CHEM 1312/1112
General Chemistry
Spring, 2020

Instructors:

Dr. Kyle Beran
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   Phone: 486-6663
   Office: CAV 102B
   Office Hours: MWF 2-3, TR 11-12, or by appointment

Dr. David Carter
   Email: David.Carter@angelo.edu
   Phone: 486-6626
   Office: CAV 218
   Office Hours: M 10:30-11:30; W 8:00-11:00; R 11:30-12:00 or by appointment

Dr. Gregory Smith
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   Office: CAV 207A
   Office Hours: MTWF 11:00-noon, or by appointment

Dr. Janet Maxwell
   Email: Janet.Maxwell@angelo.edu
   Phone: 486-6624
   Office: CAV 229B
   Office Hours: MTWF 10:00-11:00; T 2:00-3:00; R 11:00-12:00, or by appointment

Dr. Ralph Zehnder
   Email: Ralph.Zehnder@angelo.edu
   Phone: 486-6662
   Office: CAV 204B
   Office Hours: M 11:00-Noon; W 11:00-12:30pm; F 11:00-1:00pm, or by appointment
CHEM 1312 — GENERAL CHEMISTRY LECTURE CLASS

Lecture Class Meeting Times

<table>
<thead>
<tr>
<th>Sec</th>
<th>Days</th>
<th>Time</th>
<th>Instructor</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>010</td>
<td>MWF</td>
<td>09:00 am-09:50 am</td>
<td>Dr. Beran</td>
<td>CAV 200</td>
</tr>
<tr>
<td>020</td>
<td>MWF</td>
<td>09:00 am-09:50 am</td>
<td>Dr. Beran</td>
<td>CAV 211</td>
</tr>
<tr>
<td>030</td>
<td>TR</td>
<td>09:30 am-10:45 am</td>
<td>Dr. Smith</td>
<td>CAV 215</td>
</tr>
<tr>
<td>040</td>
<td>TR</td>
<td>09:30 am-10:45 am</td>
<td>Dr. Carter</td>
<td>CAV 200</td>
</tr>
</tbody>
</table>

Required Texts and Materials

- **Textbook and SmartWork online homework [Both Required]:**

  Purchasing Options:
  1. Textbook (printed) + eBook + SmartWork
  2. eBook + SmartWork
  3. SmartWork only (only if you get a textbook from another source that does not include SmartWork.)

- **Approved Lab Goggles [Required]** (available from the ASU Bookstore or from the lab stockroom)

- **Calculator [Required]:** Scientific calculator capable of performing calculations with scientific notation and logarithms. *Bring your calculator to class and to lab every day. Only non-programmable calculators may be used on the exams.*

- **Lab Notebook [Required]:** Scientific lab notebook (ISBN: 9780984516315) can be found in the ASU Bookstore.

Course Description

1312/CHEM 1312 General Chemistry II (3-0). This course, which is a continuation of Chemistry 1311, focuses on chemical kinetics, chemical equilibrium, acid-base chemistry, and thermodynamics. Additional topics, such as environmental chemistry, electrochemistry, coordination chemistry, nuclear chemistry, organic chemistry, and/or polymers, may also be introduced.

**Prerequisites:** Chemistry 1311/1111 or 1411, must be completed with a “C” or better in order to enroll in Chemistry 1312/1112. **Corequisite:** Chemistry 1112.

1112/CHEM 1112 General Chemistry II Laboratory (0-3). Laboratory experiments that focus on laboratory technique, data collection, and analysis. The experiments will expand upon the concepts and topics presented in Chemistry 1312.

**Corequisite:** Chemistry 1312.
Technology Requirements
To successfully complete this course, students need to obtain access to SmartWork, an online homework program which accompanies the Gilbert textbook. These assignments will be averaged to give a 200-point grade. To register with SmartWork, follow the instructions in the “SmartWork Student Registration” handout.

Grading

Evaluation and Grades
Course grades will be determined as indicated in the table below.

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams (3×100 pts)</td>
<td>300 pts</td>
</tr>
<tr>
<td>Final Exam</td>
<td>150 pts</td>
</tr>
<tr>
<td>Quizzes, classroom participation</td>
<td>150 pts</td>
</tr>
<tr>
<td>SmartWork Homework</td>
<td>200 pts</td>
</tr>
<tr>
<td>Laboratory Points</td>
<td>200 pts</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1000 pts</strong></td>
</tr>
</tbody>
</table>

Students who are taking both CHEM 1112 and CHEM 1312 for the first time who wish to drop either course must drop both courses, because dropping either course would result in the co-requisite requirement no longer being met.

Overall grades in CHEM 1312/1112 will be determined as follows:

- If BOTH CHEM 1312 and CHEM 1112 are completed, the letter graded will be based on a total of 1000 points.
- For students who begin and complete ONLY CHEM 1312, a percentage will be calculated using only lecture assessments (first four items listed above with 800 points possible) and the letter grade will be assigned based on that percentage.
- For students who begin and complete ONLY CHEM 1112, the percentage will be calculated using only lab assessments and that percentage will be used to assign a letter grade.

Grading System
Course grades will be dependent upon completing course requirements and meeting the student learning outcomes.

The following grading scale will be used for this course:

- A = 900-1000 points (90-100%)
- B = 800-899 points 80-89.9%
C = 700-799 points (70-79.9%)
D = 600-699 points (60-69.9%)
F = 0-599 points (<60%)

Exams
The exams will be given outside of regular class time on the dates listed below:

<table>
<thead>
<tr>
<th>Exam</th>
<th>Date</th>
<th>Room</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam 1</td>
<td>Thursday, February</td>
<td>CAV</td>
<td>5:30 pm</td>
</tr>
<tr>
<td>Exam 2</td>
<td>March 19</td>
<td>CAV</td>
<td>5:30 pm</td>
</tr>
<tr>
<td>Exam 3</td>
<td>Thursday, April 23</td>
<td>CAV</td>
<td>5:30 pm</td>
</tr>
</tbody>
</table>

Most of the exams will be over material covered since the last exam. However, the course builds on material delivered earlier so the concepts, calculations and techniques from earlier exams may be required. Only non-programmable calculators may be used on the exams (i.e., no graphic calculators are allowed).

Make-up exams will be at the discretion of your individual faculty. Usually, allowances will only be made in the case of an excused university absence. Communication with your instructor is critical.

Final Exam
The Final Exam will be a comprehensive multiple-choice standardized exam published by the American Chemical Society (ACS). Study guides for the ACS exam (“General Chemistry - Official Study Guide”) are available for sale in the lab stockroom and from the ACS web page. The schedule for the 1312 final exams is shown below. The complete final exam schedule is also available on the ASU web page.

<table>
<thead>
<tr>
<th>Sec</th>
<th>Days</th>
<th>Time</th>
<th>Instructor</th>
<th>Final Exam Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>010</td>
<td>MWF</td>
<td>09:00 - 09:50</td>
<td>Dr. Beran</td>
<td>Wednesday, May 6</td>
<td>8:00-10:00 am</td>
</tr>
<tr>
<td>020</td>
<td>MWF</td>
<td>10:00 - 09:50</td>
<td>Dr. Beran</td>
<td>Monday, May 4</td>
<td>10:30-12:30 pm</td>
</tr>
<tr>
<td>030</td>
<td>TR</td>
<td>9:30 - 10:45</td>
<td>Dr. Smith</td>
<td>Thursday, May 7</td>
<td>8:00 am-10:00 pm</td>
</tr>
<tr>
<td>040</td>
<td>TR</td>
<td>9:30 - 10:45</td>
<td>Dr. Carter</td>
<td>Thursday, May 7</td>
<td>8:00 am-10:00 pm</td>
</tr>
</tbody>
</table>

Blackboard
Grades will be posted on Blackboard. Information, handouts, homework assignments, and other course documents will either be posted on your instructor’s faculty web page, or on Blackboard.
Attendance
You are expected to attend all class meetings. You are expected to arrive on time and to stay until the end of the lecture. In-classroom activities such as worksheets and quizzes cannot be made up. You will not be automatically dropped if you stop attending class.

If you have the flu, please stay home. Do not help spread the flu to everyone else. Keep your professor informed as to your status by email (preferred) or telephone (if necessary). Your faculty will work with you to keep up to date in the class.

Last Day to Drop
The last day to drop the course with a grade of “W” is Thursday, March 26, 2020.

CHEM 1112 — GENERAL CHEMISTRY LABORATORY

Laboratory Meeting Times
The lab classes that accompany the CHEM 1312 lecture course are shown in the table below. The labs will meet first for pre-lab lectures in the Class Room listed in the table.

<table>
<thead>
<tr>
<th>Section</th>
<th>Day</th>
<th>Meeting Time</th>
<th>Instructor</th>
<th>Class Room</th>
<th>Lab Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>05Z</td>
<td>M</td>
<td>02:00 am-04:50 pm</td>
<td>Dr. Carter</td>
<td>CAV 211</td>
<td>CAV 212</td>
</tr>
<tr>
<td>06Z</td>
<td>T</td>
<td>11:00 pm-01:50 pm</td>
<td>Dr. Carter</td>
<td>CAV 215</td>
<td>CAV 212</td>
</tr>
<tr>
<td>07Z</td>
<td>T</td>
<td>02:00 pm-04:50 pm</td>
<td>Dr. Zehnder</td>
<td>CAV 215</td>
<td>CAV 212</td>
</tr>
<tr>
<td>09Z</td>
<td>R</td>
<td>11:00 am-01:50 pm</td>
<td>Dr. Smith</td>
<td>CAV 219</td>
<td>CAV 212</td>
</tr>
<tr>
<td>10Z</td>
<td>R</td>
<td>02:00 pm-04:50 pm</td>
<td>Dr. Smith</td>
<td>CAV 219</td>
<td>CAV 212</td>
</tr>
<tr>
<td>11Z</td>
<td>M</td>
<td>11:00 am-01:50 pm</td>
<td>Dr. Maxwell</td>
<td>CAV 211</td>
<td>CAV 212</td>
</tr>
</tbody>
</table>

The CHEM 1112 General Chemistry laboratory class accompanies this lecture class. The lab is designed to illustrate some of the principles involved in performing scientific measurements, handling chemicals, and performing chemistry experiments. In some cases, the experiments in the lab will introduce you to concepts before you cover them in the lecture course, and in some cases, the experiments will reinforce concepts already covered in the lecture course.

Labs will begin meeting on the first day of class. Bring your calculator!

Laboratory Attire
Beginning on the first day of lab, everyone MUST have approved goggles, long-sleeved shirts which cover the midriff, long pants, and shoes with closed toes and heels (no sandals, slides, etc.). (Basically, you should have as little exposed skin as possible.) Anyone not wearing the appropriate attire will not be allowed into lab.
Lab Procedures and Lab Reports
The procedures for these labs will be posted on Blackboard in the section labeled “Lab Resources.” The procedures will provide a description of the background for each experiment, pre-laboratory questions that will be turned in at the beginning of the lab period, a procedure for the experiment, and a lab report form which must be handed in when the lab is completed. It is essential that you read the materials posted in Blackboard for that week’s lab before coming to lab. Each lab will be worth 100 points. The point average in Lab will be scaled to 200 points and then incorporated into your overall CHEM 1312/1112 grade.

Cleaning Up After Lab
Make sure that your lab area is clean and that all glassware and hardware has been cleaned and returned to the appropriate drawers before leaving the lab.

Make-Up Lab Policy
The lowest lab score will be dropped from the total. If you miss a lab for a valid reason, that is the score that will be dropped.

Lab Safety Training
All students enrolled in lab courses are required to take a Mandatory Laboratory Safety Training and Quiz on Blackboard. Instructions for completing the quiz are given below:
1. Login to Blackboard, and choose the course: entitled “Lab Safety Training.”
2. Under the left hand menu, choose: “Get Started Here”.
3. There are three sections:
   a. Welcome to Lab Safety Training — There are your instructions.
   b. Lab safety training — Click on "Lab Safety — Click here to begin". This will download a PowerPoint slide show which will cover the safety training.
   c. The lab safety quiz. You must score 90% or higher. You can take it again in 24 hours.

The Lab Safety Training must be completed by the evening of Friday, January 24.

Lab Final
There will be one 50-point lab mid-term, one 50-point lab practical, and a 100-point lab final. These grades will not be dropped from the total.

This syllabus is subject to change.
<table>
<thead>
<tr>
<th>Date</th>
<th>Week Of</th>
<th>Lecture</th>
<th>Lab</th>
</tr>
</thead>
</table>
| 1/13 | 1/13     | Chapter 10 Intermolecular Forces  
Chapter 11 Properties of Solutions  
Interactions between ions, vapor pressures of solutions, lattice energy, Born-Haber Cycle, colligative properties. | Qualitative Analysis of Anions (all lab procedures are posted on Blackboard) Mandatory Lab Safety Training and Quiz  
— instructions given in Lab Safety Training section (must be completed by January 24)  
**ONLY necessary if not taken before.** |
| 1/20 | 1/20     | Monday, Jan 21 — Martin Luther King Day  
Chapter 11 continued | Labs Do Not Meet MLK day Monday, January 20. Take home assignment (Significant Figures and Algebra worksheet) will be posted on Blackboard and is due at the beginning of lab during the week of January 27 (Lectures will continue Tuesday through Friday) |
| 1/27 | 1/27     | Chapter 12 Solids  
The solid state, structures of metals, ionic solids, salt crystals. | Qualitative Analysis of Group I Cations |
| 2/3  | 2/3      | Chapter 13 Chemical Kinetics  
Reaction rates, integrated rate laws, Arrhenius Equation, reaction mechanisms. | Qualitative Analysis of an Unknown Salt |
| 2/10 | 2/10     | Chapter 13 continued Thursday, February 14 Exam 1 (Chpt. 10, 11, 12, 13) | Spectrophotometry of FD&C Red 40 |
| 2/17 | 2/17     | Chapter 13 continued  
Chapter 14 Chemical Equilibrium  
Dynamics of equilibria, equilibrium constants, Le Châtelier's Principle. | A Kinetic Study: The Reaction of Crystal Violet with NaOH |
<p>| 2/24 | 2/24     | Chapter 14 continued | A Kinetic Study Part II: Temperature Dependence and Activation Energy of the Rate of Reaction of Crystal Violet and NaOH |</p>
<table>
<thead>
<tr>
<th>Date</th>
<th>Week Of</th>
<th>Lecture</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>3/2</td>
<td>Chapter 14 continued</td>
<td>Equilibrium and Le Châtelier’s Principle</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Chapter 15 Acid and Base Equilibria</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Strong and weak acids and bases, pH, pKb, pKa, pKw, acidic and basic salts.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>3/9</td>
<td>Spring Break – No Classes!</td>
<td>Spring Break – No Classes!</td>
</tr>
<tr>
<td>10</td>
<td>3/16</td>
<td>Chapter 15 continued</td>
<td>Analysis of Antacid Tablets</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Thursday, March 21 Exam 2</strong> (Chpt. 13, 14, 15)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>3/23</td>
<td>Chapter 16 Additional Aqueous Equilibria</td>
<td>Lab Midterm Exam</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Common ion effect, buffer solutions, solubility product constant.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>3/30</td>
<td>Chapter 17 Thermodynamics</td>
<td>Analysis of Titration Curves</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spontaneous process, entropy, free energy, chemical equilibrium.</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>4/6</td>
<td>Chapter 17 continued</td>
<td>Lab Practical</td>
</tr>
<tr>
<td>14</td>
<td>4/13</td>
<td>Chapter 18 Electrochemistry</td>
<td>Gibb’s Free Energy, Entropy, and Spontaneous Reactions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Voltaic cells, standard potential, concentration cells, batteries, fuel cells, corrosion.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Thursday, April 18 Exam 3</strong> (Chpt. 16, 17, 18)</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>4/20</td>
<td>Chapter 18 continued</td>
<td>Electrochemistry: Anodizing Aluminum and Etching Brass</td>
</tr>
<tr>
<td></td>
<td>4/27</td>
<td>Chapter 19 Nuclear Chemistry</td>
<td>LAB FINAL EXAM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Radioactive decay, nuclear fission, nuclear fusion, nuclear energy.</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>5/4</td>
<td>Final Exams</td>
<td></td>
</tr>
</tbody>
</table>

**General Policies Related to This Course**

All students are required to follow the policies and procedures presented in these documents:

- [Angelo State University Student Handbook](#)
- [Angelo State University Catalog](#)
Academic Integrity
Students are expected to maintain complete honesty and integrity in all work. Any student found guilty of any form of dishonesty in academic work is subject of disciplinary action and possible expulsion from ASU.

The College of Science and Engineering adheres to the university’s Statement of Academic Integrity.

Accommodations for Students with Disabilities
ASU is committed to the principle that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs or activities of the university, or be subjected to discrimination by the university, as provided by the Americans with Disabilities Act of 1990 (ADA), the Americans with Disabilities Act Amendments of 2008 (ADAAA) and subsequent legislation.

Student Disability Services is located in the Office of Student Affairs, and is the designated campus department charged with the responsibility of reviewing and authorizing requests for reasonable accommodations based on a disability. It is the student’s responsibility to initiate such a request by contacting an employee of the Office of Student Affairs, in the Houston Harte University Center, Room 112, or contacting the department via email at ADA@angelo.edu. For more information about the application process and requirements, visit the Student Disability Services website.

The employee charged with the responsibility of reviewing and authorizing accommodation requests is:

Dallas Swafford
Director of Student Disability Services
Office of Student Affairs
325-942-2047
dallas.swafford@angelo.edu
Houston Harte University Center, Room 112

Incomplete Grade Policy
It is policy that incomplete grades be reserved for student illness or personal misfortune. Please contact faculty if you have serious illness or a personal misfortune that would keep you from completing course work. Documentation may be required. See ASU Operating Policy 10.11 Grading Procedures for more information.
**Plagiarism**
Plagiarism is a serious topic covered in ASU’s Academic Integrity policy in the Student Handbook. Plagiarism is the action or practice of taking someone else’s work, idea, etc., and passing it off as one’s own. Plagiarism is literary theft.

In your discussions and/or your papers, it is unacceptable to copy word-for-word without quotation marks and the source of the quotation. It is expected that you will summarize or paraphrase ideas giving appropriate credit to the source both in the body of your paper and the reference list.

Papers are subject to be evaluated for originality. Resources to help you understand this policy better are available at the ASU Writing Center.

**Student Absence for Observance of Religious Holy Days**
A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. See ASU Operating Policy 10.19 Student Absence for Observance of Religious Holy Day for more information.

**Title IX at Angelo State University**
The University prohibits discrimination based on sex, which includes pregnancy, sexual orientation, gender identity, and other types of Sexual Misconduct. Sexual Misconduct is a broad term encompassing all forms of gender-based harassment or discrimination including: sexual assault, sex-based discrimination, sexual exploitation, sexual harassment, public indecency, interpersonal violence (domestic violence and/or dating violence), and stalking. As a faculty member, I am a Responsible Employee meaning that I am obligated by law and ASU policy to report any allegations I am notified of to the Office of Title IX Compliance.

Students are encouraged to report any incidents of sexual misconduct directly to ASU’s Office of Title IX Compliance and the Director of Title IX Compliance/Title IX Coordinator at:

Michelle Boone, J.D.
Director of Title IX Compliance/Title IX Coordinator
Mayer Administration Building, Room 210
325-942-2022
michelle.boone@angelo.edu

You may also file a report online 24/7 at www.angelo.edu/incident-form.
If you are wishing to speak to someone about an incident in confidence you may contact the University Health Clinic and Counseling Center at 325-942-2173 or the ASU Crisis Helpline at 325-486-6345.

For more information about Title IX in general you may visit www.angelo.edu/title-ix.

Student Learning Outcomes

- **Learning Goal 1:** Students will be able to analyze complex chemical problems and draw logical conclusions.
  - Students will be able to identify intermolecular interactions in a solid, liquid or solution and analyze the strength and nature of those interactions.
  - Students should be able to write equilibrium expression for any chemical reaction and determine the value of equilibrium constants from experimental data.
  - Students should be able to use equilibrium constants and expressions to
    - describe the tendency of the reaction to favor reactants or products
    - predict the direction of the reaction given the equilibrium constant and the starting concentrations of all reactants and products
    - determine the equilibrium concentrations given sufficient information about either the equilibrium or starting concentrations of the reactants and products
  - Students should be able to use Le Chatelier’s Principle to determine how a system at equilibrium will change with changes in reaction conditions such as concentration, pressure or temperature.
  - Students should be able to describe electrochemical cells using cell notations or a sketch and determine the standard state cell potential.
  - Students should be able to use the relationship between cell potential, free energy and equilibrium constants.

- **Learning Goal 2a:** Students will be able to understand and apply scientific reasoning in the chemical sciences.
  - Students should be able to classify solids by type of bonding (molecular, ionic, metallic or network covalent) and extent of organization (crystalline, microcrystalline and amorphous) and describe and explain the properties of different solids based on that classification.
  - Students will be able to define the phases of matter using the following frameworks:
    - Compressibility and fluidity
    - Kinetic molecular theory (movement of molecules within a sample)
    - Kinetic molecular theory (kinetic energy vs. intermolecular interactions)
  - Students should be able to describe phase transitions in terms of enthalpies, heating curves and phase diagrams.
  - The student should be able to state the first three laws of thermodynamics and explain how they affect real world systems.
• Students should have a knowledge of common forms of nuclear radiation and processes.
• Student should be able to use oxidation numbers to identify and balance redox reactions.

• Learning Goal 2b: Students will be able to employ mathematics in the analysis of chemical problems.
  • Students should be able to describe solution concentrations in a variety of ways and use concentration to predict properties of solutions.
  • Students should be able to do calculations involving solution concentrations including those involving colligative properties.
  • Students should be able to use experimental data to obtain reaction rate laws and use reaction rate laws to predict the rates of reactions.
  • Students should understand how free energy, enthalpy and entropy are related and how free energy is dependent on temperature.
  • Students should be able to determine the entropy and enthalpy changes of a reaction from free energy values or equilibrium constants measured at different temperatures.
  • Students should be able to use an understanding of the relationship between free energy, enthalpy and entropy to explain the dependence of free energy on temperature.

• Learning Goal 3: Students will be able to demonstrate technical and analytical skills in chemistry.
  • Students will be able to analyze rates of chemical reactions and be able to relate reaction rates to the molecular mechanisms of those reactions.
  • Students should be able to determine the entropy and enthalpy changes of a reaction from free energy values or equilibrium constants measured at different temperatures.
  • Students should be able to use reaction rate versus temperature data to determine the activation energy of a chemical reaction.
  • The student should be able to predict the products of α-particle and β-particle emission.
  • The student should know how to determine cell potentials at non-standard state concentrations and partial pressures of reactants and products or be able to use potentials measured under these conditions to determine the concentration of a reactant or product.

Evaluation of Student Learning Outcomes
Student learning outcomes will be evaluated by test questions or by the grading of in-classroom activities, as described by your instructor.

Texas Higher Education Coordinating Board Natural Sciences Objectives
The objective of the study of a natural sciences component of a core curriculum is to enable the student to understand, construct, and evaluate relationships in the natural sciences, and to enable the student to understand the basis for building and testing theories.

**Exemplary Educational Objectives**

1. To understand and apply method and appropriate technology to the study of natural sciences.
2. To recognize scientific and quantitative methods and the differences between these approaches and other methods of inquiry and to communicate findings, analyses, and interpretation both orally and in writing.
3. To identify and recognize the differences among competing scientific theories.
4. To demonstrate knowledge of the major issues and problems facing modern science, including issues that touch upon ethics, values, and public policies.
5. To demonstrate knowledge of the interdependence of science and technology and their influence on, and contribution to, modern culture.

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1. [www.wwnorton.com/smartwork](http://www.wwnorton.com/smartwork)
3. [http://www.angelo.edu/services/registrars_office/final.html](http://www.angelo.edu/services/registrars_office/final.html)
4. [http://blackboard.angelo.edu](http://blackboard.angelo.edu) (or access Blackboard from RamPort)
5. [https://www.angelo.edu/student-handbook/](https://www.angelo.edu/student-handbook/)
6. [https://www.angelo.edu/catalogs/](https://www.angelo.edu/catalogs/)
8. [https://www.angelo.edu/services/disability-services/](https://www.angelo.edu/services/disability-services/)
9. [https://www.angelo.edu/content/files/14197-op-1011-grading-procedures](https://www.angelo.edu/content/files/14197-op-1011-grading-procedures)
11. [https://www.angelo.edu/dept/writing_center/academic_honesty.php](https://www.angelo.edu/dept/writing_center/academic_honesty.php)
12. [https://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of](https://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of)