This is a QEP Course.

Clear written communication is important in all disciplines, and increasingly employers are expecting college graduates to be good writers. That's one reason why UWG is focusing on improving undergraduate student writing across the core. When you hear about the QEP—UWG's Quality Enhancement Plan—know that what your peers and professors are talking about is WRITING, because we are committed to giving you opportunities across your core curriculum to improve the quality of your writing. Want to know more? Visit the QEP website at http://www.westga.edu/qep/

Materials

1. All required lab supplies are included in the laboratory fee for the course.
2. MeasureNet Access
3. Composition Book
4. **Scientific Calculator** (Recommend TI-84 Plus)

Course Outline: This course introduces fundamental lab principles and applications of chemistry for science majors.

1. Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science.
   a. Exhibit the above traits in their own scientific activities.
   b. Recognize that different explanations often can be given for the same evidence.
   c. Explain that further understanding of scientific problems relies on the design and execution of new experiments, which may reinforce or weaken opposing explanations.

2. Students will use standard safety practices for all classroom laboratory and field investigations.
   a. Follow correct procedures for use of scientific apparatus.
   b. Demonstrate appropriate techniques in all laboratory situations.
   c. Follow correct protocol for identifying and reporting safety problems and violations.
3. Students will identify and investigate problems scientifically.
   a. Suggest reasonable hypotheses for identified problems.
   b. Develop procedures for solving scientific problems.
   c. Collect, organize and record appropriate data.
   d. Graphically compare and analyze data points and/or summary statistics.
   e. Develop reasonable conclusions based on data collected.
   f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

4. Students will use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.
   a. Develop and use systematic procedures for recording and organizing information.
   b. Use technology to produce tables and graphs.
   c. Use technology to develop, test, and revise experimental or mathematical models.

5. Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.
   a. Trace the source on any large disparity between estimated and calculated answers to problems.
   b. Consider possible effects of measurement errors on calculations.
   c. Recognize the relationship between accuracy and precision.
   d. Express appropriate numbers of significant figures for calculated data, using scientific notation where appropriate.
   e. Solve scientific problems by substituting quantitative values, using dimensional analysis and/or simple algebraic formulas as appropriate.

6. Students will communicate scientific investigations and information clearly.
   a. Write clear, coherent laboratory reports related to scientific investigations.
   b. Write clear, coherent accounts of current scientific issues, including possible alternative interpretations of the data.
   c. Use data as evidence to support scientific arguments and claims in written or oral presentations.
   d. Participate in-group discussions of scientific investigation and current scientific issues.

7. Students will analyze how scientific knowledge is developed.
   Students recognize that:
   a. The universe is a vast single system in which the basic principles are the same everywhere.
   b. Universal principles are discovered through observation and experimental verification.
   c. From time to time, major shifts occur in the scientific view of how the world works. More often, however, the changes that take place in the body of scientific knowledge are small modifications of prior knowledge. Major shifts in scientific views typically occur after the observation of a new phenomenon or an insightful interpretation of existing data by an individual or research group.
   d. Hypotheses often cause scientists to develop new experiments that produce additional data.
   e. Testing, revising, and occasionally rejecting new and old theories never ends.

8. Students will understand important features of the process of scientific inquiry.
Students will apply the following to inquiry learning practices:

a. Scientific investigators control the conditions of their experiments in order to produce valuable data.
b. Scientific researchers are expected to critically assess the quality of data including possible sources of bias in their investigations’ hypotheses, observations, data analyses, and interpretations.
c. Scientists use practices such as peer review and publication to reinforce the integrity of scientific activity and reporting.
d. The merit of a new theory is judged by how well scientific data are explained by the new theory.
e. The ultimate goal of science is to develop an understanding of the natural universe which is free of biases.
f. Science disciplines and traditions differ from one another in what is studied, techniques used, and outcomes sought.

**Tardiness / Missed Lab:** Lab attendance is mandatory. Unexcused absences will result in a grade of zero. No make-up labs will be permitted. At the beginning of each laboratory we will discuss the laboratory. You must be present. Lateness will be penalized by deduction from the grade for that lab.

**Preparation for Each Lab:** The labs will require preparation and careful work to complete in the allotted time. Read all laboratory material before coming to lab. It is important that you understand the theory and procedure of the experiment. The lab material will be posted on Course Den. You must print out lab material to bring to lab each week.

**During the lab:** You must record all data and observations in your composition book. Use non-erasable ink, and never use white out.

**After the lab:** Clean up the lab space, clean the glassware and put back in the drawer, and unplug hotplates.

**Reports:** Laboratory reports are due before the next lab period. They are to be submitted in the appropriate dropbox in CourseDen. One report per student is required. Late reports will incur a 10% penalty for each day the report is late. (No reports will be accepted after 5 days).

**Academic Honesty:** Plagiarism and cheating will not be tolerated. Students caught cheating will receive a zero for the assignment and possibly face further disciplinary action.
**What Counts as Plagiarism?**

This course is one in which you will be working with a lab partner. To be clear, this does not mean that your lab reports are group reports. They are instead individual reports. What this means is that all of the following are examples of things that would be included as plagiarism:

- Dividing the lab in half and each person doing half of the assignment and then putting the halves together to create the final report.
- Having one person create all of the graphs and tables and send them to other group members for them to use.
- Getting a copy of the lab from someone else and changing a few words and sentences so as to try and make it “different enough”.
- Getting a copy of the calculations from someone else even though you did the rest of the lab yourself.

Overall what this means is that you are supposed to do the write up portion of the lab on your own. No part of the lab should be a copy from someone else. However, you will be doing the labs together. This means that the actual data will be the same but no part of the lab write up should be copied from someone else (including copying someone but changing a few words).

**Evaluation:**

- **Lab Reports** - (Submitted on CourseDen) 80%
- **Composition Notebooks** - (Data Records) 10%
- **Instructor points** 10%
  i. Lab efficiency
  ii. Pre-lab preparation
  iii. Cooperation, attitude
  iv. Performance, and cleanliness.
Tentative Lab Schedule:

### 1211 Lab Schedule – Fall 2017

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<th>Monday</th>
<th>Tuesday</th>
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<td><strong>August 7</strong></td>
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<tr>
<td><strong>Lab 0</strong> - lab syllabus, lab safety and QEP</td>
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<td><strong>Lab 1</strong> - Basic Measurements</td>
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<td><strong>Lab 2</strong> - Emission Analysis/Density</td>
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<td><strong>Lab Day (Monday 4th) NO LAB</strong></td>
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<td><strong>Lab 3</strong> - Determination of % by Mass Thermal Gravimetric Analysis</td>
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<td><strong>Lab 4</strong> - Lewis Structures and Resonance</td>
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<td><strong>Lab 5</strong> - Molecular Modelling – VESPR and polarity</td>
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<td><strong>Lab 6</strong> - Stoichiometry I</td>
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<td><strong>Lab 7</strong> - Stoichiometry II Limiting Reactants (Analysis of Alum)</td>
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<td><strong>Lab 8</strong> - Aqueous Chemistry (Vinegar Titration, Solubility Rules, pH probe) Vinegar Titration</td>
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<td><strong>Lab 9</strong> - Separation of a Mixture</td>
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<td><strong>Lab 10</strong> - Behavior of Gases (Pressure Probe)</td>
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<td><strong>Lab 11</strong> - Calorimetry (Lab Final Solubility Rules Guided Practice)</td>
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<td><strong>Thanksgiving Break</strong></td>
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<td><strong>Class Ends</strong></td>
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Other Labs – Hydrate; Making Aspirin; Balloon Stoichiometry; Paper Chromatography