September-December 2005

CHEMISTRY 103

Lecture Section 1
MWF 11:00 A.M. Room 1351 Chemistry
www.scifun.org

UNIVERSITY OF WISCONSIN MADISON

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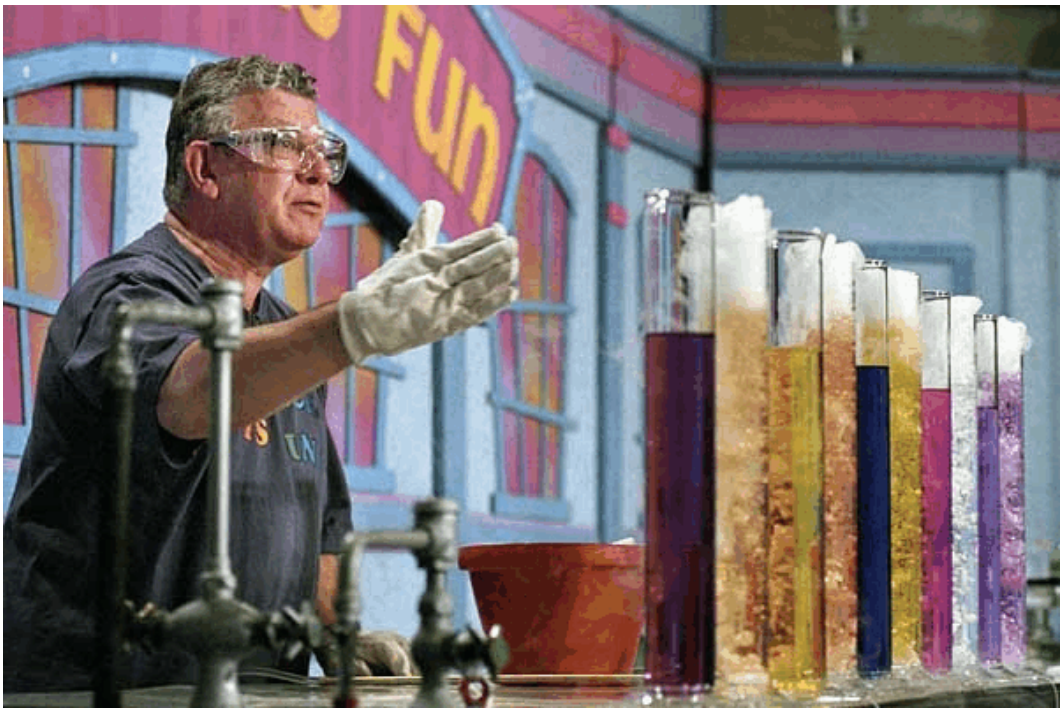
1970-2005

General Chemistry:	4 credit hours
Lecturer:	Professor Bassam Z. Shakhashiri
Office:	9355 Chemistry
Telephone:	262-0538
E-Mail:	bassam@chem.wisc.edu (please include your lab section number and your T.A.'s name in your messages to me)
Office Hours:	Mondays 1:30 – 3:00 p.m. Also, by appointment. Students are encouraged to see me immediately after class near the lecture table.



ALWAYS BRING THIS SYLLABUS TO CLASS

You should obtain a copy of each handout when it is distributed in lecture or from your T.A. Copies of handouts are also available in the General Chemistry Computer Room (1375).

CONTENTS

INTRODUCTION

Chemistry 103 is the first semester course in a two semester General Chemistry sequence. The second semester course is Chemistry 104. Chemistry 103 and 104 are a unit, and students who take Chemistry 103 should plan to take Chemistry 104 also. Chemistry 103 and 104 provide a general background concerning the principles and factual basis of chemistry. The 103-104 sequence serves as a prerequisite for advanced courses such as Organic Chemistry (341 or 343) and Analytical Chemistry (327 or 329).

The prerequisites for this course are Math 101 or placement at or above Math 112. Concurrent registration in Math 112 or above and one year of high school chemistry are recommended. Students who have not taken a high school chemistry course should expect to commit some extra time to this course, particularly in the early weeks of the session. If you have not had chemistry before, you should seek advice from your instructor immediately.

These General Chemistry courses explore chemical phenomena and principles with emphasis on developing an understanding of chemistry and an appreciation of what chemists do. You must commit yourself to learning the basic vocabulary of chemistry. You will acquire skills in dealing with chemical phenomena and principles and in manipulating mathematical expressions that describe chemical behavior.

I am especially interested in having you develop an informed and sensible attitude toward chemistry in particular and science in general. In addition, I would like you to develop good study habits and skills so that you can fulfill your intellectual and emotional capabilities. Your T.A. and I need to be informed about what is good, bad, and indifferent about what we do.

CONNECTIONS

In this chemistry course we will encounter and use a robust vocabulary. Several of the words begin with the letter "C" and one of the most significant is: CONNECTIONS. It is important that you strive to make connections among all aspects of the course material: facts, principles, theories, explanations, etc. in order to increase your

knowledge and to deepen your understanding of the simple and complex relationships that make chemistry *the* central science.

Often the connections are easy to make, especially, if you seek to make them and if you seek help in making them. Mental connections are not always obvious and making them is greatly enhanced by one's eagerness, patience, determination, perseverance, and general emotional readiness to learn. The great joy of making discoveries comes from being focused and from being willing to learn from mistakes without succumbing to frustration.

It is important that you try to make connections, as appropriate, with other course material that you may have had or with what you are learning this semester in your other courses.

In addition, it is very important that you make connections with people and places. Personal connections with fellow students, teachers, experts, advisors, and others in our community will greatly enhance your academic progress and personal maturity. Furthermore, your emotional growth and development will greatly benefit from pursuing the rich offerings available in our community.

TEXTBOOKS AND OTHER MATERIAL

1. *Chemistry and Chemical Reactivity,* John C. Kotz and Paul Treichel, Jr., 5th ed., Saunders College Publishing (2003).
2. *Chemistry 103/104 Lab Manual, Fall 2005,* Department of Chemistry, University of Wisconsin-Madison. (Available in the lobby outside room 1351 during the first two weeks of class, then from the General Chemistry Office – ***cash only***.)
3. *Workbook for General Chemistry, Third Edition*, Bassam Z. Shakhashiri and Rodney Schreiner, Stipes Publishing Company (2004).
4. Carbonless laboratory notepad (100 pgs), available at local bookstores and in lobby of Chemistry building.
5. Safety goggles. Industrial quality eye protection is *required* in all chemistry laboratories. Safety goggles that fit over regular glasses can be purchased from local bookstores and drugstores.
6. An inexpensive calculator is required. It should have capabilities for square roots, logarithms and inverse logarithms, and exponential (scientific) notation operations. The calculator will be used on exams, quizzes, homework assignments and in the laboratory.

COURSE FORMAT

LECTURES. During lectures we will discuss principles, outline goals, and present illustrations and demonstrations. To prepare for lecture, you should read the suggested readings in the Course Outline starting on page 10 of this syllabus. During lecture, take your own thorough notes. Be sure to take effective notes about the demonstrations; the Guidelines for Demonstration Notes on page 9 should help you do this. (In addition, a set of lecture notes will be available in the General Chemistry Computer Room, Room 1375, where they may be duplicated.) After lecture you should review your notes and study the appropriate readings and work the suggested exercises. (The answers to many of the exercises are provided in the book.) In addition, I will suggest exercises in lecture.

DISCUSSION (QUIZ) SECTION. A group of 22 or fewer students constitutes a discussion and laboratory section supervised by one Teaching Assistant. Discussion sections are for review and problem solving relevant to the recent lecture material. The sessions include short quizzes to help evaluate your progress. You should be prepared when you come to the discussion class. Ask specific questions of your T.A. Make sure you understand the questions and the answers given by your T.A. and fellow students.

LABORATORY. In laboratory you will have the opportunity to experience directly some of the relationships discussed in lectures and in the textbook and to apply experimental techniques to solving chemical problems. Laboratory work is, by nature, slow compared with text reading. You will succeed only with adequate preparation.

You must read the experiment and complete the pre-lab assignment **prior** to coming to lab. We encourage you to discuss your work with your fellow students and with your T.A. while doing the experiment.

DISCUSSION AND LABORATORY TIMETABLE

601	3:30 MW	2307 Chem	7:45-10:45 T	2325 Chem	Laura Luther	601
602	4:35 MW	2307Chem	7:45-10:45 R	2325 Chem	Mike Boll	602
603	1:20 MW	2307 Chem	7:45-10:45 T	2325 Chem	Jim O'Donnell	603
604	2:25 MW	2307 Chem	7:45-10:45 R	2325 Chem	Laura Luther	604
605	1:20 MW	2373 Chem	11:00-2:00 T	2325 Chem	Julie Byram	605
606	2:25 MW	2373 Chem	11:00-2:00 R	2325 Chem	Julie Byram	606
607	7:45 TR	2373 Chem	11:00-2:00 T	2325 Chem	Siyuan Chen	607
608	8:50 TR	B21 Chad	11:00-2:00 R	2325 Chem	Siyuan Chen	608
609	8:50 TR	10 Ogg Hall	2:25-5:25 T	2325 Chem	Doug Weittenhiller	609
610	9:55 TR	49 Sellery	2:25-5:25 R	2325 Chem	Doug Weittenhiller	610
611	1:20 MW	2385 Chem	2:25-5:25 T	2325 Chem	Megan Frisk	611
612	2:25 MW	138 Witte	2:25-5:25 R	2325 Chem	Megan Frisk	612
613	2:25 TR	2307 Chem	7:45-10:45 W	2325 Chem	May Wang	613
614	3:30 TR	2307 Chem	7:45-10:45 F	2325 Chem	May Wang	614
615	11:00 TR	2385 Chem	7:45-10:45 W	2325 Chem	Ruhang Ding	615
616	12:05 TR	2385 Chem	7:45-10:45 F	2325 Chem	Ruhang Ding	616

Desk numbers and E-mail addresses for T.A.s:

Desk 18	Laura Luther	lmluther@wisc.edu
Desk 19	Mike Boll	mrboll@wisc.edu
Deck 18	Jim O'Donnell	jjodonnell@wisc.edu
Desk 21	Julie Byram	byram@wisc.edu
Desk 17	Siyuan Chen	schen@chem.wisc.edu
Desk 20	Doug Weittenhiller	dweitten@uwc.edu
Desk 19	Megan Frisk	frisk@wisc.edu
Desk 17	May Wang	mswang@wisc.edu

ACADEMIC PERFORMANCE, PROGRESS, AND ACCOMPLISHMENT

In this large course, the students have diverse backgrounds and different expectations. My expectations include individual accomplishment on the part of every student, so that all of you not only fulfill your capabilities, but also expand your capacity and enrich your life. Of great importance to me are the knowledge you acquire, the skills you cultivate, and the attitude you develop. I expect that by the end of the semester each of you will have enough accomplishment to be at least at the ACCEPTABLE level (see below). Everything the instructional staff does is aimed toward helping you achieve this goal.

To help you gauge your academic performance and progress I am offering you a collection of learning aids. For example, you should take advantage of the self-paced WORKBOOK FOR GENERAL CHEMISTRY (see page 6). The self-paced approach helps you ascertain your own knowledge and level of understanding of chemistry.

Although grades are not the ultimate measure of your knowledge, abilities, or potential, they are useful guides to you and to others. Your level of accomplishment will be recognized at the end of the semester by the letter grade you receive for the course. Individual accomplishment is measured against course standards and not necessarily against the performance of other students. The course standards and levels of accomplishment are:

Points	Accomplishment Level	Letter Grade
90 - 100	Superior	A
88 - 89	Excellent	AB
80 - 87	Proficient	B
78 - 79	Good	BC
70 - 77	Acceptable	C
60 - 69	Mediocre	D
below 60	Unacceptable	F

ACADEMIC MISCONDUCT AND CHEATING. In this course you are encouraged to study and prepare for quizzes and examinations with other students. However, when taking quizzes and examinations, and when writing laboratory reports, you are to work alone. The University regulations are very explicit about academic misconduct and cheating, and these regulations will be fully enforced. During examinations, we will apply a code of honor, under which you are to work alone and neither give nor receive help from any sources. Also, you are expected to help enforce this code.

GRADES. Your grades will be based on a maximum of 1000 points distributed as follows:

3 examinations	340 points
Lecture assignments	100 points
TA quizzes	100 points
Laboratory	120 points
Final examination	340 points

EXAMINATIONS. There will be three mid-term exams of approximately 50 minutes each, given on select Fridays during the scheduled lecture period. The first of the mid-term exams is worth 100 points, and the remaining two are worth 120 points each. At the end of the semester, there will be a 2-hour final examination. Please check the Lecture and Laboratory Schedule (page 14) for the examination dates. The location of each exam will be announced later. **Make-up exams will not be given.**

LECTURE ASSIGNMENTS. At the Wednesday lecture of each week (except exam weeks), an assignment sheet will be distributed, to be completed by you and handed in during the following Wednesday's lecture. (The days on which these are distributed are marked with "A" in the Lecture and Laboratory Schedule on page 14.) The assignments will include questions of the sort you may expect to see on examinations. You may discuss the assignment with your fellow students and with your instructors, but the work you submit should be your own. These assignments will be graded and returned to you.

QUIZZES. Your T.A. will give a quiz during the second of the two weekly in discussion sessions. Your T.A. will provide detailed information about this and the conduct of the discussion/laboratory sessions.

LABORATORY. The laboratory work is important to understanding and appreciating chemistry. **You must successfully complete the laboratory assignments in order to receive a passing grade in the course.** Exams may include questions based on the laboratory material.

Quiz and lab grades will be normalized to a common scale at the end of the semester to minimize differences in grading practices in discussion/lab sections. Cumulative course grades will be scaled at the end of the semester, guided by the scale shown above and by class accomplishment.

LEARNING AIDS

LEARNING COMMUNITIES. Many departments on Campus especially in physical sciences areas have begun to collaborate extensively to promote learning across courses. This Chemistry 103 course is part of a

collaborative effort with the other courses. The Learning Community sections are 608, 609, 610, and 612. We are interested in the progress and potential success of such efforts and we welcome your input. Students not involved in such efforts should seek to learn about them and communicate their opinions to Professor Shakhashiri regarding possible expansion in future semesters.

WORKBOOK FOR GENERAL CHEMISTRY. The WORKBOOK lessons provide a type of self-tutorial for each topic. These lessons provide you with written instructional materials as well as drill exercises. The format allows you to learn at your own pace by following the illustrations and examples in the Workbook.

CHEMICAL OF THE WEEK. To increase your knowledge about chemicals, their properties, production, cost, uses, etc., fact sheets about one or two key chemicals will be distributed on a weekly basis. You will be tested on the content of each fact sheet on each hour exam as well as on the final exam.

EXAM STUDY QUESTIONS. About one week prior to each examination, a list of questions taken from old exams will be distributed. You should answer the questions as part of your review and study for the exam. Compare your solutions and answers with those of fellow students. If your solutions do not agree with those of others, then you should tackle the questions together. (Most, if not all, of the answers will be provided with the questions.)

HOMEWORK EXERCISES. Homework assignments are given in the Course Outline starting on page 10. You are not required to turn in the assignment; consequently homework problems are not graded. You should work out the assigned problems because they are typical of the kinds of problems you are expected to master and handle with ease. If you have questions about the homework assignment, you should seek help from your T.A. in quiz section.

ADDITIONAL ACTIVITIES

BULL SESSIONS. These informal sessions are held 1-3 times during the semester. Their aim is to enable the professor to meet students in small groups. The sessions are held in the evening and are open to all those registered in this lecture section and their friends. Topics of discussion are not necessarily related to course materials. Refreshments will be served. The date of each session will be announced one week in advance.

KEEPING IN TOUCH WITH YOUR INSTRUCTORS. You should take full advantage of the availability of your lecture professor and your T.A. outside the classroom for face-to-face meetings and e-mail contact. My e-mail address is on page 1 of this syllabus. I usually check my e-mail box once a day and attempt to answer my mail promptly. The T.A. e-mail addresses are on page 4.

HELPFUL STUDY HINTS

Read the assignment prior to lecture. Take *good* notes during the lecture (see p.9 of this syllabus for examples). Reread and study the appropriate pages in the textbook. Do the sample exercises in the book. Try the suggested exercises in the book. Also learn the key words and concepts listed on the left-hand side of this syllabus under each unit number. Use the Workbook which accompanies them.

Come to the discussion section prepared. Ask specific questions of your T.A. Make sure you understand the questions of your fellow students and the answers which your T.A. and others give.

Read the experiment. Complete the pre-lab assignment. While in lab, discuss your work with your fellow students and T.A. and complete the laboratory report before leaving unless instructed otherwise by your T.A.

UNIVERSITY COUNSELING SERVICE

Please take advantage of these services as soon as the need arises. Come and see me as soon as possible regarding the type of help suitable for your needs.

STUDY SKILLS. Study skills groups include discussions corresponding to the expressed needs and desires in a particular group. Possible topics include: problem solving, self-assessment, time-scheduling, note taking, exam preparation/taking, reading efficiency, memory, concentration, and avoiding procrastination. Students wishing to improve their performance on academic tasks are encouraged to participate in a group. Study skills groups usually meet for four 90-minute sessions. PREREGISTRATION IS REQUIRED.

TEST ANXIETY. Students who believe their study skills and habits are adequate but who are not performing well on tests because of anxiety are encouraged to call University Health Services at 265-5600 to set up an intake appointment. For more information, call 265-5600.

CHEMISTRY LEARNING CENTER

The Chemistry Learning Center is for students who wish to improve their ability to learn chemistry. Participation is voluntary and there is no fee. Students meet in small groups with staff to work out effective strategies for mastering the chemical content. The Chemistry Learning Center is located in Room B311 of the Chemistry Building. Fall hours are from 9:00 a.m. to 5:00 p.m, Monday through Friday. Contact Scott Mellon at 265-5497 (srmellon@wisc.edu).

WRITING CENTER

As you work on your lab reports I'd encourage you to take advantage of the instruction offered by the University's Writing Lab. Writing lab instructors can help you make your writing the best that it can be. They'll meet with out individually or with your entire group to discuss drafts of your work. They can help you get started as you're generating and organizing ideas. They can give you a critical reaction to a draft—asking questions where ideas aren't clear, pointing out problems in organization and style, and offering advice for revision.

To schedule an appointment, contact the Writing Lab in 6171 Helen C. White Hall, tel. 263-1992. The hours are Monday through Thursday, 9:00 a.m.–8:00 p.m., and Friday, 9:00 a.m.–3:00 p.m. For more information, check their Web site at *www.wisc.edu/writing*.

GREATER UNIVERSITY TUTORING SERVICE (GUTS)

GUTS offers free assistance to all enrolled UW-Madison students through a variety of programs. These include drop-in centers at the Steenbock Library, College Library, and Gordon Commons, study group tutoring, individual tutoring, study skills counseling, and exam files. For more information, visit or call the GUTS Tutoring Office, 303 Union South, 263-5666, Monday through Thursday, 1:00-5:00 p.m.

ALCOHOL AND DRUG ABUSE

Serious impediments to learning, personal growth and development, and responsible behavior can be caused by alcohol and substance abuse. The notorious national reputation of this Campus in this regard is shameful. Please follow the guidance provided by the Office of the Dean of Students and other officials to help achieve a drug-free environment and to exercise responsible and lawful use of alcoholic beverages.

NATIONAL CHEMISTRY WEEK

The week of October 16 has been proclaimed as National Chemistry Week for 2005. This year's theme is "The Joy of Toys." Be on the lookout for a variety of items and activities which will be brought to your attention by me and by your T.A. Also, check the University Bookstore calendar for the dates and locations of the **SCIENCE IS FUN** activity during the academic year.

THE CHRISTMAS LECTURE

Every year for the past 35 years, Professor Shakhashiri, has presented the annual Christmas lecture, titled "Once Upon a Christmas Cheery, In the Lab of Shakhashiri ." This science-oriented entertainment has played to packed houses at such varied locations as the University of Wisconsin-Madison, the National Academy of Sciences and the Smithsonian's National Air and Space Museum in Washington, and Boston's Museum of Science, and it has been televised by stations across the country. This year's presentations in Madison are on Saturday, December 3rd, and Sunday, December 4th, at 1:00 p.m. and 4:30 p.m. each day. Mark your calendars, and bring your friends and family!

GUIDELINES FOR DEMONSTRATION NOTES

These Guidelines should help you take effective notes about the demonstrations presented during lecture. The demonstrations display phenomena and illustrate principles discussed in the lecture. They are intended to enhance your understanding of the lecture material. Therefore, it is essential that you take accurate and complete notes about the demonstrations.

Three steps are involved in taking good notes about the demonstrations.

1. Describe the equipment and materials at the start of the demonstration. Be sure to include any information the lecturer may provide about the equipment and materials.
2. Describe what the lecturer does with the equipment and materials.
3. Describe what happens as a result of what the lecturer does. Describe the changes that occur during the process, as well as the final condition of the materials.
4. Review your notes and rewrite them when necessary to ensure clarity.

As examples, notes for some lecture demonstrations are included below; they show how a student writes out in fuller comprehensible form the abbreviated notes written down during lecture.

A. "Bubbles and Fog" Demonstration (Part 1)

1. Describe the equipment and materials at the start of the demonstration. Be sure to include any information the lecturer may provide about the equipment and materials.

   4 glass cylinders, each with volume of about 1 liter. One pair of cylinders contains about 800 mL of pink liquid in each cylinder. The other pair contains about 800 mL of purple liquid in each. A bucket of white solid chunks. The white solid is dry ice (solid carbon dioxide). Dry ice has a temperature of –78°C. It sublimes, that is, changes directly from solid to gas.

2. Describe what The lecturer does with the equipment and materials.

   The lecturer puts on cloth gloves and drops chunks of dry ice into one of the cylinders of pink liquid and one of the cylinders of purple liquid.

3. Describe what happens.

   The chunks of dry ice sink to the bottom of the liquids. Bubbles form on the dry ice and rise to the top of the liquids. Fog forms at the tops of the cylinders containing dry ice. The fog spills over the tops of the cylinders and sinks down their sides. The colors of the liquids gradually change: the pink liquid fades to colorless, the purple liquid changes to green and then to yellow. The color changes take about 30 seconds.

B. "Bubbles and Fog" Demonstration (Part 2)

1. Describe the equipment and materials at the start of the demonstration.

   5-liter flask of hot water. Red plastic dish pan. Chunks of dry ice.

2. Describe what is done with the equipment and materials.

   The hot water is poured into the dish pan. Then, dry ice is poured into the hot water.

3. Describe what happens.

   Cloud of fog rises to about 2 meters above the pan. Then, the cloud sinks and fog pours over the edge of the pan and onto the floor. The production of fog gradually diminishes and stops after about 3 minutes.

COURSE OUTLINE

TEXT = Chemistry & Chemical Reactivity, WKBK = Workbook for General Chemistry

INTRODUCTION – Sept 2
- Macroscopic Properties
- Heterogeneous and Homogeneous Substances
- Particulate Structure
- Atoms and Molecules

MEMORIZE THE NAMES & SYMBOLS OF THE FIRST 36 ELEMENTS IN THE PERIODIC TABLE.
TEXT 1.1–1.2
QUESTIONS
TEXT Ch.1: 3
WKBK: Lesson 35

ELEMENTS AND ATOMS – Sept 7
- Classifying matter
- Mixtures and pure substances
- Elements and compounds
- Quantitative properties
- Significant figures

TEXT 1.3–1.8
QUESTIONS
TEXT
Ch.1: 7,12,14,20,28,32,42,44,56,58,62, 64,74

ATOMS AND THE MOLE – Sept 9
- Atomic structure
- Isotopes
- Atomic mass
- The mole
- Molar mass
- The periodic table

TEXT 2.1 – 2.8
QUESTIONS
TEXT
Ch. 2: 6,10,14,20,22,24,30,36,38,46,48, 52,54,56

CHEMICAL COMPOUNDS – Sept 12
- Ionic compounds
- Naming ionic compounds
- Properties of ionic compounds
- Molecular compounds
- Naming molecular compounds
- Properties of molecular compounds

TEXT 3.1–3.4
QUESTIONS
TEXT
Ch. 3: 3,12,18,20,22,24,30,32,34,36,40, 42,90
WKBK: pp 1–9

COMPOUNDS AND MOLES – Sept 14
- Molar mass of a compound
- Percent composition
- Empirical formulas
- Molecular formulas

TEXT 3.5–3.7
QUESTIONS
TEXT
Ch. 3: 1,44,48,52,54,60,64,68,74,78,86
WKBK: pp 9–17

CHEMICAL EQUATIONS – Sept 19
- Chemical reactions and equations
- Balancing chemical equations
- Mass relationships in chemical reactions
- Stoichiometry

TEXT 4.1–4.3
QUESTIONS
TEXT
Ch. 4: 2,8,10,12,14,18,44,46
WKBK: Lessons 2 & 3

CHEMICAL ANALYSIS – Sept 21
- Limiting reactant
- Percent yield
- Determining the formula of a compound

TEXT 4.4–4.6
QUESTIONS
TEXT
Ch. 4: 6,20,22,24,26,28,36,56
WKBK: Lesson 4

Exam 1 — Friday, September 23 — 11:00–11:50 a.m.

REACTIONS IN SOLUTION 1 – Sept 26

- Electrolytes
- Solubility of ionic compounds
- Precipitation reactions
- Net ionic equations
- Acids and bases
- Acid-base reactions

TEXT 5.1–5.4
QUESTIONS
TEXT
Ch. 5: 1,3,5,7,22,24,26,28,30,40,42
WKBK: Lesson 5

REACTIONS IN SOLUTION 2 – Sept 28

- Classification of reactions
- Reaction-driving forces
- Oxidation numbers
- Oxidation-reduction reactions

TEXT 5.5–5.7
STUDY QUESTIONS
TEXT
Ch. 5: 9,44,46,52,54,56,96,106,118
WKBK: pp 145–151

CONCENTRATIONS OF SOLUTIONS – Oct 3

- Molarity
- Preparing solutions
- pH
- Solution stoichiometry

TEXT 5.8–5.10
QUESTIONS
TEXT
Ch. 5: 13,58,62,64,68,72,74,78,84,94,100
WKBK: Lesson 6

HEAT AND ENERGY – Oct 5

- Temperature
- Energy
- Heat capacity
- Heat transfer
- Heat energy
- Enthalpy
- Enthalpy of fusion and vaporization

TEXT 6.1–6.5
QUESTIONS
TEXT
Ch. 6: 2,16,18,22,26,70,
WKBK: pp 79–81

HEAT AND CHEMICAL REACTIONS – Oct 10

- Calorimetry
- Enthalpy of reaction
- Hess's law
- Enthalpy of formation
- Fuels

TEXT 6.6–6.10
QUESTIONS
TEXT
Ch. 6: 34,36,40,50,52,56,58,78,82
WKBK: pp 82–96

THE BOHR MODEL OF THE ATOM – Oct 12

- Wave properties
- Electromagnetic radiation
- Atomic emission
- Bohr's model of the atom

TEXT 7.1–7.3
QUESTIONS
TEXT
Ch. 7: 20,22,24,28,34,36,38,70

MODERN ATOMIC THEORY – Oct 17

- Schrödinger wave equation
- Orbitals
- Electron spin
- Magnetism
- Electron configuration

TEXT 7.4–8.2
QUESTIONS
TEXT
Ch. 7: 44,56,74
Ch.8: 3,8,10,20,22,24
WKBK: Lesson 10

PERIODIC PROPERTIES – Oct 19

- Atomic size
- Ionization energies
- Electron affinities
- Ion sizes

TEXT 8.3–8.7
QUESTIONS
TEXT
Ch. 8: 34,36,38,40,52,54,58,60,70,76
WKBK: Lesson 11

Exam 2 — Friday, October 21 — 11:00 – 11:50 a.m.

BONDING & LEWIS STRUCTURES – Oct 24
- Valence electrons
- Lewis structures
- Ionic bonding
- Covalent bonding
- Octet rule
- Resonance

TEXT 9.1–9.5
QUESTIONS
TEXT
Ch. 9: 4,28,30,36,38,42,86,90,
WKBK: pp 130–141

BOND PROPERTIES – Oct 26
- Exceptions to octet rule
- Formal charge
- Bond polarity
- Bond length
- Bond energy

TEXT 9.6–9.8
QUESTIONS
TEXT
Ch. 9: 10,18,46,50,54,56,62,64,66,68, 70,96,106
WKBK: pp 141–144 & 152–155

SHAPES OF MOLECULES – Oct 31
- Describing molecular shapes
- VSEPR
- Molecular polarity

TEXT 9.9–9.11
QUESTIONS
TEXT
Ch. 9: 24,72,74,78,82,84,88,98,108
WKBK: Lesson 14

VALENCE BOND THEORY – Nov 2
- Overlap of atomic orbitals
- Hybrid atomic orbitals
- Sigma and pi bonds

TEXT 10.1–10.2
QUESTIONS
TEXT
Ch. 10: 2,4,18,20,24,26,42,52,74
WKBK: Lesson 15

MOLECULAR ORBITAL THEORY – Nov 7
- Molecular orbitals
- Combinations of atomic orbitals
- Diatomic molecules
- Band theory
- Semiconductors

TEXT 10.3–10.4
QUESTIONS
TEXT
Ch. 10: 34,36,40,60,64,68,70

IDEAL GAS LAW – Nov 9
- Pressure
- Boyle's law
- Charles's law
- Avogadro's law
- Ideal gas law

TEXT 12.1–12.5
QUESTIONS
TEXT
Ch. 12: 10,12,14,18,22,26,28,30,36,46,74
WKBK: Lesson 9

KINETIC MOLECULAR THEORY – Nov 14
- Postulates
- Molecular speed and kinetic energy
- Diffusion and effusion
- Deviations from ideal gas behavior

TEXT 12.6–12.9
QUESTIONS
TEXT
Ch. 12: 50,52,54,58,66,90

INTERMOLECULAR FORCES – Nov 16

Dipole interactions
Polar molecules
Non-polar molecules
Hydrogen bonding

TEXT 13.1–13.4
QUESTIONS
TEXT
Ch. 13: 16, 18, 20, 22, 50, 54

Exam 3 — Friday, November 18 — 11:00–11:50 a.m.

PROPERTIES OF SOLIDS 1 – Nov 21

Crystalline solids
Properties of solids
X-ray diffraction
Metals
Ionic solids
Molecular solids
Network solids
Amorphous solids

TEXT 13.6–13.7
QUESTIONS
TEXT
Ch.13: 36, 40, 64, 66
HANDOUT

PROPERTIES OF SOLIDS 2 – Nov 28

Molecular solids
Network solids
Amorphous solids
Phase diagrams

TEXT 13.8–13.10
QUESTIONS
TEXT
Ch.13: 52
HANDOUT

PROPERTIES OF LIQUIDS – Nov 30

Boiling & freezing points
Vaporization
Vapor pressure
Viscosity
Miscible and Immiscible Liquids

TEXT 13.5, 14.2
QUESTIONS
TEXT
Ch.13: 28, 30, 32
Ch.14: 28, 34, 96

PROPERTIES OF SOLUTIONS – Dec 5

Heat of Solution
Henry's Law
LeChatelier's Principle
Colligative properties

TEXT 14.3 – 14.4
QUESTIONS
TEXT Ch.14: 46, 50, 54, 58, 64, 68
WKBK Lesson 16

MOLECULAR ORBITAL THEORY – Nov 7

Molecular orbitals
Combinations of atomic orbitals
Diatomic molecules
Band theory
Semiconductors

TEXT 10.3–10.4
QUESTIONS
TEXT
Ch. 10: 34,36,40,60,64,68,70

MOLECULAR SPECTROSCOPY 1 – Nov 9

Absorption of electromagnetic radiation
UV-visible spectroscopy
IR spectroscopy

Handout
QUESTIONS
Handout

MOLECULAR SPECTROSCOPY 2 – Nov 14

Nuclear magnetic resonance
^{13}C-nmr spectroscopy
Determining molecular structures

Handout
QUESTIONS
Handout

Final Exam — Wednesday, December 21 — 2:45 – 4:45 p.m.

36th Annual Presentation of
"Once Upon a Christmas Cheery, In the Lab of Shakhashiri"
Saturday and Sunday, December 3 and 4

Chemistry 103 – Lecture Section 1 – Fall 2005

Lecture and Laboratory Schedule

DATE		LECTURE TOPIC	LABORATORY
Sept 2 (F)		Introduction	No Lab
Sept 7 (W)	A	Elements & Atoms	Solutions, Density & Graphing (in lab)
Sept 9 (F)		Atoms and the Mole	
Sept 12 (M)		Chemical Compounds	Lake Study (outside)
Sept 14 (W)	A	Compounds & Moles	
Sept 16 (F)		Special Guest Lecture: Prof. Kevin Strang	
Sept 19 (M)		Chemical Equations	Reaction of Zinc & Iodine; Check-in (in lab)
Sept 21 (W)		Chemical Analysis	
Sept 23 (F)		**EXAM I 11:00-11:50 a.m.** (10%)	
Sept 26 (M)		Reactions in Solution 1	No Lab
Sept 28 (W)	A	Reactions in Solution 2	
Oct 3 (M)		Concentrations of Solutions	Synthesis of an Alum (in lab)
Oct 5 (W)	A	Heat & Energy	
Oct 10 (M)		Heat & Chemical Reactions	Reaction Types & Chemical Logic (outside)
Oct 12 (W)	A	The Bohr Model of the Atom	
Oct 17 (M)		Modern Atomic Theory	Solution Calorimetry (in lab)
Oct 19 (W)		Periodic Properties	
Oct 21 (F)		**EXAM II 11:00-11:50 a.m.** (12%)	
Oct 24 (M)		Bonding & Lewis Structures	No Lab
Oct 26 (W)	A	Bond Properties	
Oct 31 (M)		Shapes of Molecules	Alcohol in Wine (in lab)
Nov 2 (W)	A	Valence Bond Theory	
Nov 7 (M)		Valence Bond Theory	No lab
Nov 9 (W)	A	Ideal Gas Law	
Nov 14 (M)		Kinetic Molecular Theory	Project Lab, Part 1 (in lab)
Nov 16 (W)		Intermolecular Forces	
Nov 18 (F)		**EXAM III 11:00 - 11:50 a.m.** (12%)	
Nov 21 (M)		Properties of Solids 1	No lab
Nov 23 (W)	A	No Lecture	
Nov 28 (M)		Properties of Solids 2	Project Lab, Part 2; Check-out (in lab)
Nov 30 (W)	A	Properties of Liquids	
Dec 5 (M)		Properties of Solutions	Window on the Solid State (outside)
Dec 7 (W)	A	Molecular Orbital Theory	
Dec 12 (M)		Molecular Spectroscopy 1	No Lab
Dec 14 (W)		Molecular Spectroscopy 2	
Dec 21 (W)		**FINAL EXAM 2:45 – 4:45 p.m.** (34%)	

DUE To Your T.A. Friday, September 16

CHEMISTRY 103 Lecture Section 1
Professor Bassam Z. Shakhashiri

INFORMATION SHEET
Please PRINT

Name_____,_____
(last) (first)

Lab Section_____

T.A._____

Telephone_____ attach photograph here

e-mail_____

Classification_____

Major_____

I have completed the Math prerequisite for this course (see page 2 of the syllabus): Yes No

If you are currently enrolled in a Math course, indicate its number: _____

Number of high school chemistry years completed: 0 1 2 3 AP

Indicate year of last high school chemistry course:_____

Name and location of high school: _____

Circle number of college chemistry courses taken: 0 1 2 3

Give the number of credit hours you are taking this semester: _____

Give number of hours per week you are working (paid or volunteer) this semester:_____

I plan to take another chemistry course beyond this: Yes No Don't Know

Please tell me a couple of interesting things about yourself.