Introductory Chemistry Lab
CHE 111.023, 111.024, 111.025 3:30-5:20
Spring 2019

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Department: Chemistry & Biochemistry
Email: barngrovbm@sfasu.edu
Phone: (936) 468-1568
Office: M-124
Office Hours: MWF 9:00 AM - 11:00 AM, M 1:30 PM- 2:30 PM;
Appointments available upon request

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>3:30-5:20 M</td>
</tr>
<tr>
<td>24</td>
<td>C-106</td>
<td>C-105</td>
<td>3:30-5:20 M</td>
</tr>
<tr>
<td>25</td>
<td>C-106</td>
<td>C-102</td>
<td>3:30-5:20 M</td>
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Text and Materials: Introductory Chemistry Lab (CHE 111 L) Laboratory Manual 16th ed. for Fall 2017, Spring 2018, & Summer 2018. 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.

COURSE CALENDAR: ON SEPARATE PAGE

GRADING POLICY: The point total for the requirements shown in the Course Requirements is 505. Grades are based on the total number of points earned out of 465.

The grading scale for the lab is:

\[
[A \geq 450; \ B \geq 400; \ C \geq 350; \ D \geq 300; \ F \leq 299]
\]

Safety Quiz will be given at the beginning of the semester on D2L and is worth 25 points. The safety quiz cannot be dropped from the final grade.

Laboratory quizzes will be given each week as shown in the laboratory calendar. The lowest quiz grade will be dropped. The 7 best quiz grades will be kept. Each laboratory quiz is worth 10 points. A total of 70 points from laboratory quizzes is possible. The laboratory quiz will be given at the beginning of lab.

Pre-labs/Experiments/Assignments will be done. A total of eight laboratory experiments will be done. Each Pre-lab is due at the BEGINNING of lab and is worth 10 points. The best 7 Pre-labs will be kept for a possible 70 total points. Each report sheet for the experiment is worth 20 points. The lowest experiment will be dropped, and the best 7 experimental grades will be kept. A total of 140 points from experiments 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.
Midterm and Final Exam:
- A midterm exam will be given March 11th during the laboratory period. It will cover material from the first week of the semester through Lab #4.
- The final exam will be given May 6th (dead week) during the laboratory period. It will cover material from Labs #5-#8
- The midterm and the final are worth 80 points each.

Make-up Policy: NO make-up labs or quizzes will be given since the lowest quiz grade and the lowest experiment, 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 and Significant Figures (Entire Lab)
- Density (2 lab days)
- Beer’s Law/Concentration and Dilution (1 lab day)
- Chemical Reactions (1 lab day)
- 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.

- **Introductory Chemistry Lab** is a general education core curriculum course and fulfills the teamwork general education core curriculum requirement. Another, “shell” course has been created to collect student artifacts to meet this state requirement. You will see this course on your D2L list.

- During this semester, you will receive an assignment that fulfills both the requirements of this course and the needs of Stephen F. Austin State University’s Core Curriculum Assessment Plan with the Texas Higher Education Coordinating Board.

- When you complete this one assignment, you need to upload the assignment to both the Introductory Chemistry Lab dropbox and the Teamwork dropbox.

- Please note that this only applies to the specific assignment listed in the matrix below. All other assignments should be submitted according to regular class operations.

- If you have any questions, please see your instructor or contact the University Assessment Specialist at (936) 468-1267 or jstringfield@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 the D2L Teamwork dropbox this semester, and the date the assignment(s) should be uploaded to the D2L Teamwork dropbox. Not every assignment will be submitted for core assessment every semester. Your instructor will notify you which assignment(s) must be submitted for assessment in the D2L Teamwork dropbox.

<table>
<thead>
<tr>
<th>Core Objective</th>
<th>Definition</th>
<th>Course Assignment Title</th>
<th>Date Due in D2L</th>
</tr>
</thead>
<tbody>
<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>Team work rubrics</td>
<td>Monday, Apr. 23 at beginning of lab 1:00 pm.</td>
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<tr>
<td>Date</td>
<td>Lab Exercise/Assignment/Activity</td>
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<tr>
<td>Jan. 21</td>
<td><strong>No Lab Meeting</strong> Check D2L for Group Assignment</td>
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<td></td>
<td>Read the safety rules on page 3 of the Laboratory Manual. Watch the following Safety Video by the American Chemical Society. Take notes on the video, study the notes, and prepare for quiz to be taken January 22nd.</td>
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<td></td>
<td>The link to the safety video is: <a href="https://www.youtube.com/watch?v=0zHev9iM8kU">https://www.youtube.com/watch?v=0zHev9iM8kU</a></td>
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<tr>
<td>Jan. 28</td>
<td>Lab #1: Density of Pennies Laboratory—complete pre-lab for density before coming to lab.</td>
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<td></td>
<td>Quiz 1 – Safety quiz</td>
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<td></td>
<td><strong>Instruction:</strong> Density measurements and calculations.</td>
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<td></td>
<td>Read the Teamwork Expectation section in the syllabus.</td>
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<td></td>
<td><strong>Assignment:</strong></td>
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<td></td>
<td>1) Complete density laboratory and perform all calculations</td>
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<td></td>
<td>2) Evaluate data, discuss findings, and provide a written summary and conclusion of your results.</td>
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<td>3) Turn in Density Laboratory Report before leaving lab.</td>
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<td></td>
<td>4) CHECK INTO LABORATORY DRAWERS</td>
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<tr>
<td>Feb. 4</td>
<td>Lab #2 Density of Water Laboratory <strong>Group 1</strong> – complete pre-lab for density before coming to lab.</td>
<td>Quiz 2 – Density calculations, teamwork expectations, and pre-lab information</td>
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<td></td>
<td><strong>Instruction:</strong> Density, graphing and calculation. Read the Critical Thinking section in the syllabus.</td>
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<td></td>
<td><strong>Assignment:</strong></td>
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<td></td>
<td>1) Complete density laboratory and perform all calculations</td>
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<td></td>
<td>2) Graph data appropriately</td>
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<td>3) Evaluate data, discuss findings, and provide a written summary and conclusion of your results.</td>
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<td>4) Turn in Density Laboratory Report before leaving lab.</td>
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<tr>
<td>Feb. 11</td>
<td>Lab #2 Density of Water Laboratory <strong>Group 2</strong> – complete pre-lab for density before coming to lab.</td>
<td>Quiz 2 – Density calculations, teamwork expectations, and pre-lab information</td>
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<td></td>
<td><strong>Instruction:</strong> Density, graphing and calculation. Read the Critical Thinking section in the syllabus.</td>
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<td></td>
<td><strong>Assignment:</strong></td>
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<tr>
<td></td>
<td>1) Complete density laboratory and perform all calculations</td>
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<td>2) Graph data appropriately</td>
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<td></td>
<td>3) Evaluate data, discuss findings, and provide a written summary and conclusion of your results.</td>
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<td>4) Turn in Density Laboratory Report before leaving lab.</td>
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<td>Feb. 18</td>
<td>Lab #3: Concentration and Dilution Laboratory <strong>Group 1</strong> – complete pre-lab before coming to lab.</td>
<td>Quiz 3 – Concentration and Dilution, graphing, and critical thinking, and pre-lab information</td>
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<td></td>
<td><strong>Instruction:</strong> Concentration units, dilution and solution calculations, how to make a solution, information about spectrophotometers. Read syllabus about communications skills in the sciences</td>
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<td></td>
<td><strong>Assignment:</strong></td>
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<td></td>
<td>1) Complete concentration and dilution lab</td>
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<td>2) Discuss results with team.</td>
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<td>Turn in laboratory report before leaving lab</td>
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<tr>
<td>Feb. 25</td>
<td>Lab #3: Concentration and Dilution Laboratory <strong>GROUP 2</strong> – complete pre-lab before coming to lab.</td>
<td>Quiz 3 – Concentration and Dilution, graphing, and critical thinking, and pre-lab information</td>
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<tr>
<td></td>
<td><strong>Instruction:</strong> Concentration units, dilution and solution calculations, how to make a solution, information about spectrophotometers. Read syllabus about communications skills in the sciences</td>
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<td></td>
<td><strong>Assignment:</strong></td>
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<tr>
<td></td>
<td>1) Complete concentration and dilution lab</td>
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<td>2) Discuss results with team.</td>
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<td>Turn in laboratory report before leaving lab</td>
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<tr>
<td>Date</td>
<td>Event/Assignment</td>
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| Mar. 4 | **Lab #4: Chemical Reactions ALL STUDENTS** – complete pre-lab before coming to lab  
|       | **Quiz 4 – Chemical reactions, and communication skills, and pre-lab information**  
|       | **Instruction:** Types of chemical equations, balancing chemical equations. Read syllabus about empirical and quantitative skills  
|       | **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  
|       | Time permitting work on Balancing Chemical Reactions Assignment.  
| Mar. 11 | **Midterm Exam (80 pts) – covers everything through February 27**  
|         | **Turn in Balancing Chemical Reactions Assignment**  
| Mar. 18 | **SPRING BREAK NO LAB MEETING**  
| Mar. 25 | **Introduction to Titration**  
|       | **Quiz 5 – Concepts most missed on midterm**  
|       | **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. Students will also be given information for teamwork rubric for assessment.  
| Apr. 1  | **#5 Titration I: General Acid/Base Titration** – complete pre-lab before coming to lab  
|       | **Quiz 6 – covers information from the pre-lab and titration calculations.**  
|       | **Assignment:**  
|       | 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.  
|       | 4) Turn in Laboratory Report before leaving lab  
| Apr. 8  | **#6: Titration II: Experimental Control for Antacid Titration** – complete pre-lab before coming to lab  
|       | **Quiz 7 – covers pre-lab information & calculations**  
|       | **Assignment:**  
|       | 1) Perform simple titrations using pH indicator to determine endpoint qualitatively  
|       | 2) Use data to perform titration calculations  
|       | 3) Have each team member explain one calculation to the rest of the team  
|       | 4) Discuss team plan for accomplishing task.  
|       | 5) Turn in Laboratory Report before leaving lab  
| Apr. 15 | **#7: Titration III: Comparison of Name Brand and Generic** - complete pre-lab before coming to lab  
|         | **Quiz 8 – covers pre-lab information/calculations and information from Titration I or II.**  
|         | **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. 22 | **#8 Importance of Buffers and pH**  
|         | **Quiz 9: buffer information and calculations**  
|         | **Assignment:**  
|         | 1) Determine which sample acts as a buffer  
|         | 2) Compare reaction rate of O₂ production at different pH/buffers.  
|         | 3) Turn in Laboratory Report before leaving lab.  
| Apr. 29 | **Final Review and CHECK OUT OF DRAWERS**  
|         | **Teamwork rubrics AND Titration summary** – due at beginning of lab  
| May 6   | **Laboratory Final (80 pts) – covers titration labs and buffer labs**  


# 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](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/sosciences/philosophy/reichenbach/m1_chap02studyguide.html](http://www.mhhe.com/sosciences/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](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.

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

**Every laboratory activity meets all 4 Core Objectives:**

<table>
<thead>
<tr>
<th>Core Objective</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Critical Thinking Skills</td>
<td>Every lab will require a collection of data in which you must analyze the information. Each lab has objectives that are achieved by manipulating chemicals and equipment which involves inquiry skills.</td>
</tr>
<tr>
<td>Communication Skills</td>
<td>Communication with your lab partner is absolutely essential in order to perform the experiment, take data, and analyze the results.</td>
</tr>
<tr>
<td>Empirical and Quantitative Skills</td>
<td>Each lab will include the manipulation and analysis of numerical data or observable facts from which an informed conclusion will be drawn.</td>
</tr>
<tr>
<td>Teamwork</td>
<td>When working with a partner in a lab setting, it is important to work as a team, considering different points of view and working effectively to meet the objectives set forth in the lab manual. <strong>This Core Objective is Strongly Emphasized in Lab.</strong></td>
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