarm switches in the laboratory. It is unlikely that you will need to use them, since the laboratories are all equipped with several smoke detectors. But you should locate them and look at them so you know how they work.

Note: We will prosecute for intentional false alarms!

8. **Gas shutoff valve.** Each lab has a master valve which shuts off the gas supply to the entire lab. If you cannot locate this valve, ask your instructor to point it out to you. This valve is especially useful in case of a

**QUANTITATIVE CHEMICAL ANALYSIS (CHE310) 4 CREDIT HOURS
SYLLABUS**

fire in the lab. In case of a fire, students as well as instructors are authorized to shut off the room's gas supply.

9. **Student Health Services.** The Healthplex nurse practitioner can provide treatment for any minor injuries or illnesses. There are also trained medical personnel there whose advice may be useful. Whenever a student needs health services, the student must be but because the class must be supervised, the instructor will probably not be able to escort you personally. Another student or a teaching assistant will be assigned as escort.

What to Do in Case of an Accident

Always tell your instructor about all accidents immediately!!!

1. **Broken glass.** Do not pick up broken glass with your fingers! Get a broom and dust pan. Sweep the broken glass into the dust pan and dump it into the specially marked containers provided in each lab.
2. **Small chemical spill.** Wipe up liquid spills with paper towels and dispose of them as your instructor suggests. Solids should be dissolved in water, if possible, and wiped up. Otherwise, sweep them up with a broom and a dust pan and dispose of them as your instructor suggests. In all cases, after the chemical spill has been wiped up, rinse the area with water to make sure that all residual chemicals have been removed.
3. **Large chemical spill.** Move away from the area of the spill. Warn the people around you LOUDLY. Call your instructor! Let the expert handle the clean-up!
4. **Chemical splash in your face, goggles on.** If the goggles have protected your eyes, DON'T TAKE YOUR GOGGLES OFF! Yell for help. Go to the eye wash station and rinse your face quickly with the goggles still on. Then remove the goggles and rinse your face again.
5. **Chemical splash or broken glass in your face, goggles off.** If this sort of accident happens, you may not be able to see well enough to go to the eye wash station on your own. YELL LOUDLY FOR HELP and cooperate with anyone who comes to your aid.
6. **Large splash of dangerous chemical on your clothing and/or body.** Quickly follow this procedure while continuously YELLING FOR HELP:
 - A. **Move away from the area where the spill occurred (you don't want to get more chemical on you).**
 - B. **CALL LOUDLY FOR HELP and to warn others to stay away from the spill!**
 - C. **Remove any contaminated clothing.**
 - D. **Use the safety shower. (The treatment for chemical exposure is 15 minutes under cold running water, or as long as you can stand it.)**
7. **Small, confined fire.** If you have a small fire in a container, (for instance, a small beaker full of alcohol has caught fire) find something you can use as a lid for the container. When the container is covered, the fire will quickly burn itself out. Call the instructor for help.

**QUANTITATIVE CHEMICAL ANALYSIS (CHE310) 4 CREDIT HOURS
SYLLABUS**

8. **Small, open fire.** If you have a small fire which is not in a container, move away from the fire and SHOUT FOR HELP! You can use a fire extinguisher to put the fire out. If you ever need to use a fire extinguisher, remember the following (A) pull the pin, (B) aim to the side at first, (C) depress the handle, (D) sweep the spray from side to side across the BASE of the fire (where the fire meets the fuel), not just at the flames! When the fire is out, clean up the area!
9. **Large fire.** SHOUT FOR HELP and leave the area immediately! The fire alarm will probably sound. When it does, evacuate the building and TELL EVERYONE YOU CAN, where the fire is.
10. **Your clothing on fire.** Don't run! It will only fan the flames and make the fire worse! Instead, you should STOP moving, DROP to the ground (lie down!), and ROLL on the ground to squash out the flames! YELL continuously!

Note: If you want to help a person who is in this sort of trouble, don't use a fire extinguisher! You must never use a fire extinguisher on a human being. The chemicals in the extinguisher can be harmful!

11. **Fire Alarm If a fire alarm sounds you must evacuate the building immediately!**
To evacuate properly, you should quickly and calmly do the following:

A. **Turn off all flames and unplug any hot plates or other electric equipment you are using.**

B. **Get your stuff.** Take your book bag, purse, car keys, etc. with you. We never know whether the evacuation will last for 5 minutes or 5 hours. You don't want to become stranded on campus!

C. **Walk calmly out the door, down the hall, down the stairs (elevators should not be used during an emergency unless you are handicapped), out the door and away from the building.**

Your instructor should escort the class out of the building. Try to stay together as a class, and stay near to your instructor. If your class is allowed back into the building, you should finish your experiment, or at least clean up what you have left on the work bench. If the evacuation lasts beyond the end of the class period, then you are free to go.

What to Do in Case of an Injury or Illness

1. **Small cut.** Tell your instructor, and let your instructor look at the injury. Wash the injury thoroughly with water. If the injury is minor, you may use the first aid kit in the laboratory. (The first aid kit contains triple antibiotic ointment and adhesive bandages.) If your injury still hurts so badly that you can't finish the experiment, then you may be escorted to the Student Health Services office so the cut can be treated.
2. **Large cut.** Tell your instructor, and let your instructor look at the injury. To stop or slow down bleeding, apply pressure to the wound. If the wound is very large or there is glass or other foreign matter in the wound, then apply pressure around the arm or leg (between the body's torso and the injury) to slow the bleeding. In all cases, a large cut must be attended to by medical professionals! If you can walk, you may be escorted to the Student Health Services office or you may wait while an Emergency Medical Service (EMS) is called.

**QUANTITATIVE CHEMICAL ANALYSIS (CHE310) 4 CREDIT HOURS
SYLLABUS**

3. **Small burn.** Tell your instructor, and let your instructor look at the injury. Chemical burns and heat burns should both be treated with lots of cold running water. *Never put anything but cold water on a burn!* Doctors often have to remove ointments because they retard healing! After this treatment, if the burn still hurts badly enough that you cannot complete the experiment then you will be escorted to the Student Health Services office so the burn can be treated.
4. **Large burn.** In all cases, a large burn must be attended to by medical professionals! Tell your instructor, and let your instructor look at the injury. Then you may be escorted to the Student Health Services office or you may wait while an Emergency Medical Service (EMS) team from the Fire Department is called.
5. **Fainting.** In all cases, an Emergency Medical Services team will be called! If you feel like you might faint, please ask for an escort to the Student Health Services office before it is too late. You can usually lie down there, and you may avoid the expense of calling for emergency help.
6. **Breathing difficulties.** In all cases, the student will be escorted to the Student Health Services office *if the student so chooses*. Otherwise an Emergency Medical Service (EMS) team *will* be called!

**QUANTITATIVE CHEMICAL ANALYSIS (CHE310) 4 CREDIT HOURS
SYLLABUS**

B) chemicals have splashed on your face.

C) the fire alarm sounds.

D) your lab manual has caught on fire.

E) your shirt has caught on fire.

F) chemicals have spilled on your pants.