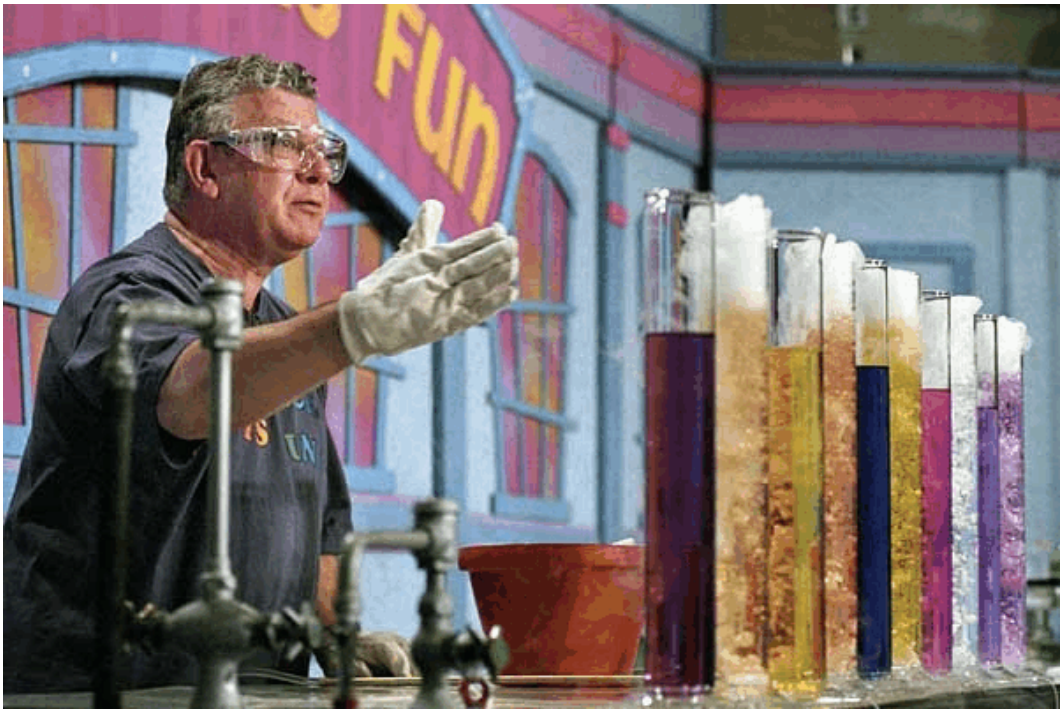
CHEMISTRY 103

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

1970 – 2009

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. You must use your *wisc.edu* mailbox; otherwise I will not respond.)
Office Hours:	Mondays 12:05 – 1:15 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 more 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 and the science of the familiar.

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,* 7th ed., John C. Kotz and Paul Treichel, Jr., and Gabriela C. Weaver, Thomson Brooks/Cole (2009).
2. *Laboratory Experiments for Chemistry 103, Fall 2009,* 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 in the lobby of Chemistry building (***cash only***) during the first two weeks of the semester and at local bookstores.
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, study assignments and in the laboratory.

COURSE FORMAT

LECTURES. During **Monday/Wednesday** 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.
- 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.)
- See page 6 for Helpful Study Hints.
- In addition, I will suggest exercises in lecture.

During **Friday** lectures we will have enrichment presentations by guest lecturers or you will meet with your Cooperative Learning Group. Materials presented during enrichment sessions will be covered on exams.

DISCUSSION (QUIZ) SECTION. A group of about 22 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 guide and 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	Daniel Sweat	601
602	4:35 MW	2307Chem	7:45-10:45 R	2325 Chem	Daniel Sweat	602
603	1:20 MW	2307 Chem	7:45-10:45 T	2325 Chem	Hongngoc Pham	603
604	2:25 MW	2307 Chem	7:45-10:45 R	2325 Chem	Hongngoc Pham	604
605	1:20 MW	2373 Chem	11:00-2:00 T	2325 Chem	Robert Guenette	605
606	2:25 MW	2373 Chem	11:00-2:00 R	2325 Chem	Robert Guenette	606
607	7:45 TR	2373 Chem	11:00-2:00 T	2325 Chem	Kasia Kornecki	607
608	8:50 TR	2373 Chem	11:00-2:00 R	2325 Chem	Kasia Kornecki	608
609	11:00 TR	1225 Ogg	2:25-5:25 T	2325 Chem	ShiShi Lin	609
610	12:05 TR	49 Sellery	2:25-5:25 R	2325 Chem	ShiShi Lin	610
611	1:20 MW	2381 Chem	2:25-5:25 T	2325 Chem	Fei Meng	611
612	2:25 MW	138 Witte	2:25-5:25 R	2325 Chem	Fei Meng	612
613	2:25 TR	2307 Chem	7:45-10:45 W	2325 Chem	Brian Parker	613
614	3:30 TR	2307 Chem	7:45-10:45 F	2325 Chem	Brian Parker	614
615	11:00 TR	2311 Chem	7:45-10:45 W	2325 Chem	Tyler Adint	615
616	12:05 TR	2311 Chem	7:45-10:45 F	2325 Chem	Tyler Adint	616

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

Desk 1	Tyler Adint	tadint@chem.wisc.edu
Desk 3	Robert Guenette	rguenette@chem.wisc.edu
Desk 3	Kasia Kornecki	kkornecki@chem.wisc.edu
Desk 4	ShiShi Lin	slin@chem.wisc.edu
Desk 4	Fei Meng	fmeng@chem.wisc.edu
Desk 1	Brian Parker	bparker@chem.wisc.edu
Desk 2	Hongngoc Pham	hpham@chem.wisc.edu
Desk 2	Daniel Sweat	dsweat@chem.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 page 5). 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:

5 examinations	50%
TA quizzes	10%
Laboratory	15%
Final examination	25%

EXAMINATIONS. There will be five mid-term exams of approximately 50 minutes each, given on select Fridays during the scheduled lecture period. 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. If you have a documented disability and a VISA from the McBurney Center regarding exams please notify your TA and myself as early in the semester as possible. **Make-up exams will not be given, nor will it be possible to give any exam outside of its scheduled time.**

QUIZZES. Your T.A. will give a quiz during the second of the two weekly 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 among the 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

COOPERATIVE LEARNING GROUPS. Students are asked to form groups of 4-5 students. Groups should sit together in the lecture hall and discussion sessions. Group discussions and assignments may occur during lecture. *Each group may find it helpful to study together outside of class.* Group membership is to be established and identified by September 11; see your T.A. for details. **One of the hallmarks of excellence of UW-Madison is the quality of its students. Share your talents with others and take advantage of the rich talent surrounding you.**

LEARNING COMMUNITIES. Several sections in this lecture have been set aside for specific residence hall students: section 309/609, Ogg residents; section 310/610, Sellery residents; and section 312/612, Witte residents. Sellery, Ogg and Witte discussion sections will meet in their respective residence halls. All lab sections meet in the Chemistry building (room 2325).

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 during the first lecture of the week . The information is at *www.scifun.org*. You will be tested on the content of each fact sheet on each exam as well as on the final exam. The schedule of the Chemical of the Week is listed on page 14.

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, but not all, of the answers will be provided with the questions.)

WEEKLY STUDY QUESTIONS. Study assignments are given in the Course Outline starting on page 10. You are not required to turn in the assignment; consequently study 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 study assignment, you should seek help from your T.A. in discussion section.

HELPFUL HINTS TO ENHANCE LEARNING

- Read the assignment prior to lecture.
- Take *good* notes by hand during the lecture (see page 9 of this syllabus for examples).
- Rewrite your notes and reread and study the appropriate pages in the textbook the same day of lecture.
- 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 instructions in the lab manual.
- 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.

- Every week, for every hour of scheduled class time you should devote two hours of personal study time outside class.
- On average, each hour of weekly study should consist of 45 minutes of focused work alone and 15 minutes with others including your cooperative learning group.

- Learn with the goal of wanting to explain fully and clearly what you know to another person. When you take exams this person will be me!
- Every weekend, take an hour (or more) to *reflect*, in writing, on what you have *learned*. This will help establish your confidence in being able to *act* correctly on what you have learned.

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 but you must use your *wisc.edu* address if you expect me to respond. The T.A. e-mail addresses are on page 4. Face-to-face meetings are superior to electronic contact.

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.

Individual counseling is available at University Counseling and Consultation Services. For more information call 265-5600 or go to 115 N. Orchard Street, Monday, Tuesday, Thursday and Friday, 8:30 - 5:00 p.m., and Wednesday, 9:00 to 5:00 p.m. or visit their web page at *http://www.uhs.wisc.edu*

WRITING LAB

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 you 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. For more information see their web page at *http://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 study group tutoring, individual tutoring, study skills counseling, exam files and drop-in centers. For more information, consult *http://guts.studentorg.wisc.edu/*

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. The University Counseling Service (see above) can help students who are dealing with these issues.

NATIONAL CHEMISTRY WEEK

The week of October 18 has been proclaimed as National Chemistry Week for 2009. This year's theme is "Chemistry—It's Elemental!" 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 39 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 network and cable stations across the country. This year's 40th anniversary presentations in Madison are on Saturday, December 5th, and Sunday, December 6th, at 1:00 p.m. and 4:00 p.m. each day. Mark your calendars, and bring your friends and family!

40th Annual Presentation of
"Once Upon a Christmas Cheery, In the Lab of Shakhashiri"
Saturday and Sunday, December 5 and 6
1:00 pm and 4:00 pm each day

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

ATOMS & ELEMENTS – Sept 4
- Heterogeneous and homogeneous substances
- Atoms and molecules
- Elements and compounds
- Atomic structure
- The mole and molar mass
- The periodic table

MEMORIZE THE NAMES & SYMBOLS OF THE FIRST 36 ELEMENTS IN THE PERIODIC TABLE.

TEXT 1.1 – 1.6, Review 1– 3, 2.1 – 2.5
SQ Ch.1: 1,3 Review: 3,7,11,19,21,29,33
Ch 2: 1,3,7,9,21,53,55,57,85,93
WKBK: Lesson 37, pp 1 – 7

CHEMICAL COMPOUNDS – Sept 9
- Ionic compounds
- Naming ionic compounds
- Properties of ionic compounds
- Molecular compounds
- Naming molecular compounds
- Properties of molecular compounds

TEXT 2.6 – 2.8
SQ Ch.2: 29,31,33,35,37,41,43,45,99,129

WKBK: pp 7 – 9

CHEMICAL COMPOSITION – Sept 14
- Molar mass of a compound
- Percent composition
- Empirical formulas
- Molecular formulas

TEXT 2.9 – 2.11
SQ Ch2: 25,49,51,59,63,65,67,69,71,73,75,79,83, 115,121
WKBK: pp 9 – 17

CHEMICAL REACTIONS – Sept 16
- Chemical reactions and equations
- Reactions in solution
- Electrolytes and non-electrolytes
- Solubility of ionic compounds
- Precipitation reactions
- Net-ionic equations

TEXT 3.1 – 3.6
SQ Ch 3: 1,3,5,11,13,17,19,33,35,53,55

WKBK: Lessons 2 & 5

Exam 1 — Friday, September 18 — 11:00–11:50 a.m.

CLASSIFYING REACTIONS – Sept 21
- Acids and bases
- Acid-base reactions
- Gas-forming reactions
- Oxidation-reduction reactions
- Oxidation numbers

TEXT 3.7 – 3.10
SQ Ch 3: 21,25,27,29,37,41,43,45,47,49,59,61

WKBK: pp 145 – 151

STOICHIOMETRY – Sept 23
- Mass relationships
- Limiting reactant
- Percent yield
- Chemical Analysis

TEXT 4.1 – 4.4
SQ Ch 4: 1,3,7,9,13,15,17,19,21,77

WKBK: Lessons 3 & 4

SOLUTION STOICHIOMETRY – Sept 28
- Concentration (molarity)
- pH
- Titrations
- Beer's Law

TEXT 4.5 – 4.8
SQ Ch 4: 37,39,41,43,47,53,55,59,65

WKBK: Lesson 6

HEAT AND ENERGY – Sept 30

- Temperature
- Energy
- Heat capacity
- Heat transfer
- Changes of state

TEXT 5.1 – 5.3
SQ Ch 5: 9,13,15,17,19,33,59,67

WKBK: pp 79 – 81

HEAT AND CHEMICAL REACTIONS – Oct 5

- Enthalpy
- Enthalpy of reaction
- Calorimetry

TEXT 5.4 – 5.6
SQ Ch 5: 27,29,31,35,37,85

WKBK: pp 82 – 90

CHEMICAL ENERGY – Oct 7

- Hess's law
- Enthalpy of formation
- Fuels

TEXT 5.7 – 5.9, pp 255 – 266
SQ Ch 5: 43,45,47,49,51,53,57,75,81
p 267: 5,11,13,17

WKBK: pp 90 – 96

Exam 2 — Friday, October 9 — 11:00–11:50 a.m.

LIGHT AND ATOMS – Oct 12

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

TEXT 6.1 – 6.3
SQ Ch 6: 1,3,5,9,15,17,19,21,55,65

MODERN ATOMIC THEORY – Oct 14

- Schrödinger wave equation
- Orbitals
- Electron spin
- Magnetism

TEXT 6.4 – 6.7
SQ Ch 6: 25,29,31,35,61,67,69

PERIODIC PROPERTIES – Oct 19

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

TEXT 7.1 – 7.6
SQ Ch 7: 1,5,7,11,17,19,23,25,27,29,33,47,51,55,63

WKBK: Lessons 10 & 11

CHEMICAL BONDS – Oct 21

- Valence electrons
- Lewis structures
- Ionic bonding
- Covalent bonding
- Octet rule
- Formal charge

TEXT 8.1 – 8.3
SQ Ch 8: 1,3,5,7,11,53,61

WKBK: pp 130 – 136, 152 – 155

BOND PROPERTIES – Oct 26

- Resonance
- Exceptions to octet rule
- Bond polarity
- Bond length
- Bond energy

TEXT 8.4 – 8.5, 8.9
SQ Ch 8: 13,15,27,31,33,43,47,55,71

WKBK: pp 137 – 144

SHAPES OF MOLECULES – Oct 28

- Describing molecular shapes
- VSEPR
- Molecular polarity

TEXT 8.6 – 8.8
SQ Ch 8: 17,19,21,23,37,39,41,65

WKBK: Lesson 14

Exam 3 — Friday, October 30 — 11:00–11:50 a.m.

MOLECULAR ORBITALS – Nov 2

- Molecular orbitals
- Combinations of atomic orbitals
- Diatomic molecules

TEXT 9.1, 9.3
SQ Ch 9: 15,17,19,41,57

VALENCE BOND THEORY – Nov 4

- Overlap of atomic orbitals
- Hybrid atomic orbitals
- Sigma and pi bonds

TEXT 9.2
SQ Ch 9: 1,3,5,7,11,23,25,29,37,39

WKBK: Lesson 15

MOLECULAR SPECTROSCOPY 1 – Nov 9

- Absorption of electromagnetic radiation
- UV-visible spectroscopy
- IR spectroscopy

HANDOUT

MOLECULAR SPECTROSCOPY 2 – Nov 11

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

HANDOUT

IDEAL GAS LAW – Nov 16

- Pressure
- Boyle's law
- Charles's law
- Avogadro's law
- Ideal gas law

TEXT 11.1 – 11.5
SQ Ch 11: 1,3,5,7,9,11,17,19,25,27,37,71

WKBK: Lesson 9

KINETIC MOLECULAR THEORY – Nov 18

- Postulates
- Molecular speed and kinetic energy
- Diffusion and effusion
- Deviations from ideal gas behavior

TEXT 11.6 – 11.9
SQ Ch 11: 41,43,45,47,49,51,93,101

Exam 4 — Friday, November 20 — 11:00–11:50 a.m.

INTERMOLECULAR FORCES – Nov 23

Dipole interactions
Polar molecules
Non-polar molecules
Hydrogen bonding

TEXT 12.1 – 12.3
SQ Ch 12: 1,3,5,7,25,47

PROPERTIES OF LIQUIDS – Nov 25

Boiling & freezing points
Vaporization
Vapor pressure
Viscosity

TEXT 12.4
SQ Ch 12: 17,19,29,31,39,41,43

PROPERTIES OF SOLIDS 1 – Nov 30

Crystalline solids
Properties of solids
X-ray diffraction
Amorphous solids
Ionic solids

TEXT 13.1 – 13.3
SQ Ch 13: 1,3,5,17,39

PROPERTIES OF SOLIDS 2 – Dec 2

Molecular solids
Network solids
Amorphous solids
Phase diagrams

TEXT 13.4 –13.6
SQ Ch 13: 21,25

PROPERTIES OF SOLUTIONS – Dec 7

Factors that affect solubility
Henry's Law
Colligative properties
Osmotic pressure

TEXT 14.1 – 14.4
SQ Ch 14: 1,3,9,13,17,21,25,29,31,35,41,45

WKBK: Lesson 16

MODERN MATERIALS – Dec 9

Metals
Semiconductors
Band Theory
Ceramics

TEXT pp 657-669
SQ p 669: 1,3

Exam 5 — Friday, December 11 — 11:00–11:50 a.m.

COURSE SUMMARY – Dec 14

Final Exam — Monday, December 21 — 12:25 – 2:25 p.m.

40th Annual Presentation of
"Once Upon a Christmas Cheery, In the Lab of Shakhashiri"
Saturday and Sunday, December 5 and 6

Chemistry 103 – Lecture Section 1 – Fall 2009
Lecture and Laboratory Schedule

DATE	LECTURE TOPIC	COW	LABORATORY
Sept 2 (W)	Introduction	Lake Lore	No lab
Sept 4 (F)	Atoms & Elements		
Sept 9 (W)	Chemical Compounds	Ethanol	Citizenship in the Lab
Sept 11 (F)	Enrichment/CLG		
Sept 14 (M)	Chemical Composition	Methane	No lab
Sept 16 (W)	Chemical Reactions		
Sept 18 (F)	**Exam 1**		
Sept 21 (M)	Classifying Reactions	Sulfuric Acid	Solutions, Density, & Graphing
Sept 23 (W)	Stoichiometry		
Sept 25 (F)	Enrichment/CLG		
Sept 28 (M)	Solution Stoichiometry	Lime	Zinc & Iodine
Sept 30 (W)	Heat & Energy		
Oct 2 (F)	Enrichment/CLG		
Oct 5 (M)	Heat & Chemical Reactions	Hydrogen	No lab
Oct 7 (W)	Chemical Energy		
Oct 9 (F)	**Exam 2**		
Oct 12 (M)	Light & Atoms	Gases that Emit Light	Solution Calorimetry
Oct 14 (W)	Modern Atomic Theory		
Oct 16 (F)	Enrichment/CLG		
Oct 19 (M)	Periodic Properties	Autumn Colors	Chemical Logic
Oct 21 (W)	Chemical Bonds		
Oct 23 (F)	Enrichment/CLG		
Oct 26 (M)	Bond Properties	Agricultural Fertilizers	No lab
Oct 28 (W)	Shapes of Molecules		
Oct 30 (F)	**Exam 3**		
Nov 2 (M)	Molecular Orbitals	Ozone	Lake Study
Nov 4 (W)	Valence Bond Theory		
Nov 6 (F)	Enrichment/CLG		
Nov 9 (M)	Molecular Spectroscopy 1	Fireworks	Alcohol in Wine
Nov 11 (W)	Molecular Spectroscopy 2		
Nov 13 (F)	Enrichment/CLG		
Nov 16 (M)	Ideal Gas Law	Gases of the Air	No lab
Nov 18 (W)	Kinetic Molecular Theory		
Nov 20 (F)	**Exam 4**		
Nov 23 (M)	Intermolecular Forces	Chemoreception	No lab
Nov 25 (W)	Properties of Liquids		
Nov 30 (M)	Properties of Solids 1	Liquid Crystals	Project Lab
Dec 2 (W)	Properties of Solids 2		
Dec 4 (F)	Enrichment/CLG		
Dec 7 (M)	Properties of Solutions	Water	Window on the Solid State
Dec 9 (W)	Properties of Modern Materials		
Dec 11 (F)	**Exam 5**		
Dec 14 (M)	Summary		
Dec 21 (M)	**FINAL EXAM** 12:25 - 2:25 p.m.		