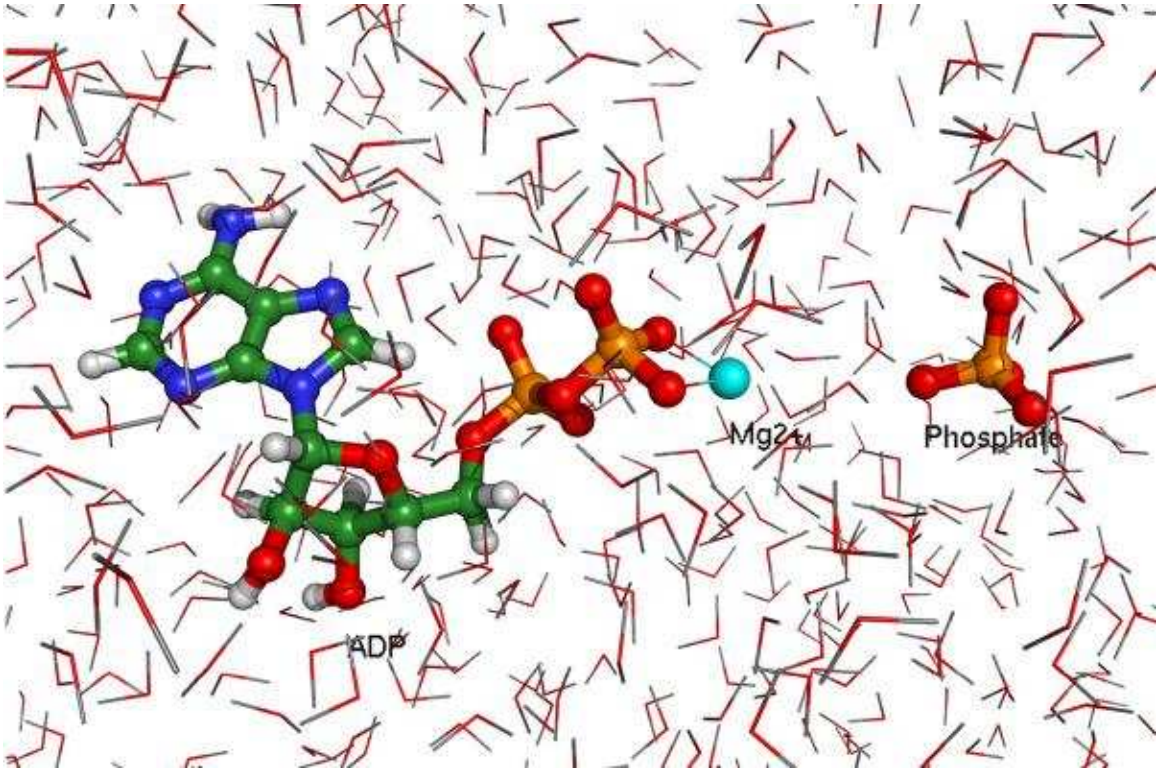
CHEMISTRY MAJOR'S HANDBOOK

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF NEVADA, RENO
http://www.chem.unr.edu

2007-2008 Academic Year



Contents

Cover Figure

A representation of a molecular complex of ADP, phosphate, and Mg^{2+} in water from molecular dynamics simulations, performed by Christopher Moss, a chemistry major and 2006 UNR graduate, in Dr. Woo's lab in Fall 2005. Estimates of the free energy of separating the phosphate from ADP are considerably larger in the presence of Mg^{2+} than without the ion, suggesting that the magnesium ion coordinating ATP helps stabilize the compound against hydrolysis. The ATP hydrolysis plays key roles in operations of motor proteins including myosin, for which Chris Moss also participated in the development and testing of a theoretical model [H.-J. Woo and C. L. Moss, *Phys. Rev. E* **72**, 051924 (2005)].

1 Faculty and Staff

Faculty (area of specialization indicated)

Prof. Frank Baglin	Physical Chemistry
Prof. Thomas Bell	Organic Chemistry
Prof. Ana de Bettencourt-Dias	Inorganic Chemistry
Prof. Sean Casey	Physical Chemistry
Prof. Vincent Catalano	Inorganic Chemistry (Department Chair)
Prof. Joseph Cline	Physical Chemistry
Dr. Sarah A. Cummings	Chemical Education
Prof. Kent Ervin	Physical Chemistry
Prof. Garry Fickes	Organic Chemistry
Prof. John Frederick	Physical Chemistry
Prof. Brian Frost	Inorganic Chemistry
Prof. Benjamin King	Organic Chemistry
Prof. David Leitner	Physical Chemistry
Prof. Eugene LeMay	Inorganic Chemistry
Prof. David Lightner	Organic Chemistry
Dr. Sési McCullough	Chemical Education
Prof. Charles Rose	Organic Chemistry
Prof. Jason Shearer	Inorganic Chemistry
Prof. Robert Sheridan	Organic Chemistry
Prof. Hyung Shin	Physical Chemistry
Prof. Suk-Wah Tam-Chang	Organic Chemistry
Prof. Hyung-June Woo	Physical Chemistry
Prof. Liming Zhang	Organic Chemistry

Administrative Faculty

Lew Cary	Director of Magnetic Instruments Laboratory
Dr. Scott Waite	Director of Laboratories

Classified Staff

Thomas Grothaus	Electrical Engineer
Doug Howard	Research Stockroom Manager
Dan Jacques	Organic Instructional Stockroom Manager
Walt Weaver	Machinist
Doug Ziech	General Chemistry Instructional Stockroom Manager

Office Staff

Jenny Costa	Administrative Assistant
Xanthea Elsbree	Office Manager
Jennifer Melius	Administrative Assistant
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2 Important Contact Information

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Reno, Nevada 89557-0020

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3 General Information and Department Resources

3.1 Department Office (CB 213)

The Chemistry Department Office in room CB 213 (775-784-6041) is a general source of information about course schedules and enrollment conflicts, locating your instructors (or their mailboxes), recovering lost and found items, and contacting the Director of Laboratories about safety issues. CB 213 is also the location of the Department Chair's office.

3.2 What's happening in the department?

There is a *lot* going on in the Chemistry Department beyond your chemistry lecture and laboratory courses. Internationally recognized scientific research is a major part of the department's activity. Your professors and graduate student teaching assistants are practicing scientists, and you can become involved in their research activity as an undergraduate. Each week during the academic year the department hosts research-oriented seminars, many of which feature prominent chemists from across the country and around the world. Other department seminars, which can be just as enlightening, are given by graduate students (your TA's) reporting on their research activity towards Master's or Doctoral degrees in chemistry. Even though these seminars are not a part of your formal coursework, you should be sure to attend at least a few seminars of interest during your studies at Nevada. Both research seminars and hands-on undergraduate research can provide you with a taste of the excitement at the periphery of chemical knowledge. These seminars can inform your choice of career or future study. Seminar times and locations are posted throughout the building, and always on the bulletin boards outside the Department Office in room CB 213. Graduate student seminars are generally held Tuesday and Thursday afternoons. Seminars given by external scientists are typically held Friday afternoons, but commonly appear other times of the week as well.

3.3 UNR Chemistry Website

The UNR Chemistry Website (`http://www.chem.unr.edu`) should be a primary information resource during your chemistry studies. Information you will find there includes:

- Detailed information about your professors, including office numbers, email addresses, and phone numbers. Also available are synopses of their research interests and recent scientific publications.
- Chemistry course homepages are maintained by many professors. Assignments, schedules, and study aids are among some of the useful information found there.
- The latest listing of chemistry courses and requirements for the chemistry major.
- Downloadable forms for your degree.
- Safety information.
- Links to a variety of other internet resources for chemistry, on campus and beyond.
- The latest version of this document.

3.4 Instructional Facilities

3.4.1 Chemistry Building

The Chemistry Department is housed in the Chemistry Building (CB), a four-story structure located on the New Quad of the central campus, adjoining the Leifson Physics Building (LP) and near the engineering research complex. The Chemistry Building is open at least from 8am-5pm on days that classes meet.

The Chemistry Building is both an instructional and a research facility. Chemistry research relies heavily on modern facilities, instrumentation, and technical support personnel. The Chemistry Building is endowed with a full complement of support services, shops for fabrication of research equipment, and specialized research laboratories.

3.4.2 DeLaMare Library

The DeLaMare Library (see `http://www.delamare.unr.edu/` for schedule and further information) is located in the Macky Mines Building, room MM 113. It houses the majority of the University's library materials in the areas of chemistry and physics. We currently have approximately 140 scientific journal subscriptions in Chemistry and Physics and 30,000 monographic volumes.

Available from the Circulation Desk of the DeLaMare Library are chemistry course-specific reserve materials, which include supplementary texts and readings, practice review exams, course notes, and solution keys for exams and problem sets. Many course reserve materials are also available online (`http://www.library.unr.edu/reserves.html`).

Online Resources provided by the DeLaMare Library include access to the online library catalog and the other NEON (Nevada Education Online Network) databases, such as SciFinder Scholar (Chemical Abstracts) and Web of Science (Science Citation Index). Nearly all of our current journal subscriptions and thousands more titles are available online. Additionally, most of our major reference works, including the CRC Handbook of Chemistry and Physics, are online.

3.4.3 Computer Instructional Laboratory (CB 316)

The Computer Instructional Laboratory (see `http://www.chem.unr.edu/cil/` for schedule and further information) is housed in Chemistry Building room CB 316. This is a general use computer lab, enhanced with many specialized programs for molecular modeling, visualization, and other scientific applications. During open hours the "CIL" is staffed by a Teaching Assistant who can help you with chemistry-related work. Undergraduates involved in research work may obtain a key to the CIL for after-hours access.

3.4.4 Undergraduate Research Facilities

Undergraduate research activity is generally conducted in the specialized laboratory of your research mentor, and you will gain access to this laboratory when you choose a mentor. In addition to these specialized laboratories, there are other shops and labs that can be used by all researchers in the department:

- Machine Shop (LP B16) This facility is devoted to the fabrication of scientific research instruments. Walt Weaver is the professional machinist contact for chemistry projects.

- Electronics Shop (CB P4) This facility is devoted to the fabrication of research electronic equipment and electronics repair. Electrical Engineer Tom Grothaus manages this shop.
- Magnetic Resonance Facility (CB 006) The department houses several NMR spectrometers and other specialized analytical equipment. Lew Cary manages this facility.

3.5 Special Scholarships for Chemistry Majors

The following scholarships are available to UNR Chemistry Majors ranging in amounts from $400 to $2000. The scholarship application deadline is in the early part of the Spring semester of each year. Contact the Chemistry Office for details regarding the application deadline.

- Ben A. Edwards Scholarships
- Chemistry Alumni Scholarships
- Chemistry Faculty Scholarships
- Jonathan H. Reeder Scholarship
- Kenneth C. Kemp Scholarships
- Thurston Memorial Scholarship
- Hans R. Wolfe Scholarship

4 Advisement

4.1 Who is my advisor?

The chemistry major academic advisor can help you choose among the various chemistry degree options, help select courses, and help design the Curriculum Plan that plots your progress towards timely graduation. The 2007-2008 chemistry major academic advisor is Prof. Tam-Chang (email `advising@chem.unr.edu`, phone 775-784-6041).

The Chemistry Department offers three different Bachelor of Science degrees (see Sec. 5), and you should meet with the academic advisor early in your first semester to select a degree program and design your Curriculum Plan. It is a good idea to contact your academic advisor each semester, usually when choosing courses for the next semester.

If you become involved in undergraduate research, your research mentor is the faculty member who directs your senior thesis and other research projects, and provides laboratory space for your work. Your research mentor will normally assume the role of your advisor regarding selection of elective courses and career planning. Questions regarding degree requirements or course substitutions should referred to Prof. Tam-Chang as the chemistry major academic advisor.

4.2 Chemistry degree timeline

Below is a suggested timeline for completion of your degree in four years, listing a number of important tasks that must be completed on schedule. Use the timeline in conjunction with your Curriculum Plan (example Curriculum Plans for each of the three degree types are given on pages 19, 23, and 26). In using this timeline, keep in mind that undergraduate research (and the Senior Thesis) is not required of BS-CH (Field of Concentration) majors, although it is highly recommended.

Year 1	Fall	– Choose type of chemistry degree (either BS-CHP, BS-CEC, or BS-CH – see Sec. 5). – Create your Curriculum Plan (see appropriate example on page 19, 23, 26, or 27). – Meet with academic advisor to discuss your Curriculum Plan.
	Spring	– Progress meeting with academic advisor.
Year 2	Fall	– Progress meeting with academic advisor.
	Spring	– Progress meeting with academic advisor. – Mid-stream preparation evaluation in CHEM 348 (Major's Organic Lab).
Year 3	Fall	– Complete Field of Concentration Form (see Sec. 4.4). – Meet with academic advisor to approve Field of Concentration Form. – Interview prospective undergraduate research advisors.
	Spring	– Progress meeting with advisor. – Choose undergraduate research advisor.
	Summer	– Possibly start undergraduate research.
Year 4	Fall	– Progress meeting with academic advisor. – Take professional exams (GRE, MCAT, *etc.*). – Apply to graduate programs or for employment. – Submit Application for Graduation Form before deadline (see Sec. 4.4). – Should be well into Senior Thesis research.
	Spring	– Present Senior Thesis. – Graduate at end of semester. Congratulations!
	Summer/Fall	– Start graduate study or employment.

4.3 Important University publications and web pages

UNR General Catalog

This document contains the official policies and requirements regarding students and degrees. It also contains detailed descriptions of all courses offered at the University, the Academic Calendar, and much more. You can obtain the catalog from
`http://www.ss.unr.edu/records/catalog.asp`.

UNR Class Schedule

This document is published three times a year (for the Fall, Spring, and Summer academic terms). It lists the courses offered each semester; course meeting times, meeting places, instructor names, and final exam schedules; and the Academic Calendar. It is available for free on campus or you can access it online at `http://www.ss.unr.edu/records/sched.asp`.

ePAWS

The ePAWS system (`http://www.unr.edu/epaws/`) is used to enroll in classes, to keep track of your status toward degree completion, and for other UNR enrollment functions. Using ePAWS, you can obtain your DARS (Degree Audit Report System) report. This is the University's official record of your academic progress (and can also be used to verify that you are registered under the proper degree code!). You should always bring a current DARS report to your meetings with a chemistry advisor.

4.4 Important forms and paperwork

There are a few forms that must be completed at specific points in your progress towards the degree. These forms will require you to indicate the name of your degree. The three chemistry degrees (see Sec. 5) have similar names and are easily confused. It is best to distinguish among them using the relevant degree codes (BS-CHP, BS-CEC, and BS-CH). Be sure to clearly indicate your degree code when using these forms or in correspondence with Admissions and Records.

Field of Concentration Form

At the beginning of the junior year, you must meet with your advisor to complete "Field of Concentration Forms" for your major and minor programs. [Notes: (1) Completion of a minor is optional for chemistry majors. (2) You attain junior standing when you have completed 60 credits.] These forms, which outline the courses required for completing the major or minor, must be signed by the Department Chair in the major and minor fields and then submitted to the Office of the Dean of the College of Science. Each of the three chemistry major degree programs has its own Field of Concentration Form (download from `http://www.chem.unr.edu/undergraduates/forms.php`).

Request for Major/College Substitution/DARS exception

Use this form to make *any* substitution or to gain approval for any deviations from the standard degree requirements. Submitting the completed form requires approval from your academic advisor and the Department Chair
(see `http://www.chem.unr.edu/undergraduates/forms.php`).

Change of Major Declaration Form

If you are changing your major to chemistry, if you are a chemistry major who wants to switch to another type of chemistry degree, or if you want to pursue a second major in addition to chemistry, then you need to complete the Change of Major Declaration Form (from `http://www.chem.unr.edu/undergraduates/forms.php`).

Application for Graduation Form

You must submit the Application for Graduation Form approximately one semester prior to the anticipated graduation date. The exact due date for this form is printed in the University calendar in the current UNR General Catalog and in the front of each semester's Class Schedule. To obtain the form, you must pay an application fee in the Cashier's Office in the Student Services Building. Candidates must obtain signatures for their applications from their major and minor advisors and from the Department Chair of their major field. The major department will forward a student's signed application to the dean's office for review. Once the application has been reviewed and signed by the dean's office, it will be forwarded to Admissions and Records. Only Admissions and Records can certify that a student has officially met all graduation requirements.

4.5 FAQ – Frequently Asked Questions

1. **I have transferred to UNR from another college or university. How can I receive credit for courses taken at another institution?**

You need to contact the Transfer Center in the Student Services Building (SSB) room 231 (775-682-8083, `http://www.unr.edu/stsv/trcenter/`). The Transfer Center will review your academic record and determine how your coursework will transfer to UNR.

2. **I took the Advanced Placement (AP) Chemistry Exam or higher level International Baccalaureate (IB) Exam and tested out of CHEM 121 (or 121/122). What should I take my first year?**

   Detailed procedures for assigning AP credit are given on page 39 of the 2007-2008 UNR General Catalog. For the AP Chemistry Exam, depending upon your AP score and whether you have taken the CHEM 121 and 122 laboratories at UNR, credit may be given for all or parts of CHEM 121 and 122 (but not CHEM 201 and 202). Students who have AP credit may still want to take CHEM 201 and 202 as this sequence is better preparation for more advanced chemistry courses. The detailed procedures for assigning IB exam credit are similar and are given on page 41 of the 2007-2008 UNR General Catalog. Chemistry AP or IB credit is awarded as described in the following table:

Score on AP or IB Chem exam	Credit granted	Passed AP labs held at UNR while in high school	Course to take in year 1 at UNR†
AP: 1 or 2; IB: < 5	none	none	CHEM 121 or 201, 122 or 202
		121L	CHEM 121A, 122
		121L&122L	CHEM 121A, 122A
AP: 3; IB: 5	CHEM 121A (3 credits)‡	none	CHEM 121L, 122
		CHEM 121L	CHEM 122
		CHEM 121L&122L	CHEM 122A
AP: 4 or 5; IB: 6 or 7	CHEM 121A, 122A (6 credits)♢	none	CHEM 121L, 122L, 330, 341
		CHEM 121L	CHEM 122L, 330, 341
		CHEM 121L&122L	CHEM 330, 341

Notes:

† Special lecture and laboratory courses are listed below (these may not appear in the Class Schedule; contact the Chemistry Department Office for call numbers):
- 121A – CHEM 121 lecture portion (3 credits)
- 122A – CHEM 122 lecture portion (3 credits)
- 121L – CHEM 121 lab portion (1 credit)
- 122L – CHEM 122 lab portion (1 credit)

‡ Core science requirement is satisfied only after successful completion of CHEM 121L.

♢ Core science requirement is satisfied only after successful completion of CHEM 121L and 122L.

3. **Can I make substitutions for certain courses listed in the degree requirements?**

   Yes, with the approval of your advisor and the Chemistry Department Chair. You should first discuss the proposed substitution with your chemistry advisor. If your advisor agrees the substitution is reasonable then it is appropriate to seek approval from the Chair. You must complete and file a "Request for Major/College Substitution/DARS exception" form (download from
   `http://www.chem.unr.edu/undergraduates/forms.php`).

4. **What/how much foreign language must I take?**

   Chemistry majors are required to take two semesters of a modern foreign language at the college level. Two years of high school foreign language study is usually considered equivalent

to two semesters of college foreign language. If you are using high school foreign language to satisfy this requirement you should attach a high school transcript to your "Request for Substitutions or Corrections on Degree Audit Report (DARS)" form.

5. **Do I have to take the courses in the listed sequence? How much flexibility do I have?**

   The chemistry curriculum is relatively rigid, and the course sequences shown in the Curriculum Plans on pages 19, 23, and 26 are highly recommended for completion of the degree in four years. A few courses can be moved: for example CHEM 330 can be taken anytime after General Chemistry, and Organic Chemistry Laboratory might be moved into the junior year. Of course, there is flexibility in your scheduling of the required humanities core courses. However, it is a good idea to complete these courses early so that you can satisfy your evolving interests with electives in the senior year.

   Note that completing CHEM 201/202/341/342 in the first two years requires placement into MATH 181 (Calculus I) in the first semester and postponing some lower-division core requirements into the junior year. However, it is also possible to complete a chemistry degree with all lower-division requirements met in the first two years, either at UNR or at a community college, as shown in the Curriculum Plan on page 27.

6. **How can I earn a "double major"?**

   To establish your intent to pursue two majors, you must complete and file the "Change of Major Declaration" form, as described in Sec. 4.4 on page 8. In the College of Science at UNR, a "double major" is called either a *dual degree* or a *dual major*. The complicated details which apply are given on pages 51 and 282 of the 2007-2008 UNR General Catalog. The information below is specific to how the catalog rules apply to the three different chemistry degrees:

   - Both the BS-CHP (Professional Option) and the BS-CEC (Environmental Option) chemistry majors are "Bachelor of Science in Chemistry" degrees unique and distinct from any other degree in the University. Therefore, if you are pursuing one of these chemistry degrees simultaneously with another degree then you can only earn a *dual degree*. You must satisfy the requirements of both degrees, and you must complete a minimum of 32 credits beyond those required for the first degree.
   - The BS-CH (Field of Concentration) chemistry major is an ordinary Bachelor of Science degree (officially known as the "Bachelor of Science with a Major in Chemistry"). If you are pursuing a BS-CH chemistry major you would earn a *dual major* if the second major also leads to an ordinary Bachelor of Science degree (within the College of Science, this could be only the Atmospheric Sciences, Biology, Mathematics, Physics, or Biotechnology BS degrees). If the second major is not an ordinary Bachelor of Science degree, then you must pursue a *dual degree*.

7. **How do I find a research mentor, and/or when can I start doing research?**

   Undergraduate research (leading to a Senior Thesis) is a requirement for BS-CHP (Professional Option) and BS-CEC (Environmental Option) Chemistry Majors, and is highly recommended for BS-CH (Field of Concentration) Chemistry Majors.

Undergraduates often make research arrangements with professors teaching chemistry courses they have taken. This is fine, but you may miss out on opportunities in the research groups of professors you have not happened to meet. A good approach is to discuss your general chemistry interests with your chemistry academic advisor or another favorite chemistry professor, who can then recommend professors with similar interests. This chemistry faculty can also give you a Chemistry Department research brochure, which lists the research interests of all the chemistry faculty.

You should select a few professors with the research you find most interesting, and then arrange appointments with them to discuss their work and possible research projects you would undertake under their supervision. This is an important decision and worth making carefully. Your relationship with your research mentor is likely to be the closest faculty contact you will make at UNR, and is often a relationship that will continue throughout your professional career. There is an expectation of mutual commitment to the research project by both the student and the professor. It is not uncommon for undergraduate students to share authorship on research papers published in scientific journals.

You can start doing research at any time, and undergraduate research projects can begin in your freshman year. If you have an interest in starting on research immediately then don't hesitate! However, it is also often the case that a certain degree of experience in coursework and in laboratory techniques is necessary to make progress on a research project. Your prospective research mentor will evaluate your training. Generally you should be seeking a research mentor no later than your first semester with junior standing. This will give you adequate time to select a research mentor, and time for your research mentor to put together a plan for your research project. Most chemistry majors doing research begin in their junior year.

Academic credit can be obtained for undergraduate research. CHEM 495 and 496 (Senior Thesis in Chemistry I and II) is the course taken for undergraduate research at the senior level. CHEM 392 (Special Problems in Chemistry) and CHEM 490 (Independent Study) can be used to obtain academic credit for undergraduate work in the sophomore and junior years.

8. **What capstone courses must I take?**

   All students are required to take two capstone courses. CHEM 495 (Senior Thesis in Chemistry I) is the chemistry capstone and is a required course for the BS-CHP (Professional Option) and BS-CEC (Environmental Option) degrees, but not the BS-CH (Field of Concentration) degree. If you are a BS-CH major then CHEM 495 is highly recommended, but a non-chemistry capstone course can be taken instead. For all degrees, the second capstone *must* be taken outside the Chemistry Department.

9. **Are there jobs available in the department?**

   Yes, work study employment in the stockrooms or other laboratories is sometimes available. Contact the Director of Laboratories in the Chemistry Office for availability information. Some undergraduates are also employed as research assistants by their research mentors. Occasionally there is the opportunity for undergraduates to work as grading or laboratory teaching assistants.

4.6 Guidelines for Senior Theses

Individual faculty mentors have the primary responsibility to set requirements and grading standards for their Senior Thesis students. Before commencing work, the student and mentor should have a clear understanding of expectations. The following guidelines serve as general recommendations:

CHEM 495 Senior Thesis in Chemistry I should involve laboratory and library research culminating in a written thesis, typically 10-20 pages in length. If the student is planning to take CHEM 496 (Senior Thesis in Chemistry II), the first-semester thesis may emphasize the introduction, literature background, and proposed methods or initial results.

CHEM 496 Senior Thesis in Chemistry II should involve laboratory and library research culminating in a written thesis, typically 25-30 pages in length. The final thesis may expand and update the thesis from CHEM 495. A formal oral presentation of the research, perhaps in a group meeting setting, should be required.

The senior thesis should have the general structure and style of a graduate thesis. The faculty mentor should set the due dates for initial drafts and the final thesis. Senior theses from both CHEM 495 and 496 are to be kept in a departmental file. A final copy of each thesis must be submitted to the department offfice by the date grades are due each semester. If the final copy is not received by the department office by the due date then a grade of "incomplete" will be recorded for Senior Thesis.

5 Undergraduate Chemistry Degree Programs

5.1 Overview: Which degree should I choose?

Undergraduate chemistry majors complete courses providing a solid background in the physical sciences and mathematics, together with a sequence of courses in general, organic, inorganic and physical chemistry. Lecture classes are complemented by laboratories that give hands-on experience in chemical methods and instrumentation. The department also strongly encourages undergraduate students to become involved in laboratory research under the supervision of a faculty member. Undergraduate research is an outstanding learning opportunity that cannot be found in classwork alone.

Three bachelor's degree programs are available for undergraduate students majoring in chemistry:

- The **Bachelor of Science in Chemistry** is offered with a **Professional Chemistry Option** and an **Environmental Chemistry Option**. Both options provide rigorous training in experimental and theoretical chemistry, and include undergraduate research and specialized courses chosen according to the student's interests.
  - The **Professional Chemistry Option** (BS-CHP) is designed for students who are interested in a career as a chemist in industry or government, or in graduate school in chemistry or related areas. This degree is described in Sec. 5.3.1 and an example Curriculum Plan is given on page 19. This degree is certified by the American Chemical Society if the course electives include Introductory Biochemistry (BCH 400).
  - The **Environmental Chemistry Option** (BS-CEC) is recommended for students in employment as an environmental chemist or in graduate study in environmental science. This degree is described in Sec. 5.3.2 and an example Curriculum Plan is given on page 23. This degree is certified by the American Chemical Society if the course electives include Introductory Biochemistry (BCH 400).
- The third program, a regular **Bachelor of Science with a Field of Concentration (major) in Chemistry** (BS-CH), has a more flexible curriculum that provides basic training for careers in chemistry or other areas, such as health sciences or teaching. This degree is described in Sec. 5.3.3 and example Curriculum Plans are given on pages 26 and 27.

The chemistry courses taken by the three chemistry majors are very similar through the sophomore year. The BS-CHP (Professional Option) and BS-CEC (Environmental Option) degrees require physical chemistry laboratory, more upper-division courses, and two years of mathematics. These two degrees provide a better background if you plan to enter the chemical industry or go to graduate school in chemistry.

The BS-CH (Field of Concentration) degree allows for more flexibility in elective courses, which may be an advantage for someone going on to medical school, dental school, pharmacy school, *etc.* This degree allows more time for courses for pre-health professions. A BS-CH degree does not preclude one from doing graduate work in chemistry – the chemistry background you get is just not as strong as the other two degrees.

General pre-professional and graduate school curriculum recommendations are given on pages 86-89 of the 2007-2008 UNR General Catalog (also see

http://www.unr.edu/career/students/undergrad/PGSP/PGSP.html). Chemistry majors planning to pursue medicine, dentistry, or other health professions will need to take elective courses in Biology and possibly Biochemistry and are advised to consult a UNR pre-health professions advisor (TSS 200, 775-784-4678) for detailed information and personal assistance. Chemistry majors seeking employment as professional chemists or who plan to continue into graduate study in the sciences should discuss their choices of upper-division chemistry and other science electives with their chemistry advisor. Your selection of upper-division chemistry electives will depend upon your area of chemistry specialization.

The UNR undergraduate chemistry program has been approved by the American Chemical Society (ACS). Students completing the Bachelor of Science in Chemistry with the Professional Chemistry Option (BS-CHP) satisfy the standards set by the ACS for certification. The Bachelor of Science in Chemistry with the Environmental Option (BS-CEC) is certified as the ACS environmental chemistry option. For ACS certification of these two degrees, Introductory Biochemistry (BCH 400) must be taken as a Chemical Science elective.

5.2 Chemistry Minor

Students majoring in another field may obtain a minor in chemistry by completing one of the following two course sequences:

1. Analytical-Organic Option

   - CHEM 121 – General Chemistry I or CHEM 201 (4 credits)
   - CHEM 122 – General Chemistry II or CHEM 202 (4 credits)
   - CHEM 330 – Analytical Chemistry (4 credits)
   - CHEM 341 – Organic Chemistry for Scientists and Professionals I (3 credits)
   - CHEM 342 – Organic Chemistry for Scientists and Professionals II (3 credits)
   - CHEM 345 – Organic Chemistry Laboratory (2 credits)

   Total: 20 credits

2. Biophysical-Organic Option

   - CHEM 121 – General Chemistry I or CHEM 201 (4 credits)
   - CHEM 122 – General Chemistry II or CHEM 202 (4 credits)
   - CHEM 341 – Organic Chemistry for Scientists and Professionals I (3 credits)
   - CHEM 342 – Organic Chemistry for Scientists and Professionals II (3 credits)
   - CHEM 345 – Organic Chemistry Laboratory (2 credits)
   - CHEM 425 – Biophysical Chemistry (3 credits)
   - CHEM 443 – Organic Spectroscopy and Structure (2 credits)

   Total: 21 credits

Deviations from these sequences are possible with approval of a chemistry advisor. Minimum requirements are a total of 20 chemistry credits, including nine upper-division credits and a two-credit organic chemistry laboratory course. A maximum of two credits of CHEM 392 and 490 may be applied to comprise the nine upper-division credits, with departmental approval.

To apply for the minor, complete the minor application form (available from the Chemistry Department Office or website) and submit it to the Chemistry Department Office in CB 213.

5.3 Degree Requirements and Example Curriculum Plans

The requirements listed in Secs. 5.3.1-5.3.3 are taken from the UNR 2007-2008 General Catalog. The General Catalog is the authoritative reference for course requirements; please inform the Chemistry Department (`advising@chem.unr.edu`) of any discrepancies you detect between the listing in this Section and the General Catalog.

All three chemistry degrees are designed to be completed within four years for full-time students taking courses during the Fall and Spring semesters. The advanced chemistry courses and many in other departments require completion of prerequisite courses. To complete the degrees within four years, you must take the necessary prerequisite courses early in your curriculum – careful planning during the first few semesters is crucial to the timely completion of your degree.

Along with the formal requirements listed for each degree in Secs. 5.3.1-5.3.3, there are given example Curriculum Plans you can use as models. Using the appropriate model (on page 19, 23, 26, or 27) as a guide, you must design your own Curriculum Plan. You should then schedule an appointment with your academic advisor to discuss your personal plan. This meeting should be done during your first semester of undergraduate study. (Be sure to write out your proposed plan in advance of the appointment with your academic advisor.)

The example Curriculum Plans have been constructed so that the necessary prerequisites are fulfilled in the proper sequence. The plans on pages 19, 23, and 26 assume that you are a typical freshman chemistry major entering UNR:

- Your ACT or SAT math scores or math placement tests place you into MATH 181 (Calculus I).
- Your ACT or SAT verbal scores or placement examination place you into ENG 101 (Composition I).
- You will start your foreign language studies. (German is used as an example in the curriculum plans.)
- You have not tested out of any other requirements.

The Curriculum Plan on page 27 assumes that you are a typical entering student at a Nevada community college who will transfer to UNR after two years, and that your mathematics entrance examination score requires you to take MATH 128 (Precalculus and Trigonometry) before calculus.

If your entering qualifications give you a different starting point than that assumed in the example plans, then you will need to modify your personal Curriculum Plan accordingly. In designing your Curriculum Plan, you need to be aware of the following:

- All chemistry, physics, and mathematics courses, and many courses in other fields beyond the introductory level, have prerequisites or corequisites. You need to consult the catalog course description to discover these requirements, and plan your curriculum so that needed prerequisites are completed on schedule.
- Some courses, especially upper division courses with small enrollments, are not taught every semester. In these cases the course will usually be taught in alternate semesters – every Fall or every Spring. For your convenience in planning, in the degree requirements listed in Secs. 5.3.1-5.3.3 the customary semester a course is taught is marked with a [F] (for Fall) and [S] (for Spring). However, you should be sure to consult the University Class Schedule to verify course availability.
- It is possible to replace required courses with approved substitutions (see FAQ #3 on page 9). Officially recognized substitutions for some courses are listed in the degree requirements. For other substitutions, you should consult your academic advisor. The Department Chair must ultimately approve any such substitutions in advance.

5.3.1 Bachelor of Science in Chemistry – Professional Chemistry Option (BS-CHP)

Credits

I. UNIVERSITY CORE CURRICULUM REQUIREMENTS 39-42

A. English – 3-6 credits

ENG 101 – Composition I [FS] 3
ENG 102 – Composition II [FS] 3
Note: Students who place in ENG 102 are not required to complete ENG 101.

B. Mathematics – 4 credits

MATH 181 – Calculus I [FS] 4

C. Natural Sciences – 8 credits

CHEM 201 – General Chemistry for Scientists and Engineers [F] 4
CHEM 202 – General Chemistry for Scientists and Engineers [S] 4
Note: CHEM 121 [FS] and 122 [FS] are acceptable.

D. Social Sciences – 3 credits

Refer to the "Social Sciences" section of the Core Curriculum chapter in the catalog..... 3

E. Fine Arts – 3 credits

Refer to the "Fine Arts" section of the Core Curriculum chapter in the catalog. 3

F. Core Humanities – 9 credits

CH 201 – Ancient and Medieval Cultures [FS] 3
CH 202 – The Modern World [FS] 3
CH 203 – American Experiences and Constitutional Change [FS] 3

G. Capstone Courses – 6 credits

CHEM 495 – Senior Thesis in Chemistry I [FS] 3
Refer to the "Capstone" section of the Core Curriculum chapter in the catalog for second capstone course. 3

H. Diversity – 3 credits

Refer to the "Diversity" section of the Core Curriculum chapter in the catalog. 3
Note: A single course may simultaneously satisfy the diversity requirement and another core requirement.

II. ADDITIONAL COLLEGE REQUIREMENTS 0

III. MAJOR REQUIREMENTS 68

A. Required Chemistry Courses – 32 credits

CHEM 201 – General Chemistry for Scientists and Engineers I [F] (see Core Curriculum Natural Sciences requirement).

CHEM 202 – General Chemistry for Scientists and Engineers II [S] (see Core Curriculum Natural Sciences requirement).

CHEM 330 – Analytical Chemistry [FS] 4
CHEM 341 – Organic Chemistry for Scientists and Professionals I [FS] 3
CHEM 342 – Organic Chemistry for Scientists and Professionals II [S] 3
CHEM 347 – Laboratory Techniques of Organic Chemistry I [F] 2
CHEM 348 – Laboratory Techniques of Organic Chemistry II [S] 2

CHEM 421 – Physical Chemistry I [F] 3
CHEM 422 – Physical Chemistry II [S] 3
CHEM 423 – Physical Chemistry Laboratory [S] 3
CHEM 431 – Advanced Inorganic Chemistry [F] 3
CHEM 435 – Chemical Synthesis [F] 3
CHEM 455 – Instrumental Analysis [S] 3
CHEM 495 – Senior Thesis in Chemistry I [FS] (see Core Curriculum Capstone requirement).

B. Required Related Courses – 27 credits

GER 111 [F] and 112 [S] – First Year German I and II or equivalent courses in another modern foreign language 8

MATH 181 – Calculus I [FS] (Also satisfies Core Curriculum Mathematics requirement, see above.)

MATH 182 – Calculus II [FS] 4
MATH 283 – Calculus III [FS] 4
MATH 285 – Differential Equations [FS] 3

PHYS 180 – Physics for Scientists and Engineers I [FS] (PHYS 151 – General Physics I [FS], 4 credits, acceptable) 3

PHYS 180L – Physics for Scientists and Engineers Laboratory I [FS] (PHYS 151L – General Physics Laboratory I [FS], 0 credits, acceptable) 1

PHYS 181 – Physics for Scientists and Engineers II [FS] (PHYS 152 – General Physics II [FS], 4 credits, acceptable) 3

PHYS 181L – Physics for Scientists and Engineers Laboratory II [FS] (PHYS 152L – General Physics Laboratory II [FS], 0 credits, acceptable) 1

C. Elective Chemical Science Courses – 9 credits

Select from the following courses: 9
CHEM 442 – Advanced Organic Chemistry [F] (3 credits)
CHEM 443 – Organic Spectroscopy and Structure [S] (2 credits)
CHEM 444 – Organic Structure Determination Laboratory [S] (1-2 credits)
CHEM 449 – Polymer Chemistry (3 credits)
CHEM 450 – Advanced Physical Chemistry [F] (3 credits)
CHEM 496 – Senior Thesis in Chemistry II [FS] (3 credits)
BCH 400 – Introductory Biochemistry† [FS] (4 credits)
BCH 403 – Biochemistry Laboratory [F] (2 credits)

IV. MINOR REQUIREMENTS 0

V. ELECTIVES 18-21

VI. TOTAL CREDITS 128

Note: A candidate for a bachelor's degree must earn a minimum of 40 credits numbered 300 or above.

[F] = customarily taught in Fall semester
[S] = customarily taught in Spring semester
[FS] = customarily taught both semesters
†BCH 400 is required for ACS certification.

Example Curriculum Plan for BS-CHP degree (Professional Option)			
Year	Semester	Course	Credits
1	Fall	CHEM 201 – General Chemistry for Scientists and Engineers I	4
		MATH 181 – Calculus I	4
		ENG 101 – Composition I	3
		GER 111 – First Year I	4
		General elective	1
	Fall semester total		16
	Spring	CHEM 202 – General Chemistry for Scientists and Engineers II	4
		MATH 182 – Calculus II	4
		ENG 102 – Composition II	3
		GER 112 – First Year German II	4
		General elective	1
	Spring semester total		16
Year 1 total			32
2	Fall	CHEM 341 – Organic Chemistry for Scientists and Professionals I	3
		CHEM 347 – Laboratory Techniques of Organic Chemistry I	2
		MATH 283 – Calculus III	4
		PHYS 180 – Physics for Scientists and Engineers I	3
		PHYS 180L – Physics for Scientists and Engineers Laboratory I	1
		CH 201 – Ancient and Medieval Cultures	3
	Fall semester total		16
	Spring	CHEM 342 – Organic Chemistry for Scientists and Professionals II	3
		CHEM 348 – Laboratory Techniques of Organic Chemistry II	2
		MATH 285 – Differential Equations	3
		PHYS 181 – Physics for Scientists and Engineers II	3
		PHYS 181L – Physics for Scientists and Engineers Laboratory II	1
		CH 202 – The Modern World	3
		General elective	1
	Spring semester total		16
Year 2 total			32
3	Fall	CHEM 421 – Physical Chemistry I	3
		CHEM 330 – Analytical Chemistry	4
		CH 203 – American Experiences and Constitutional Change	3
		Fine Arts core course	3
		General elective(s)	3
	Fall semester total		16
	Spring	CHEM 422 – Physical Chemistry II	3
		CHEM 423 – Physical Chemistry Laboratory	3
		Chemical science elective (see list III.C. on page 18)†	3
		Social Science core course	3
		General elective(s)	4
	Spring semester total		16
Year 3 total			32
4	Fall	CHEM 431 – Advanced Inorganic Chemistry	3
		CHEM 435 – Chemical Synthesis	3
		CHEM 495 – Senior Thesis in Chemistry I (Chemistry capstone)	3
		Chemical science elective (see list III.C. on page 18)†	3
		General elective(s)	4
	Fall semester total		16
	Spring	CHEM 455 – Instrumental Analysis	3
		Chemical science elective (see list III.C. on page 18)†	3
		Non-Chemistry capstone (selected to also satisfy Diversity requirement)	3
		General electives	7
	Spring semester total		16
Year 4 total			32
Total credits for graduation			128

†BCH 400 is required for ACS certification.

5.3.2 Bachelor of Science in Chemistry – Environmental Chem. Option (BS-CEC)

Credits

I. UNIVERSITY CORE CURRICULUM REQUIREMENTS 39-42

A. English – 3-6 credits

ENG 101 – Composition I [FS] 3
ENG 102 – Composition II [FS] 3
Note: Students who place in ENG 102 are not required to complete ENG 101.

B. Mathematics – 4 credits

MATH 181 – Calculus I [FS] 4

C. Natural Sciences – 8 credits

CHEM 201 – General Chemistry for Scientists and Engineers [F] 4
CHEM 202 – General Chemistry for Scientists and Engineers [S] 4
Note: CHEM 121 [FS] and 122 [FS] are acceptable.

D. Social Sciences – 3 credits

Refer to the "Social Sciences" section of the Core Curriculum chapter in the catalog..... 3

E. Fine Arts – 3 credits

Refer to the "Fine Arts" section of the Core Curriculum chapter in the catalog. 3

F. Core Humanities – 9 credits

CH 201 – Ancient and Medieval Cultures [FS] 3
CH 202 – The Modern World [FS] 3
CH 203 – American Experiences and Constitutional Change [FS] 3

G. Capstone Courses – 6 credits

CHEM 495 – Senior Thesis in Chemistry I [FS] 3
Refer to the "Capstone" section of the Core Curriculum chapter in the catalog for 3
second capstone course

H. Diversity – 3 credits

Refer to the "Diversity" section of the Core Curriculum chapter in the catalog. 3
Note: A single course may simultaneously satisfy the diversity requirement and another core requirement.

II. ADDITIONAL COLLEGE REQUIREMENTS 0

III. MAJOR REQUIREMENTS 70-71

A. Required Chemistry Courses – 30-31 credits

CHEM 201 – General Chemistry for Scientists and Engineers I [F] (See Core Curriculum Natural Sciences requirement.)

CHEM 202 – General Chemistry for Scientists and Engineers II [S] (See Core Curriculum Natural Sciences requirement.)

CHEM 330 – Analytical Chemistry [FS] 4
CHEM 341 – Organic Chemistry for Scientists and Professionals I [F] 3
CHEM 342 – Organic Chemistry for Scientists and Professionals II [S] 3
CHEM 347 – Laboratory Techniques of Organic Chemistry I [F] 2
CHEM 348 – Laboratory Techniques of Organic Chemistry II [S] 2

CHEM 421 – Physical Chemistry I [F] . . . 3
CHEM 422 – Physical Chemistry II [S] . . . 3
CHEM 423 – Physical Chemistry Laboratory [S] . . . 3
CHEM 431 – Advanced Inorganic Chemistry [F] . . . 3
CHEM 432 – Inorganic Chemistry Laboratory [F] . . . 1
CHEM 443 – Organic Spectroscopy and Structure [S] . . . 2
CHEM 444 – Organic Structure Determination Laboratory [S] . . . 1-2
CHEM 495 – Senior Thesis in Chemistry I [FS] (See Core Curriculum Capstone requirement.) The senior thesis for the environmental chemistry option must involve research in environmental chemistry and may include field work.

B. Required Related Courses – 27 credits

GER 111 [F] and 112 [S] – First Year German I and II or equivalent courses in another modern foreign language . . . 8

MATH 181 – Calculus I [FS] (4 credits). Also satisfies Core Curriculum Mathematics requirement; see above.

MATH 182 – Calculus II [FS] . . . 4
MATH 283 – Calculus III [FS] . . . 4
MATH 285 – Differential Equations [FS] . . . 3
PHYS 180 – Physics for Scientists and Engineers I [FS] (PHYS 151 – General Physics I [FS], 4 credits, acceptable) . . . 3

PHYS 180L – Physics for Scientists and Engineers Laboratory I [FS] (PHYS 151L – General Physics Laboratory I [FS], 0 credits, acceptable) . . . 1

PHYS 181 – Physics for Scientists and Engineers II [FS] (PHYS 152 – General Physics II [FS], 4 credits, acceptable) . . . 3

PHYS 181L – Physics for Scientists and Engineers Laboratory II [FS] (PHYS 152L – General Physics Laboratory II [FS], 0 credits acceptable) . . . 1

C. Environmental Science Courses – 10 credits

Required courses (7 credits):
NRES 430 – Analysis of Environmental Contaminants [S odd-numbered years] . . . 3
NRES 431 – Analysis of Environmental Contaminants Laboratory [S odd-numbered years] . . . 1

NRES 433 – Environmental Chemicals: Exposure, Transport, and Fate [S even-numbered years] . . . 3

Select three (3) credits from the following courses: . . . 3
NRES 432 – Advanced Environmental Toxicology [F] (3 credits)
GEOL 416 – Environmental Geochemistry [F] (3 credits)
ATMS 412 – Introduction to Air Pollution [F] (3 credits)

D. Chemical Science Electives – 3 credits

Select three (3) credits from the following courses: . . . 3
BCH 400 – Introductory Biochemistry† [FS] (4 credits)
CHEM 455 – Instrumental Analysis [S] (3 credits)

CHEM 496 – Senior Thesis in Chemistry II [FS] (3 credits) The senior thesis for the environmental chemistry option must involve research in environmental chemistry and may include field work.

IV. MINOR REQUIREMENTS 0

V. ELECTIVES 15-19

VI. TOTAL CREDITS 128

Note: A candidate for a bachelor's degree must earn a minimum of 40 credits numbered 300 or above.

[F] = customarily taught in Fall semester
[S] = customarily taught in Spring semester
[FS] = customarily taught both semesters
†BCH 400 is required for ACS certification.

Example Curriculum Plan for BS-CEC degree (Environmental Option)			
Year	Semester	Course	Credits
1	Fall	CHEM 201 – General Chemistry for Scientists and Engineers I	4
		MATH 181 – Calculus I	4
		ENG 101 – Composition I	3
		GER 111 – First Year German I	4
		General elective	1
	Fall semester total		16
	Spring	CHEM 202 – General Chemistry for Scientists and Engineers II	4
		MATH 182 – Calculus II	4
		ENG 102 – Composition II	3
		GER 112 – First Year German II	4
		General elective	1
	Spring semester total		16
Year 1 total			32
2	Fall	CHEM 341 – Organic Chemistry for Scientists and Professionals I	3
		CHEM 347 – Laboratory Techniques of Organic Chemistry I	2
		MATH 283 – Calculus III	4
		PHYS 180 – Physics for Scientists and Engineers I	3
		PHYS 180L – Physics for Scientists and Engineers Laboratory I	1
		CH 201 – Ancient and Medieval Cultures	3
	Fall semester total		16
	Spring	CHEM 342 – Organic Chemistry for Scientists and Professionals II	3
		CHEM 348 – Laboratory Techniques of Organic Chemistry II	2
		MATH 285 – Differential Equations	3
		PHYS 181 – Physics for Scientists and Engineers II	3
		PHYS 181L – Physics for Scientists and Engineers Laboratory II	1
		CH 202 – The Modern World	3
		General elective	1
	Spring semester total		16
Year 2 total			32
3	Fall	CHEM 421 – Physical Chemistry I	3
		CHEM 330 – Analytical Chemistry	4
		CH 203 – American Experiences and Constitutional Change	3
		Fine Arts core course	3
		General elective(s)	3
	Fall semester total		16
	Spring	CHEM 422 – Physical Chemistry II	3
		CHEM 423 – Physical Chemistry Laboratory	3
		NRES 430 – Analysis of Environ. Contaminants (see scheduling note in list III.C. on page 21)	3
		NRES 431 – Analysis of Environ. Contaminants Lab. (see sched. note in list III.C. page 21)	1
		Social Science core course	3
		General elective(s)	3
	Spring semester total		16
Year 3 total			32
4	Fall	CHEM 431 – Advanced Inorganic Chemistry	3
		CHEM 435 – Chemical Synthesis	3
		CHEM 495 – Senior Thesis in Chemistry I (Chemistry capstone)	3
		Environmental science elective (see list III.C. on page 21)	3
		Non-Chemistry capstone (selected to also satisfy Diversity requirement)	3
		General elective(s)	1
	Fall semester total		16
	Spring	CHEM 455 – Instrumental Analysis	3
		CHEM 443 – Organic Spectroscopy and Structure	2
		CHEM 444 – Organic Structure Determination Laboratory	1
		NRES 433 – Environ. Chem.: Exposure, Transport, Fate (see sched. note in list III.C. page 21)	3
		Chemical science elective (see list III.D. on page 21)†	3
		General electives	4
	Spring semester total		16
Year 4 total			32
Total credits for graduation			128

†BCH 400 is required for ACS certification.

5.3.3 Bachelor of Science with Field of Concentration in Chemistry (BS-CH)

Credits

I. UNIVERSITY CORE CURRICULUM REQUIREMENTS 39-42

A. English – 3-6 credits

ENG 101 – Composition I [FS] 3
ENG 102 – Composition II [FS] 3
Note: Students who place in ENG 102 are not required to complete ENG 101.

B. Mathematics – 4 credits

MATH 181 – Calculus I [FS] 4

C. Natural Sciences – 8 credits

CHEM 201 – General Chemistry for Scientists and Engineers I [F] 4
CHEM 202 – General Chemistry for Scientists and Engineers II [S] 4
Note: CHEM 121 [FS] and 122 [FS] are acceptable.

D. Social Sciences – 3 credits

Refer to the "Social Sciences" section of the Core Curriculum chapter in the catalog. 3

E. Fine Arts – 3 credits

Refer to the "Fine Arts" section of the Core Curriculum chapter in the catalog. 3

F. Core Humanities – 9 credits

CH 201 – Ancient and Medieval Cultures [FS] 3
CH 202 – The Modern World [FS] 3
CH 203 – American Experiences and Constitutional Change [FS] 3

G. Capstone Courses – 6 credits

Refer to the "Capstone" section of the Core Curriculum chapter in the catalog 6
Recommended: CHEM 495 – Senior Thesis in Chemistry I

H. Diversity – 3 credits

Refer to the "Diversity" section of the Core Curriculum chapter in the catalog. 3
Note: A single course may simultaneously satisfy the diversity requirement and another core requirement.

II. ADDITIONAL COLLEGE REQUIREMENTS 0

III. MAJOR REQUIREMENTS 51

A. Required Chemistry Courses – 23 credits

CHEM 201 – General Chemistry for Scientists and Engineers I [F] (See Core Curriculum Natural Sciences requirement.)

CHEM 202 – General Chemistry for Scientists and Engineers II [S] (See Core Curriculum Natural Sciences requirement.)

CHEM 330 – Analytical Chemistry [FS] 4
CHEM 341 – Organic Chemistry for Scientists and Professionals I [F] 3
CHEM 342 – Organic Chemistry for Scientists and Professionals II [S] 3
CHEM 347 – Laboratory Techniques of Organic Chemistry I [F] 2
CHEM 348 – Laboratory Techniques of Organic Chemistry II [S] 2
CHEM 421 – Physical Chemistry I [F] 3

CHEM 422 – Physical Chemistry II [S] 3
CHEM 431 – Advanced Inorganic Chemistry [F] 3

B. Required Related Courses – 20 credits

GER 111 and 112 – First Year German I [F] and II [S] or equivalent courses in another modern foreign language 8

MATH 181 – Calculus I [FS] (See Core Curriculum Mathematics requirement.)
MATH 182 – Calculus II [FS] 4
PHYS 151 – General Physics I [FS] 4
PHYS 151L – General Physical Laboratory I [FS] 0
PHYS 152 – General Physics II [FS] 4
PHYS 152L – General Physical Laboratory II [FS] 0

C. Elective Chemical Science Courses – 8 credits

Select from the following courses, taking one laboratory course: 8
CHEM 423 – Physical Chemistry Laboratory [S] (3 credits)
CHEM 435 – Chemical Synthesis [F] (3 credits)
CHEM 442 – Advanced Organic Chemistry [F] (3 credits)
CHEM 443 – Organic Spectroscopy and Structure [S] (2 credits)
CHEM 444 – Organic Structure Determination Laboratory [S] (1-2 credits)
CHEM 449 – Polymer Chemistry (3 credits)
CHEM 450 – Advanced Physical Chemistry [F] (3 credits)
CHEM 455 – Instrumental Analysis [S] (3 credits)
BCH 400 – Introductory Biochemistry [FS] (4 credits)
BCH 403 – Biochemistry Laboratory [F] (2 credits)

IV. MINOR REQUIREMENTS 0

V. ELECTIVES 35-38

VI. TOTAL CREDITS 128

Note: A candidate for a bachelor's degree must earn a minimum of 40 credits numbered 300 or above.

[F] = customarily taught in Fall semester
[S] = customarily taught in Spring semester
[FS] = customarily taught both semesters

Example Curriculum Plan for BS-CH degree (Field of Concentration)			
Year	Semester	Course	Credits
1	Fall	CHEM 201 – General Chemistry for Scientists and Engineers I	4
		MATH 181 – Calculus I	4
		ENG 101 – Composition I	3
		GER 111 – First Year German I	4
		General elective	1
	Fall semester total		16
	Spring	CHEM 202 – General Chemistry for Scientists and Engineers II	4
		MATH 182 – Calculus II	4
		ENG 102 – Composition II	3
		GER 112 – First Year German II	4
		General elective	1
	Spring semester total		16
Year 1 total			32
2	Fall	CHEM 341 – Organic Chemistry for Scientists and Professionals I	3
		CHEM 347 – Laboratory Techniques of Organic Chemistry I	2
		PHYS 151 – General Physics I	4
		PHYS 151L – General Physics Laboratory I	0
		CH 201 – Ancient and Medieval Cultures	3
		General elective(s)	4
	Fall semester total		16
	Spring	CHEM 342 – Organic Chemistry for Scientists and Professionals II	3
		CHEM 348 – Laboratory Techniques of Organic Chemistry II	2
		PHYS 152 – General Physics II	4
		PHYS 152L – General Physics Laboratory II	0
		CH 202 – The Modern World	3
		General elective(s)	4
	Spring semester total		16
Year 2 total			32
3	Fall	CHEM 421 – Physical Chemistry I	3
		CHEM 330 – Analytical Chemistry	4
		CH 203 – American Experiences and Constitutional Change	3
		Fine Arts core course	3
		General elective(s)	3
	Fall semester total		16
	Spring	CHEM 422 – Physical Chemistry II	3
		Chemical science elective (laboratory course from list III.C. on page 25)	2
		Social Science core course	3
		General electives	8
	Spring semester total		16
Year 3 total			32
4	Fall	CHEM 431 – Advanced Inorganic Chemistry	3
		Chemical science elective (see list III.C. on page 25)	3
		Capstone (recommend Chemistry capstone CHEM 495 – Senior Thesis I)	3
		General electives	7
	Fall semester total		16
	Spring	Chemical science elective (see list III.C. on page 25)	3
		Non-Chemistry capstone (selected to also satisfy Diversity requirement)	3
		General electives	10
	Spring semester total		16
Year 4 total			32
Total credits for graduation			128

Note: this page applies to students transferring into UNR from a community college.

Example Curr. Plan for Comm. Coll. transfer into BS-CH degree (Field of Concentration)			
Year	Semester	Course	Credits
1	Fall	MATH 128 – Precalculus and Trigonometry	5
		ENG 101 – Composition I	3
		GER 111 – First Year German I	4
		Social Science core course	3
		General elective	1
	Fall semester total		16
		MATH 181 – Calculus I	4
		ENG 102 – Composition II	3
		GER 112 – First Year German II	4
		Fine Arts core course	3
		General elective	2
	Spring semester total		16
Year 1 total			32
2	Fall	CHEM 201 – General Chemistry I (CHEM 121 acceptable)	4
		PHYS 151 – General Physics I	4
		PHYS 151L – General Physics Laboratory I	0
		MATH 182 – Calculus II	4
		CH 201 – Ancient and Medieval Cultures	3
		General elective(s)	1
	Fall semester total		16
	Spring	CHEM 202 – General Chemistry II (CHEM 122 acceptable)	4
		PHYS 152 – General Physics II	4
		PHYS 152L – General Physics Laboratory II	0
		CH 202 – The Modern World	3
		CH 203 – American Experiences and Constitutional Change	3
		General elective(s)	2
	Spring semester total		16
Year 2 total			32
3	Fall	CHEM 341 – Organic Chemistry for Scientists and Professionals I	3
		CHEM 330 – Analytical Chemistry	4
		CHEM 347 – Laboratory Techniques of Organic Chemistry I	2
		General elective(s)	7
	Fall semester total		16
	Spring	CHEM 342 – Organic Chemistry for Scientists and Professionals II	3
		CHEM 348 – Laboratory Techniques of Organic Chemistry II	2
		Non-Chemistry capstone (selected to also satisfy Diversity requirement)	3
		General electives	8
	Spring semester total		16
Year 3 total			32
4	Fall	CHEM 421 – Physical Chemistry I	3
		CHEM 431 – Advanced Inorganic Chemistry	3
		Chemical science elective (see list III.C. on page 25)	3
		Capstone (recommend Chemistry capstone CHEM 495 – Senior Thesis I)	3
		General electives	4
	Fall semester total		16
	Spring	CHEM 422 – Physical Chemistry II	3
		Chemical science elective (see list III.C. on page 25)	3
		Chemical science elective (laboratory course from list III.C. on page 25)	2
		General electives	8
	Spring semester total		16
Year 4 total			32
Total credits for graduation			128