

Course Assessment Report
Washtenaw Community College

Discipline	Course Number	Title
Chemistry	111	CEM 111 12/28/2018- General Chemistry I
Division	Department	Faculty Preparer
Math, Science and Engineering Tech	Physical Sciences	Tracy Schwab
Date of Last Filed Assessment Report		05/03/2017

I. Review previous assessment reports submitted for this course and provide the following information.

1. Was this course previously assessed and if so, when?

Yes

Data collected for all sections in Fall 2016. Assessment report written and submitted in Winter 2017.

2. Briefly describe the results of previous assessment report(s).

There are three outcomes for this course. Outcomes 1 and 2 are assessed using a departmental final exam while Outcome 3 is assessed using lab reports. During the last assessment, Outcomes 1 and 3 did meet the standard of success while Outcome 2 just missed the standard of success (only 73.15% of students achieved 70% or higher on the lab report rubric instead of 75%).

3. Briefly describe the Action Plan/Intended Changes from the previous report(s), when and how changes were implemented.

There were no changes suggested and/or implemented for the course.

Action Plan: All instructors (both lecture and lab) for CEM 111 were notified via e-mail that the assessment report was available for them to peruse. I encouraged all of the instructors to review the report and to make changes to their courses to address topics that students found challenging. In addition, lab instructors were reminded each semester to ensure that their students are writing their lab reports correctly.

II. Assessment Results per Student Learning Outcome

Outcome 1: Recognize the concepts and principles of general chemistry relating to stoichiometry, electronic structure, periodic properties, chemical bonding, energy and heat, intermolecular forces and physical properties of substances.

- Assessment Plan
 - Assessment Tool: Departmental final assessment exam
 - Assessment Date: Fall 2019
 - Course section(s)/other population: All
 - Number students to be assessed: All
 - How the assessment will be scored: The final assessment exam (specifically part A) is a multiple choice exam and will be scored using an answer key.
 - Standard of success to be used for this assessment: 75% of students will score 70% or higher on the test questions from Part A of the final assessment exam.
 - Who will score and analyze the data: Faculty teaching the course will score the test. The data will be analyzed by the full-time chemistry faculty.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2018		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
206	156

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

Part A of the departmental final assessment exam is used to analyze Outcome 1. This exam is given during lecture on the last day of class at the end of the semester. During the semester, students withdraw or drop from the course, while other students just stop coming to class all together.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All students in all 9 sections were assessed for Outcome 1. This course only meets face-to-face and includes day, evening, and Saturday sections. In addition, 8

sections were 15 weeks, while one section was a late start section (12 weeks). All sections met on main campus.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

The departmental final assessment exam contains two sections, Part A and Part B. Part A of this exam is used to assess Outcome 1. Part A contains multiple choice questions that focus on chemistry concepts and principles that do not involve any calculations. This part of exam is scored using a departmental generated answer key by each instructor.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: No

The standard of success for Outcome 1 is that 75% of students will score 70% or higher on Part A of the final departmental assessment exam. Unfortunately, only 79 students out of the 156 students met the standard of success (50.64%). Therefore, the standard of success for Outcome 1 was not met.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students performed well on topics such as geometric shape of molecules, electron configurations, expressing numbers in scientific notation, wavelength, elemental symbols, balancing chemical reactions, valence electrons, phase diagrams, Hund's rule, diatomic molecules, and types of chemical reactions.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Students had difficulty with topics such as nomenclature, oxidation numbers, atomic size, isoelectronic series, indicators of a chemical reaction, intermolecular forces, and formal charges. These topics are not surprising since it is known that these can commonly be the more challenging concepts for students to understand. All instructors will be given this information so that these topics can be re-emphasized throughout the semester.

In addition, we suspected that our final exam questions and answer key had been compromised and rewrote the exam. The low exam scores confirmed our suspicion.

Outcome 2: Apply the appropriate concepts or principles of chemistry to solve chemical problems.

- Assessment Plan
 - Assessment Tool: Departmental final assessment exam
 - Assessment Date: Fall 2019
 - Course section(s)/other population: All
 - Number students to be assessed: All
 - How the assessment will be scored: The problems with multiple choice answers (Part B of the departmental final exam) will be blind-scored against an answer key. The limiting reactant problem in which students have to show their work will be blind-scored using a departmentally-developed rubric.
 - Standard of success to be used for this assessment: 75% of students will score 70% or higher on the multiple choice questions. 75% of students will score 70% or higher on the limiting reactant problem requiring that they show their work.
 - Who will score and analyze the data: The test questions will be scored by the faculty teaching the course. The data will be analyzed by the full-time chemistry faculty.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2018		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
206	156

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

Outcome 2 is assessed using Part B of the departmental final exam, which is given on the last day of lecture. During the semester, students drop or withdraw from the course, or have stopped coming to class.
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4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All students in the 9 sections were assessed. This includes day, evening, and Saturday sections. All classes meet face-to-face. Most sections are 15 weeks, while one section was a late start section (12 weeks). All sections met on main campus.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

Part B of the departmental assessment final exam is used to assess Outcome 2. Outcome 2 specifically assesses concepts and principles that require calculations to solve problems. Part B of this exam is broken into two sections: multiple-choice section and the limiting reactant question section. The limiting reactant question is not multiple choice and required students to show all of their work.

The multiple choice question section was scored using a departmental answer key. The limiting reactant question was scored using a 10 point rubric by full time faculty.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: No

For the multiple choice section of Part B on the departmental final assessment exam, only 112 students out of 156 (71.79%) met the standard of success. (Standard of success is that 75% of students score 70% or higher). This did not meet the standard of success.

For the limiting reactant question in Part B on the departmental final assessment exam, 136 students out of 156 (87.18%) met the standard of success. (Standard of success is that 75% of students score 70% or higher). This did meet the standard of success.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

For Part B of the departmental final assessment exam (multiple choice questions): Students did well on calculations involving molar mass, Hess's Law, molarity, density, and theoretical yield.

For Part B of the departmental final assessment exam (limiting reactant question in which all work had to be shown -- not multiple choice): Students did well recognizing that the problem required the use of stoichiometry. In addition, the majority of students recognized that it was a limiting reactant question in which a calculation had to be shown for each reactant. Majority of students also gave the correct number of significant figures and units in their final answer.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

For Part B of the exam (multiple choice questions): Students had difficulty with calculations involving Avogadro's number, specific heat capacity, and titrations using stoichiometry. Once again, not too surprising as these can be the more challenging concepts of the semester.

For Part B of the exam (limiting reactant question in which all work had to be shown-not multiple choice): Some students had difficulty with following the correct path (how to set up the problem correctly). Students had it mostly set up correctly, but either they used the incorrect mole ratio or molar masses.

These data will be shared with all faculty so that these concepts can be re-emphasized throughout the semester.

In addition, we suspected that our final exam questions and answer key had been compromised and rewrote the exam. The lower test scores confirmed our suspicion.

Outcome 3: Follow the science process in the laboratory by properly collecting and recording data, calculating and analyzing results, and drawing conclusions based on the analyses.

- Assessment Plan
 - Assessment Tool: Lab reports
 - Assessment Date: Fall 2019
 - Course section(s)/other population: All
 - Number students to be assessed: Random sample of 25%

- How the assessment will be scored: The lab report will be scored using a departmentally-developed rubric.
- Standard of success to be used for this assessment: 75% of the students assessed will score 70% or higher on the lab report (7 out of 10 points).
- Who will score and analyze the data: The chemistry faculty will score the lab reports and analyze the data.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2018		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
206	109

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

For Outcome 3, lab reports for week 12 (titration lab) were assessed. A random 25% minimum sampling was requested for each lab section. All lab sections did provide at least a 25% random sampling of lab reports. In some sections, all of the lab reports were submitted for assessment.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

Lab reports from all 9 sections were assessed. This includes all day, evening, and Saturday sections. In addition, this included 15 week sections, and one 12 week late start section. All sections are face to face and met on main campus.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

All submitted lab reports were scored using a 10 point rubric by departmental faculty.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

The standard of success for Outcome 3 is that 75% of students will score 70% or higher on their lab reports. 84 students out of 109 (77.06%) met the standard of success (scored 7 or higher on the 10 point rubric). This met the standard of success.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

In their lab reports, students did well on their data and result tables (showing the correct number of significant figures and unit labels). In addition, students did well on their purpose, conclusion, and questions.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

In their lab reports, a majority of students did not do well on showing the required work (subtractions, averages, and stoichiometry). Some students had the correct path in mind, but they reversed their volumes within the calculations. In some instances, the mole ratio was not clearly shown. Lastly, some students had difficulty with the proper format of the lab reports (i.e. they had all of the parts, but not in the correct order).

This information will be shared with all lab instructors so that these issues can be addressed throughout the semester.

III. Course Summary and Intended Changes Based on Assessment Results

1. Based on the previous report's Intended Change(s) identified in Section I above, please discuss how effective the changes were in improving student learning.

No intended changes were identified in the last assessment report. Therefore, no changes were made to the course.

2. Describe your overall impression of how this course is meeting the needs of students. Did the assessment process bring to light anything about student achievement of learning outcomes that surprised you?

The data from Outcome 1 was disappointing since only 50.64% of students met the standard of success (instead of 75%). Since the departmental final assessment exam has been used every semester for approximately 10 years, I decided to re-write the exam over this past summer. This new departmental final assessment exam contains the same number of questions in both Parts A and B. In addition, I ensured that the topics covered were the same as the previous exam. Most of the

changes made were to use different numbers, chemical formulas, and reactions. The only major difference was that incorrect answers on the multiple choice section contained more common mistakes that students make. This way, instructors could more easily see (based on the student's answers) where the mistake was made. This exam was reviewed by several other chemistry instructors before it was used this semester. Therefore, this exam is not any harder than the previous departmental final exam.

Specifically for Part A (concepts, with no calculations), common mistakes were given as the correct answer for a large number of questions that were missed. The types of questions that were missed in this section are very similar to questions that are missed each semester.

Specifically for Part B (concepts that require calculations), the standard of success was barely missed (71.79% instead of 75%). This is the difference of only 5 students (i.e., if 5 more students had received a 75% or higher, the standard of success would have been met). Calculations for many students can be more challenging than a question that does not require calculations. Based on their responses (knowing that common mistakes are possible answers), it is clear that some students had the right idea, but failed to set up the math correctly. The questions that were most often missed, once again, are the same type of questions that are missed semester to semester. For the limiting reactant question (not a multiple choice question), students performed well on this question and met the standard of success. Since all work had to be shown on this question, it was easy to see where students made mistakes. A large majority of students understood that stoichiometry needed to be used--even if they did set up the calculation itself incorrectly.

In regard to Outcome 3 in which lab reports were assessed, it was not surprising where students made mistakes. The mistakes made are seen often since students are required to write a formal lab report each week for this course. These mistakes include (but are not limited to) incorrect format, missing and incorrect calculations, and significant figures.

As a side note: the final departmental assessment exam (which is used to assess Outcomes 1 and 2) is given on the last day of lecture. At this point in the semester, it is clear to some students that they will not pass the course. These students are encouraged to finish out the semester and to take this exam, as it will help them when they repeat the course. The data from these students are included in this assessment.

3. Describe when and how this information, including the action plan, was or will be shared with Departmental Faculty.

The data (spreadsheets with names omitted) and this assessment report will be shared with all faculty who teach this course. In addition, information gleaned

from this assessment will be discussed in person at the departmental meeting that is held the week before the semester begins. At this meeting, instructors break into groups based on the course(s) that they teach. Lastly, an e-mail will be sent to all instructors that highlight the main concepts that are missed and topics to emphasize next semester.

4.

Intended Change(s)

Intended Change	Description of the change	Rationale	Implementation Date
Assessment Tool	The final exam will be changed on a regular basis to prevent compromising the results.	By modifying exam questions, moving them around and change values used in the calculations, we will get a more accurate view of how well students are doing on the exam and in the course.	2018

5. Is there anything that you would like to mention that was not already captured?

In regard to the final departmental exam to assess Outcomes 1 and 2:

There are 32 questions in part A (Outcome 1), and 12 questions in part B (Outcome 2).

For Part A: Students have to get at least 23 questions correct out of 32 correct to meet the 70% threshold. If a student gets 23 questions correct, it is 71.9% (instead of 70%). Anything less than 23 questions is below 70%.

For Part B: Students have to get at least 9 questions correct out of 12 to meet the 70% threshold. If a student gets 9 questions correct, it is 75% (instead of 70%). Anything less than 9 questions correct is below 70%.

Since this test is taken during the last lecture period (and is therefore a timed exam at 1.5 hours)--I do not want to add questions to either part to provide an absolute 70% score. This is to ensure that students have ample time to finish the exam.

In addition, every question in both parts is important for the assessment of the course. No two questions duplicate concepts. Therefore, I do not want to remove any questions to either part to provide an absolute 70% score.

III. Attached Files

[Data for Outcome 3](#)

[Limiting Reactant Rubric](#)

[Outcome 1 and 2 Data](#)

[Lab Report Scoring Rubric](#)

[Sample Questions from Departmental Final Exam](#)

Faculty/Preparer: Tracy Schwab **Date:** 01/04/2019

Department Chair: Suzanne Albach **Date:** 01/29/2019

Dean: Kristin Good **Date:** 01/29/2019

Assessment Committee Chair: Shawn Deron **Date:** 02/25/2019

Course Assessment Report
Washtenaw Community College

Discipline	Course Number	Title
Chemistry	111	CEM 111 01/29/2017- General Chemistry I
Division	Department	Faculty Preparer
Math, Science and Engineering Tech	Physical Sciences	Tracy Schwab
Date of Last Filed Assessment Report		

I. Assessment Results per Student Learning Outcome

Outcome 1: Recognize the concepts and principles of general chemistry relating to stoichiometry, electronic structure, periodic properties, chemical bonding, energy and heat, intermolecular forces and physical properties of substances.

- Assessment Plan
 - Assessment Tool: Departmental Exam
 - Assessment Date: Fall 2014
 - Course section(s)/other population: All
 - Number students to be assessed: All
 - How the assessment will be scored: The assessment will be scored against an answer key.
 - Standard of success to be used for this assessment: 75% of students will score 70% or higher on the test questions.
 - Who will score and analyze the data: Faculty teaching the course will score the test. The data will be analyzed by the full-time chemistry faculty.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2016		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
235	190

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

The departmental final exam is given on the last day of lecture (end of semester). By this time, students have withdrawn from the course or have stopped participating/attending class.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All sections (including 15 week, late start, day and night sections) of CEM 111 that met during the Fall 2016 were assessed. All sections met on main campus.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

The departmental final exam contains two sections--Part A and Part B. Part A contains multiple choice questions that focus on chemistry concepts and principles to assess Outcome #1. Part A is scored using a departmental generated answer key by a faculty member.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

The average score on Part A of the final assessment exam was 26.02 points out of a total of 32 points (81.31%). In regards to the standard of success, 166 out of 190 students (87.37%) scored 70% or higher on Part A of the final assessment exam. Therefore, the standard of success was met for Outcome #1.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Outcome #1 focuses on chemistry concepts and principles (i.e., not calculations). Part A of the departmental final assessment exam is used to assess this outcome. The average score on Part A was 26.02 points out of 32 possible points (81.31%). Of the 190 students who took the departmental final assessment exam, 166 students achieved a score of 70% or higher (87.37%). The standard of success is that 75% of students will score 70% or higher on part A of the departmental exam. The standard of success was met for Outcome #1.

Specifically, students did well on questions concerning electron distribution, balancing chemical reactions, chemical bonding, and molecular shape.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Although the standard of success was met for Outcome #1, students still had difficulty with concepts distinguishing between ionic and molecular compounds, identifying reducing agents, electron configurations, and gas principles. Several of these concepts are discussed early in the class and as such, are commonly forgotten by the end of the semester. An effort will be made to ensure that these concepts are re-emphasized throughout the semester.

Outcome 2: Apply the appropriate concepts or principles of chemistry to solve chemical problems.

- Assessment Plan
 - Assessment Tool: Departmental Exam
 - Assessment Date: Fall 2014
 - Course section(s)/other population: All
 - Number students to be assessed: All
 - How the assessment will be scored: The problems with multiple choice answers will be blind-scored against an answer key. The exam problem in which students have to show their work will be blind-scored using a departmentally-developed rubric.
 - Standard of success to be used for this assessment: 75% of students will score 70% or higher on the multiple choice questions. 75% of students will score 3 or higher out of 4 on the problem requiring that they show their work.
 - Who will score and analyze the data: The test questions will be blind-scored by the faculty teaching the course. The data will be analyzed by the full-time chemistry faculty.
1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2016		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
235	190

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

The departmental final assessment exam was given on the last day of the semester. By this time, students have withdrawn or have stopped attending/participating in the class.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All students enrolled in CEM 111 were assessed (including day, evening, 15 week and late start sections). All sections met on main campus.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

Part B of the final assessment exam contains multiple choice questions in which students must calculate an answer. Part B of this exam was scored using a departmental answer key. In addition, Part B contains one limiting reactant problem that is not multiple choice and requires students to show their work. This one question was scored using a departmental rubric. Taken together, Part B of the departmental assessment exam assesses Outcome #2.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: No

Part B contains 11 multiple choice questions plus a limiting reactant question in which students are required to show their work.

For the multiple choice questions in Part B, the average score was 8.26 points out of 11 (75.09%). In regards to the standard of success, only 73.16% of students achieved 70% or higher on this section of the final exam. As such, this did not meet the standard of success for Outcome #2.

For the limiting reactant question in Part B of the exam in which students had to show their work (not a multiple choice question), the average score using the departmental rubric was 9.13 (out of 10 points) or 91.30%. In regards to the standard of success, 175 students out of 190 (92.11%) achieved 70% or higher on

this limiting reactant question. Therefore, this section of Outcome #2 did meet the standard of success.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Outcome #2 is assessed using Part B of the departmental final assessment exam as well as the limiting reactant question in which all work was required to be shown. Specifically, the average score on the multiple choice Part B of the exam was 8.26 points out of 11 possible points (75.09%). The standard of success for Outcome #2 was that 75% of students will score 70% or higher on Part B of the departmental exam. Out of the 190 students who took the exam, 139 students scored 70% or higher (73.16%). In regard to Part B of the final assessment exam, students did particularly well on calculations involving molar mass, moles, density, and gas laws.

For the limiting reactant question, students did well on recognizing that this problem involved limiting reactant stoichiometry, correct set-up of the calculations, and understanding which calculation produced the correct answer.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

In regards to Part B of the departmental exam, students had difficulty with calculations involving dimensional analysis which requires students to set up a problem using multiple steps. This is not surprising since this is one of the main areas that students struggle in every semester. Other topics that were difficult involved dilution problems and calculations involving Avogadro's number. Again, not too surprising as these are also concepts that students can somewhat struggle with. Continued efforts will be made to reinforce these calculations throughout the semester, both in lecture and in lab.

Outcome 3: Follow the science process in the laboratory by properly collecting and recording data, calculating and analyzing results, and drawing conclusions based on the analyses.

- Assessment Plan
 - Assessment Tool: Review sample of lab reports using departmental rubric.
 - Assessment Date: Fall 2014
 - Course section(s)/other population: All
 - Number students to be assessed: Random sample of 25%

- How the assessment will be scored: The lab report will be blind-scored using a departmentally-developed rubric.
- Standard of success to be used for this assessment: 75% of the students assessed will score 6 out of 9 or higher on the lab report.
- Who will score and analyze the data: The chemistry faculty will score the lab reports and analyze the data.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2016		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
235	61

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

For Outcome #3, a 25% random selection of lab reports were requested from each section. One instructor provided all of the lab reports from their two sections--these extra lab reports were also included in the total number that were scored using the departmental rubric.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All sections were assessed (25% random sample) from 15 week, late start, day, and evening sections. All sections met on main campus.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

49 randomly selected lab reports were collected and scored using a departmental generated lab report rubric (scored out of 10 points).

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

A minimum of 25% of randomly selected lab reports from each section were assessed. The average score of the lab reports was 8.62 out of 10 points (86.20%). In regards to the standard of success, 49 lab reports out of 61 (80.33%) scored 70% or higher using the departmental rubric. This meets the standard of success for Outcome #3.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

For Outcome #3, at least 75% of randomly selected lab reports from each section were collected and scored against a departmental rubric (total of 62 lab reports used). Students did very well organizing their lab reports, recording their data, performing the required calculations, and arriving at the correct conclusion. Currently, the standard of success for this outcome is that 75% of students assessed will score at least 6 out of 9 on their lab reports (66.6%). For this assessment, the lab scoring rubric was changed to a 10 point item rubric. This change was a result of the last Assessment Report in which an additional report item was added to further delineate a student's ability to perform the correct calculations. This change will be included in the Master Syllabus submission to follow this report. Using this 10 point item rubric, the average score of the randomly collected lab reports was 86.20%. Specifically, 49 lab reports out of the 62 lab reports (79.03%) collected achieved 70% or higher.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Using the new 10 point rubric, the average score on the lab reports was 86.20%. Most specifically, 79.03% collected achieved 70% or higher. This meets the standard of success for Outcome #3 (which is 66.6% on the 9 point rubric). For the most part, students did very well on their lab reports. However, the issues that students had the most difficulty with were incorrect calculations and answering some of the questions incorrectly. As stated previously, incorrect calculations is a continued issue with students every semester (this has already been addressed). In regards to the questions (which come at the end of the lab report), students are required to critically analyze and conclude what would happen to their results if they had made specific mistakes in the procedure during the lab. For some students, this can be challenging.

II. Course Summary and Action Plans Based on Assessment Results

1. Describe your overall impression of how this course is meeting the needs of students. Did the assessment process bring to light anything about student achievement of learning outcomes that surprised you?

Students were able to meet the standard of success for all outcomes except for one part of Outcome #2. Outcome #2 analyzes student's ability to perform calculations. Students did not achieve the standard of success for Part B of the departmental exam (73.15%). As you can see from the raw data, four students (who were present for the exam) did not even attempt to take the exam. I believe this is due to the fact that instructors routinely encourage students to stay in the class even if they are failing so that they can receive all of the information which will help them when they re-take the class. This can certainly explain why the standard of success was not met.

2. Describe when and how this information, including the action plan, was or will be shared with Departmental Faculty.

Any information, including the Action Plan, will be shared with the chemistry faculty at department meetings. In addition, information will also be shared with part-timers and adjuncts either by e-mail or personal meetings with the lead instructor for the course.

3. Intended Change(s)

Intended Change	Description of the change	Rationale	Implementation Date
No changes intended.			

4. Is there anything that you would like to mention that was not already captured?

5.

III. Attached Files

[CEM 111 Fall 2016 Organized Data Assessment](#)
[CEM 111 Lab Report Rubric](#)
[CEM 111 Departmental Final Assessment Exam](#)
[CEM 111 Limiting Reactant Question \(Outcome #2\)](#)
[CEM 111 Fall 2016 Raw Data Assessment](#)
[CEM 111 Limiting Reactant Rubric \(Outcome #2\)](#)

Faculty/Preparer: Tracy Schwab **Date:** 03/08/2017
Department Chair: Kathleen Butcher **Date:** 03/30/2017
Dean: Kristin Good **Date:** 03/31/2017
Assessment Committee Chair: Ruth Walsh **Date:** 04/19/2017

Course Assessment Report
Washtenaw Community College

Discipline	Course Number	Title
Chemistry	111	CEM 111 09/23/2014- General Chemistry I
Division	Department	Faculty Preparer
Math, Science and Health	Physical Sciences	Tracy Schwab
Date of Last Filed Assessment Report		

I. Assessment Results per Student Learning Outcome

Outcome 1: Recognize the concepts and principles of general chemistry relating to stoichiometry, electronic structure, periodic properties, chemical bonding, energy and heat, intermolecular forces and physical properties of substances.

- Assessment Plan
 - Assessment Tool: Departmental Exam
 - Assessment Date: Fall 2014
 - Course section(s)/other population: All
 - Number students to be assessed: All
 - How the assessment will be scored: The assessment will be scored against an answer key.
 - Standard of success to be used for this assessment: 75% of students will score 70% or higher on the test questions.
 - Who will score and analyze the data: Faculty teaching the course will score the test. The data will be analyzed by the full-time chemistry faculty.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
	2014	

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
243	155

3. If the number of students assessed differs from the number of students enrolled,

please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

Assessment data was not provided by all sections. One instructor did not provide any data (this instructor taught several sections). In addition, the departmental exam is given on the last day of class. At this point, some students have already withdrawn from the course.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

Eight sections who met on main campus were assessed. These sections included day and evening sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

The departmental final exam contains two sections, section A and section B. Section A contains multiple choice questions that focus on chemistry concepts and principles to assess outcome #1. Section A is multiple choice and is scored using a departmentally-generated answer key.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

The average score on the multiple-choice questions in section A of the departmental final exam was 26.60 points/32 possible points, or 83.13%. Of the 155 students taking the departmental final exam, 86.56% scored 70% and higher on section A (22.5 points/32 possible points). The standard of success is that 75% of students will score 70% or higher on the final departmental exam, part A. The standard of success for outcome #1 was met.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students generally performed well on the conceptual questions and clearly met the standard of success for outcome #1 since 86.56% scored 70% and higher on section A of the departmental exam. Students did especially well on questions involving reaction balancing, electron configurations, and chemical bonding.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Although the standard of success was met for outcome #1, students had the most difficulty with concepts involving identifying ionic versus molecular compounds, gas laws, significant figures, and redox reactions. Instructors will continue to stress these concepts in both lecture and in lab.

Outcome 2: Apply the appropriate concepts or principles of chemistry to solve chemical problems.

- Assessment Plan
 - Assessment Tool: Departmental Exam
 - Assessment Date: Fall 2014
 - Course section(s)/other population: All
 - Number students to be assessed: All
 - How the assessment will be scored: The problems with multiple choice answers will be blind-scored against an answer key. The exam problem in which students have to show their work will be blind-scored using a departmentally-developed rubric.
 - Standard of success to be used for this assessment: 75% of students will score 70% or higher on the multiple choice questions. 75% of students will score 3 or higher out of 4 on the problem requiring that they show their work.
 - Who will score and analyze the data: The test questions will be blind-scored by the faculty teaching the course. The data will be analyzed by the full-time chemistry faculty.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
	2014	

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
243	155

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal,

or did not complete activity.

Assessment data was not provided by all sections. One instructor did not provide any data (this instructor taught several sections). In addition, the departmental exam is given on the last day of class. At this point, some students have already withdrawn from the course.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

Eight sections who met on main campus were assessed. These sections included day and evening sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

Section B of the departmental exam contains multiple choice problems in which students must calculate an answer. The part of the exam was scored using a departmental generated answer key. In addition, Section B contained one limiting reactant problem that is not multiple-choice and requires students to show their work. The questions in section B assess outcome #2. This part of the exam was scored using a departmentally-generated scoring rubric.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

The average score on the multiple-choice questions in section B on the departmental exam was 8.86 points/11 possible points, or 80.55%. Of the 155 students who took the exam, 79.22% scored 70% or higher on the multiple choice questions on section B (7.7 points/11 possible points). The standard of success is that 75% of students will score 70% or higher on the multiple choice questions. This standard of success was met.

In addition, a total of 155 student responses were collected for the limiting reactant problem, which was not a multiple choice question. This question (graded using a departmental scoring rubric based on a scale of 0 – 4 points) required students to work out an answer while showing all work. Of these 155 students, 132 students (85.16%) scored three or higher (75% or higher) on the limiting reactant problem. The standard of success is that 75% of students will score 3 or higher out of 4 on limiting reactant problem. Therefore, the standard of success was met.

7. Based on your interpretation of the assessment results, describe the areas of strength

in student achievement of this learning outcome.

In regards to outcome #2, 79.22% scored 70% or higher on the multiple choice questions involving calculations on section B. Students performed particularly well on calculations involving stoichiometry and molar mass. In addition, 85.16% scored 3 or higher (75% or higher) on the additional limiting reactant question requiring students to show all work. It is clear from the data that most students understood the concept and how to set-up the calculation.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Students had the most difficulty on the calculations involving molarity, dilutions, gases, and stoichiometry (section B of the departmental final exam). These important concepts will be continued to be stressed in both lecture and in lab.

Outcome 3: Follow the science process in the laboratory by properly collecting and recording data, calculating and analyzing results, and drawing conclusions based on the analyses.

- Assessment Plan
 - Assessment Tool: Review sample of lab reports using departmental rubric.
 - Assessment Date: Fall 2014
 - Course section(s)/other population: All
 - Number students to be assessed: Random sample of 25%
 - How the assessment will be scored: The lab report will be blind-scored using a departmentally-developed rubric.
 - Standard of success to be used for this assessment: 75% of the students assessed will score 6 out of 9 or higher on the lab report.
 - Who will score and analyze the data: The chemistry faculty will score the lab reports and analyze the data.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
	2014	

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
------------------------	------------------------

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

Assessment data was not provided by all sections. One instructor did not provide any data (this instructor taught several sections). In addition, the departmental exam is given on the last day of class. At this point, some students have already withdrawn from the course.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

Eight sections who met on main campus were assessed. These sections included day and evening sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

40 randomly selected lab reports from the eight sections (25.81%) were collected and scored using a departmentally-developed scoring rubric.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

The standard of success is that 75% of randomly selected lab reports will score 70% or higher. 79.78% of the 40 randomly selected lab reports scored 70% or higher (6.3 points/9 possible points). Therefore, this standard of success was met.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

For outcome #3, 79.78% of the randomly selected lab reports scored 70% or higher. Therefore, the standard of success was met. An itemized analysis of the scored lab reports revealed that students understood the proper format of a lab report and generally performed calculations using their data correctly. Most lab reports did have unit labels indicated.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

In regard to the lab reports, itemized analyses indicated that some students did have difficulty with reporting the correct number of significant figures in both their data and result tables. In addition, some students failed to answer the conclusion correctly. Lastly, some students did not answer the questions correctly, both conceptual and calculation based. Lab instructors will continue to emphasize the importance of proper and correct lab reports.

II. Course Summary and Action Plans Based on Assessment Results

1. Describe your overall impression of how this course is meeting the needs of students. Did the assessment process bring to light anything about student achievement of learning outcomes that surprised you?

The assessment data indicates that we are meeting the needs of students since all standards of success were met. Having looked at all of the data from multiple sections, it is clear that student expectations are very similar for each section, regardless of the instructor. Students who pass CEM 111 are prepared to continue on in chemistry.

As is typical for CEM 111, some students continue to struggle with problems involving math. In chemistry, not only does a student need to calculate the correct answer, but they must report the answer to the correct number of significant figures and appropriate unit label. Hence, it is not surprising that students did struggle with some of the mathematical calculations on part B of the departmental exam.

2. Describe when and how this information, including the action plan, was or will be shared with Departmental Faculty.

Any information, including the action plan, will be shared with the chemistry faculty at department meetings. In addition, information will also be shared with part-timers via e-mail.

3. Intended Change(s)

Intended Change	Description of the change	Rationale	Implementation Date
No changes intended.			

4. Is there anything that you would like to mention that was not already captured?
-

III. Attached Files

Lab Report Scoring Rubric
Limiting Reactant Scoring Rubric
Excel Worksheet Containg All Data

Faculty/Preparer:	Tracy Schwab	Date: 09/29/2014
Department Chair:	Kathleen Butcher	Date: 10/28/2014
Dean:	Kristin Brandemuehl	Date: 10/29/2014
Assessment Committee Chair:	Michelle Garey	Date: 11/11/2014

COURSE ASSESSMENT REPORT**I. Background Information**

- Course assessed:
 Course Discipline Code and Number: CEM-111
 Course Title: General Chemistry I
 Division/Department Codes: MNBS/PHYD
- Semester assessment was conducted (check one):
 Fall 20__
 Winter 2011__
 Spring/Summer 20__
- Assessment tool(s) used: check all that apply.
 Portfolio
 Standardized test
 Other external certification/licensure exam (specify):
 Survey
 Prompt
 Departmental exam
 Capstone experience (specify):
 Other (specify): lab reports assessed by departmental scoring rubric (attached)
- Have these tools been used before?
 Yes
 No

If yes, have the tools been altered since its last administration? If so, briefly describe changes made.

- Indicate the number of students assessed/total number of students enrolled in the course.
 159/159 took the departmental exam
 33/159 (20.1%) lab reports assessed
- Describe how students were selected for the assessment.
 All students in all sections who completed the course took the departmental exam.
 One of every four lab reports from every section in the course was randomly selected by the instructor for assessment. However due to a miscommunication one instructor did not supply lab reports for assessment. As a result, only 20.1% of lab reports (instead of the expected 25%) were collected and assessed.

II. Results

- Briefly describe the changes that were implemented in the course as a result of the previous assessment.
 For Outcomes #1 and #2: The department still administers the California Chemistry Diagnostic Test during the first lab session to identify students who are under-prepared for CEM-111. However, the previous assessment identified several weaknesses with using this test as a course assessment tool. To remedy this, the department created a new exam for assessing CEM 111. The new assessment exam has two sections. Section A contains multiple choice questions that focus on chemistry concepts and principles to assess outcome #1. Section B contains multiple choice problems in which students must calculate an answer. Section B also contains one problem that is not multiple choice which requires students to show their work. The questions in section B assess outcome #2.
 For Outcome #3: Full-time faculty met with all part-time instructors prior to the beginning of the semester to discuss lab report expectations and grading. In addition, the lab report rubric was revised to make it easier to score and to provide more meaningful feedback.
- List each outcome that was assessed for this report exactly as it is stated on the course master syllabus.
 Outcome 1. Recognize the concepts and principles of general chemistry relating to stoichiometry, electronic structure, periodic properties, chemical bonding, energy and heat, intermolecular forces and physical properties of substances.
 Outcome 2. Apply the appropriate concepts or principles of chemistry to solve chemical problems.
 Outcome 3. Perform laboratory procedures that apply best chemical practices for making measurements, recording data, calculating results and drawing conclusions.

COURSE ASSESSMENT REPORT

3. Briefly describe assessment results based on data collected during the course assessment, demonstrating the extent to which students are achieving each of the learning outcomes listed above. *Please attach a summary of the data collected.*

Outcome #1. The average score on section A of the departmental exam was 25.7/32, or 80.2%. Of the 159 students taking the departmental final exam, 129 (81.1%) scored 70% or higher on section A.

Outcome #2. The average score on the multiple choice questions in section B of the departmental exam was 9.1/11, or 82.6%. Of the 159 students who took the test, 69.2% scored 70% or higher on the multiple choice questions of section B.

A total of 155 student responses were collected for the final problem requiring students to work out an answer and show all work. Of these 155, 126 (81.3%) students scored 70% (4.9 out of 7) or higher on the scoring rubric.

Outcome #3. 93.9% of the 33 randomly selected lab reports scored 70% (6.3 out of possible 9) or higher on the scoring rubric.

4. For each outcome assessed, indicate the standard of success used, and the percentage of students who achieved that level of success. *Please attach the rubric/scoring guide used for the assessment.*

Outcome #1. The standard of success is that 70% of the students will score 70% or higher. The standard has been met since 81.1% (129/159 students) scored 70% or higher on section A of the departmental final exam.

Outcome #2. The standard of success is that 70% of the students will score 70% or higher. The standard has not been met since 69.2% (110/159 students) scored 70% or higher on section B of the departmental final exam. On the worked out problem, 81.3% scored 70% or higher.

Outcome #3. The standard of success is that 70% of the students will score 70% or higher on the lab report scoring rubric. The standard has been met since 93.9% (31/33 students) scored 70% or higher.

5. Describe the areas of strength and weakness in students' achievement of the learning outcomes shown in assessment results.

Strengths: Students generally performed well on the conceptual questions and clearly met the standard of success for outcome #1. In fact, 75.5% scored 75% or higher on section A of the departmental exam. Students did especially well on questions involving electronic configuration and chemical bonding.

The standard of success for outcome #2 was not quite met since only 69.2% of students scored a 70% or higher on the multiple choice questions in Part B. However, 71% of students scored 80% or higher on the limiting reactant problem that was not multiple choice but required that a solution be calculated. This exceeded expectations.

Students scored very well on the lab report assessment for outcome #3 and exceeded the standard of success. In fact, 87.9% scored 75% or higher.

Weaknesses: Students did not do as well on questions involving calculations (section B of the departmental exam) and fell just short of the standard of success. Students had the most difficulty with questions involving significant figures, solutions (molarity, stoichiometry and dilution), gases and thermodynamics.

III. Changes influenced by assessment results

1. If weaknesses were found (see above) or students did not meet expectations, describe the action that will be taken to address these weaknesses.

We will continue to remind all instructors, both lecture and lab, to emphasize correct use of significant figures. Additional questions and problems focusing on significant figures and solutions will be added to the pre-lab assignments to provide students more practice with these topics.

2. Identify intended changes that will be instituted based on results of this assessment activity (check all that apply). Please describe changes and give rationale for change.

a. Outcomes/Assessments on the Master Syllabus

Please return completed form to the Office of Curriculum & Assessment, SC 247.

2 of 3

COURSE ASSESSMENT REPORT

Change/rationale: When doing this report, we realized that our assessment of outcome #3 does not actually measure student performance in the laboratory, but rather assesses the ability of students to follow the science processes of collecting and properly recording data, calculating and analyzing results, and drawing conclusions based on their analysis. Since following these science processes is our intended course goal, we will rewrite outcome #3 to reflect this.

b. Objectives/Evaluation on the Master Syllabus

Change/rationale:

c. Course pre-requisites on the Master Syllabus

Change/rationale:

d. 1st Day Handouts

Change/rationale:

e. Course assignments

Change/rationale: Additional questions and problems focusing on significant figures and solutions will be added to the pre-lab assignments to provide students more practice with these topics.

f. Course materials (check all that apply)

Textbook

Handouts

Other:

g. Instructional methods

Change/rationale:

h. Individual lessons & activities

Change/rationale:

3. What is the timeline for implementing these actions? Fall 2011

IV. Future plans

1. Describe the extent to which the assessment tools used were effective in measuring student achievement of learning outcomes for this course.

We are generally pleased with the department final exam that has been developed to assess CEM 111. Next time we will include an item analysis of the scoring rubric results for the worked out limiting reactant problem in section B of the departmental final exam.

The revised scoring rubric used to assess lab reports worked well, although in the future we will also include an item analysis of the scoring rubric results.

2. If the assessment tools were not effective, describe the changes that will be made for future assessments.

NA

3. Which outcomes from the master syllabus have been addressed in this report?

All XXX Selected _____

If "All", provide the report date for the next full review: Winter 2014

If "Selected", provide the report date for remaining outcomes: _____

Submitted by:

Print: Rosemary Rader
Faculty/Preparer

Signature: Rosemary Rader
Tracy Schwab

Date: 5/12/11
5/12/11

Print: Kathleen Butcher
Department Chair

Signature: Kathleen Butcher

Date: 5/16/11

Print: Martha Showalter
Dean/Administrator

Signature: M. Showalter

Date: MAY 23 2011

COURSE ASSESSMENT REPORT

I. Background Information

1. Course assessed:
 Course Discipline Code and Number: CEM-111
 Course Title: General Chemistry I
 Division/Department Codes: MNBS/PHYD

2. Semester assessment was conducted (check one):
 Fall 2006
 Winter 20__
 Spring/Summer 20__

3. Assessment tool(s) used: check all that apply.
 Portfolio
 Standardized test
 Other external certification/licensure exam (specify):
 Survey
 Prompt
 Departmental exam
 Capstone experience (specify):
 Other (specify): Lab Reports assessed by departmental scoring rubric (attached)

4. Have these tools been used before?
 Yes
 No

If yes, have the tools been altered since its last administration? If so, briefly describe changes made.
 NA, although the scoring rubric for assessing lab reports that was submitted with the course master syllabus was found to be unworkable and was modified. See attached.

5. Indicate the number of students assessed/total number of students enrolled in the course.
 112/112 All students in all sections who completed the course took the standardized test.
 28/112 Twenty-five percent (25%) of the lab reports from Lab 13 were assessed.

6. Describe how students were selected for the assessment.
 All students in all sections who completed the course took the standardized test.
 One of every four lab reports from every section in the course was randomly selected by the lead instructors for assessment.

II. Results

1. Briefly describe the changes that were implemented in the course as a result of the previous assessment.
 NA

2. State each outcome (verbatim) from the master syllabus for the course that was assessed.
 1. Recognize the concepts and principles of general chemistry relating to stoichiometry, electronic structure, periodic properties, chemical bonding, energy and heat, intermolecular forces, and physical properties of substances.

 2. Perform laboratory procedures related to stoichiometry, electronic structure, periodic properties, chemical bonding, energy and heat, intermolecular forces, physical properties of substances, and acid and bases.

 3. Apply the basic concepts to calculate stoichiometric quantities; determine electron configurations and predict trends in periodic properties; draw Lewis Structures and predict molecular shape and properties; calculate temperature, pressures, volumes or amounts of gases; determine enthalpies of changes; analyze intermolecular forces of substances and predict properties.

COURSE ASSESSMENT REPORT

3. Briefly describe assessment results based on data collected during the course assessment, demonstrating the extent to which students are achieving each of the learning outcomes listed above. *Please attach a summary of the data collected.*

Outcome #1.

On the California Diagnostic Test, the questions judged to evaluate outcome #1 were: 1, 6, 7, 8, 9, 11, 12, 14, 19, 20, 22, 25, and 29.

The percentage of students who answered correctly on each of these questions is shown below. The average score on these questions was 84.0%. Also shown in the table is the corresponding percentage of students from the national norm who answered correctly. The average score of the national norm was 51.8%.

Outcome #3.

On the California Diagnostic Test, the questions judged to evaluate outcome #3 were: 2, 3, 4, 5, 10, 13, 15, 16, 17, 18, 21, 23, 24, 26, 27, 28, 30, 30, 34, 35, 36, 37, and 44.

The percentage of students who answered correctly on each of these questions is shown above. The average score on these questions was 69.3%. Also shown in the table is the corresponding percentage of students from the national norm who answered correctly. The average score of the national norm was 41.2%.

COURSE ASSESSMENT REPORT

Outcome #2.

Each of the 28 randomly selected lab reports was blind-scored by 2 full time faculty members using the attached scoring rubric. The average of the two scores was then calculated for each report.

The average score of all lab reports was 13.4/18 or 74.4%. Overall, 75% of the reports evaluated had a score of 12 or higher.

COURSE ASSESSMENT REPORT

4. For each outcome assessed, indicate the standard of success used, and the percentage of students who achieved that level of success. *Please attach the rubric/scoring guide used for the assessment.*

Outcome #1.

The standard of success is that 75% of students must score at or above the national average on the California Chemistry Diagnostic Test. The national average reported on the California Chemistry Diagnostic Test is 20. On the test as a whole, 75 % of our students scored 29 or higher which is in the 85th percentile and clearly meets our standard of success.

The item analysis data for each test question obtained from both the WCC students and the national norms does not allow us to calculate the scores obtained by 75% of students on selected questions. We can only calculate averages scores. However, our students had an average score of 84% on the questions for outcome #1, compared to the national normed data average score of 52% on these questions, so we are confident that our students have successfully met outcome #1.

Outcome #3.

The standard of success is that 75% of students must score at or above the national average on the California Chemistry Diagnostic Test. The national average reported on the California Chemistry Diagnostic Test is 20. On the test as a whole, 75 % of our students scored 29 or higher which is in the 85th percentile and clearly meets our standard of success.

The item analysis data for each test question obtained from both the WCC students and the national norms does not allow us to calculate the scores obtained by 75% of students on selected questions. We can only calculate averages scores. However, our students had an average score of 69% on the questions for outcome #3, compared to the national normed data average score of 41% on these questions, so we are confident that our students have successfully met outcome #3.

Outcome #2.

The standard of success is that 75% of the sampled reports have a score of 3 or higher out of 4. The revised scoring rubric has a maximum of 18 points. Because our intent was to have 75% of sampled reports have a score of 75% or higher, using the revised rubric, 75% or more of the sampled reports should have a score of 13.5 or higher. The results showed an average score of 13.4 or 74.4% and that 21/28 students (75%) scored 12/18 (67%) or higher. This does not meet the standard of success for outcome #2.

5. Describe the areas of strength and weakness in students' achievement of the learning outcomes shown in assessment results.

Strengths: Our students met the standard of success for outcomes #1 and #3. It must be noted that we are continuing to search for a better assessment tool for this course. We administer the California Chemistry Diagnostic Test during the first lab meeting of the course and again on the last day of lecture. It has been very helpful as a "pre-test" in identifying students who are under-prepared for CEM-111. When given at the end of the semester as course assessment it provides useful information but the comparison to the national normed data may be flawed because we are not certain if the normed data was obtained from students taking the diagnostic test at the beginning or at the end of their college general chemistry class.

Students were close to meeting the standard of success for outcome #2 and would have if the scores from one section had not been included. We have noted that the students who performed poorly were all from one section taught by a part-time instructor and generally had lower scores because the lab report conclusion was not written properly.

Weaknesses: In general students performed better on conceptual questions (outcome #1) than on those involving calculations (outcome #3). It has been noted that of the outcome #1 questions, Question #12 was the only one answered correctly by fewer than 60% of students. This question involves predicting products of a reaction that is not well covered in the course and should either be eliminated from the assessment or else more emphasis should be given to these reactions.

COURSE ASSESSMENT REPORT

Of the outcome #3 questions, it is noted that students scored particularly low on questions #34 and #44. Students did not recognize the need to use significant figures in answering #34. Question #44 was mathematical in nature and involved predicting the expected change in volume when pressure and temperature are changed by various factors.

III. Changes influenced by assessment results

1. If weaknesses were found (see above) or students did not meet expectations, describe the action that will be taken to address these weaknesses.

Outcome #2: The full-time faculty will meet with our part-time lab instructors about what is expected on lab reports, especially in the conclusion section. A sample of a well-written lab report will be posted on Blackboard for students to view. We will also revisit the scoring rubric for evaluating lab reports to be certain that it is easy to use and provides meaningful feedback.

Outcome #1: Combustion reactions will be reviewed in lecture when reaction balancing is discussed.

Outcome #3: The topic of significant figures will continue to be emphasized in both lecture and lab. Questions similar in form to test question #34 that asks for a correctly reported value for a measured quantity without using the “prompt” of “use proper significant figures” will be added to lab questions and to lecture problems. Similarly, students will be specifically shown how to solve problems like test question #44 and will be asked to work these on homework assignments.

We will also contact the American Chemical Society to try and learn if the students who make up the California Diagnostic Test national norms were tested when starting or finishing college level general chemistry.

2. Identify intended changes that will be instituted based on results of this assessment activity (check all that apply). Please describe changes and give rationale for change.

- a. Outcomes/Assessments on the Master Syllabus

Change/rationale: Revise the scoring rubric for evaluating laboratory reports so that it is easier to use and provides more meaningful information than the rubric currently attached to the Master Syllabus.

- b. Objectives/Evaluation on the Master Syllabus
Change/rationale:

- c. Course pre-requisites on the Master Syllabus
Change/rationale:

- d. 1st Day Handouts
Change/rationale:

- e. Course assignments

Change/rationale: Post a sample of a well written laboratory report on Blackboard for students to view. Meet with part-time instructors to be sure everyone knows the expectations for lab reports so these can be communicated to students correctly.

- f. Course materials (check all that apply)

- Textbook
- Handouts

Other: Adopt the use of on-line homework that comes with our textbook to give students more practice solving problems.

- g. Instructional methods
Change/rationale:

- h. Individual lessons & activities
Change/rationale:

COURSE ASSESSMENT REPORT

- 3. What is the timeline for implementing these actions?
These will be implemented in the Fall 2007 semester.

IV. Future plans

- 1. Describe the extent to which the assessment tools used were effective in measuring student achievement of learning outcomes for this course.

The California Diagnostic Test gives useful information about how well our students are achieving outcomes #1 and #3 but the comparison to national norms may be flawed since it is not known if the students included in the normed data took the test at the beginning or at the end of their college level general chemistry course.

- 2. If the assessment tools were not effective, describe the changes that will be made for future assessments.

The original scoring rubric for evaluating lab reports was found to be ineffective and was modified to complete this assessment. See attached. The original rubric was difficult to score and did not provide useful information about which sections of a lab report students do correctly and which sections are substandard. The revised rubric will be further evaluated for its effectiveness and will be modified as needed.

- 3. Which outcomes from the master syllabus have been addressed in this report?

All X Selected _____

If "All", provide the report date for the next full review: Fall 2009

If "Selected", provide the report date for remaining outcomes: _____

Submitted by:

Name: Rosemary Rader/ Rosemary Rader Date: 12 July 2007
 Print/Signature

Name: Gary Van Genderen/ Gary Van Genderen Date: 12 July 2007
 Print/Signature

Department Chair: Kathleen Butcher/ Kathleen Butcher Date: 12 July 2007
 Print/Signature

Dean: Martha Showalter/ M. Showalter Date: 17/7/07
 Print/Signature