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Name: ______________________________________________________________
Campus Address: ______________________________________________________
Telephone Number: _____________________________________________________

Laboratory Section Information:
   Section Number: _____________________________________________________
   Time: _________________________________________________________________
   Rooms: ________________________________________________________________
   TA’s name: ____________________________________________________________
   TA’s Office Hours: _____________________________________________________
   TA’s Office Number: ____________________________________________________

Discussion Section Information:
   Section Number: _____________________________________________________
   Time: _________________________________________________________________
   Room: _________________________________________________________________
   TA’s name: ____________________________________________________________
   TA’s Office Hours: _____________________________________________________
   TA’s Office Number: ____________________________________________________
INTRODUCTION

to CHEMISTRY 101A

Instructor: Gretchen M. Adams
Office: 210 Chemistry Annex
Phone: 217-244-8279
E-mail: gadams4@illinois.edu
Office Hours: Tuesdays and Thursdays from 3-4 pm
(after lecture) and by appointment
Website Address: www.chem.uiuc.edu
ACTIVE LEARNING

Learning chemistry is not a passive event in which you simply absorb facts given by the teacher like a sponge absorbs water. Learning chemistry requires you to take an active role. In fact, in a very real sense you must construct your own version of chemistry and store it away in a form that is meaningful to you.

We are here to help you in every way we can, but ultimately you bear the responsibility for learning chemistry and making it your own. To do this you must go beyond simple memorization of facts to a real understanding of the concepts of chemistry. We want you to learn to “think like a chemist” – to understand the concepts of chemistry in a way that enables you to solve problems because you understand the fundamental ideas not because you have memorized a particular solution. This is a lofty goal – it is not easy to achieve this kind of understanding. So how do you do it? You do it by

1. listening to (not just hearing) the overview of the concepts given in lecture
2. reading the appropriate sections of the textbook (several times)
3. struggling with homework problems
4. having discussions with your peers and your teachers

The purpose of lecture is not to give a detailed account of a particular topic. Rather the lecturer will give an overview of a topic, showing how a particular topic fits in with previously learned material and why the concept is important. Typically a lecturer will not go over detailed solutions to particular problems but will talk in general terms about how to think through the problems associated with that topic. The lecturer “paints with a broad brush”.

The textbook is a source of detailed information about a particular concept and about the problems associated with that concept. Understanding the material in the textbook requires repeated readings and thorough study. The text is dense with ideas that require slow, careful consideration. It is a good idea to read the text before coming to lecture.
The **homework** in this course requires you to provide the overall strategy for solving the problems. This will show whether you understand the concepts well enough to think your way through an entire problem with no hints along the way.

The **discussion** section provides an opportunity for you to interact with other students and the teaching assistant. **This is not a session in which the TA does the homework while you listen.** In fact you should have your homework completed **before** you go to class. You will be expected to assume an active role in your discussion section. A central feature of these sessions will be group discussions in which you and three or four other students will consider questions that test your understanding of the fundamental concepts of chemistry. It turns out that one of the best ways to find out if you truly understand a concept is whether or not you can explain it clearly to your peers. Teaching is one of the best ways to learn. The TA will be there to facilitate your group discussions, not giving you answers as much as helping you and those in your group ask the right questions as you proceed. You will also consider questions on the homework problems using an active, participatory style.

The **lab** sections provide an opportunity for you to apply some of the chemistry concepts you are learning in lecture and from the text. Through your lab write-ups you have a chance to demonstrate your understanding of chemistry by providing thorough, detailed explanations and answers to lab questions. Your lab TA is there to monitor safety in the lab and help you to fine tune points. It is not the lab TA's job to provide you with explanations or answers to lab questions that are part of your write-up. Many of the lab days are actually discussion days, allowing you to interact with others in the class to come to a better understanding of the concepts covered in lecture and in your reading.

In summary, to learn chemistry effectively requires that you must take an active role. You must take responsibility for participating in the activities described above. We are anxious to help you but we cannot do it for you.
COURSE INFORMATION

**Times:**
- **Lecture:** Tuesday and Thursday: 2:00-2:50 p.m., 100 NL
- **Discussion:** Friday
- **Lab:** Wednesday or Thursday

**Required Materials:**
- **Textbook:** *Introductory Chemistry*, 6th Ed., S.S. Zumdahl and D. J. DeCoste
- **Lab Manual:** *General Chemistry Lab Book: Chemistry 101, Fall 2008*
- **Calculator:** A simple calculator that performs scientific notation.
- **Safety Goggles:** These can be purchased in the bookstore.
- **Lab Apron:** This can be purchased in the bookstore.
- **Lab Notebook:** Any notebook designated for the lab, or college-ruled theme paper.
- **Usage Fee Card:** This can be purchased at the Illini Union bookstore.

**Grading:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hour Exams (3)</td>
<td>300</td>
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<tr>
<td>Final Exam</td>
<td>300</td>
</tr>
<tr>
<td>Lab Write-Ups (13)</td>
<td>280</td>
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<tr>
<td>Electronic HW</td>
<td>80</td>
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<td>Stoichiometry Workshop</td>
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<tr>
<td>TA Evaluation</td>
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<td><strong>Total</strong></td>
<td>1000</td>
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**Exam Dates:**

There will be three hour exams during the semester. These will be given from 7:00 pm to 8:15 pm on:

- **Tuesday, September 23** (Chapters 1, 2, 3.1-3.5, 4, 5, 8, 13.1-13.9)
- **Tuesday, October 28** (Chapters 6, 7.1-7.4, 9.1-9.4, 13.10, 15.1-15.2, 15.4 -15.7)
- **Thursday, December 4** (Chapters 10.1-10.3, 11, 12, 14.1, 14.3-14.4)

Conflicts for exams must be arranged ahead of time by signing up outside of 105 Chem Annex.
**Final Exam:**

Monday, December 15, 7:00-10:00 pm

The final exam will be cumulative. There is no scheduled conflict for the Final Exam. **Do not** make plans to leave campus before the Chemistry 101 final.

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**COURSE DETAILS**

**Lectures:**

Lectures meet each Tuesday and Thursday from 2:00-2:50 pm in 100 Noyes Lab. The purpose of the lecture is to present main concepts and ideas. The emphasis is on how to think about chemistry. Active participation (asking and answering questions) is strongly encouraged.

**Discussions:**

Discussion sections meet each Friday. This is the time to ask questions of a teaching assistant and to be asked conceptually challenging problems. Active participation is strongly encouraged.

**Laboratory:**

Labs meet each Wednesday or Thursday. Always bring your textbook, lab manual and calculator to lab. You will perform the experiment and complete as much of the lab write-up as you can before leaving the lab. If you decide to leave the lab early, you must turn in your lab write-up (anything not completed will be given a score of zero). Lab write-ups are due within the first five minutes of the next lab session. The exceptions are the Review Questions before each exam. These are due at the end of the lab period in which you are to work on them.

*You must be present in lab to receive credit for the lab write-up. Late lab write-ups will not be accepted.*

**Office Hours:**

I will be in my office (210 Chem Annex) Tuesdays and Thursdays from 3-4 pm (after lecture). You can also make appointments to meet with me by seeing me after lecture, sending me an e-mail, or calling me on the phone.

Your TA will have at least 2 hours of office hours each week. He/she will discuss these with you in class in both lab and discussion.

**Electronic Homework:**

You will be given electronic homework using an interactive web-based learning tool. These questions can be attempted an unlimited number of times for full credit before the due date.
**Learning Center (212 Chem Annex):**

General chemistry TA’s will be available for assistance in the Learning Center from 9 am to 5 pm Monday-Friday during the weeks classes are in session. Additional texts and study aids are available.

**The hours of operation for the Learning Center are:**
- Monday-Thursday: 8:30 am - 10:00 pm
- Friday: 8:30 am - 5:00 pm
- Saturday: 10:00 am - 5:00 pm
- Sunday: 1:00 pm - 8:00 pm

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**CALENDAR—Fall 2008**

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<tr>
<th>Week</th>
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<td>Thanksgiving</td>
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<td>15</td>
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<td>4 HE III</td>
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<td>15 FINAL</td>
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<td>17</td>
<td>18</td>
<td>19</td>
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</tbody>
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*HE = Hour Exams  
S/F = Classes start/finish in Chemistry 101  
Final Exam Date = Monday, December 15 (7:00 – 10:00 PM)*
<table>
<thead>
<tr>
<th>DATE</th>
<th>TOPIC</th>
<th>CHAPTER</th>
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<td>Atoms, Molecules, and Ions</td>
<td>4 (1, 2, 3.1-3.5)</td>
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<td>9/4, 9/9</td>
<td>Chemical Composition</td>
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<td>9/23 (Tuesday)</td>
<td>EXAM I: 7:00 - 8:15 PM</td>
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<tr>
<td>9/25, 9/30, 10/2</td>
<td>Chemical Equations and Reactions in Aqueous Solutions</td>
<td>6, 7.1-7.4</td>
</tr>
<tr>
<td>10/7</td>
<td>Solutions</td>
<td>15 (Sections 1,2,4,5)</td>
</tr>
<tr>
<td>10/9, 10/14, 10/16, 10/21</td>
<td>Stoichiometry</td>
<td>9.1-9.4, 13.10, 15.6-15.7</td>
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<td>10/23</td>
<td>Stoichiometry Workshop</td>
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<tr>
<td>10/28 (Tuesday)</td>
<td>EXAM II: 7:00 - 8:15 PM</td>
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<tr>
<td>10/30</td>
<td>Energy</td>
<td>10.1-10.3</td>
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<tr>
<td>11/20, 12/2</td>
<td>Liquids and Solids</td>
<td>14 (Sections 1,3,4)</td>
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<tr>
<td>12/4 (Thursday)</td>
<td>EXAM III: 7:00 - 8:15 PM</td>
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<tr>
<td>12/15 (Monday)</td>
<td>FINAL EXAM: 7:00-10:00 PM</td>
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</tbody>
</table>
Laboratory Schedule—2:00 Lecture

Activity 1: Measurements (25 pts)  August 27/28
Discussion Questions for Introductory Material (20 pts)  September 3/4
Lab 1: Explorations with Gases (20 pts)  September 10/11
Review Questions for Exam I (20 pts)  September 17/18
Lab 2: Chemical Reactions: Precipitation Reactions (25 pts)  September 24/25
Activity 2: Nuts & Bolts and Stoichiometry (20 pts)  October 1/2
Lab 3: Limiting Reactants (25 pts)  October 8/9
Discussion Questions for Stoichiometry (20 pts)  October 15/16
Review Questions for Exam II (20 pts)  October 22/23
NO LAB  October 29/30
Lab 4: Weak Acid Unknown (20 pts)  November 5/6
Lab 5: Modern Atomic Theory (25 pts)  November 12/13
Activity 3: Making Models of Molecules (20 pts)  November 19/20
Review Questions for Exam III (20 pts)  December 3/4

Electronic Homework Schedule

Assignment #1:  Friday, September 5, 4:00 pm
Assignment #2:  Friday, September 12, 4:00 pm
Assignment #3:  Friday, September 19, 4:00 pm
Assignment #4:  Friday, October 10, 4:00 pm
Assignment #5:  Friday, October 24, 4:00 pm
Assignment #6:  Friday, November 14, 4:00 pm
Assignment #7:  Friday, November 28, 4:00 pm
Assignment #8:  Wednesday, December 3, 4:00 pm
This homework is in addition to the electronic homework. Your TA’s will tell you the specific due dates for the particular problems they assign, and collect them at the beginning of Friday discussion sections. You are expected to understand all of the concepts in these problems. Each problem is found under the Questions and Problems section at the end of the chapter.

Note: Chapter 2 and Chapter 3 homework is due Friday, August 29.

**Text Homework for Exam I**

- **Chapter 2:** 5, 7, 11, 26, 33, 35, 36, 37, 42, 68, 96
- **Chapter 3:** 15, 18, 19, 20, 27, 28, 29, 32, 39, 57
- **Chapter 4:** 9, 10, 13, 14, 19, 39, 41, 43, 53, 60, 74, 77, 83, 84, 91, 93, 104
- **Chapter 5:** 9, 10, 13, 14, 17, 19, 22, 33, 35, 36, 39, 41, 43, 45, 50, 57, 60, 73, 77, 78, 83, 84, 91, 93
- **Chapter 8:** 6, 8, 11, 14, 16, 18, 19, 22, 27, 29, 32, 34, 37, 46, 50, 52, 55, 58, 59, 66, 70, 77, 81, 92, 100, 118, 124
- **Chapter 13:** 17, 21, 24, 31, 36, 37, 42, 43, 52, 56, 60, 69, 75, 77, 78, 81, 82, 105, 138, 146

**Text Homework for Exam II**

- **Chapter 6:** 2, 6, 13, 16, 18, 19, 21, 24, 29, 34, 38, 40, 41, 43, 73, 76
- **Chapter 7:** 11, 15, 18, 21, 22, 26, 40, 74
- **Chapter 15:** 34, 35, 37, 41, 47, 55, 56, 58, 62
- **Chapter 9:** 5, 12, 14, 16, 19, 24, 29, 35, 37, 45, 48, 51, 56, 90
- **Chapter 13:** 85, 87, 113
- **Chapter 15:** 64, 65, 67, 70, 71

**Text Homework for Exam III**

- **Chapter 10:** 6, 8, 13
- **Chapter 11:** 3, 7, 8, 12, 16, 19, 25, 26, 29, 31, 35, 39, 45, 47, 50, 51, 55, 58, 61, 63, 73, 74, 76, 77, 78, 95, 116
- **Chapter 12:** 1, 7, 8, 11, 14, 16, 19, 23, 25, 33, 38, 40, 43, 44, 45, 48, 60, 63, 66, 67, 77, 78, 80, 81, 86, 110, 116, 119
- **Chapter 14:** 1, 5, 7, 8, 9, 10, 11, 19, 21, 25, 27, 31, 74, 75, 76, 80
PREFACE

This General Chemistry Lab Book contains laboratory experiments, activities, and discussion questions. All of these have the same goal – to get you to actively think about the chemical principles involved. The emphasis is not on memorization of the “what’s” but on understanding of the “how’s” and the “why’s” of chemistry.

Something you should take note of immediately is that the procedure sections of the labs in this book are quite short and do not list steps for you to follow. This requires you to read and think about the experiments before coming to lab.

In general, before coming to lab, you should:

1. Read about the experiment.
2. Think about the procedure you will follow and write this in your notebook.
3. Read the background material (in the text and your lecture notes).
4. Write any tables you will need for your data/observations in your notebook. Give some thought to the organization of the tables.
5. Read and think about the questions.

The questions asked of you for the lab write-ups often ask for the significance of your results. This requires that you not only understand what you did, and how you did it, but why you did it. It is best to think about all of this before coming to lab.

Also, the discussion questions (or “Additional Questions”) cannot be answered adequately by merely copying words or phrases from the text. These questions require that you apply the knowledge you are getting from the text, lectures, and discussion sections. You will find that you will not be able to answer all of the questions immediately, but that is the point; you should think about these questions for an extended period of time. Take advantage of your time in the lab to discuss these questions with others in the class. You will have sufficient time to think about these questions, and to complete your lab write-ups.

In general, the lab write-ups should include a discussion of your procedure (when appropriate) along with your observations. Finally, you should discuss the significance of your findings by answering the questions. When you are asked to include observations
and data, make sure they are presented neatly, and in a format that makes sense. Also, be sure to show all of your work for your calculations.

The concepts in the lab will coincide with what you are learning about in lectures and discussion sections, but will also add to these. **It is to your advantage to understand the labs, activities, and discussion questions as these ideas will appear on the exams.**

### LABORATORY SAFETY PROCEDURES

1. Goggles and safety aprons must be worn for the experiments performed. This is a state law. These may be rented from 206 Chemistry Annex. On those days in which you are doing activities or answering discussion questions, goggles and aprons are not necessary.

2. Clothing must cover your legs and feet. No sandals, open-toed shoes, skirts, capris or shorts are allowed.

3. Broken glass must be discarded only in the designated “sharps” containers.

4. Report all injuries to the lab instructor immediately no matter how minor you think the injury is.

5. There is no smoking, eating, drinking, or chewing gum in the lab, even on activity and discussion days.

6. Properly dispose of all waste material. Your TA will advise you of the procedure for each experiment.

7. It is strongly suggested that you do not wear contact lenses to the lab. They absorb solvents that are detrimental to the eye, even when you are wearing goggles.

8. Know the location of the fire extinguishers, showers, and eye washes in the lab.

### LABORATORY EQUIPMENT

You are expected to know the following equipment in your lab drawer.

Some equipment found in the laboratory should not be placed in your drawer. Heavy metal rings deposit rust inside the drawer and break glassware.

If you are requested to use an item of equipment not on your list: first, look around the lab for the item, then ask your TA.

You are responsible for all equipment not on your list. If equipment is lost or broken, you will have to get a replacement. Replacement equipment is obtained from the stockroom (206 CA).
## LAB EQUIPMENT IN DRAWERS CHECK LIST

<table>
<thead>
<tr>
<th>CHECK-IN LIST for Rm. 1, 101 and 201 CHEM ANNEX</th>
<th>CHECK if PRESENT</th>
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<td>150 mL (1)</td>
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<td>250 mL (1)</td>
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<td>400 mL (2) and/or 600 mL (2)</td>
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<td>large test tube brush (1)</td>
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<td>test tube holder (1)</td>
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<td><strong>Rubber Policeman</strong></td>
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<td><strong>Plastic Wash Bottle</strong></td>
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<td><strong>Funnel</strong></td>
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<td><strong>Pair of Tongs</strong></td>
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<td><strong>Thermometer (-10°C – 100°C)</strong></td>
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<td><strong>10 mL Mohr Pipet-graduated</strong> (2)</td>
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<td><strong>Pipet Bulb with Teflon Tip</strong></td>
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<td><strong>Small Pipet Bulbs (3)</strong></td>
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<td><strong>Sponge</strong></td>
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<td><strong>Glass Plate</strong></td>
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<td><strong>10mL Graduated Cylinder</strong></td>
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<td><strong>100 mL Graduated Cylinder</strong></td>
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LAB EQUIPMENT

beaker  Erlenmeyer flask  filtering flask  volumetric flask

Mohr pipet  graduated cylinder  test tube  thermometer  buret

Büchner funnel  gravity funnel  wash bottle  wide mouth bottle

buret clamp  Bunsen clamp holder  Bunsen clamp  burner

filter-vac  glass plate  watch glass  wire gauze
ring stand  ring  florence flask  Dumas flask
rubber bulb  rubber policeman and glass stirring rod  rubber stoppers
test tube rack  evaporating dish  porcelain spatula
sponge  test tube brush  test tube holder  small pipet bulb
tongs  file  clay triangle
Conduct of Work in the Laboratory
(Student Copy)

As conditions for using the laboratory in the study of Chemistry 101, I will:

1. Wear safety goggles at all times. (Required by State Law.) Wear safety apron or lab coat at all times.

2. Never wear shorts, skirts, capris or open-toed shoes (especially sandals) to lab.

3. Never smoke, eat, drink, or chew gum in the lab, even on activity and discussion days.

4. Read and understand the Laboratory Conduct and Safety information as outlined on pages 9-10 of this manual.

5. Know the location of all safety equipment—fire extinguishers, showers, eye washes and fire alarms—in the lab.

6. a. Dispose of all solid chemical waste in waste containers or special containers provided for special chemical wastes.
   b. Never throw solids (especially paper, matches, or glass) into the sink.
   c. Put all broken glass in the special containers designated by the TA and laboratory specialist.

7. Report any accident, broken equipment, or other damage IMMEDIATELY to the TA or the storeroom supervisor.

8. Clean up spills immediately.

9. Leave my work space and shared equipment ready for use by the next student to occupy the station.

10. Have adequate insurance coverage to cover costs of transportation and treatment in the case of an emergency.

I have read and will follow all guidelines as stated above. I understand that failure to comply with these rules will adversely affect my laboratory grade and will be cause for dismissal from the lab.

______________________________         ______________         ___________
Signature                                            Section                           Date

_______________________________
PRINTED NAME
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