**CHEM 1112 - Lower Division AGCM Spring 2012 Course Description**

Basic laboratory experiments supporting theoretical principles presented in CHEM 1312; introduction of the scientific method, experimental design, chemical instrumentation, data collection and analysis, and preparation of laboratory reports.

*(http://www.thecb.state.tx.us/aar/undergraduateed/workforceed/acgm.htm)*

**University of North Texas Course Description**

This is the second of two-course laboratory sequence for general chemistry.

Quantitative, gravimetric and volumetric analyses; coordination compounds.

*(CHEM 1440: General Chemistry for Science Majors course description from the 2011-12 University of North Texas Course Catalog)*

**Hours of Credit**: One (1)

**Required Co-requisite:**

* CHEM 1312: General Chemistry II for Science Majors must be taken concurrently.

**Prior Knowledge and Prerequisites**

* CHEM 1311 and CHEM 1111: General Chemistry I for Science Majors course and laboratory is required.

Students who expect to be successful in CHEM 1112 should exhibit the following College and Career Readiness Standards skills. Only the specific standards and performance expectations pertinent to the course are listed on the following pages.

**Science College and Career Readiness Standards**

1. **Nature of Science: Scientific Ways of Learning and Thinking**
2. Cognitive skills in science
3. Scientific inquiry
4. Collaborative and safe working practices
5. Current scientific technology
6. Effective communication of scientific information
7. **Foundation Skills: Scientific Applications of Mathematics**
   1. Basic mathematic conventions
   2. Mathematics as a symbolic language
   3. Understand relationships among geometry, algebra, and trigonometry
   4. Scientific problem solving
   5. Scientific application of probability and statistics
   6. Scientific measurement
8. **Foundation Skills: Scientific Applications of Communication**
   1. Scientific writing
   2. Scientific reading
   3. Research skills/information literacy
9. **Science, Technology, and Society**
   1. Interactions between innovations and science
   2. Social ethics
   3. History of science
10. **Cross-Disciplinary Themes**
    1. Matter/States of matter
    2. Energy (thermodynamics, kinetic, potential, energy transfers)
    3. Change over time/equilibrium
    4. Classification
    5. Measurements and models
11. **Chemistry**
    1. Matter and its properties
    2. Atomic structure
    3. Periodic table
    4. Chemical bonding
    5. Chemical reactions
    6. Chemical nomenclature
    7. The mole and stoichiometry
    8. Thermochemistry
    9. Properties and behavior of gases, liquids, and solids
12. Nuclear Chemistry

**Mathematics College and Career Readiness Standards**

1. **Numeric Reasoning**
2. **Algebraic Reasoning**
3. **Measurement Reasoning**
4. **Probabilistic Reasoning**
5. **Statistical Reasoning**
6. **Functions**
7. **Problem Solving and Reasoning**

**Cross-Disciplinary Standards**

1. **Key Cognitive Skills**
   1. Intellectual curiosity
   2. Reasoning
   3. Problem solving
   4. Academic behaviors
   5. Work habits
   6. Academic integrity
2. **Foundational Skills**
   1. Reading across the curriculum
   2. Writing across the curriculum
   3. Research across the curriculum
   4. Use of data
   5. Technology

**Course Objectives**

Upon successful completion of CHEM 1112, students should be able to:

1. Experimentally determine the order of a reaction and rate constant based on differential rate form expression.
2. Analyze the concentration of various solutions using titration to an end point (as shown by an indicator) as a volumetric form of analysis.
3. Experimentally determine acid-dissociation constant for a weak acid using titration curves.
4. Identify an unknown weak acid based on measuring the dissociation constant and molar mass of the acid.
5. Determine the pH of various household chemicals and of buffer solutions.
6. Experimentally verify Beer’s Law.
7. Determine the molar absorption constant of a dye.
8. Experimentally determine the order and rate constant of a reaction based on the integral rate form expression using spectrometric methods.
9. Experimentally determine an equilibrium constant for complex formation using spectrometric methods.
10. Determine the solubility product for an ionic salt using pH and titration.
11. Standardize a solution using volumetric methods.
12. Build an electrochemical cell.
13. Experimentally verify the Nernst equation

**Class Policies and Practices**

**Accommodation for Disability (Section 504)**

The Chemistry Department believes in reasonably accommodating individuals with disabilities and complies with university policy established under Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (1990) to provide for equal access and opportunity. Please communicate with your professor as to you specific needs so that the appropriate arrangements/accommodations can be made**.**

**Safety**

Texas state law and University policy require eye protection in the form of chemical safety glasses or chemical safety goggles for ALL persons in academic chemistry laboratories. This will be strictly enforced. **PERSISTENT OFFENDERS WILL BE DROPPED WITH “WF.”**

Contact lenses can be worn in lab, HOWEVER, there is great potential for corrosive and/or volatile chemicals to get underneath the lenses and cause damage before the contact lenses can be removed. Proper wearing of chemical safety goggles prevents most issues with contact lenses.

*Open-toe shoes* (flip-flops, sandals, strappy heels, ballet flats), *bare feet*, and *chewing gum* are not permitted in lab. Failure to comply will result in removal from the lab area until the issue is taken care of.

Good clothing which might be damaged should not be worn. Report all accidents to your TA at once. Read and follow the safety rules inside the cover of the textbook and in Chapter 2 of the textbook.

All students are responsible for their own actions in the laboratory and for the results of their actions. If you break any glassware or allow glassware with cracks to be heated, you will pay for their replacement.

**Make-Up Labs:**

There are **no make-up laboratories**.

If you miss a lab due to one of the following five reasons it will be excused. Otherwise, a missed laboratory will result in a zero for that experiment.

Acceptable reasons for missing an experiment are:

1. Illness (with physician’s note)

2. Death of a close family member or friend

3. Religious holiday (preplanned and cleared with instructor in advance)

4. An official University activity (preplanned and cleared with instructor in advance)

5. Cancellation of classes by the University

**Turn in the documentation for the missed laboratory to the Teaching Assistant.**

**Course Texts and Materials**

1. Acree, W. E. Jr. (2005). *Modern General Chemistry Laboratory: Incorporating Computer-Oriented Data Acquisition and Evaluation Approach into the Student Laboratory Experiment*. Denton, TX: Eagle Image Publishing.
2. Chemical safety glasses or chemical splash goggles that meet ANSI standards must be purchased before the first lab. You can purchase them at the university bookstore or through AΧ∑, the Chemistry honor society.

**Grade Practices: Assessments and Assignments**

Your grade will be determined entirely by your performance in the laboratory (completed laboratory reports and instructor assessment of safe laboratory practices). This semester 12 laboratory experiments will be performed. The 230 total points in the laboratory are broken down as follows:

Best 11 of 12 Laboratory experiments Points Possible = 11 x 20 = 220

Assessment of Safe Laboratory Practices Points Possible = 10

Total: = 230

Letter grades will be based upon the following grading scale:

90 – 100 % of the total points Grade = A

80 – 89 % of the total points Grade = B

70 – 79 % of the total points Grade = C

60 – 69 % of the total points Grade = D

Below 60 % Grade = F

For individuals with a single excused absence, the total possible points in the laboratory will be adjusted appropriately to reflect the one excused absence. For students with more than one excused absence, please see the Instructor in charge to see if any of the missed work can be made up.

1. Laboratory Reports – 96%
   1. There are 11 lab reports that must include complete and accurately recorded data, appropriate graphs, all calculations, answers to analysis questions, and essay-style conclusions.
2. Safety – 4%
   1. The laboratory instructor will assess how well each student performs lab experiments safely. This will be assessed each lab period.

**Method of Instruction**

1. Laboratory Work – 75%
   1. Laboratory work is defined as a method of instruction in which students use appropriate tools and instrumentation to experimentally determine results. This work can be either open ended in nature (unknown outcomes) or closed in nature (pre-determined outcomes).
   2. Laboratory work is accomplished by the students under the guidance and supervision of laboratory instructors.
   3. Students will be expected to come to lab ready to participate in the laboratory work and to follow all safety rules.
   4. Students will be expected to listen and respond appropriately to each other’s comments.
2. Laboratory Lecture – 25%
   1. Laboratory lecture is defined as pre-laboratory explanation of upcoming lab experiments that the students will accomplish that week.
   2. Lab instructors conduct lab lectures. Pertinent topics include theory behind the experiments, safety issues, and demonstration of new lab techniques.
   3. Students are expected to attend recitation and are expected to listen and implement instructions in the laboratory

**Class Schedule**

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| Week | Recitation Topic | Lab Experiment | Assignment Due |
| 1 | Safety  Exp 13: *Chemical Kinetics I – Determination of the Order of Reaction and Rate Constant Based on Differential Rate Form Expression* | None  Check in |  |
| 2 | Exp 14: *Introduction to Acid-Base Chemistry – Determination of Acetic Acid in Vinegar*  Exp 15: *Introduction to pH – Titration of Acetic acid in Vinegar and Phosphoric Acid in Coca Cola ®* | Experiment 13 |  |
| 3 | Exp 15 review  Exp 16: *Determination of Acetic Acid in Vinegar by use of pH Titration Curve* | Experiment 14 | Experiment 13 lab report |
| 4 | Exp 16 review  Exp 17: *Determination of pKa and Molar Mass of an Unknown Acid* | Experiment 15 | Experiment 14 lab report |
| 5 |  | Experiment 16 | Exp 15 lab report |
| 6 | Exp 18: *Acids & Bases in Common Household Products and pH Measurements for Carefully Prepared Buffered Solutions*  Exp 19: *Introduction to Spectrometry – Verification of Beer’s Law* | Experiment 17 | Exp 16 lab report |
| 7 |  | Experiment 18 | Exp 17 lab report |
| 8 | Exp 19 review  Exp 20: *Chemical Kinetics II – Determination of the Order of Reaction and Rate Constant Based on Integral Rate Form Expression* | Experiment 19 | Exp 18 lab report |
| 9 | Exp 20 review  Exp 21: *Spectrophotometric Determination of an Equilibrium Constant for Complex Formation* | Experiment 20 | Exp 19 lab report |
| 10 | Exp 22: *Molar Solubility and Determination of Solubility Product* | Experiment 21 | Exp 20 lab report |
| 11 | Exp 23: *Redox Titration – Standardization of Potassium Permanganate* | Experiment 22 | Exp 21 lab report |
| 12 | Exp 25: *Electrochemistry – Verification of the Nernst Equation* | Experiment 23 | Exp 22 lab report |
| 13 | Exp 25 review | Experiment 25 | Exp 23 lab report |
| 14 | None | None | Exp 25 lab report |