Official Program Title:  AS Chemistry emphasis
Degree Designation (A.A., A.S. etc.):  AS
Date Submitted:  04-14-08
Date of Previous Review:  n a
Internal Program Team Members (name, institution, title):

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Carolyn Collins, Professor of Chemistry, College of Southern Nevada
External Reviewer outside WNC, within subject matter
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Note: The report of the External Reviewers should be attached to this report.

The WNC Program Review Report has four sections. Details on what should be included in each section are outlined below in the WNC Program Review Process Instructions. Use this form.

1. Program Description
   A. Provide the mission and outcomes of the program.

Mission of Program:
To prepare students for baccalaureate programs in the science, health, teaching, and engineering fields, or the work force in chemistry-related industries.

Student Learning Outcomes of Program:
- Students will have the ability to design and conduct laboratory experiments, as well as to analyze and interpret data.
- Students will be able to demonstrate an introductory level of knowledge in principles of general and organic chemistry with applications to biological systems.
- Students will be able to use mathematics and computers to solve chemistry problems.
- Students will be able to demonstrate an understanding of the scientific method.
- Students will be capable of applying safety standards when using laboratory chemicals, equipment, and instruments.

see above

Type your responses above. The box will expand as needed

   B. Discuss the relationship of the program’s mission and outcomes to the overall College mission, strategic plan other programs at WNC and in the NSHE.

AS CHEM emphasis degree program contributes to options for the WNC Transfer program.

<table>
<thead>
<tr>
<th>COLLEGE MISSION STATEMENT</th>
<th>CHEMISTRY PROGRAM MISSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Nevada College inspires success in our community through opportunities that</td>
<td>To prepare students for baccalaureate programs in the science, health, teaching, and</td>
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Last revised May 17, 2007
cultivate creativity, intellectual growth and technological excellence, in an environment that nurtures individual potential and respects differences.

college Strategic Goals

- Improve student success in program completion and graduation rates
- Ensure institutional excellence in teaching, programs and services
- Embrace our college’s many communities and respond to their diverse needs.

Student Learning Outcomes

- Students will have the ability to design and conduct laboratory experiments, as well as to analyze and interpret data
- Students will be able to demonstrate an introductory level of knowledge in principles of general and organic chemistry with applications to biological systems
- Students will be able to use mathematics and computers to solve chemistry problems
- Students will be able to demonstrate an understanding of the scientific method
- Students will be capable of applying safety standards when using laboratory chemicals, equipment, and instruments.

C. Include a short description of the program. Append supporting documents as appropriate.

1. Primary goals and objectives

The chemistry program is part of the Science, mathematics, and Engineering division and shares the goals of the division in serving WNC students. The Science, Mathematics and Engineering division at WNC offers Associate of Applied Science and Associate of Science degrees, as well as certificates of achievement. Disciplines include agriculture, animal science, astronomy, biology, chemistry, computer science, engineering, environmental studies, geographic information systems, geography, geology, mathematics, natural resources, nutrition, ornamental horticulture, physics and statistics. The mission of the division is to prepare students to succeed in college-level science, math and engineering courses, to prepare students to transfer to 4-year colleges, to provide students with the knowledge they need in their careers, and to provide students with opportunities for personal enrichment.

2. Unique characteristics

The AS Chemistry degree focuses on chemistry and biochemistry majors. It also provides the flexibility for those wishing to fulfill pre-professional requirements in such programs as dentistry, medicine, pharmacy, and other health related professions, that require two full years of laboratory chemistry.
3. Concerns of trends affecting the program

See Findings and Recommendations and references (links) below for details

4. Significant changes or needs in the next five years

See Findings and Recommendations and references (links) below for details

D. List the degrees, certificates and any other courses offered by the program.

AS Chemistry

E. What specific niches does the program serve?

AS Chemistry option

Type your responses above. The box will expand as needed

2. Quality of Program

D. Resource Matrix

1. Complete The Resource Matrix which is a spreadsheet that covers adequacy of course scheduling and provides faculty & staff information and attach. You may add a short narrative explanation for the data in the Resources Matrix below if necessary.

attached.xls file

Type your responses above. The box will expand as needed

E. Evidence of the Effectiveness of the Department, Service or Program

1. Program Review Data Sheet: Academic programs should include the Program Review Summary Data Sheet. You may add a short narrative explanation for the data in the Resource Matrix below if necessary.

attached.xls file- IR data

Type your responses above. The box will expand as needed

2. Systematic Assessment: Academic programs should include the new Five Year Assessment Plan and Annual Assessment Update Forms for the period covered by the Program Review.

attached, see page 26 & 27 of this form

Type your responses above. The box will expand as needed

3. Evidence of Satisfaction: Academic programs may include additional hard data regarding student satisfaction with courses and programs, employer satisfaction studies, etc., as indicators of effectiveness of the program.
see findings below

Type your responses above. The box will expand as needed

4. **Certifications/Licenses:** Academic programs need to explain if there are special certifications or accreditations available to the program and the status of the program relative to these certifications or accreditations.

n.a

3. **Curriculum Review**

Academic program should summarize the recommendations contained in the Curriculum Committee Program Evaluation and the Program Review Team’s response to the recommendations. The completed Curriculum Report should be attached to the Program Review.

attached, curriculum committee November 2007

Type your responses above. The box will expand as needed

4. **Findings and Recommendations**

**A. S. CHEM Program Review Team Findings:**

- 18 WNC students currently declare the A.S. Chemistry degree as a major. However there have been no graduates and no evidence that a needs assessment has ever been conducted prior to or during the life of the program since its inception in 2002.

- Nationally the trend in the number of baccalaureate degrees in Chemistry has not changed much since the 1970's, and less than 1 in 4 community college transfer students who pursue the baccalaureate degree in Chemistry receive an Associate degree.

- In the past five years at WNC student enrollment in General Chemistry I, CHEM 121, generates a comparatively high FTE/cost ratio. Yet low enrollment resulting in class cancellation of required or elective follow-up courses (CHEM 122, 220, 241, 242) makes it difficult to sustain a degree program.

- The WNC program guide of the suggested course sequence for the AS Chemistry degree does not appear to correspond to historic course scheduling at all WNC campuses. For example, WNC Fallon campus does not always offer a complete sequence of required courses, e.g. Physics 151 or 180, to allow a student to pursue the AS CHEM degree in a timely fashion, or without travel to the Carson campus, TMCC, or UNR.

- The current list of required chemistry courses for the degree at WNC is General Chemistry I & II, which is grossly inadequate by national and Nevada (NSHE) standards. The required chemistry course list should include some organic
chemistry courses with lab to meet these standards and the program learning outcomes.

- Beyond meeting with counselors, if they choose, students at WNC have no formal advising protocols or procedures with chemistry faculty, and are left to mainly informal conversations, having little to no formal input on scheduling of courses.

- Laboratory facilities are adequate, though over-crowded with students in CHEM 121 sections, on all three main campuses. Equipment is needed for organic chemistry courses, specifically instrumentation such as GC and NMR. IR capabilities exist on only the Carson campus.

- Five-year assessment of student learning outcomes will be difficult considering the limited number of chemistry students beyond CHEM 121 and no graduates. The dearth of students fails to provide a cohort that would represent effective changes in the program.

- Three full time faculty members, with an average of 20+ years experience and graduate degrees in Biochemistry, teach the bulk of the chemistry courses on all campuses of WNC and generate a comparatively large amount of FTE at a relatively low cost. This is accomplished because faculty provide service courses to a large population of pre-nursing and pre-professional students. W-D-F rates from chemistry courses are at or below national norms. Student evaluations show a positive trend toward meeting their goals with CHEM 121, and have a more pronounced positive overall attitude on evaluations of subsequent chemistry courses.

**A. S. CHEM Program Review Team Recommendations:**

- Following national and NSHE standards require a one semester course in organic chemistry, either CHEM 220 or 241/241L, for the degree. Leave CHEM 242/242L in the elective status. Change the PHYS 151-152/180-181 courses to elective status. Change the Mathematics and Biology required courses to read: BIOL 100 or higher (8 credits), Math 126 or higher (8 credits). This will give more flexibility and choice to the students at each campus and insure that all three main campuses offer the required courses.

- Purchase needed instrumentation to upgrade organic chemistry labs on all three main campuses. Primarily GC and NMR instruments appropriate for undergraduate education, and any needed upgrades of existing UV-VIS and IR. Currently Chem 220 students use IR in several laboratory exercises. The instrumentation on the Fallon campus is not on par with the IR for Carson and Douglas. An upgrade for Fallon should be a priority so all students in Chem 220 have access to instrumentation that provides for equal experience.

- Survey students on their career goals and course needs and begin a mentoring/advising program for those students that are committed to a specific chemistry or science field. Include the pre-professional students who need two
years of chemistry leading to acceptance in pharmacy, medical, dental, nursing, and related health programs. Allow students to make recommendations on course offerings and scheduling on each of the three main WNC campuses.

- Offer all four required courses in chemistry, CHEM 121, 122, 220 or 241/241L, on all three main campuses at least once a year. The exact semester of a specific course offering may be different on each campus depending on student needs on that campus.

- Establish a benchmark of 2011 for students to graduate from this program, or consider removing it from the program list, perhaps creating a more viable new program in its place. This will give current CHEM 122 students (Sp'08) three years more to complete their coursework. Statistics nationally suggest it is unrealistic to believe that time to degree is two years at a two-year college.

References:

The Role of the Community College in the Education of Recent Science and Engineering Graduates, May 2004, NSF 04-315

AAUDE Statement on Undergraduate Education, September 2007, Vol 1
http://www.pb.uillinois.edu/aaude/documents/specialupdate01.pdf

The Status of Chemistry in Two Year Colleges, American Chemical Society,
http://portal.acs.org/portal/acs/corg/content?_nfpb=true&_pageLabel=PP_TRANSITIONMAIN&node_id=965&use_sec=false&sec_url_var=region1

American Chemical Society Committee on Professional Training, New Recommendations, Spring 2006
http://portal.acs.org/portal/acs/corg/content?_nfpb=true&_pageLabel=PP_TRANSITIONMAIN&node_id=1540&use_sec=false&sec_url_var=region1

Transforming General Chemistry at the University of Iowa, December 2002
http://genchem.chem.uiowa.edu/chemed/intro/Iowa_Redesign_Pew_Final_Report_1-10-03.pdf

What can student right to know graduation rates tell us about community college performance? CCRC, Working paper No. 6, August 2006
http://ccrc.tc.columbia.edu/Publication.asp?UID=498

WNC Institutional Research excel data files, 2007, attached

Last revised May 17, 2007
### Five Year Assessment Plan Form

**revised 04-14-08**

Complete this plan as a part of each five year Program Review cycle and supplement it by submitting an Annual Assessment Update Report form to Division Chair, Dean of Instruction, and the Chair of PARC each year by May 15th. For information on assessment and how to create measurable program outcomes, contact the Assessment Coordinator housed in Institutional Research or go to [http://www.WNC.edu/institutional/programreview.php](http://www.WNC.edu/institutional/programreview.php)

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<tbody>
<tr>
<td>1. Students will have the ability to design and conduct laboratory experiments, as well as to analyze and interpret data</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>Lab practical following an inquiry rubric developed by WNC chemistry faculty in CHEM 122 and, CHEM 220 or 241L.</td>
</tr>
<tr>
<td>2. Students will be able to demonstrate and introductory level of knowledge in principles of general and organic chemistry with applications to biological systems.</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>Common final exam question(s) in all sections of CHEM 122 and, CHEM 220 or 241. ACS national exam.</td>
</tr>
<tr>
<td>3. Students can apply safety standards in the laboratory when using chemicals, equipment, and instruments.</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>Survey students of all chemistry lab classes. WNC chemistry faculty derive test and assessment tool.</td>
</tr>
<tr>
<td>4. Students will be able to use mathematics and computers to solve chemistry problems.</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Institutional Research data on rates of completion of CHEM 121 vs Math 120 or higher math prereqs / math testing. *</td>
</tr>
<tr>
<td>5. Students will demonstrate an understanding of the scientific method.</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>Common final exam question(s) in all sections of CHEM 122 and, CHEM 220 or 241. ACS national exam.</td>
</tr>
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</table>

Please list the program outcomes, and briefly describe the means of assessment for each one. Insert an X in the column of each year that the program outcome will be assessed.

**Comments/Reflections:** *During ’07-’08 we conducted a 5 year study of the mathematics preparation, prerequisite math courses and math testing for entering CHEM 121 students. The data produced by IR is attached to this report as an Excel file, and was used to adjust/revise math prereqs of Chem 121.*

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**Signature, Division Chair** Brigitte Dillet  
**Date**

**Signature, Instruction** Carol Lange  
**Date**
# Annual Assessment Update Report Form

<table>
<thead>
<tr>
<th>&lt;A.S. CHEMISTRY emphasis&gt;</th>
<th>Assessment Plan for &lt;2007-2008&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mike Sady, 445-4400, <a href="mailto:mbsady@wnc.edu">mbsady@wnc.edu</a></td>
<td>Submitted: 04-14-08</td>
</tr>
</tbody>
</table>

### College Mission Statement/Goals
Enter portion of statement that relates to your unit here

**College Strategic Goals is to:** Improve student success in program completion and graduation rates  
**The mission of the division is to:** prepare students to succeed in college-level science, math and engineering courses.

### Academic Program Mission Statement/Goals
Enter your program statement and goals here

**To prepare students for baccalaureate programs in the science, health, teaching, and engineering fields, or the work force in chemistry-related industries.**

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Means of Assessment</th>
<th>Findings</th>
<th>Actions</th>
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</thead>
</table>
| 1. Students will be able to use mathematics and computers to solve chemistry problems | Institutional research five year data *(see Excel file attached: Math vs CHEM 121).*  
Grades in MATH prereqs/test scores vs CHEM 121 grades were compared. | There is little correlation between WNC student success (grades) in CHEM 121 and Math prereqs or test scores ($r^2 < .35$). | Revise mathematics prerequisites to conform to MATH 120 or higher, OR MATH 128 (126-127) if planning on taking CHEM 122. See catalog for update. |

Table expands as needed. Rows can be added where necessary. For assistance, please contact the Coordinator for Assessment

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**Signature, Division Chair**  
Brigitte Dillet  
**Date**

**Signature, Dean of Instruction**  
Carol Lange  
**Date**

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Last revised May 17, 2007