Introductory Chemistry Lab
CHE 111.023, 111.024, 111.025 2:30-4:20
Spring 2016

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Office: M-124
Office Hours: MWF 9:00 – 11:00, TR 2:00 – 4:00

Class location & time:

<table>
<thead>
<tr>
<th>lab section</th>
<th>pre-lab lecture location</th>
<th>lab location</th>
<th>lab time</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>C-106</td>
<td>C-101</td>
<td>2:30-4:20 M</td>
</tr>
<tr>
<td>24</td>
<td>C-106</td>
<td>C-105</td>
<td>2:30-4:20 M</td>
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<tr>
<td>25</td>
<td>C-106</td>
<td>C-102</td>
<td>2:30-4:20 M</td>
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Text and Materials: *Introductory Chemistry Lab (CHE 111 L) Laboratory Manual 14th ed.* for Fall 2015, Spring 2016, & Summer 2016. This manual is available at local bookstores. A non-programmable, scientific calculator is required for all exams and quizzes. Communication for lab will be sent through D2L. Students must have active LiveText Account.

COURSE CALENDAR: ON SEPARATE PAGE

GRADING POLICY: The point total for the requirements shown in the Course Requirements is 300. Grades are based on the total number of points earned out of 300.

The grading scale for the lab is:

\[ A \geq 270; \ B \geq 240; \ C \geq 210; \ D \geq 180; \ F \geq 179 \]

Laboratory quizzes will be given each week as shown in the laboratory calendar. The lowest quiz grade will be dropped. The 10 best quiz grades will be kept. Each laboratory quiz is worth 10 points. A total of 100 points from laboratory quizzes is possible. The laboratory quiz will be given at the beginning of lab. The laboratory quiz will cover the laboratory from the previous week as well as the information from the pre-laboratory assignment for the lab. STUDENTS WHO COME IN LATE AND MISS THE QUIZ WILL NOT BE ALLOWED TO TAKE THE QUIZ.

Experiments/Assignments will be done. Each report sheet for the experiment or the assignment is worth 10 points. A total of 100 points from experiments and assignments is possible. The report sheets will be turned in at the end of the laboratory period, unless otherwise stated by the instructor. Any assignment turned in after the announced time will have 10% deducted per day beginning with the first day. The lowest experiment/assignment grade will be dropped.
Midterm and Final Exam:
- A midterm exam will be given March 7 during the laboratory period. It will cover material from the first week of the semester through Lab #6.
- The final exam will be given May 2 during the laboratory period. It will cover material from Labs #7-11.
- The midterm and the final are worth 50 points each.

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

Attendance Policy:
Attendance of class 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.

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 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. This program provides students with recommendations for resources or other assistance that is available to help SFA students succeed.

- Come to lab prepared (spend at least ONE HOUR reading over entire lab before lab period AND reviewing the previous week’s lab) and on time.
- 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 texting 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. Shoes MUST completely cover feet. 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 lab partner 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 can NOT 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.
  - Missing a pre-lab lecture will result in a 10% deduction from the lab for and a zero will be recorded for 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.

POINTS WILL BE DEDUCTED FROM YOUR GRADE FOR NOT FOLLOWING THE COURSE REQUIREMENTS OR THE LABORATORY BEHAVIOR POLICY
**Course Description:** Introductory laboratory experiments.

**Number of Credit Hours:** 1 semester hour – 2 hours lab per week

**Course Prerequisites and Co-requisites:** Co-requisite: CHE 111. Lab fee required.

**Program Learning Outcomes:** There are no specific program learning outcomes for this major addressed in this course. This course is a general education core curriculum course and a service course.

**Course Objective:** To provide students with an explanation of the basic principles of chemistry as illustrated through laboratory experiments and to apply these principles to laboratory work involving critical thinking.

**Student Learning Outcomes:** The student is expected to recognize and apply the following concepts to problem solving in a laboratory setting.

- 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 as well as Lewis structure and VSEPR theory.
- Determination of mass calculations in chemical formulas and chemical reactions, writing balanced chemical reactions
- Principles of the gaseous state, gas laws (Boyles, Charles, Gay-Lussac, Ideal, Dalton’s) as well as intermolecular forces in liquids and properties of solutions.
- Principles of acid/base theories, pH, buffers, acid-base indicators, and titration

**Outline of Topics (approximate course time):**

Safety (1 lab day)
- Metric System, Significant Figures, Scientific Notation (1 lab day)
- Density (1 lab day)
- Purification of Water (1 lab day)
- Chemical Reactions (1 lab day)
- Nomenclature / VSEPR/Polarity/Solubility (2 lab days)
- Titration of Antacid (3 lab days)
- Solutions, Concentration, Buffers, pH (1 lab day)
General Education Core Curriculum

- This course has been selected to be part of Stephen F. Austin State University’s core curriculum. The Texas Higher Education Coordinating Board has identified six objectives for all core courses: Critical Thinking Skills, Communication Skills, Empirical and Quantitative Skills, Teamwork, Personal Responsibility, and Social Responsibility. SFA is committed to the improvement of its general education core curriculum by regular assessment of student performance on these six objectives.

- Assessment of these objectives at SFA will be based on student work from all core curriculum courses. This student work will be collected in D2L through LiveText, the assessment management system selected by SFA to collect student work for core assessment. LiveText accounts will be provided to all students enrolled in core courses through the university technology fee. You will be required to register your LiveText account, and you will be notified how to register your account through your SFA e-mail account. If you forward your SFA e-mail to another account and do not receive an e-mail concerning LiveText registration, please be sure to check your junk mail folder and your spam filter for these e-mails. If you have questions about LiveText call Ext. 1267 or e-mail SFALiveText@sfasu.edu.

- The chart below indicates the core objectives addressed by this course, the assignment(s) that will be used to assess the objectives in this course and uploaded to LiveText this semester, and the date the assignment(s) should be uploaded to LiveText. Not every assignment will be collected for assessment every semester. Your instructor will notify you which assignment(s) must be submitted for assessment in LiveText this semester.

<table>
<thead>
<tr>
<th>Core Objective</th>
<th>Definition</th>
<th>Course Assignment Title</th>
<th>Date Due in LiveText</th>
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<tbody>
<tr>
<td>Critical Thinking Skills</td>
<td>To include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information.</td>
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<tr>
<td>Communication Skills</td>
<td>To include effective development, interpretation and expression of ideas though written, oral, and visual communication.</td>
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<tr>
<td>Empirical and Quantitative Skills</td>
<td>To include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions.</td>
<td>Team/group paper over the three week titrations lab.</td>
<td>Wednesday, Dec. 02 by noon. (both to LiveText and hard copy to Dr. Barngrover)</td>
</tr>
<tr>
<td>Teamwork</td>
<td>To include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal.</td>
<td>Individual reflective paper</td>
<td>Monday, Nov. 30 by 1:00 p.m. to LiveText (hard copy to Dr. Barngrover at beginning of lab 2:00 pm.)</td>
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<tr>
<td>Personal Responsibility</td>
<td>To include the ability to connect choices, actions and consequences to ethical decision-making.</td>
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<tr>
<td>Social Responsibility</td>
<td>To include intercultural competence, knowledge of civic responsibility, and the ability to engage effectively in regional, national, and global communities.</td>
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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.


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/soccience/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

Scientific communication traditionally includes writing in third person, past tense, passive voice. In formal, scientific writing slang terms and contractions are avoided.
**Core Objective 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*

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**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.


**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
<table>
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<tr>
<th>Date</th>
<th>Lab Exercise/Assignment/Activity</th>
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| first week | **Before coming to the first lab on January 25**  
Instruction: Read the safety rules on page 3 of the Laboratory Manual AND watch the following Safety Video by the American Chemical Society. Take notes on the video, study the notes, and be prepared to take a quiz on Monday, January 26, at the beginning of the lab period.  
The link to the safety video is: [https://www.youtube.com/watch?v=0zHev9iM8kU](https://www.youtube.com/watch?v=0zHev9iM8kU)  
Instruction: Read the Teamwork Expectation section included in the syllabus                                                                                     |
| of class   |                                                                                                                                                                                                                             |
| Jan 25     | **#1: Laboratory Introduction, Communication, Scientific/Exponential/Conversions** (p. 5)  
**Quiz 1 – Safety**  
Instruction: Scientific Communication, Significant Figures/Scientific Notation  
**Assignment:**  
• Begin memorizing names/symbols of elements in Table 1 on page 4 of the Laboratory Manual  
• Work on Significant Figures, Scientific/Exponential Notation Lab Assignment. Work in teams. Have each team member explain one problem to the other members. **The Assignment will be due at the beginning of lab on February 01.**  
CHECK INTO LABORATORY DRAWERS                                                                                                                                   |
| Feb 01     | **#2 Density Laboratory** (p. 15)– complete pre-lab for density **before** coming to lab.  
**Instruction:** graphing  
**Assignment:**  
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.  
4) Turn in Density Laboratory Report before leaving lab.                                                                                                     |
| Feb 08     | **#3 Purification of Water** (p.22)– complete pre-lab **before** coming to lab  
**Instruction:** Pure substances and mixtures, sediments, etc., data collection and analysis.  
**Assignment:**  
1) Complete Laboratory exercise  
2) Summarize data collected  
3) Write conclusion to experiment  
4) Turn in Laboratory Report before leaving lab.                                                                                                           |
| Feb 15     | **#4 Nomenclature** (p.30)– complete pre-lab **before** coming to lab  
**Instruction:** How to name compounds, pulling information together to develop skills to name compounds correctly  
**Assignment:**  
1) Complete Laboratory assignment of naming compounds correctly.  
2) Discuss naming rules/applications with team.  
3) Turn in Laboratory Report before leaving lab.                                                                                                           |
| Feb 22     | **#5 Polarity/Solubility** (p. 36)– complete pre-lab before coming to lab  
**Instruction:** How to synthesize various concepts and apply to the topic of polarity and solubility.  
**Assignment:**  
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.  
| Feb 29     | **#6: Chemical Reactions** (p.45)– complete pre-lab before coming to lab  
**Assignment:**  
1) Carry out assigned chemical reaction in lab  
2) Discuss findings and write as summary and conclusion  
3) Turn in Laboratory Report before leaving lab  
4) Time permitting work on Balancing Chemical Reactions Assignment.                                                                                         |
| Mar. 07    | **Midterm Exam** – covers everything through March 02  
**Turn in Balancing Chemical Reactions Assignment**                                                                                                             |
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<thead>
<tr>
<th>March 14</th>
<th>Spring Break</th>
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<tbody>
<tr>
<td>Mar 21</td>
<td>#7 Titration I: General Acid/Base Titration (p. 55) – complete pre-lab before coming to lab</td>
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<tr>
<td>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.</td>
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<tr>
<td>Assignment:</td>
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<tr>
<td>1) Perform practice titration using NaOH and HCl with indicator to determine endpoint quantitatively</td>
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<tr>
<td>2) Have each team member explain one calculation to the rest of the team</td>
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<tr>
<td>3) Discuss team plan for accomplishing task for next week.</td>
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<td>4) Turn in Laboratory Report before leaving lab</td>
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<tr>
<th>Mar 28</th>
<th>Easter Break</th>
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<tbody>
<tr>
<td>Apr 4</td>
<td>#8: Titration II: Experimental Control for Antacid Titration p (59)– complete pre-lab before coming to lab</td>
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<tr>
<td>Assignment:</td>
<td></td>
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<tr>
<td>1) Perform simple titrations using pH indicator to determine endpoint qualitatively</td>
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<tr>
<td>2) Use data to perform titration calculations</td>
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<tr>
<td>3) Have each team member explain one calculation to the rest of the team</td>
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<tr>
<td>4) Discuss team plan for accomplishing task.</td>
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<tr>
<td>5) Turn in Laboratory Report before leaving lab</td>
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| Apr 11 | #9: Titration III: Comparison of Name Brand and Generic (p 63) complete pre-lab before coming to lab |
| Assignment: |
| 1) Perform titration using generic brand antacid |
| 2) Perform titration using name brand |
| 3) Analyze data and provide conclusion of antacid analysis. |
| 4) Turn in Laboratory Report before leaving lab |

| Apr 18 | #10: Titration Report information due 4/25 |
| Instruction: Acids/Bases/Buffer information |

| Apr 25 | #11: Acids/Bases/Buffers/Making a Buffer (p. 75) |
| Assignment: |
| 1) Complete assignment involving calculations concerning acids bases and buffers. |
| 2) Make solutions needed to prepare buffer and determine pH |
| 3) Make buffer and explore the properties of a buffer |
| 4) Turn in Laboratory Report before leaving lab |
| 5) Check out of drawers |

| May 02 | Laboratory Final – covers titration labs and buffer labs |
| May 09 | No lab – finals week |