FACULTY INFORMATION

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

- Dr. Edith Osborne
  Office: CAV 204A
  Phone: 486-6629
  E-mail: Edith.Osborne@angelo.edu
  Office Hours: MWRF 11:00-12:00, F 9:00-10:00

- Dr. Gregory Smith
  Office: CAV 207A
  Phone: 486-6628
  E-mail: Gregory.Smith@angelo.edu
  Office Hours: MTWF 11 am – 12 pm

- Dr. Steven King
  Office: CAV 214B
  Phone: 486-6625
  E-mail: steven.king@angelo.edu
  Office Hours: M-F 9:00-10:00

- Dr. Ralph Zehnder
  Office: CAV 204B
  Phone: 486-6662
  E-mail: Ralph.Zehnder@angelo.edu
  Office Hours: M 12:00 -1:00, T 11:00 -1:00, W 12:00 -1:00, F 12:00 -1:00, or by appointment; Review sessions W 5 pm

CHEM 1412 LECTURE CLASSES

Lecture Class Schedule

<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>10:00 am-10:50 am</td>
<td>Dr. Beran</td>
<td>CAV 211</td>
</tr>
<tr>
<td>030</td>
<td>TR</td>
<td>9:30 am-10:45 am</td>
<td>Dr. Osborne</td>
<td>CAV 215</td>
</tr>
<tr>
<td>040</td>
<td>TR</td>
<td>9:30 am-10:45 am</td>
<td>Dr. Zehnder</td>
<td>CAV 200</td>
</tr>
</tbody>
</table>

Required Supplies

- **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.) Options 1 and 2 are available from the ASU Bookstore or directly from the publisher at the Norton website. Option 3 is only available from the publisher.

- **Carbon Copy Lab Notebook** (available from the ASU Bookstore or from the lab stockroom)
- **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. Only non-programmable calculators may be used on the exams. Bring your calculator to class and to lab every day.

**Course Description**

This course, which is a continuation of CHEM 1411, focuses on chemical kinetics, chemical equilibrium, acid-base chemistry, and thermodynamics. Additional topics, such as environmental chemistry, electrochemistry, coordination chemistry, nuclear chemistry, and/or polymers may be introduced.

**Prerequisites**

Chemistry 1411 is to be completed with a grade of C or better before Chemistry 1412. Proficiency in algebra required. Only students eligible to take college-level mathematics courses may take Chemistry 1412.

**Grading**

<table>
<thead>
<tr>
<th>Category</th>
<th>Points Possible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams (3×100 pts)</td>
<td>300 pts</td>
</tr>
<tr>
<td>Final</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</td>
<td>200 pts</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1000 pts</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percent</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90-100%</td>
<td>900-1000 pts</td>
</tr>
<tr>
<td>B</td>
<td>80-89.9%</td>
<td>800-899 pts</td>
</tr>
<tr>
<td>C</td>
<td>70-79.9%</td>
<td>700-799 pts</td>
</tr>
<tr>
<td>D</td>
<td>60-69.9%</td>
<td>600-699 pts</td>
</tr>
<tr>
<td>F</td>
<td>&lt;60%</td>
<td>0-599 pts</td>
</tr>
</tbody>
</table>

**Exams**

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

<table>
<thead>
<tr>
<th>Exam</th>
<th>Date</th>
<th>Room</th>
<th>Time</th>
<th>Point Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam 1</td>
<td>Thursday, February 14</td>
<td>CAV</td>
<td>5:30 pm</td>
<td>100 pts</td>
</tr>
<tr>
<td>Exam 2</td>
<td>Thursday, March 21</td>
<td>CAV</td>
<td>5:30 pm</td>
<td>100 pts</td>
</tr>
</tbody>
</table>
Exam Date Room Time Point Value

Exam 3 Thursday, April 18 CAV TBD 5:30 pm 100 pts

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 graphing calculators are allowed).

Make-up Exams
To obtain permission to make up an examination, prior to the next class meeting you must verify with the course instructor whether or not an absence is excused according to the ASU Student handbook (www.angelo.edu/cstudent/). (This handbook also provides information concerning academic integrity and student services.)

Final Exam Schedule
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 1411 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>Final Exam Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>010</td>
<td>MWF</td>
<td>09:00 am-09:50 am</td>
<td>Dr. Beran</td>
<td>Wednesday, May 8</td>
<td>8:00 am-10:00 am</td>
</tr>
<tr>
<td>020</td>
<td>MWF</td>
<td>10:00 am-10:50 am</td>
<td>Dr. Beran</td>
<td>Monday, May 6</td>
<td>10:30 am-12:30 am</td>
</tr>
<tr>
<td>030</td>
<td>TR</td>
<td>09:30 am-10:45 am</td>
<td>Dr. Osborne</td>
<td>Thursday, May 9</td>
<td>08:00 am-10:00 pm</td>
</tr>
<tr>
<td>040</td>
<td>TR</td>
<td>09:30 am-10:45 am</td>
<td>Dr. Zehnder</td>
<td>Thursday, May 9</td>
<td>08:00 am-10:00 pm</td>
</tr>
</tbody>
</table>

SmartWork Computer Homework
SmartWork is an online homework program which accompanies the Gilbert textbook. These assignments will be averaged to give a 200-point grade. To register with SmartWork from within Blackboard, follow the instructions at the end of this syllabus.

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 28, 2019.

Honor Code / Academic Dishonesty
Angelo State University expects its students to maintain complete honesty and integrity in their academic pursuits. Students are responsible for understanding the Academic Honor Code, which is to be found in the Student Handbook. The penalty for ANY sort of dishonesty, cheating or plagiarism can range from a grade of zero on the assignment to a F in the course and disciplinary action as warranted in accordance with university guidelines. Don’t even consider it.

Disabilities
Persons with disabilities which may warrant academic accommodations must contact the Student Life Office, Room 112 University Center, in order to request and to implement academic accommodations.

CHEM 1412 LAB CLASSES

The lab classes that accompany the CHEM 1412 lecture course are shown in the table below. The labs will generally meet 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 pm-04:50 pm</td>
<td>Dr. Zehnder</td>
<td>CAV 211</td>
<td>CAV 212</td>
</tr>
<tr>
<td>06Z</td>
<td>T</td>
<td>11:00 am-01:50 pm</td>
<td>Dr. Osborne</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>08Z</td>
<td>W</td>
<td>02:00 pm-04:50 pm</td>
<td>Dr. Zehnder</td>
<td>CAV 219</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 211</td>
<td>CAV 212</td>
</tr>
<tr>
<td>11Z</td>
<td>W</td>
<td>11:00 am-01:50 pm</td>
<td>Dr. King</td>
<td>CAV 211</td>
<td>CAV 212</td>
</tr>
</tbody>
</table>

Lab Course
The CHEM 1412 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 Experiments and Lab Reports
All laboratory experiment handouts will be posted on Blackboard. Print off the experiment handout and bring it with you to lab. The lab handout provides 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. You will also need to record data in a lab notebook, and hand in the carbon copies from that notebook when the lab is complete. It is essential that you read the handout
before coming to class. Grades for the lab reports for the experiments, the lab assignments, and
the lab final will be averaged together and reported to your lecture instructor as a 200 point

You will also need to record data in a lab notebook, and hand in the carbon copies from
that notebook when the lab is complete. The lab notebook should include an abstract for the
experiment, a short summary of the procedure for the lab, all of the data collected during the lab
and any observations that are made, and a conclusion for the lab.

The grade for each lab will come from the lab report, the pre-lab questions, and the
carbon copy pages from the lab notebook. Each lab will be worth 100 points.

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 Sunday, January 13, 2019.
If you have taken the lab safety training during a previous semester you do not have to take the
safety training again.

Lab Quizzes and 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.
## LECTURE AND LAB SCHEDULE — SPRING, 2019

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Lecture</th>
<th>Lab</th>
</tr>
</thead>
</table>
| 1   | 1/14  | Chapter 10 Intermolecular Forces  
Dipole-dipole forces, dispersion forces, polarity and solubility, vapor pressures, solubility of gases, phase diagrams.  
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 13)  
ONLY necessary if not taken before. |
| 2   | 1/21  | Monday, Jan 21 — Martin Luther King Day  
Chapter 11 continued | Labs Do Not Meet  
MLK day Monday, January 21.  
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 28  
(Lectures will continue Tuesday through Friday) |
| 3   | 1/28  | Chapter 12 Solids  
The solid state, structures of metals, ionic solids, salt crystals. | Qualitative Analysis of Group I Cations |
| 4   | 2/04  | Chapter 13 Chemical Kinetics  
Reaction rates, integrated rate laws, Arrhenius Equation, reaction mechanisms. | Qualitative Analysis of an Unknown Salt |
| 5   | 2/11  | Chapter 13 continued  
Thursday, February 14 Exam 1 (Chpt. 10, 11, 12, 13) | Spectrophotometry of FD&C Red 40 |
| 6   | 2/18  | 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>| 7   | 2/25  | 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>Day</th>
<th>Lecture</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>3/4  Chapter 14 continued</td>
<td>Equilibrium and Le Châtelier’s Principle</td>
</tr>
<tr>
<td></td>
<td><strong>Chapter 15 Acid and Base Equilibria</strong></td>
<td></td>
</tr>
<tr>
<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>3/11 Spring Break – No Classes!</td>
<td>Spring Break – No Classes!</td>
</tr>
<tr>
<td>10</td>
<td>3/18  Chapter 15 continued</td>
<td>Analysis of Antacid Tablets</td>
</tr>
<tr>
<td></td>
<td><strong>Thursday, March 21 Exam 2</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Chpt. 13, 14, 15)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>3/25  Chapter 16 Additional Aqueous Equilibria</td>
<td>Lab Midterm Exam</td>
</tr>
<tr>
<td></td>
<td>Common ion effect, buffer solutions, solubility product constant.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>4/01  Chapter 17 Thermodynamics</td>
<td>Analysis of Titration Curves</td>
</tr>
<tr>
<td></td>
<td>Spontaneous process, entropy, free energy, chemical equilibrium.</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>4/08  Chapter 17 continued</td>
<td>Lab Practical</td>
</tr>
<tr>
<td>14</td>
<td>4/15  Chapter 18 Electrochemistry</td>
<td>Gibb’s Free Energy, Entropy, and Spontaneous Reactions</td>
</tr>
<tr>
<td></td>
<td>Voltaic cells, standard potential,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>concentration cells, batteries, fuel cells, corrosion.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Thursday, April 18 Exam 3 (Chpt. 16, 17, 18)</strong></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>4/22  Chapter 18 continued</td>
<td>Electrochemistry: Anodizing Aluminum and Etching Brass</td>
</tr>
<tr>
<td>16</td>
<td>4/29  Chapter 19 Nuclear Chemistry</td>
<td>Lab Final</td>
</tr>
<tr>
<td></td>
<td>Radioactive decay, nuclear fission, nuclear fusion, nuclear energy.</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>5/06  Final Exams</td>
<td>(see Final Exam Schedule, final will be given in your lecture classroom)</td>
</tr>
</tbody>
</table>
STUDENT LEARNING OUTCOMES

- **Learning Goal 1:** Students will be able to analyze complex chemical problems and draw logical conclusions.
  - Students will be able to use an understanding of atomic structure at the basic and atomic levels to analyze the structure and reactivity of substances and chemical species.
  - Students will be able to use an understanding of how energy interacts with matter to predict stable chemical species, and perform thermodynamic calculations describing chemical reactions.

- **Learning Goal 2a:** Students will be able to understand and apply scientific reasoning in the chemical sciences.
  - Students will be able to use an understanding of ions and molecules at the atomic level to predict the behavior of reactions in aqueous solutions.
  - Students will be able to use the basic ideas of quantum mechanics to describe how molecular bonds form and to predict molecular shape and polarity. Molecular structure and polarity will be used to predict the forces between molecules and relate those forces to the states of matter and phase changes.

- **Learning Goal 2b:** Students will be able to employ mathematics in the analysis of chemical problems.
  - The mole concept, chemical formulas and balanced chemical equations will be used to do chemical calculations that relate macroscopic measurements to numbers of atoms, ions or molecules.
  - Students will be able to do calculations involving solution concentration and know how to prepare solutions of given concentrations.
  - Students will be able to quantitatively predict gas properties using gas law calculations.

- **Learning Goal 3:** Students will be able to demonstrate technical and analytical skills in chemistry.
  - Students will be able to use the periodic table to determine basic atomic information and to predict trends in atomic properties.
  - Students will be able to interconvert between chemical names and formulas to the extent that they can work problems given only one of those pieces of information.
  - Students will be able to classify common types of chemical reactions and predict the outcomes of reactions.

**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.

4. www.wwnorton.com/smartwork
5. http://blackboard.angelo.edu (or access Blackboard from RamPort)
6. www.angelo.edu/cstudent/