

Introductory Chemistry and Laboratory Syllabi

Department: Chemistry and Biochemistry

Laboratory Description: Introductory Laboratory I (CHEM 1105) One semester hour, two hours lab per week. Introductory laboratory experiments. Co-requisite: CHE 111.

Class Description: Introductory Chemistry I (CHEM 1305) Introduction to the principles and concepts of chemical thought. Co-requisite CHE 111 L. Prerequisite: eligibility for MTH 138.

Pre-requisites: must be eligible for MTH 138.

Laboratory Text and Materials: *Introductory Chemistry Lab (CHE 111 L) Laboratory Manual*. This manual is available at local bookstores. A non-programmable, scientific calculator is required for all exams and quizzes. Students will need to check their SFA email accounts each week before coming to lab.

Course (Class) Text and Materials: *Chemistry: Fundamentals and Principles* by Charles Davidson (e-text via saplinglearning.com) On-line homework will be through saplinglearning.com as well. A non-programmable, scientific calculator is required for all exams and quizzes. Students will need to check their SFA email accounts each week.

Core Objectives:

1. Critical Thinking: to include creative thinking, innovation, inquiry and analysis, evaluation and synthesis of information.
2. Communication Skills: to include effective development, interpretation and expression of ideas through written, oral, and visual communication.
3. Empirical and Quantitative Skills: to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions.
4. Teamwork: to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal.

Lab/Class Objective: To provide students with an explanation of the basic principles of chemistry discussed in class and illustrated through laboratory experiments and to apply these principles to laboratory work and communicate their findings. The laboratory work involves working in teams to gather/analyze/evaluate data so that informed conclusions can be reached.

Major Topics Covered

- Units of measure and significant figures, unit conversion, density and definitions of matter.
- Basics of atomic theory applied to the atom, basics of the periodic table, correct use of terms.
- Writing correct formulas of compounds and inorganic nomenclature.
- Determination of mass calculations in chemical formulas and chemical reactions, writing balanced chemical reactions

- Principles of intermolecular forces in liquids and properties of solutions as they relate to polarity and solubility.
- Principles of acid/base theories, pH, buffers, acid-base indicators, and titration

Course Calendar for Lab and Class: SHOWN ON PAGES 9-12 OF THIS SYLLABUS

Grading Policy: Laboratory Portion (varies by section)

The grade for the lab is separate from the course. Quizzes, pre-lab assignments, and laboratory exercises/reports/assignments will be done each week. In addition a midterm exam and a final exam will be given. See the course calendar for dates. The lowest quiz, lowest pre-lab, and lowest lab exercise/report/assignment will be dropped. The grades will be determined as follows:

$\geq 90\% = \mathbf{A}$; $\geq 80\% = \mathbf{B}$; $\geq 70\% = \mathbf{C}$; $\geq 60\% = \mathbf{D}$; $< 60\% = \mathbf{F}$

Make-up Policy: NO make-up labs or quizzes will be given since the lowest quiz grade and the lowest experiment/assignment grade will be dropped.

Grading Policy: Class Portion (varies by section)

4-hour exams (100 pts per test). The dates of exams are shown on the course calendar. The exams will be given during class time. Exams may consist of any of the following types of questions: problems that must be set up and solved, nomenclature, discussion questions, fill in the blank, matching, and/or multiple choice. Partial credit may be given on some types of questions so it is important to always show your work. Credit **will not be given** for correct answers unless you show how you arrived at the answer.

Final Exam – The final exam will be comprehensive. It is worth 100 points.

Quizzes - Quizzes will be given periodically in class, usually at the beginning of class. Announced or pop-quizzes are possible. No make up quizzes will be given. The lowest quiz grade will be dropped.

Group assignments - Group assignments will be given periodically in class. The point value will be indicated on each group assignment. No make-up group work will be allowed.

On-line homework – Saplinglearning.com. The course identification is Assignments will be given approximately every week.

The total points of quizzes, group assignments and on-line homework will be averaged and will total 100 points for the class.

Method of Evaluation: The final grade will be based upon percentage of points obtained in the following:

<i>item</i>	<i>point value</i>
Exam I	100
Exam II	100
Exam III	100
Exam IV	100
Final Exam	100
On-line homework, Quizzes, & Group Assignments	100
TOTAL POINTS	600

Grading scale (Based on total of 600 points possible)

>540 = A; >480 = B; >420 = C; >360 = D; < 360 = F

Attendance Policy:

Attendance of **lab** is mandatory. Three (3) or more absences will result in an 'F' for the course. Absences may be assigned to anyone that disrupts class, sleeps in class, or consistently comes in late or leaves early.

Attendance of **class** is mandatory. Seven (7) or more absences will result in an 'F' for the course. Absences may be assigned to anyone that disrupts class, sleeps in class, or consistently comes in late or leaves early. For a ***proven, excused absence*** for an exam during the semester, a comprehensive make up exam will be given at an arranged time during dead week.

Academic Integrity (A-9.1):

Academic integrity is a responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism.

Definition of Academic Dishonesty: Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) the falsification or invention of any information, including citations, on an assigned exercise; and/or (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1) submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another; (2) submitting a work that has been purchased or otherwise obtained

from an Internet source or another source; and (3) incorporating the words or ideas of an author into one's paper without giving the author due credit.

Please read the complete policy at

http://www.sfasu.edu/policies/academic_integrity.asp

Any student found cheating will be subject to the penalties as stated in the Student Code of Conduct handbook; including but not limited to a score of zero on exam, expulsion from the class or expulsion from the University.

Students with Disabilities:

To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to <http://www.sfasu.edu/disabilityservices/>.

Classroom/ Lab Behavior Policy:

Acceptable Student Behavior: Classroom behavior should not interfere with the instructor's ability to conduct the class or the ability of other students to learn from the instructional program (see the Student Conduct Code, policy D-34.1). Unacceptable or disruptive behavior will not be tolerated. Students who disrupt the learning environment may be asked to leave class and may be subject to judicial, academic or other penalties. This prohibition applies to all instructional forums, including electronic, classroom, labs, discussion groups, field trips, etc. The instructor shall have full discretion over what behavior is appropriate/inappropriate in the classroom. Students who do not attend class regularly or who perform poorly on class projects/exams may be referred to the Early Alert Program.

LAB (varies by section)

- Come to lab on time and prepared (spend at least **ONE HOUR** reading & studying *entire* lab before lab period **AND** reviewing the previous week's lab).
- Bring a **NON-programmable**, scientific calculator. Cell phones and programmable calculators may **NOT** be used on quizzes.
- Turn off and put away cell phones; **NO** text messaging during lab.
- Come dressed as described in the safety rules that will be given: (Clothes to the ankles, no mid-drift shirts, closed-toe shoes. Anyone not dressed appropriately for **lab will be sent home.**)
- Follow **all** safety rules and good laboratory practices at all time:
- Wear safety glasses/goggles when **anyone** in the lab is working on an experiment.
- One warning concerning safety glasses/goggles will be given. A person will be sent home for a second offense and be will earn a zero that may **NOT** be dropped.
- **NO** horseplay in laboratory
- Be courteous and respectful of other students, laboratory assistants, and stockroom personnel.
- Learn your section number and your laboratory assistant's name.

- Work with assigned team members unless otherwise instructed by the lab assistant.
- Students are responsible for any answer they report on a lab, assignment, or quiz. Laboratory teaching assistants are students and sometimes may make an error or misunderstand a question. You CANNOT claim the lab assistant told you the wrong answer and get points back.
- Significant figures are required on **all** answers given in lab on laboratory report sheets, assignments, quizzes, and exams.
- No make up quizzes will be given if a student comes in late and misses the quiz.
- Absences may be assigned to anyone that disrupts class, sleeps in class, or consistently comes in late or leaves early. Any assigned absence will result in a zero for the day which can NOT be dropped.

Class (varies by section)

- Come to class prepared (spend at least 2 hours working problems and reviewing previous material before each class period) and be on time and in your seat.
- Absences may be assigned to anyone that disrupts class, sleeps in class, or consistently comes in late or leaves early. Read Attendance Policy Section for how this can affect grades.
- Bring a **NON-programmable**, scientific calculator. Cell phones and programmable calculators may NOT be used on quizzes or exams.
- Turn off and put away cell phones; **NO** text messaging during class. Anyone caught using a cell phone during class will have an absence assigned to them.
- Be courteous and respectful of other students, SI leader, and instructor.
- Learn your section number and your row number. Place row number on **all** items turned in.
- Significant figures are required on **all** answers given on quizzes, assignments and exams.
- No make up quizzes will be given if a student comes in late and misses the quiz.
- Students who violate these rules will be asked to leave. Repeat offenders will be subject to disciplinary action in accordance with University policies as described in the Code of Student Conduct.

CORE OBJECTIVES AND RESOURCES

Core Objective 1: Critical Thinking: to include creative thinking, innovation, inquiry and analysis, evaluation and synthesis of information.

Definition of **CRITICAL THINKING**: disciplined thinking that is clear, rational, open-minded, and informed by evidence.

<http://dictionary.reference.com/browse/critical+thinking>; (accessed May 23, 2013)

Critical thinking involves the use of a group of interconnected skills. The skills needed can be broken down into six steps.

Six Steps of CRITICAL THINKING

1. **Knowledge** means a student must have basic knowledge about the subject.
2. **Comprehension** requires understanding of the subject. Students that comprehend the new knowledge are able to relate the new knowledge to what they already know. Comprehending goes beyond simply parroting material back.
3. **Application** requires both knowledge and comprehension. Students must be able to carry out a task or apply their knowledge and comprehension to an assigned task.
4. **Analysis** involves breaking the knowledge down into smaller parts so it become clear how the smaller parts are related to other ideas.
5. **Synthesis** involves the ability to put together the parts you analyzed with other information to create something original
6. **Evaluation** occurs once we have understood and analyzed what is said or written and the reasons offered to support it. Then we can appraise this information in order to decide whether you can give or withhold belief, and whether or not to take a particular action.

Adapted from:

http://www.mhhe.com/socsicence/philosophy/reichenbach/m1_chap02studyguide.html

(accessed May 23, 2013)

Core Objective 2: Communication Skills: to include effective development, interpretation and expression of ideas through written, oral, and visual communication.

COMMUNICATION SKILLS in the sciences

For an excellent resource in scientific communication from a highly reputable source see the information provided on the Nature website link shown below.

<http://www.nature.com/scitable/topic/scientific-communication-14121566> (accessed May 31, 2013)

Three especially informative links within the link shown above are:

- Effective Communication
- Effective Writing
- Audience/Purpose

Core Object 3: Empirical and Quantitative Skills: to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions.

EMPIRICAL AND QUANTITATIVE SKILLS

Chemists rely on observations to explain the nature of the substances they study. There are two types of observations exist: qualitative and quantitative. A **qualitative observation** *is an observation made with the senses and is usually expressed using words instead of numbers.* Qualitative observations about a person sick in the hospital might include that the person is breathing rapidly, has a high temperature, and is very thin.

A **quantitative observation** *is an observation that requires a numerical measurement and describes something in terms of "how much".* The quantitative observation that a person has a temperature of 103.6 °F is much more useful information than just knowing that the person has a fever. Quantitative observations are preferred by scientists. Often quantitative data is acquired in lab.

One or more measurement is always a part of any quantitative observation. A **measurement** *determines the dimensions, capacity, quantity, or extent of something.* The most common types of measurements made in chemical laboratories are those of mass, volume, length, temperature, pressure, and concentration. Measurements always consist of two parts: a *number*, which tells the amount of the quantity measured, and a *unit*, which tells the nature or kind of quantity measured. A measured number without a unit is meaningless.

Once quantitative data is obtained, chemists then mathematically manipulate and analyze data.

Adapted from saplinglearning.com; accessed May 31, 2013

Core Objective 4: Teamwork: to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal.

Definition of ***TEAMWORK***: work done by several associates with each doing a part but all subordinating personal prominence to the efficiency of the whole.

<http://www.merriam-webster.com/dictionary/teamwork> (accessed May 23, 2013)

TEAMWORK General Rules

Each team member needs:

- all ideas evaluated critically;
- treat others in the group with respect
- everyone needs to pull their weight, meet deadlines, and contribute equally;
- actions need to be followed through;
- reporting needs to be accurate and comprehensive;
- problems with under-performing team members need to be discussed openly and resolved quickly; and
- peer assessment should be given fairly

CHE 111 Class and Lab Schedule

CHE 111 Lab Calendar			CHE 111 Class Schedule
Week	Lab Exercise/Assignment/Activity Text: <i>Introductory Chemistry Laboratory Manual 12th ed.</i> Anthony Duben, Michele Harris, Kefa Onchoke, Tayo Odunuga	CO	NOTE: instruction will be provided in class the week prior to the concept being applied in lab; the portions shown in (parenthesis) will be emphasized by instructors in class.
1	<p>Laboratory Introduction & Safety Instruction: Teamwork Expectations and Introduction to Scientific Communications Assignment: Begin memorizing names/symbols of elements in Table 1 of the Laboratory Manual</p>	N/A	<p>What is Chemistry</p> <p>Scientific Method/Process</p> <p>Measurements and units in Chemistry</p> <p>(empirical skills)</p>
2	<p>Significant Figures, Scientific Notation, and Unit Conversion Instruction: Empirical/Quantitative Skills. How to approach problem in chemistry. Assignment:</p> <ol style="list-style-type: none"> 1) Complete Significant Figures, Scientific Notation & Unit Conversion work sheet. 2) Have each member of your team explain to the other members how to work one of the problems on the worksheet. 	2, 3, 4	<p>Atoms and the Periodic Table (part I)</p> <p>Classification of Matter</p> <p>Calculations in Chemistry: Conversions, Density, etc.</p> <p>(Problem Solving)</p>
3	<p>Density Laboratory – complete pre-lab for density before coming to lab. Instruction: Critical Thinking Assignment:</p> <ol style="list-style-type: none"> 1) Complete density laboratory and perform all calculations 2) Graph data appropriately 3) Evaluate data, discuss findings, and provide a written summary and conclusion of your results. 	1-4	<p>Representing Molecules</p> <p>Naming Chemical Compounds (applying concepts to naming)</p> <p>Formula and Names of Ionic Compounds</p> <p>(chemical communication)</p> <p>EXAM I</p>
4	<p>Separation of a Mixture– complete pre-lab before coming to lab Instruction: Pure substances and mixtures, data collection and analysis.</p>	1-4	<p>Trends in the Periodic Table (part II)</p> <p>Aqueous Solutions &</p>

	<p>Assignment:</p> <ol style="list-style-type: none"> 1) Complete Laboratory exercise 2) Summarize data collected 3) Write conclusion to experiment 		<p>Properties of solution</p> <p>(problem solving/empirical skills)</p>
5	<p>Nomenclature – complete pre-lab before coming to lab</p> <p>Instruction: How to name compounds, pulling information together to develop skills to name compounds correctly</p> <ol style="list-style-type: none"> 1) Complete Laboratory assignment of naming compounds correctly. 2) Discuss naming rules/applications with team. 	2, 3, 4	<p>Intermolecular forces</p> <p>Polarity/Solubility</p> <p>(How to pull various topics previously covered and apply to new concept of polarity/solubility)</p>
6	<p>Polarity/Solubility– complete pre-lab before coming to lab</p> <p>Instruction: Quantitative Skills and Critical Thinking. How to synthesize various concepts and apply to the topic of polarity and solubility.</p> <p>Assignment:</p> <ol style="list-style-type: none"> 1) Complete Laboratory assignment 2) Reflect on issues of oil spills and/or pollution in waterways and how it relates to the polarity and solubility of the substance contaminating the waterway. 	3, 4	<p>Amounts of Compounds</p> <p>Gram/moles conversion (quantitative/empirical skills)</p> <p>EXAM II</p>
7	MIDTERM EXAM		<p>Introduction to Chemical Reactions</p> <p>Balancing Chemical Reactions</p> <p>(quantitative/empirical skills) (writing chemical equations correctly)</p>
8	<p>Introduction to Chemical Reactions</p> <p>Instruction: How to apply knowledge about chemical reactions in a laboratory setting.</p> <p>Assignment:</p> <ol style="list-style-type: none"> 1) Use data provided to perform calculations pertaining to chemical reactions 2) Have each member of the group explain to other members one calculation 	1-4	<p>Chemical Reactions and Calculations</p> <p>Limiting Reagent and Calculations (quantitative/empirical skills & critical thinking.)</p>
9	Chemical Reactions – complete pre-lab before coming to lab	1-4	Precipitation reactions and Calculations

	<p>Instruction: Provide information about safety, chemical reactions.</p> <p>Assignment:</p> <ol style="list-style-type: none"> 1) Carry out assigned chemical reaction in lab 2) Perform calculations 3) Discuss findings 4) Write a summary and conclusion 		<p>Acids and Bases</p> <p>(empirical skills/problem solving)</p>
10	<p>Introduction to Titration – complete pre-lab before coming to lab</p> <p>Instruction: Review of chemical concepts needed for titration, demonstrate how to perform titrations, teamwork, empirical/quantitative skills, emphasize good communication among group members to accomplish task, analyze data so conclusion(s) can be made.</p> <p>Assignment:</p> <ol style="list-style-type: none"> 1) Perform practice titration using NaOH and HCl with indicator to determine endpoint quantitatively 2) Have each team member explain one calculation to the rest of the team 3) Discuss team plan for accomplishing task for next week. 	2, 3, 4	<p>pH Scale and Calculations</p> <p>Acid/Base Reactions and Calculations (quantitative/empirical skills)</p> <p>EXAM III</p>
11	<p>Titration Analysis of Antacids – part I- complete pre-lab before coming to lab</p> <p>Instruction: Demonstrate how to perform titration.</p> <p>Assignment:</p> <ol style="list-style-type: none"> 1) Perform control titration with pure substance, CaCO_3. 2) Do titration three times and average. 3) Perform calculations 4) Discuss team plan for accomplishing next week's task. 	3,4	<p>Acid/Base Titrations and Calculations</p> <p>Redox Reactions (quantitative/empirical skills)</p>
12	<p>Titration Analysis of Antacids – part II:</p> <p>Instruction: Instructors will present the question: Are generic antacids equivalent to name brand antacids? Analyze the cost/benefit of generic versus name brand.</p> <p>Assignment:</p> <ol style="list-style-type: none"> 1) Perform titration using generic brand antacid 2) Perform titration using name brand 3) Graph data appropriately 4) Analyze data and provide conclusion of antacid analysis. 	1-4	<p>Buffers</p> <p>Capacity of Buffers</p> <p>Preparation and Calculation of</p>

	<p>5) Turn in one complete report per team.</p> <p><i>Core Objectives: will be assessed on this laboratory through the use of rubrics. Instructors have provided instruction on all Core Objectives throughout the semester. Students have had opportunity to practice and demonstrate each Core Objective prior to this laboratory. Students will self and/or peers assess Teamwork and Oral Communication. Instructors will assess Written Communication, Empirical and Quantitative Skills as well as Critical Thinking.</i></p>		<p>Buffers</p> <p>(critical thinking)</p>
13	<p>Introduction to Acids/Bases/Buffers Instructions: Provide theory about acid, bases, and buffers. Emphasize how to pull various pieces of information together and to apply concepts to making solutions. Assignment: 1) Complete assignment involving calculations concerning acids bases and buffers.</p>	3	<p>Behavior of Gases</p> <p>Gas Laws and Calculations (quantitative/empirical skills)</p> <p>Chemistry of the Atmosphere</p> <p>EXAM IV</p>
14	<p>Making a buffer laboratory – complete pre-lab before coming to lab Instruction: Review how to make solutions/buffers Assignment: 1) Make solutions needed to prepare buffer and determine pH 2) Make buffer and explore the properties of a buffer</p>	1-3	<p>Nuclear Chemistry</p> <p>Applications of nuclear/radio chemistry</p>
15	FINAL EXAM		Review