Course Format

1. Lecture (meets twice per week with yours truly)  
   Powerpoint slides will be posted on website - print off and bring to class.

2. Discussion (meets twice per week with your designated T.A.)  
   Attendance is mandatory.  
   Time to interact with each other, participate and ask questions.  
   Quizzes will be given in discussion.
Grading Policy

Discussion: 3%
Lon-Capa Electronic Homework: 7%
Quizzes (total of 6): 20%
Hour Exams (total of 3): 35%
Final Exam: 35%
Discussion and Quiz Grades

- Your grade is based on participation in class and completion of assigned homework.

- Homework assignments can be found in your interactive course guide (pg. 25).

- You should complete these assignments before discussion so that you can ask informed questions.

- Quiz dates will be announced in discussion but will occur approximately every two weeks in your discussion section.
Lon-Capa Homework

- To access Lon-Capa online homework go to http://www.chem.uiuc.edu
- Then click on the link for Chem 102 B/F
- On the left hand side there should be a menu which links to the Lon-Capa website.
- There you will need to use your NetID (e-mail address without the illinois.edu part)
- You will use your AD password, if you have previously created a password you use that one if you have not follow the links on the chem homepage to create one.
- Lon-Capa is due at 9 am every Wednesday starting on September 10th - a detailed schedule can be found in the Interactive Course Guide (pg15).
- Three hour exams each weighted the same.
- Hour exams are at 7:00 pm on September 25th, October 30th and December 4th.
- They last approximately 75 minutes and consist of 30 multiple choice questions.
- Exams are SCALED! When you get your grade consider the average on the exam before you freak out!
- The final exam consists of 70 multiple choice questions and you have three hours to complete the exam.
- For 102 B - Final December 16th from 7-10 pm
- For 102 F - Final December 12th from 1:30-4:30 pm
1. Your instructor - DON’T BE AFRAID TO COME AND SEE ME!

2. Your Teaching Assistant. They will also have office hours.

3. Chemistry Learning Center - 212 Chemistry Annex. Open from 9am until 4 pm.
1. Read the textbook prior to coming to class.

2. Attend every lecture.

3. Review material covered in class after attending lecture, then complete the assigned homework prior to attending discussion.

4. Attend and actively participate in your assigned discussion section.

5. Take advantage of your resources: me, the teaching assistants and the learning center.
What I need from YOU!

1. Attend and participate in lecture and discussion!

2. Enthusiasm!

3. Complete your homework assignments everyday!

4. Feedback!
Course Goals

1. Increase student’s knowledge and understanding of chemistry.

2. To develop problem solving skills and an understanding of science that can be applied to other courses and in everyday situations.
Science Literacy - POP QUIZ

Answer the following True or False:

1. Electrons are smaller than atoms. T - 48%
2. Antibiotics kill viruses as well as bacteria. F - 55%
3. Light travels faster than sound. T - 82%
4. The Earth goes around the Sun once a year. T - 63%
5. Lasers work by focusing sound waves. F - 46%

http://chronicle.com/weekly/v54/i38/38a00101.htm
All is not lost!

- It has been 400 years since Galileo helped prove that the Earth orbits the sun.

- 4/5 of respondents couldn’t define a molecule.

- America’s overall score ranks second only behind Sweden.

- Major factor most strongly predictive of a passing score was college course work in science.
Abbreviated Outline

Hour Exam 1

Atomic Theory

Stoichiometry

Solution Chemistry

Properties of Gases
Observations can be **qualitative** or **quantitative**. What is the difference?

Hypothesis is a possible explanation for an observation.

**Theory** is a set of tested hypotheses that gives an overall explanation of some natural phenomenon. Explains **WHY**.

**Law** is a summary of observed measureable behavior. Summarizes **WHAT**.
Units of Measurement

A quantitative measurement always involves a **number** and a **unit**.

<table>
<thead>
<tr>
<th>Physical Quantity</th>
<th>Name of Unit</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass</td>
<td>kilogram</td>
<td>kg</td>
</tr>
<tr>
<td>Length</td>
<td>meter</td>
<td>m</td>
</tr>
<tr>
<td>Time</td>
<td>second</td>
<td>s</td>
</tr>
<tr>
<td>Temperature</td>
<td>kelvin</td>
<td>K</td>
</tr>
<tr>
<td>Electric current</td>
<td>ampere</td>
<td>A</td>
</tr>
<tr>
<td>Amount of substance</td>
<td>mole</td>
<td>mol</td>
</tr>
<tr>
<td>Luminous intensity</td>
<td>candela</td>
<td>cd</td>
</tr>
</tbody>
</table>
Prefixes used in SI system

Prefixes are commonly used to change the size of a unit. You must memorize this table.

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Symbol</th>
<th>Meaning</th>
<th>Exponential Notation*</th>
</tr>
</thead>
<tbody>
<tr>
<td>exa</td>
<td>E</td>
<td>1,000,000,000,000,000,000</td>
<td>$10^{18}$</td>
</tr>
<tr>
<td>peta</td>
<td>P</td>
<td>1,000,000,000,000,000,000</td>
<td>$10^{15}$</td>
</tr>
<tr>
<td>tera</td>
<td>T</td>
<td>1,000,000,000,000,000,000</td>
<td>$10^{12}$</td>
</tr>
<tr>
<td>giga</td>
<td>G</td>
<td>1,000,000,000,000,000,000</td>
<td>$10^9$</td>
</tr>
<tr>
<td>mega</td>
<td>M</td>
<td>1,000,000,000,000,000,000</td>
<td>$10^6$</td>
</tr>
<tr>
<td>kilo</td>
<td>k</td>
<td>1,000,000,000,000,000,000</td>
<td>$10^3$</td>
</tr>
<tr>
<td>hecto</td>
<td>h</td>
<td>100,000,000,000,000,000</td>
<td>$10^2$</td>
</tr>
<tr>
<td>deka</td>
<td>da</td>
<td>10,000,000,000,000,000</td>
<td>$10^1$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,000,000,000,000,000</td>
<td>$10^0$</td>
</tr>
<tr>
<td>deci</td>
<td>d</td>
<td>0.1,000,000,000,000,000</td>
<td>$10^{-1}$</td>
</tr>
<tr>
<td>centi</td>
<td>c</td>
<td>0.01,000,000,000,000,000</td>
<td>$10^{-2}$</td>
</tr>
<tr>
<td>milli</td>
<td>m</td>
<td>0.001,000,000,000,000,000</td>
<td>$10^{-3}$</td>
</tr>
<tr>
<td>micro</td>
<td>μ</td>
<td>0.000001,000,000,000,000</td>
<td>$10^{-6}$</td>
</tr>
<tr>
<td>nano</td>
<td>n</td>
<td>0.00000000000000001</td>
<td>$10^{-9}$</td>
</tr>
<tr>
<td>pico</td>
<td>p</td>
<td>0.000000000000000001</td>
<td>$10^{-12}$</td>
</tr>
<tr>
<td>femto</td>
<td>f</td>
<td>0.000000000000000001</td>
<td>$10^{-15}$</td>
</tr>
<tr>
<td>atto</td>
<td>a</td>
<td>0.000000000000000001</td>
<td>$10^{-18}$</td>
</tr>
</tbody>
</table>

*See Appendix 1.1 if you need a review of exponential notation.
Uncertainty in Measurements

There is always some degree of uncertainty in a measurement.

The degree of uncertainty is dependent on the measuring device.

It is important to indicate the uncertainty in any measurement.

This is done by recording certain digits and the first uncertain digit.

These numbers are called significant figures.

Figure 1.9

20.15 ± 0.01 mL
**Accuracy** refers to the agreement of a particular value to the “true” value.

**Precision** refers to the degree of agreement among several measurements of the same quantity, also called reproducibility.

![Figure 1.10](image)

- **(a) Neither**
  - Random Error
- **(b) Precise**
  - Systematic Error
- **(c) BOTH**

Figure 1.10
**Significant Figures**

1. **Nonzero integers** are significant.

2. **Zeroes:**
   
   (i) **Leading Zeros** (precede nonzero integers) are **not** significant.  
   **Example:** 0.0025  
   **Answer:**

   (ii) **Captive Zeros** (zeroes sandwiched between integers) are **significant**.  
   **Example:** 1.008  
   **Answer:**

   (iii) **Trailing Zeros** (zeroes after integers) are significant **only** if the number contains a decimal point.  
   **Examples:** 100; 1.00 \times 10^3; 100.  
   **Answers:**
Significant Figures Continued

3. **Exact numbers are numbers obtained by counting and contain an infinite number of significant figures.**

   **Example:** 10 experiments or 3 cats
Scientific Notation is used to condense numbers:

**Example:** 1000 in scientific notation is....

Examples of Counting Number of Significant Figures:

1. $6.07 \times 10^{-5}$
2. 300
3. 301
4. 463.8052
1. For multiplication or division the number with the fewest significant figures limits the significant figures in the answer.

Example: \(4.56 \times 1.4 = \)

2. For addition or subtraction the answer should have the same number of decimal places as the number with the fewest decimal places.

Example: \(12.11 + 18.0 + 1.013 = \)

Example: \(\frac{2.6234 \times (6.022 \times 10^{23})}{1.0 + 35.45} = \)
Dimensional Analysis

Converting between units, we will always give you conversion factors, you DO NOT need to memorize them.

**Question:** A pencil is 7.00 in long. What is its length in cm?

**Answer:**

**Question (Chapter 1 #46):** You pass a road sign saying “New York 112 km.” If you drive at a constant speed of 65 mi/h, how long should it take you to reach New York?

**Answer:**
Lockheed Martin used British units and NASA used metric units which caused a miscommunication and the orbiter to get dangerously close to Mars’ atmosphere and break into pieces.

**COST: 125 MILLION DOLLARS**

http://www.cnn.com/TECH/space/9909/30/mars.metric/
Density

A property of matter that is used as an identification tag.

Important in designing materials.

Density = mass/volume; units: \( g/cm^3 \) or \( g/mL \) or \( kg/m^3 \)

**Question:** A kg of feathers = A kg of bricks but do they have the same density?

**Answer:**
**Question:** For a material to float on the surface of water, the material must have a density less than that of water (1.0 g/mL) and must not react with the water or dissolve in it. A spherical ball has a radius of 0.50 cm and weighs 2.0 g. Will this ball float or sink when placed in water? (Note: Volume of a sphere = \( \frac{4}{3}\pi r^3 \))

**Answer:**