

**Chemistry Assessment 2003-2004**  
**Schreiner University**

**1. State the educational purpose of the assessment program:**

Students majoring in chemistry should progress well beyond the science outcomes designated for all Schreiner University graduates. In addition to serving the basic roles of producing scientifically literate individuals and enabling these individuals to effectively participate in a democratic society, completion of a chemistry major should prepare them for more specialized roles. Such students should be leaders in helping other citizens become scientifically literate. In other words, a major in chemistry should prepare students to communicate their scientific knowledge to others. In addition, chemistry graduates should be prepared for the job market, advanced study in chemistry in particular and other natural sciences in general. Toward these ends, chemistry major curricula at Schreiner University will emphasize communication skills and the kinds of skills and knowledge, which enable students to be successful in the work force and graduate school as well as in postgraduate professional schools.

**2. Educational goals, assessment for each goal, performance standards, and findings:**

**Upon graduating with a major in chemistry a student will be able to:**

- Goal # 1: Design and carry out an independent experiment.

Satisfactory performance (C or better) in general chemistry, organic chemistry, analytical chemistry, physical chemistry, and in the senior project.

1997-1998    Organic Chemistry 88% (C or better)

                 Analytical Chemistry 70%

                 Physical Chemistry 90%

                 Senior Project 100%

1998-1999    General Chemistry 85% (C or better)

                 Organic Chemistry 92%

                 Physical Chemistry 90%

                 Senior Project 71%

1999– 2000    General Chemistry 86% (C or better)

                 Organic Chemistry 83%

                 Analytical Chemistry 88%

                 Physical Chemistry 100%

                 Senior Project 100%

2000-2001    General Chemistry 85% (C or better)

                 Organic Chemistry 96%

                 Physical Chemistry 100%

                 Senior Project 100%

2001-2002    General Chemistry 90% (C or better)

                 Organic Chemistry 85%

                 Analytical Chemistry 96%

2002-2003    General Chemistry 90 % (C or better)

                 Organic Chemistry 94%

                 Physical Chemistry 100%

                 Senior Project 100%

2003-2004    General Chemistry 97 % (C or better)  
                   Organic Chemistry 81%  
                   Analytical Chemistry 88%  
                   Senior Project 100%

*Curriculum:* Emphasis will be placed on design of good lab projects in general chemistry, organic chemistry, and physical chemistry. Senior projects do not always contain an independent experiment due to the nature of the internship and readings option.

*Faculty Development:* Faculty will be encouraged to seek projects that appear in the literature and attend workshops where appropriate.

*Out-of-class experience:* Give students the opportunity to visit working chemistry laboratories where research is being done.

- Goal # 2: Obtain, read, and analyze the current research literature.

The students will make a presentation of research results at end of course. The students will show correct use and analysis of primary literature in a group of related articles. All students must meet the above criteria. Students may be given the opportunity to redo the research project. Satisfactory performance (C or better) in writing and research, chemical research, and in the senior project.

1997 – 1998    Writing and Research 100%  
                   Senior Project 100%

1998 – 1999    Writing and Research 71%  
                   Senior Project 88%

1999 – 2000    Writing and Research 78%  
                   Senior Project 100%

2000-2001    Writing and Research 100%  
                   Senior Project 100%

2001-2002    Writing and Research 89%

2002-2003    Writing and Research 90%  
                   Senior Project 100%

2003-2004 Writing and Research 77%  
Senior Project 100%

*Curriculum:* Emphasis is placed on reading and analyzing the current literature in chemistry research and writing and research. All senior projects lend themselves to reading and analyzing current literature.

*Faculty Development:* Faculty are encouraged to keep-up with current literature in their research field of interest. Faculty are also encouraged to participate in research in their field of interest.

*Out-of-class experience:* Students are introduced to practicing scientists.

➤ Goal # 3 : Write scientific research papers.

Students will complete a coherent research paper. Students will show correct use of the literature and style of writing science papers. All students must complete the above criteria. Students may be given the opportunity to redo the research paper. Satisfactory performance (C or better) in writing and research, chemical research, and in the senior project.

1997 – 1998 Writing and Research 100%  
Senior Project 100%

1998 – 1999 Writing and Research 71%  
Senior Project 88%

1999 – 2000 Writing and Research 78%  
Senior Project 100%

2000-2001 Writing and Research 100%  
Senior Project 100%

2001-2002 Writing and Research 89%

2002-2003 Writing and Research 90%  
Senior Project 100%

2003-2004 Writing and Research 77%  
Senior Project 100%

*Curriculum:* Emphasis is placed on writing a research paper in writing and research, chemical research, and in the senior project. All senior projects lend themselves to writing a research paper as part of the course requirements.

*Faculty Development:* Faculty are encouraged to keep-up with current literature in their research field of interest. Faculty are also encouraged to participate in research in their field of interest and to publish the results of the research.

*Out-of-class experience:* Students are introduced to practicing scientists.

➤ Goal # 4 : Perform statistical analyses of data.

The students will show satisfactory performance of statistical analysis of laboratory data. Student should be able to calculate central tendency statistics and percent error of laboratory data. Satisfactory performance (C or better) of statistical analysis of laboratory data in general chemistry, analytical chemistry, and in the senior project.

1997 – 1998	General Chemistry 87%
	Analytical Chemistry 70%
	Senior Project 100%
1998 – 1999	General Chemistry 85%
	Analytical Chemistry 89%
	Senior Project 71%
1999 – 2000	General Chemistry 86%
	Analytical Chemistry 88%
	Senior Project 100%
2000-2001	General Chemistry 85%
	Senior Project 100%
2001-2002	General Chemistry 90%
	Analytical Chemistry 96%
2002-2003	General Chemistry 90%
	Senior Project 100%
2003-2004	General Chemistry 97%
	Analytical Chemistry 88%
	Senior Project 100%

*Curriculum:* The statistical nature of laboratory data readily lends itself to analysis in general chemistry, analytical chemistry, and in the senior project. Projects are required of all students in each of these courses.

*Faculty Development:* Faculty are encouraged to keep-up with the latest trends in software that is available for statistical analysis of laboratory data.

*Out-of-class experience:* Students are encouraged to use the statistical software packages that are available in the computer labs in the department and in the university.

➤ Goal # 5: Give well-organized oral reports.

Students will make an oral presentation of the results of a research project. The presentation must be logical, organized, and informative. All students must meet the above criteria. Students may be given the opportunity to redo the oral presentation. Satisfactory performance (C or better) in writing and research, chemical research, and in the senior project.

1997 – 1998 Writing and Research 100%  
Senior Project 100%

1998 – 1999 Writing and Research 71%  
Senior Project 71%

1999 – 2000 Writing and Research 78%  
Senior Project 100%

2000-2001 Writing and Research 100%  
Senior Project 100%

2001-2002 Writing and Research 89%

2002-2003 Writing and Research 90%  
Senior Project 100%

2003-2004 Writing and Research 77%  
Senior Project 100%

*Curriculum:* Students are required to present the results of research during an oral report in writing and research, chemical research, and in the senior project. All students are required to present the results of their senior project in an oral report.

*Faculty Development:* Faculty are encouraged to present the results of their own research projects at local, regional, and national conferences.

*Out-of-class experience:* Students are encouraged to attend meetings of professional societies to discover how a good oral presentation is delivered.

- Goal # 6: Effectively manipulate scientific computer software.

Students should be able to design and calculate energy for a molecule. Students must present the results of their energy calculations in a clear and coherent manner. All students must meet the above criteria. Students may redo the project. Satisfactory performance (C or better) in analytical chemistry and physical chemistry.

1997 – 1998 Analytical Chemistry 70%

Physical Chemistry 90%

1998 – 1999 Analytical Chemistry 89%

Physical Chemistry 90%

1999 – 2000 Analytical Chemistry 88%

Physical Chemistry 100%

2000-2001 Physical Chemistry 100%

2001-2002 Analytical Chemistry 96%

2002-2003 Physical Chemistry 100%

2003-2004 Analytical Chemistry 88%

*Curriculum:* A project is required of each student in analytical chemistry and physical chemistry. These projects range from building a computer model of a molecule and calculating minimum energies to using laboratory simulations.

*Faculty Development:* Faculty are encouraged to participate in conferences and workshops to learn the latest techniques in using scientific software.

*Out-of-class experience:* Students are encouraged to use the university computer facilities to learn the proper techniques for using scientific computer software.

- Goal # 7: Exhibit a working knowledge of major chemistry concepts.

Student grades (C or better) on the final exam in Chemistry 1402, 3412, 3404, and on the ACS General Chemistry Exam. All students must pass the final exam in the above mentioned courses. Students may repeat the course if necessary.

Satisfactory performance (C or better) in general chemistry, organic chemistry, and physical chemistry. Completion of the chemistry assessment exam.

1997 – 1998 General Chemistry 87%

	Organic Chemistry 88%
	Physical Chemistry 100%
	Chemistry Assessment Exam (not given)
1998 – 1999	General Chemistry 85%
	Organic Chemistry 92%
	Physical Chemistry 90%
	Chemistry Assessment Exam indicated weaknesses in the areas of molecular structure, thermodynamics, and equilibrium.
1999 – 2000	General Chemistry 86%
	Organic Chemistry 83%
	Physical Chemistry 100%
	Chemistry Assessment Exam indicated improvement in all areas that were weaknesses in 1998-99. Molecular structure increases by 24%, thermodynamics by 2%, and equilibrium by 7%. These increase are partially due to the hiring of a physical chemist.
2000-2001	General Chemistry 85%
	Organic Chemistry 96%
	Physical Chemistry 100%
	Chemistry Assessment Exam indicated improvement in all areas. The greatest increase occurred in the states of matter/solutions section of the test. This can be attributed to the change in the content of the Inorganic Chemistry course. Other increases occurred in atomic structure, molecular structure, and thermodynamics, all physical chemistry topics. These increase are partially due to the experience gained by our physical chemistry teacher.
2001-2002	General Chemistry 90% (C or better)
	Organic Chemistry 85%
	No senior chemistry majors during 2001-2002.
2002-2003	General Chemistry 90 % (C or better)
	Organic Chemistry 94%
	Physical Chemistry 100%

The chemistry assessment exam showed an overall decline in scores. The entire chemistry faculty turned over during this academic year. Both new faculty members came with non full-time teaching experience and were getting started in their academic careers. It remains to be seen if improvement occurs during this next academic year.

2003-2004 General Chemistry 97%

Organic Chemistry 81%

During this academic year, the chemistry department decided to change to the Educational Testing Service's major field exam.

Any individual improvement will be determined after a second round of exam scores are available.

*Curriculum:* Students take final exams in general chemistry, organic chemistry, and physical chemistry.

*Faculty Development:* Faculty are encouraged to attend conferences and to participate in undergraduate research.

*Out-of-Class Experience:* Students are encouraged to apply their knowledge to everyday situations.

- Goal # 8: Understand the interrelationships of scientific concepts.

Satisfactory performance (C or better) in general chemistry, organic chemistry, and in the senior project.

1997 – 1998 General Chemistry 87%

Organic Chemistry 88%

Senior Project 100%

1998 – 1999 General Chemistry 85%

Organic Chemistry 92%

Senior Project 71%

1999 – 2000 General Chemistry 86%

Organic Chemistry 83%

Senior Project 100%

2000-2001 General Chemistry 85%

	Organic Chemistry 96%
	Senior Project 100%
2001-2002	General Chemistry 90% (C or better)
	Organic Chemistry 85%
2002-2003	General Chemistry 90 % (C or better)
	Organic Chemistry 94%
	Senior Project 100%
2003-2004	General Chemistry 97%
	Organic Chemistry 81%
	Senior Project 100%

*Curriculum:* Students take final exams in general chemistry, organic chemistry, and in the senior project.

*Faculty Development:* Faculty are encouraged to help the students understand the interrelationships of scientific concepts to other scientific concepts and to the World in general.

*Out-of-class experience:* Students are encouraged to interact with other students both science majors and non-science majors in order to discuss issues that affect their own field of study and all others.

➤ Goal #9: Successful career after graduating from Schreiner University.

Placement rate in the job market, graduate school, or professional school.

1997 – 1998 Two chemistry graduates, both are employed in chemistry related occupations.

1998 – 1999 Five chemistry graduates, two are employed in chemistry related occupations, two are employed in related occupations, one is employed in a non-related field, and one is enrolled in graduate school.

1999 – 2000 Three chemistry graduates, one is employed in the pharmaceutical industry, one is going to attend graduate school, and one will be entering medical school.

2000-2001 Two chemistry graduates, one is teaching chemistry in high school and one is working in the chemical industry.

- 2001-2002 No senior chemistry majors during 2001-2002.
- 2002-2003 One senior graduated in May 2003 and is currently not working in the field, but is seeking employment in chemistry.
- 2003-2004 Two students received their chemistry degrees in May 2004, both are in graduate or professional school.

*Curriculum:* In chemistry research the students learn how to develop a resume and interview for jobs and/or entrance into graduate schools.

*Faculty Development:* Faculty are encouraged to keep up with the latest job trends and help students find jobs and/or graduate schools that are a fit for the students.

*Out-of-class experience:* Students are encouraged to attend job fairs and visit graduate schools.