GCU Academic Program Assessment Plan (Updated Fall 2016)

Program: Chemistry and Biochemistry

Learning Outcomes: Upon successful completion of the program of studies for the Chemistry or Biochemistry major, the student will earn a Bachelor of Sciences degree and will have given evidence of the following program outcomes:

LO1: Knowledge of Foundations of the Chemical Sciences. Students will demonstrate knowledge and application of fundamental concepts and the theories of chemistry in five key areas of chemistry, including physical, organic, inorganic, analytical, and biochemistry chemistry through course exams, American Chemical Society standardized subject exams, and Major Field Test in Chemistry. The graduates will be expected to demonstrate foundational knowledge at a nationally competitive level.

LO2: Communication Skills. Students will be given the opportunity to develop skills related to effective communication, including both technical writing and oral presentations. Upon successful completion of this program, students will be prepared to use word processing and presentation software, spreadsheet and chemical drawing programs to write methods reports and short scientific papers, organize material for presentations, discuss collected data, and critically evaluate results. The communication artifacts will be evaluated using a defined set of rubrics, and the graduates will be expected to demonstrate competencies at a proficient level.

LO3: Laboratory Skills. Students will be given the opportunity to develop laboratory skills needed to confidently function in a laboratory environment, including proper use of basic scientific instrumentation and equipment such as balances, chemical glassware, pH meters, and UV-VIS spectrometers necessary to collect experimental data to evaluate substances and monitor chemical reactions. Students will demonstrate understanding of the safe handling and disposal of chemicals and hazardous materials. The laboratory skills will be evaluated using a defined set of rubrics, and the graduates will be expected to demonstrate competencies at a proficient level.

LO4: Problem Solving Skills. Students will be given the opportunity to enhance their problem-solving skills via real and scenario-based scientific data analysis and interpretation. Upon successful completion of this program, students will be prepared to evaluate experimental data, identify, and clearly state predictions that logically flow from a hypothesis, and can propose how such predictions could be tested and/or validated. The problem-solving skills will be evaluated via

targeted assignments in selected classes using a defined set of rubrics. The graduates will be expected to demonstrate competencies at a proficient level.

Program: Chemistry/ Biochemistry	**LO 1: Knowledge**	**LO 2: Communication Skills**	**LO 3: Laboratory Skills**	**LO 4: Problem Solving**
Related ISLG	3A. Demonstrate academic excellence in the major field	1. Communicate effectively in written and spoken English	3A. Demonstrate academic excellence in the major field	2. Apply critical thinking, problem-solving and research skills
Related BRIDGE General Education Goals (if applicable)				
Related Accreditation Standard (if applicable)				
Program Course and Experiential Learning Mapping to Program Outcomes				
How do students learn this? In what course(s) and/or co-curricular experience(s)?	CH113 & CH114 CH223 & CH224 CH241 CH331 & CH332 CH311 & CH332 CH334 CH416	CH241 CH304 CH311 CH420	CH113 & CH114 CH223 & CH224 CH241 CH331 & CH332 CH311 & CH332	CH113 & CH114 CH223 & CH224 CH331 & CH332 CH416

Program: Chemistry/ Biochemistry	**LO 1: Knowledge**	**LO 2: Communication Skills**	**LO 3: Laboratory Skills**	**LO 4: Problem Solving**
			CH402	
How and in what <u>course(s)</u> do they demonstrate that they have <u>achieved</u> this outcome.				
Formative Assessment will occur in …	CH114	CH241	CH241	CH223
Summative Assessment will occur in…	CH416	CH420	CH312 (Biochem.) CH402 (Chem.)	CH416
Assessment Protocol				
How and when do you assess the achievement of *all students* in your program before they graduate and record the results of your assessment?				
Formative Assessment				
Direct Evidence	American Chemical Society Subject Test.	Designated laboratory report evaluated by a faculty using department's laboratory report rubric on a 5-point scale.	Laboratory skills evaluated by a faculty during a selected laboratory session by a faculty using department's laboratory skills	Critical thinking skills evaluated by a faculty during a specifically designated exercise using a weighed numerical grading scheme

Program: Chemistry/ Biochemistry	**LO 1: Knowledge**	**LO 2: Communication Skills**	**LO 3: Laboratory Skills**	**LO 4: Problem Solving**
			rubric on a 5-point scale.	(parsing question – 20%; data analysis – 57%; solution presentation – 15%; solution evaluation 8%).
Indirect Evidence	SIR II for CH114 – Learning Outcomes Questions #29, #30, #31, #32, #33.			
Summative Assessment				
Direct Evidence	Chemistry discipline's sub-scores and item analysis (if available) of the Major Field Test in Chemistry.	Student's topic-review paper and public presentation evaluated by faculty (and student audience) using department's written report and oral presentation rubrics on a 5-point scale.	Laboratory skills evaluated by a faculty during a during a selected laboratory session by faculty using department's laboratory skills rubric on a 5-point scale.	Critical thinking skills evaluated by a faculty during a specifically designated exercise using AACU's problem solving or critical thinking value rubric on a 4-point scale.

Program: Chemistry/ Biochemistry	**LO 1: Knowledge**	**LO 2: Communication Skills**	**LO 3: Laboratory Skills**	**LO 4: Problem Solving**
Indirect Evidence				Critical Thinking sub-score on the Major Field Test in Chemistry.
What do you consider satisfactory achievement of this outcome? WHY?				
Formative Assessment				
Direct Evidence	50% of majors correctly answer at least 50% of the ACS exam questions.	80% students score at or above the intermediate level (i.e. 2 on 5-point scale) in the majority of rubric criteria related to the outcome.	80% students score at or above the intermediate level (i.e. 2 on 5-point scale) in the majority of rubric criteria related to the outcome.	40% students score at or above 80% (a letter grade B-) for most criteria related to the outcome. All students will achieve score of 60% (i.e. a letter grade D) or higher for each criterion in the evaluation rubric.
Indirect Evidence	At least 75% of students			

Program: Chemistry/ Biochemistry	**LO 1: Knowledge**	**LO 2: Communication Skills**	**LO 3: Laboratory Skills**	**LO 4: Problem Solving**
	completed the survey, with an overall satisfaction rate of 3.0 or better on a 5-point scale.			
Summative Assessment				
Direct Evidence	50% majors scoring at higher than 25th national percentile in each analyzed chemistry sub-discipline.	80% students score at or above the proficient level (i.e. 3 on 5-point scale) in the majority of rubric criteria related to the outcome.	80% students score at or above the proficient level (i.e. 3 on 5-point scale) in the majority of rubric criteria related to the outcome.	50% students score at or above the 2nd milestone level (i.e. 3 on 4-point scale) in the majority of rubric criteria related to the outcome.
Indirect Evidence				Evaluated cohort of majors scoring 30% or better on critical thinking MFAT questions.
Program Assessment Time Frame				

Program: Chemistry/ Biochemistry	**LO 1: Knowledge**	**LO 2: Communication Skills**	**LO 3: Laboratory Skills**	**LO 4: Problem Solving**
Time Frame for Assessing the outcome.	*Standardized tests administered annually; Data will be analyzed on a three-year schedule on year 1.*	*Written artifacts and oral presentations evaluated annually; Data will be analyzed on a three-year schedule on year 2.*	*Laboratory skills will be evaluated annually; Data will be analyzed on a three-year schedule on year 3.*	*Problem solving skills will be evaluated annually; Data will be analyzed on a three-year schedule on year 3.*

GCU Program Assessment Report Form

GCU Program Assessment Annual Report
Program: ***Division:*** ***Date:*** ***Program Assessment Liaison:***
Based on the above plan and the designated outcome(s) assessed for the academic year, the major program submits a Program Assessment Report annually that contains the program assessment plan, assessment data and analysis, and action steps to be taken by the program based on these results. See below for the outline of this report.
Learning Outcome(s) Assessed:
Assessment Protocol Description
Assessment Data and Findings
Analysis of Data:
Are these results satisfactory? Why or Why not?
Action Plan based on Assessment Results:
Time Frame for Action Plan:

Assessment Data: Please include the data that you used to complete the above report. Attach rubrics, tallies, and method of validation.