

## GENERAL CHEMISTRY I – SPRING 2010

**IMPORTANT:** If your science background is poor, consider taking Chemistry 1.1 instead of Chemistry 1. See the last page for the *Choosing a First Course in Chemistry* sheet.

- Required Texts:
- *Chemistry, The Central Science*, Brown, LeMay, Bursten, and Murphy, Prentice Hall Pub., 2009, 11<sup>th</sup> Edition.
  - *Laboratory Manual for General Chemistry*, M. N. Kobraik, Ed., First Edition, Kendall/Hunt, Dubuque, IA 2008.
  - *Evaluation of the Gas Law Constant*, PROP-332, Chemical Education Resources.
  - *Determining Atomic Emission by Spectroscopy*, STRC-449, Chemical Education Resources.

- Required Items:
- Scientific calculator, • lock for lab drawer,
  - Safety goggles; matches; dish detergent, roll of paper towels.

**Graphing calculators are not allowed on exams.**

- Recommended Items:
- Lab coat or apron.
  - Study Guide to Brown, LeMay, Bursten, and Murphy, James C. Hill, 11<sup>th</sup> Ed., Prentice Hall.
  - Solutions to Exercises in Brown, LeMay, Bursten, and Murphy, R. Wilson, 11<sup>th</sup> Ed., Prentice Hall.
  - Schaum's Outline: Beginning Chemistry, D. E. Goldberg, 2<sup>nd</sup> Edition, McGraw Hill Pub., N.Y., 1999.

### Online Supplements and Info:

- <http://academic.brooklyn.cuny.edu/chem/GenChem/chem1syl.pdf> (syllabus on line)  
<http://academic.brooklyn.cuny.edu/chem/howell/practice.htm> (old BC tests and exams)  
<http://academic.brooklyn.cuny.edu/chem/index.htm> (Chemistry Department Homepage)

<b><u>Counseling</u></b>	<i>Coordinator for General Chemistry</i>	TBA
	<i>Undergraduate Chemistry Advisor:</i>	TBA
	<i>Undergraduate Deputy Chair:</i>	Prof. Jarzecki, 359NE jarzecki@brooklyn.cuny.edu
	<i>Health Profession Counseling:</i>	Prof. Silbering 3207B silbering@brooklyn.cuny.edu

### LECTURE TESTS:

- FIRST TEST: Thursday, **March 11, 2010, 12:30 – 2:00 PM**, Covers Recitations 1–5
- SECOND TEST: Thursday, **April 22, 2010, 12:30 – 2:00 PM**, Covers Recitations 6–10  
(for recitation material see pages 4–5)

**NOTE:** **NO** Makeup exams are given for Lecture Tests. We mean it.  
**Graphing calculators are not allowed on exams.**

**FINAL EXAM:** **MAY 20, 2010 (Th), 8:00 AM – 10:00 AM**, rooms TBA

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**Academic dishonesty is prohibited in the City University of New York.**

Cheating, plagiarism, internet plagiarism and obtaining unfair advantages are violations of policies of academic integrity and are punishable by penalties, failing grades, suspension and expulsion.

For more information about CUNY policy on academic integrity see

**<http://www.brooklyn.cuny.edu/bc/policies/pdf/CUNY%20PolicyAcademicIntegrity.pdf>**

**Lab Exemptions:** Students who are repeating the course may be able to obtain laboratory exemptions. You may file a request for a laboratory exemption form in the Chemistry Department office (359 NE). Students who receive exemptions **must take the recitation quizzes** and possibly the lab quizzes.

**Drop Dates:** **February 17** (Wednesday) is the last day to drop a course without a grade.

**April 20** (Tuesday) is the last day to apply for non penalty withdrawal (*i.e.*, W grade). See your lab instructor or the course coordinator for advice. **To withdraw, you MUST file a form in the Registrar's Office (either electronically or in person) and go to the stockroom to CHECK OUT from the laboratory.**

**Note:** You may transfer (possibly with a W) to Chem 1.1, a slower paced course, if Chem 1 is too difficult for you. The LAST day to switch to Chem. 1.1 is **February 17** (Wednesday) **and** may be done only if seats are available in Chem 1.1.

**GRADING:**

Your final grade will be determined as follows:

- 30% Two lecture tests
- 20% Minimum of five recitation quizzes
- 18% Laboratory reports and performance
- 7% Two laboratory quizzes
- 25% Final Exam

## **Chemistry 1 Lecture Schedule**

Unless specific sections are indicated, you are responsible for the whole chapter.

For best results, read the assigned material before lecture.

<b>Lecture #</b>	<b>Topics</b>	<b>Assigned Reading</b>
1, 2	Math Review, Dimensional Analysis, Basic Concepts	Appendix A.1 Chapter 1 (memorize Table 1.2)
3, 4	Elements, Compounds, Ions, Periodic Table	Chapter 2 (memorize Tables 2.4 and 2.5)
5, 6	Chemical Equations, Moles, Empirical Formulas	Chapter 3.1–3.5
7, 8	Stoichiometry, Limiting Reagents	Chapter 3.6–3.7
9, 10	Chemical Reactions, Molarity, Solution Stoichiometry ( <u>Omit</u> Oxidation Numbers, p 139)	Chapter 4
11–13	Thermochemistry	Chapter 5
14, 15	Gases (omit van der Waals Equation, p. 422)	Chapter 10
16–18	Atomic Structure, Periodic Properties	Chapter 6, Chapter 7.1–7.6
19, 20	Ionic and Covalent Bonding, Polarity	Chapter 8
21, 22	Molecular Shape, Dipoles	Chapter 9.1–9.3
23, 24	Intermolecular Forces, Phase Changes	Chapter 11.1, 11.2, 11.4, 11.5
25, 26	Concentration, Solubility, Colligative Properties	Chapter 13.1–13.5
27, 28	Phase Diagrams, Solids	Chapter 11.6–11.8

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## Homework Assignments

Many Students who "did well" in high school chemistry do not get good grades in college chemistry. The reason: they fail to develop the learning skills and problem-solving skills necessary for the advanced level of chemistry at Brooklyn College. The big difference between high school and college is the large amount of work you must do on your own and the emphasis we place on THINKING (instead of memorizing). Your key to success? Learning how to study properly and doing LOTS of homework! Falling behind in reading and homework is a SERIOUS MISTAKE. Organize your life around your coursework and keep up with the assignments.

As you read the textbook, do the exercises and example problems in the chapter. In other words, read and work your way through the chapter. After working through each chapter work out the assigned homework problems. Note well there will not be enough time in class for your instructor to go over every assigned problem. A good indicator of the kinds of problems found in tests is the homework problems. See your teacher during office hours for extra help.

NOTE: Your workshop instructor has the option of completing an assignment one week after the scheduled meeting.

## **Reading and Homework Assignments for Weekly Recitation Meetings**

<b>Meeting #</b>	<b>Assigned Material</b>
<b>Meeting 1</b> Read: Homework:	Math Review, Dimensional Analysis, Basic Concepts Chapter 1 (Memorize Table 1.2) Most of the problems below are a review of high school math and will not be covered in class. The problems on dimensional analysis, significant figures and basic chemical concepts (BLB Ch. 1, will be covered). If you have difficulty with the math problems, consider transferring to Chemistry 1.1. Practice Exercises a–d, p. 1106 Chapter 1, Problems 6, 13, 14, 15, 17, 19, 22, 25, 27, 33, 35, 37, 39, 41, 43, 45, 71
<b>Meeting 2</b> Read: Homework:	Elements, Compounds, Ions, Periodic Table Chapter 2 (Memorize Table 2.4 and 2.5) Chapter 2, Problems 1, 9, 11, 13, 16, 23, 25, 29, 33, 35, 37, 41, 43, 45, 49, 52, 55, 59, 61, 65, 61, 69, 70, 71, 102
<b>Meeting 3</b> Read: Homework:	Chemical Equations, Moles, Empirical Formulas Chapter 3.1–3.5 Chapter 3, Problems 1, 9, 11, 13, 17, 19, 21, 23, 25, 27, 28, 33, 35, 39, 43, 45, 47, 49, 51, 53
<b>Meeting 4</b> Read: Homework:	Stoichiometry, Chemical Reactions Chapter 3.6, 3.7, and Chapter 4.1–4.2 Chapter 3, Problems 7, 57, 58, 74, 77, 80, 102, 104 Chapter 4, Problems 12, 15, 19, 21, 24
<b>Meeting 5</b> Read: Homework:	Acid-Base Reactions, Oxidation of Metals Chapter 4.3, 4.4 Chapter 4, Problems 31, 32, 37, 39, 45, 47, 51, 53, 56
<b>Meeting 6</b> Read: Homework:	Molarity, Solution Stoichiometry Chapter 4.5, 4.6 Chapter 4, Problems 59, 60, 61, 67, 71, 72, 75, 76 81, 83, 85, 111

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<b>Meeting 7</b> Read: Homework:	Thermochemistry Chapter 5 Chapter 5, Problems 11, 12, 13, 21, 24, 25, 37, 41, 44, 45, 49, 51, 53, 55, 60, 63, 65, 67, 71, 74, 81, 104
<b>Meeting 8</b> Read: Homework:	Gases Chapter 10.1–10.8 Chapter 10, Problems 5, 16, 19, 23, 24, 26, 27, 29, 30, 34, 35, 39, 41, 45, 49, 50, 54, 55, 59, 61, 65, 69, 71, 76, 77, 82
<b>Meeting 9</b> Read: Homework:	Atomic Structure Chapter 6 Chapter 6, Problems 9, 10, 11, 13, 14, 15, 17, 19, 23, 25, 26, 27, 33, 36, 37, 49, 50, 51, 53, 54, 55, 57, 59, 63, 64, 67, 71, 73, 75, 99
<b>Meeting 10</b> Read: Homework:	Periodic Properties, Ionic Bonding Chapter 7.1–7.6, and Chapter 8.1–8.3 Chapter 7, Problems 11, 15, 19, 21, 23, 24, 25, 27, 31, 33, 36, 39, 41, 42, 45, 47, 52, 53, 58, 60, 61, 69, 71 Chapter 8, Problems 7, 11, 13, 17, 20, 21, 22, 24
<b>Meeting 11</b> Read: Homework:	Covalent Bonding, Bond Energy, Polarity Chapter 8.4–8.9 Chapter 8, Problems 29, 31, 33, 35, 38, 39, 45, 49, 51, 52, 53, 54, 59, 60, 61, 65, 66, 90
<b>Meeting 12</b> Read: Homework:	Molecular Shape, Dipoles Chapter 9.1–9.3 Chapter 9, Problems 13, 16, 17, 19, 22, 23, 24, 25, 31, 36, 38, 82
<b>Meeting 13</b> Read: Homework:	Intermolecular Forces, Phase Changes, Solubility, Concentrations Chapter 11.1, 11.2, 11.4, 11.5, and Chapter 13.1–13.4 Chapter 11, Problems 9, 10, 13, 15, 16, 19, 21, 23, 35, 39, 43, 45, 47, 49, Chapter 13, Problems 15, 16, 23, 29, 33, 34, 35, 37, 39, 41, 44, 45, 47
<b>Meeting 14</b> Read: Homework:	Colligative Properties, Phase Diagrams, Solids Chapter 13.5, and Chapter 11.6–11.8 Chapter 13, Problems 61, 67, 68, 70, 75, 76 Chapter 11, Problems 53, 56, 61, 63, 67, 75, 77, 78

NOTE: Your instructor has the option of scheduling a two-hour recitation session for the 14th meeting.

**Chemistry 2 First Assignment (next semester)**

It is necessary to do some preparatory work before your first meeting in Chemistry 2.

Read: Chapter 14.1-14.5 in BLB on Chemical Kinetics. Skim Section 14.4;  
your Chem 2 instructor will tell you what to study in detail.

In Section 14.5, omit the discussion of the Arrhenius Equation.

Homework: Chapter 14, Problems 3, 5, 9, 11, 16, 17, 23, 25

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**LABORATORY EXPERIMENTS**

Before coming to laboratory, read the scheduled experiment and any other material assigned. Unless otherwise noted, page numbers refer to your laboratory manual. You must bring the lab manual to each lab class.

Brooklyn College recognizes the importance of reproductive hazard awareness and protection. During laboratory exercises students may be exposed to chemical reagents that may present specific risks to reproductive health, especially students who are pregnant. Therefore, it is strongly recommended that you do not take the following course if you are pregnant. If you become pregnant during the semester, please consult with your laboratory instructor.

NOTE: **SAFETY GOGGLES MUST BE WORN IN THE LABORATORY!** The goggles must be indirectly-vented to offer splash protection; direct vented goggles (sold by hardware stores for impact protection) are not suitable. The campus bookstore sells appropriate goggles. **If your instructor observes you violating eye protection or other safety policies, you can be removed from the laboratory and/or given a 10% (or higher) penalty on your laboratory report grade.**

Scientific data requires special treatment. It must be recorded in non-erasable ink your lab book immediately after a measurement is taken; partners cannot copy each others' data at a later time. **Altering or copying data outside of the laboratory represents academic dishonesty and will be prosecuted as such if observed.** Further, you will receive no credit for any lab report that includes data that are not your own. If your data are messy, you may copy them over onto a final report, but you must include your original data when you turn in your report.

Lab reports are due in lab the week after the experiment was concluded unless you obtain permission from your instructor. All lab reports not handed in will receive a grade of zero.

If your lab instructor is **not** grading the lab reports and returning them to you, please **notify the lecturer.**

From meeting four (Expt. 3) on, you are required to hand in an outline described at the end of the lab schedule.

**Laboratory Breakage.** In some schools, a laboratory fee is charged everyone. Our practice is to charge you only for the replacement cost of any items you lose or break. After check out, a bill will be prepared which you may pay at the bursar's office the following semester.

**NOTE:** If you have checked in for any lab course **you must check out** even if you only attend class for one or two weeks before dropping the course. Students who fail to check out will be charged a fee of **\$50** plus the cost missing or broken equipment. Students who drop a course must go to the stockroom to check out **as soon as possible.**

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<b>Meeting</b>	<b>Laboratory Assignment</b>
1	<u>Introduction to Laboratory</u> <i>Check in, Lab safety, laboratory techniques, balances, reading volumes in calibrated glassware, using burets and pipets, transferring liquid samples.</i>
2	<u>Experiment 1: Density and Measurement</u> <i>Return safety quiz</i>
3	<u>Experiment 2: Introduction to Gravimetric Analysis</u> <i>Gravimetric determination of water of crystallization.</i>
4	<u>Experiment 3: Synthesis of Zinc Iodide</u>
5	<u>Experiment 4: Basics of Chemical Reactions</u>
6	<u>Experiment 5: Volumetric Analysis: Acid-Base Titration</u>
7	<u>Experiment 6: Introduction to Calorimetry</u>
8	<u>Experiment 7: Evaluation of the Gas Law Constant</u> <i>Handout PROP-332: Evaluation of the Gas Law Constant is for sale at the campus bookstore; see the list of required materials in this syllabus (Chem 1 or 1.2 only).</i>
9	<u>Experiment 8: Determining Atomic Emission by Spectroscopy</u> <i>Handout STRC-449: Determining Atomic Emission by Spectroscopy is for sale at the campus bookstore; see the list of required materials in this syllabus (Chem 1 or 1.2 only)</i>
10	<u>Experiment 9: Synthesis of Aspirin</u>
11	<u>Experiment 10: Spectrophotometric Analysis of Aspirin</u>
12	<u>Experiment 11: Intermolecular Forces and Physical Properties</u>
13	<u>Experiment 12: Determination of Molecular Weights by the Method of Freezing-Point Depression</u>
14	Check out and Review <i>No experiments are permitted.</i>

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PREPARATION FOR LABORATORY

Preparation ahead of time for your laboratory experiment will help you to better understand the experiment, to do a better job, and to learn more. In order to encourage you to do advance preparation, we are requiring you to make an outline of the experiment before lab. This outline is to be handed in to your lab instructor at the start of the period and will count toward your laboratory grade. The outline should state the goal of the experiment and briefly outline the procedure. The outline must be neatly done (preferably typed) and on one page. An example of an acceptable outline for experiment 2B is given below.

**Sample Outline**

Experiment 2.                   Determination of Water of Crystallization of Hydrate.

Goal:                            To measure the mass of water in a sample of an ionic salt in order to determine the formula of the hydrated salt.

Procedure:                   1. Clean a crucible and cover and heat strongly.  
                                      2. Cool and weigh empty crucible.  
                                      3. A sample of hydrated salt is weighed accurately in the crucible.  
                                      4. The water is driven off by gentle heating of the crucible.  
                                      5. The sample is weighed again after cooling the crucible with the cover in place.

The Principle of the Experiment:

1. The weight loss gives the mass of water in the sample and allows us to calculate the number of moles of water which was in the hydrated salt.
2. The moles of salt are calculated from the mass of anhydrous salt.
3. The ratio of moles of water to moles of salt gives the formula of the hydrate.

Relevance of this experiment:

1. This experiment gives experience in gravimetric analysis.
2. This experiment is an example of how chemists determine empirical formulas of compounds.

## Chemistry Careers In and Out of the Laboratory

A degree in chemistry opens doors to dozens of exciting and rewarding careers. Here are just a few possibilities.

- Get involved in product development, manufacturing, or quality control for companies producing anything from chemicals to pharmaceuticals to textiles.
- Go on to obtain a MS or PhD in chemistry, biochemistry, biotechnology, bioinformatics, pharmacology, or any other biomedical field, and take a leading role in medical research. Design and test new drugs and medical devices.
- Get involved in sales and marketing for chemical and pharmaceutical firms. Companies are always looking for people with a strong technical background to market their products, and will pay top dollar for them.
- Go into the field as an environmental chemist to study and protect the natural world.
- Use your skills in interesting and challenging ways, from evaluating risk for insurance firms to restoring artwork for museums.
- Work in law enforcement, in anything from forensic investigation to health and safety regulation. Or work inside the political process at a government agency to help formulate policy on scientific, medical and environmental issues.
- Pursue a career in patent law and help bring the next great scientific breakthrough to the market. Or work in the U.S. Patent and Trademark Office to insure that inventors' rights are protected.

### Salary Information

Chemistry Degree	Median Starting Salary*	Median Base Salary (all chemists)**
BA or BS	\$36,700	\$68,700
MS	\$48,000	\$80,000
PhD	\$75,000	\$96,700

\*From M. Heylin, *Chemical and Engineering News*, June 2, p.52, 2008.

\*\*From M. Heylin, *Chemical and Engineering News*, March 3, p. 37, 2008.

Salaries for chemists are high, but do not do justice to the excitement of the field. Science as it is practiced today is collaborative, and chemists have abundant opportunities to travel, to work with interesting people, and to present the results of their work in ways that have a profound influence on the world. Science will shape the world of the 21<sup>st</sup> century, and you have the chance to be part of that process.

For more information, see the department secretary to check out the "Careers in Chemistry" folder in the Chemistry Department office (359NE). Or contact the departmental advisor: Prof. Maria Contel, (718) 951-5458

## Medical School, The Chemistry Major, and You

**Fiction #1:** Being a chemistry major will hurt my chances for medical school, because the hard courses may lead to a lower GPA.

**Fact:** Students majoring in mathematics and the physical sciences (this includes Chemistry) have the highest medical school acceptance rate of any major:

Primary Undergraduate Major	Acceptance Rate
Mathematics and Physical Sciences (including Chemistry)	50%
Biology and Health Sciences	43%
Humanities and Social Sciences	47%
Other	42%

Based on data for the entering class of 2006, reported by the American Association of Medical Colleges  
Table compiled from data available at <http://www.aamc.org/data/facts/2006/mcatgpabymaj1.htm>

**Fiction #2:** Chemists have to take a lot of hard courses so they don't have time to do volunteer work, research, and other activities that help with medical school applications.

**Fact:** A student who has completed his or her requirements for medical school can obtain a chemistry degree with as few as four additional courses. This leaves plenty of time for other activities.

**Fiction #3:** If I don't get into medical school, I may be stuck working in a lab all day.

**Fact:** Chemists have enormous opportunities outside the lab. Chemical and pharmaceutical companies desperately need managers and salespeople with chemical knowledge, and will pay top dollar for them. Chemists also find work in finance, insurance, law, government and manufacturing. Take a look at the other side of this page, or come to the Chemistry Office and ask to see the "Careers in Chemistry" folder.

### **Some other advantages of being a chemistry major:**

- Chemistry majors can receive credit for performing research work with a faculty mentor. This means the time you spend on research gets you closer to graduating and your research experience appears on your transcript.
- Chemistry majors get the skills they need to perform advanced laboratory work, so they can get better research positions, accomplish more and get stronger letters of recommendation from their mentors.
- Thanks to generous donations by alumni, the Department of Chemistry is able to give out more than \$20,000 every year in fellowships, scholarships and awards. These are an aid to both the pocketbook and the resumé.
- Brooklyn College's first Rhodes Scholar of the 21<sup>st</sup> Century is a Chemistry major.

For more information, contact the departmental advisor: Prof. Maria Contel, (718) 951-5458

## CHOOSING A FIRST COURSE IN CHEMISTRY

Some students enroll in a first course in chemistry that is not appropriate for them. The following information will help you make sure you are in the right course. If you decide you are in the wrong course, you should make any change as soon as possible. For further advice, consult your instructor, the Chemistry Department Deputy Chair in 359NE, or the Health Professions Advisor.

