UNIVERSITY OF SAN FRANCISCO | College of Arts and Sciences

CHEMISTRY DEPARTMENT

ASSESSMENT REPORT
ACADEMIC YEAR 2018 – 2019
REPORT DUE DATE: 11/01/2019

- **Who should submit the report? – All majors, minors (including interdisciplinary minors), graduate and non-degree granting certificate programs of the College of Arts and Sciences.**
- **Programs can combine assessment reports for a major and a minor program into one aggregate report as long as the mission statements, program learning outcome(s) evaluated, methodology applied to each, and the results are clearly delineated in separate sections**
- **Undergraduate, Graduate and Certificate Programs must submit separate reports**
- **It is recommended that assessment report not exceed 10 pages. Additional materials (optional) can be added as appendices**
- **Curriculum Map should be submitted along with Assessment Report**

Some useful contacts:

1. Prof. Alexandra Amati, FDCD, Arts – adamati@usfca.edu
2. Prof. John Lendvay, FDCD, Sciences – lendvay@usfca.edu
3. Prof. Mark Meritt, FDCD, Humanities – meritt@usfca.edu
4. Prof. Michael Jonas, FDCD, Social Sciences – mrjonas@usfca.edu
5. Prof. Suparna Chakraborty, AD Academic Effectiveness – schakraborty2@usfca.edu

Academic Effectiveness Annual Assessment Resource Page:

https://myusf.usfca.edu/arts-sciences/faculty-resources/academic-effectiveness/assessment

Email to submit the report: assessment_cas@usfca.edu

Important: Please write the name of your program or department in the subject line.

For example: FineArts_Major (if you decide to submit a separate report for major and minor); FineArts_Aggregate (when submitting an aggregate report)

I. LOGISTICS

1. Please indicate the name and email of the program contact person to whom feedback should be sent (usually Chair, Program Director, or Faculty Assessment Coordinator).

Osasere Evbuomwan
oevbuomwan@usfca.edu

2. Please indicate if you are submitting report for (a) a Major, (b) a Minor, (c) an aggregate report for a Major & Minor (in which case, each should be explained in a separate paragraph as in this template), (d) a Graduate or (e) a Certificate Program

Report is for the Major

3. Please note that a Curricular Map should accompany every assessment report. Has there been any revisions to the Curricular Map?

AY 18-19 was the final year in our 3-year assessment plan. We decided to focus on assessing LO#4 in all courses where this was possible, and LO#1 in courses in which the American Chemical Society Standard Exam, or a common final exam questions was administered. The revised curricular map is attached.

II. MISSION STATEMENT & PROGRAM LEARNING OUTCOMES

1. **Were any changes made to the program mission statement since the last assessment cycle in October 2018? Kindly state "Yes" or "No." Please provide the current mission statement below. If you are submitting an aggregate report, please provide the current mission statements of both the major and the minor program**

No

Mission Statement (Major/Graduate/Certificate):

To deliver a broad-based and challenging chemistry experience that will train students for graduate school in science or as professionals in a variety of health, government or private industry positions. The program will foster a culture that values our students, faculty and staff; strives to help students become self-learners; creates opportunities for students to discover the excitement and creativity of research, and promotes an understanding that social consciousness and ethical behavior are essential features of a principled chemistry community.

Mission Statement (Minor):

N/A

2. **Were any changes made to the program learning outcomes (PLOs) since the last assessment cycle in October 2017? Kindly state "Yes" or "No." Please provide the current PLOs below. If you are submitting an aggregate report, please provide the current PLOs for both the major and the minor programs.**

   Note: Major revisions in the program learning outcomes need to go through the College Curriculum Committee (contact: Professor Joshua Gamson, gamson@usfca.edu). Minor editorial changes are not required to go through the College Curriculum Committee.

PLOs (Major/Graduate/Certificate): No Changes made to PLOs during AY 18-19

LO #1: Students will demonstrate their mastery of the four (or five for BS biochemistry emphasis) principle disciplines: analytical, organic, physical, (biochemistry) and inorganic chemistry.

LO#2: Students will recognize and understand the concepts and skills learned in prerequisite courses at or before the start of the new course or laboratory

LO#3: Students or student teams will demonstrate mastery in problem solving by performing a broad variety of analytical, computational and synthetic procedures using proper safety protocols, and will critically evaluate the results

LO#4: Students will demonstrate effective scientific communications skills in both written and oral form. Students will be able to write reports and present results while following professional policies regarding intellectual property, plagiarism, and group work

LO#5: Students will be encouraged and recognized when they go beyond the minimum requirements in the major via semester or summer-long activities that apply the knowledge gained in the discipline, such as research at USF, NSF-REU programs, science internships, discipline-related volunteer or paid science positions, ongoing outreach/teaching in science or PLTL leadership experience.

PLOs (Minor):

N/A

3. State the particular Program Learning Outcome(s) you assessed for the academic year 2018-2019.

PLO(s) being assessed (Major/Graduate/Certificate):

LO #1: Students will demonstrate their mastery of the four (or five for BS biochemistry emphasis) principle disciplines: analytical, organic, physical, (biochemistry) and inorganic chemistry.

LO#4: Students will demonstrate effective scientific communications skills in both written and oral form. Students will be able to write reports and present results while following professional policies regarding intellectual property, plagiarism, and group work

PLO(s) being assessed (Minor):

N/A

III. METHODOLOGY

Methodology used (Major/Graduate/Certificate):

Slightly different methodologies and rubrics were used in the different courses assessed. The methodologies used in each course are listed below and the rubrics are attached.

CHEM 260: ACS Analytical Exam 2013 Version was used to assess LO#1 and a lab report on % ethanol in beer, graded by the instructor and 2 TAs was used to assess LO#4. We took a new approach and gave students a check list of items they needed to include in the report while they completed this 3-week project. We also gave them the rubric and an extensive "How to write your lab report" document. In addition, the report was posted in Canvas going through "Turnitin" grammar and plagiarism checks before submission.

CHEM 320: The 2009 ACS Advanced Inorganic Exam was used to assess LO#1. A lab report on a 2-week quantum dot project, and a poster presentation, were used to assess LO#4. Students were given very detailed feedback by the instructor on the first draft of their lab reports and were asked to revise and resubmit. The rubric used to grade the reports was provided to the students prior to the preparation of their reports. The first draft was ungraded. For the poster presentations, students were asked to form groups of 3 – 4, identify an inorganic chemistry-related topic relevant to the real world, and prepare a poster on their selected topics. Posters were presented on the last day of class.

CHEM 333: Each week students handed in a writing assignment corresponding to one part of a Journal of Organic Chemistry article (i.e., abstract, introduction, results and discussion, etc.) based on the experiment performed the week before. In last three weeks of the semester each student was assigned one experiment they performed during the semester to write-up as a full paper. This included: a) a rough draft) b) anonymous peer review and c) a final draft. The rough draft was apportioned more credit towards their final grade than the final draft.

CHEM 351: To assess the ability communicate in written and oral form, students were assigned a capstone project entitled "From Molecules to Patients: a Biochemical Understanding of Disease." This poster presentation required pairs of students to utilize their biochemistry knowledge to explain the molecular basis of a disease of their choice. Using a detailed guide on searching literature databases and on how to dissect a scientific paper, students read the primary literature to understand how mutation of a particular protein results in the disruption of a biological process. Students also reported the symptoms and the experience of the patient as well as updates on the most recent diagnostic tools and treatment therapies. Poster presentations were evaluated by the instructor and another member of the chemistry faculty using the attached rubric.

CHEM 352: To assess the ability to communicate in oral form, students were required to a present a peer-reviewed journal article from the American Chemical Society journal Biochemistry. After choosing an article, students were required to meet with the instructor to discuss the data, major findings, and significance of the paper. For the oral presentation, students prepared slides discussing the background, the experimental technique and resulting data associated with one figure, and the overall importance of the work. To assess the ability to communicate in written form, a formal professional-style lab report was assigned. Students generated the data during a lab practical and then presented the background, methodology, results, and interpretation in the report. Students first authored four shorter lab reports in the first half of the semester, which were both peer-reviewed and edited in great detail by the instructor. For the report described here, students were allowed to incorporate edits and to resubmit for a final grade.

CHEM 410: Students were required to write an individual final written report on their research projects. Reports were graded by the instructor (Ryan West) using a rubric (see attached). Students were also required to present the results of their research projects as a group poster presentation at CARD 2019. Faculty members (including the instructor and others) used a rubric (see attached) to assess the students' presentations.

Methodology used (Minor):

N/A

IV. RESULTS & MAJOR FINDINGS

Results (Major/Graduate/Certificate):

The results for each course is listed below the corresponding course number.

CHEM 260:

LO#1: We do not cover all topics on an ACS standardized exam, so two scores are shown below. USF students are scoring at or just below the national average indicating good mastery on a challenging exam. The ACS Raw score is based on guessing on topics not covered in the USF course. If one adjusts the Score +6 points for topics we did not cover, the average goes above the national average. Benchmark is at or above national average. Mastery was based upon national statistics and somewhat arbitrary cutoffs for full and partial mastery.

ACS Analytical Exam, Form 2013	2019 Chem 260: Raw score out of 50	Score +6 for questions not covered in the course	Subjective review of ACS test scores based on topics and national answers/rubric
AVERAGE	**24.1**	**30.1**	**Complete mastery ~30%**
STDEV	8.50	8.50	Most parts mastery ~50%
national ave	26.14	26.14	Did not mastery most ~20%
% of national	92.36%	115.31%	

3-4 students always score extremely low each year despite average course performance (2019: 3 students (14% scored 13 or less). The 2019 results are almost the same as the 2015 results (last time the instructor taught the course-~30% of student fully master the material)

LO#4: The sixth experiment required a lab report. Students wrote several short reports and one full report before this assignment. One TA meeting was devoted to grading reports separately and comparing/analyzing consistently for the remainder of the reports. These averages were much higher than the first report of the semester: 80% of the students mastered the report scoring higher than 60 out of 80 (75% by rubric); 10% of the students did not master the report (score less than 55% via rubric)

Average Score Chem 260 Lab 6 Report:	**66.07 (82.5%)**
High Score:	80
Low Score:	40
Total Graded Submissions:	21 submissions

CHEM 320:

LO#1: Due to a recent change in our curriculum, CHEM 320 was offered for the first time in Fall 2018. CHEM 320, a foundational level inorganic chemistry course, was designed to replace the previously offered advanced inorganic course (CHEM 420) which required physical chemistry (CHEM 340) as a prerequisite.

Although this change was made, we still administered the advanced inorganic chemistry ACS exam to get a sense of how our students performed relative to previous cohorts. This ACS exam has 60 questions, 17 of which focused on topics that were not covered in CHEM 320. The table below therefore shows two scores; a raw a score, and an adjusted score.

	Raw Score (Out of 60)	Adjusted Score (Out of 43)	National Score (Out of 60)
Average score	29.15	29.15	31.79
% correct	48.6%	67.7%	53%
% correct relative to National	91.7%	127.7%	

Based on the data in the table, the students did well on the questions related to concepts covered in this class as reflected in their adjusted scores. Although the average raw score was slightly below the national score, we feel that our foundational level inorganic course does not sufficiently meet the national standard for Inorganic courses on its own. We are currently in the process of developing a second in-depth Inorganic course to make up for this deficiency.

LO#4 Lab reports: The results from the different lab report categories are shown below.

Category	Average Score (Percent)
Introduction (15)	13.1 (87.7%)
Experimental Methods (30)	24.6 (82.0%)
Results and Discussion (50)	34.6 (69.2%)
Conclusions (15)	11.6 (77.0%)
References (10)	8.6 (86.0%)
Overall Quality of Writing (30)	23.2 (77.5%)
Full Report (150)	115.7 (77.2%)

The most problematic section of the lab reports was the results and discussion section. Most students struggled with properly analyzing their data and discussing their results. They often included figures that were either poorly formatted or unaccompanied with text describing what the figures showed and what the results meant in the context of the lab experiment. Nonetheless, 70.4% students completely met the standard (scored ≥ 75%), 11.1 % met the standard almost entirely (scored 70 – 74.9%), and 18.5 % did not meet the standard (scored < 70%).

LO#4 Poster Presentations: Students gave poster presentations in groups of 3 – 4. There were a total of 7 groups. The results of this assessment are shown below.

Average score	Met the standard completely (≥ 80)	Met the standard almost entirely (75 – 80%)	Did not meet the standard (< 75%)
80%	42.9 %	42.9 %	14.3%

The standard for this assessment was set a bit higher than the general standard of 75% due to the fact that students were working in groups and were expected to produce something that was better than each individual would be able to on their own. Three groups out of the seven worked well together and put together good presentations that were very well organized, engaging and thoughtful. The other four groups that scored below 80% struggled with working well in a team and also seemed to have issues with different levels of commitment and interest in the project.

CHEM 333:

1) Having students write one portion of a *JOC* paper each week was very successful. It was, however, very important they were specific guidelines and examples to follow for the majority of students to master these writing exercises.

2) It is important to have the students write multiple drafts of their final article. My intention was to teach them that a rough draft is not a first draft and having students write a rough draft that was worth a greater percent of their overall grade was a successful strategy in communicated this intention.

3) Student peer review is pedagogically important but it is difficult for most students to give actual constructive criticism to their peers, even when it is anonymous.

Complete Mastery for the full paper writing in this class was set at 90%. This assessment is based on an average of their rough and final draft grades.

Level	*Percentage of Students*
Complete Mastery of the outcome (90-100%)	*22%*
Mastered the outcome in most parts (80-89%)	*67%*
Mastered some parts of the outcome (70-79%)	*11%*
Did not master the outcome at the level intended (anything less than 70%)	*N/A*
Showed improvement from rough → final draft	*On average there was a 4% improvement from the rough to the final draft of the report, with a range of 3%-6% improvement.*

CHEM 351:

The majority of students were not only fluent in discussing biochemical concepts with proper terminology, but were also able to present their posters in language accessible to a non-expert. In general, students who did not meet the standard completely only partially understood the primary biochemical data in the literature. While students accurately conveyed the take-home-point of the data, students struggled to accurately articulate the details of the experiment.

Level	*Percentage of Students*
Meets standard completely	*30.8%*
Meets standard almost entirely	*53.8%*
Meets standard for a portion of criteria	*15.4%*
Does not meet standard	*0%*

CHEM 352:

Oral Presentations: The majority of students were able to effectively communicate the significance of a primary journal article. Their public speaking ability was admirable, and slides were aesthetically pleasing. In general, students who did not meet the standard completely struggled to explain the technique employed in the article and the details of the resulting data.

Level	*Percentage of Students*
Meets standard completely	*69.2%*
Meets standard almost entirely	*23.1%*
Meets standard for a portion of criteria	*7.7%*
Does not meet standard	*0%*

Lab Reports: The chart below represents the ability of the student to plan the experiment, execute the procedure, analyze the data and present the work in written form. It is therefore difficult to isolate and assess the ability of the student to communicate via the lab report. Common challenges included parallel sentence structure, appropriate capitalization of nouns, and run-on sentences.

Level	*Percentage of Students*
Meets standard completely	*15.4%*
Meets standard almost entirely	*46.2%*
Meets standard for a portion of criteria	*23.1%*
Does not meet standard	*23.1%*

CHEM 410:

Individual Reports: The average grade of the final written reports was a 79.3% (5 students). The lowest score was a 70% and the highest score was an 84%. The grading scale used for the course stipulated that a 74% was necessary for a C. Overall, the reports were not as good as I hoped based on their prior report writing during the semester (and previous semesters in which I had these students, i.e. Analytical Chemistry) – I know they can write better reports. 4/5 students scored lowest (and below the C threshold) on the "General Formatting" section of the rubric – the average for this section was a 60%. The style/grammar/spelling section was the next lowest section, with an average of 66.8%. The students did best on their introduction (class average of 80%). These results suggest: (1) the students did not spend adequate time proof-reading and

formatting their reports, and (2) the students did better at presenting the background and literature summary (in the Introduction) than actually reporting, analyzing, and discussing their results.

Level	*Percentage of Students*
Complete Mastery of the outcome	*0%*
Mastered the outcome in most parts	*20%*
Mastered some parts of the outcome	*80%*
Did not master the outcome at the level intended	*0%*

Group Poster Presentations: Two groups presenting their posters at CARD 2019. Both I and John Hendrix used a rubric to assess their presentations. The scores were 90% and 85%. These scores were higher than the students received on their written reports. Overall the students were confident and well-rehearsed. I think that the pressure of presenting at a campus-wide event was a motivating factor

Level	*Percentage of Students*
Complete Mastery of the outcome	*40%*
Mastered the outcome in most parts	*60%*
Mastered some parts of the outcome	*0%*
Did not master the outcome at the level intended	*0%*

Results (Minor):

N/A

V. CLOSING THE LOOP

Closing the Loop (Major/Graduate/Certificate):

CHEM 260: Take the 10 lowest scores on ACS exam questions and design new activities or more assign more problems related to these topics. Continue to write parts of full lab reports leading up to this full report. Next time have students make the checklist of items needed for reports and review/post methods of writing lab reports. Most below average reports were simply missing items; more help is needed for discussion/conclusions. Lab 6 should continue to be a full report and TA/instructors should exchange graded reports and level the grading.

CHEM 320: Although CHEM 320 is a junior-level course, the ACS has a standardized foundational inorganic chemistry exam written for a sophomore level course that may be a little more appropriate for this new course. I plan on administering this foundational ACS exam in Fall 2019 in place of the advanced inorganic chemistry ACS exam. For the lab reports, I intend to implement a mock lab writing workshop on the first day of lab in Fall 2019 to help students become more familiar with data analysis and discussion. For the oral presentations, I plan on checking-in with groups a little more frequently and also having members of each group discuss and agree upon general team expectations prior to beginning their projects.

CHEM 333: Alter the peer-review exercise to have a greater emphasis on the scientific substance (data interpretation, current literature context, etc.) of the papers.

CHEM 351: To help those students who did not meet the standard completely, the instructor will increase the number of individual check-ins during office hours and require more drafts of the assignment throughout the semester. The implementation of peer review is also under consideration.

CHEM 352: For the oral presentation, those students who are underprepared will be required to meet with the instructor a second time to ensure accurate comprehension of the journal article. For the lab report, the instructor will speak with the USF Writing Center regarding assistance in the technical and scientific writing. Additionally, the chemistry department is discussing the use of a common lab report format throughout all lab courses. Students would develop scientific writing skills in lower-level courses and improve proficiency in upper-level courses.

CHEM 410: A more comprehensive and long-term approach to prepare students for written reports is necessary. A common report formatting throughout the curriculum (at least in Analytical, Inorganic, and Integrated labs) would help. The students should spend more time writing full reports in sophomore and junior-level courses. "Small" details, including the formatting, grammar, and spelling should be emphasized

and graded severely so that the students recognize early on that these issues, i.e. "how the report reads and looks", are important. These details should also be emphasized earlier in this course with major point deductions for omissions. In large part, I believe the students did not take their reports seriously, or take pride in their final work. Many of the mistakes could be easily corrected by spending some more time in Excel and in Word. Some of the students were seniors, which may have contributed to their lack of attention to details. On the other hand, requiring them to present to their peers and the campus community at CARD provided incentive and motivation for the students. We should require the students to present to larger audiences more often.

OVERALL:

Moving forward, we hope to develop a single departmental rubric to be used by all faculty in future.

Closing the Loop (Minor):

N/A

2. What were the most important suggestions/feedback from the FDCD on your last assessment report (for academic year 2016-2017, submitted in October 2017)? How did you incorporate or address the suggestion(s) in this report?

Suggestions (Major/Graduate/Certificate):

Suggestions (Minor):

BS Chem Curriculum Map: LO#1 and LO#4 assessed in Year 3 (AY 18-19)

Chemistry Program Learning Outcomes **A=Assessed**	**113**	**114L**	**230**	**232L**	**231**	**234L**	**260**	**340/341**	**3XX**	**332**	**350/351**	**352L**	**410**	**420/320**	**397**	**Electives**
Year 1: AY 16-17 **Year 2: AY 17-18** **Year 3: AY 18-19**	**General II**	**General Lab II**	**Organic I**	**Organic Lab I**	**Organic II**	**Organic Lab II**	**Analytical + Lab**	**Physical**	**Advanced Organic Lab**	**Medicinal**	**Biochemistry I/II**	**Biochemistry Lab**	**Integrated Lab**	**Inorganic**	**Research**	
LO #1: Student will demonstrate his/her mastery of the four principle disciplines: analytical, organic, physical, and inorganic chemistry	A				A		A	A			A			A		
year of assessment (1-3 means you <u>may</u> be collecting data every year anyway….ACS exam or common final exam question).	1-3				1-3		**1-3**	1-3			1-3			**1-3**		
LO#2: Students will recognize and understand the concepts and skills learned in prerequisite courses at or before the start of the new course or laboratory								A			A					
year of assessment								2			2					
LO#3: Students or student teams will demonstrate excellent problem solving skills in performing a broad variety of analytical, computational and synthetic procedures using proper safety protocols, and will critically evaluate the results (i.e. Lab Practical)							A		A			A				
year of assessment							1-3		2			2				
LO#4: Students will demonstrate effective scientific communications skills in both written and oral form. Students will be able to write reports and present results while following professional policies regarding intellectual property, plagiarism, and group work						A	A		A	A	A	A	A	A	A	
year of assessment (written or oral)						2	**2-3**		**3**	2	**3**	**3**	**3**	**3**	2	
LO#5: Students will be encouraged and recognized when they go beyond the minimum requirements .. via semester or summer-long activities that apply the knowledge gained in the discipline, such as research at															A	

BS Chem Curriculum Map: LO#1 and LO#4 assessed in Year 3 (AY 18-19)

Chemistry Program Learning Outcomes **A=Assessed**	**113**	**114L**	**230**	**232L**	**231**	**234L**	**260**	**340/341**	**3XX**	**332**	**350/351**	**352L**	**410**	**420/320**	**397**	**Electives**
Year 1: AY 16-17 **Year 2: AY 17-18** **Year 3: AY 18-19**	**General II**	**General Lab II**	**Organic I**	**Organic Lab I**	**Organic II**	**Organic Lab II**	**Analytical + Lab**	**Physical**	**Advanced Organic Lab**	**Medicinal**	**Biochemistry I/II**	**Biochemistry Lab**	**Integrated Lab**	**Inorganic**	**Research**	
USF, NSF-REU, internships, paid science positions, ongoing outreach/teaching or PLTL leadership.																
year of assessment															1-3	

Chem 260 GC Beer Report 2019
CHEMISTRY LAB REPORT GRADING RUBRIC (adapted by Dr. Margerum, USF from Professor Susan Young, Hartwick College)

Student name: _____9 categories X 4 =36; Rubric Score= _____ Canvas Score = 80 pts x %Rubric: _____

	Beginning or incomplete 1	Developing 2	Accomplished 3	Exemplary 4	Score
Title	Title page is missing	Several aspects of title page are missing	Title page is present some information missing.	Title page present, with name, class and date.	
Introduction	Very little background information provided or information is incorrect. Missing the Goal of experiment or hypothesis being tested	Some introductory information, but still missing some major points. Goal of experiment or hypothesis is not clear.	Introduction is nearly complete, missing some minor points. Goal of experiment or hypothesis being test is there, but too general	Introduction complete and well-written; provides all necessary background principles for the experiment. Goal of experiment or hypothesis being tested clearly stated	
Methods Materials (or Experimental)	Missing several important experimental details or not written in paragraph format	Written in paragraph format, still missing some important experimental details. Paragraphs not all in passive/past tense.	Written in paragraph format, important experimental details are covered, some minor details missing. Most all in passive/past tense	Well-written in paragraph format, all experimental details are covered, passive/past tense voice.	
Figures Graphs Tables (including formatting)	Figures, graphs, tables contain errors or are poorly constructed, have missing titles, captions or numbers, units missing or incorrect, etc.	Most figures, graphs, tables OK, some still missing some important or required features. Incomplete titles and captions.	All figures, graphs, tables are correctly drawn, but some have minor problems or could still be improved (i.e. descriptive captions). <u>One or more wrong</u>: titles above tables; descriptive captions below figures	All figures, graphs, tables are correctly drawn, are numbered and contain titles above tables and descriptive captions below figures.	
Results	Very incomplete or incorrect interpretation of trends and comparison of data to a larger body of work indicating a lack of understanding of results. Tables/graphs/figures not placed after written introduction	Some of the results have been correctly interpreted and discussed; partial but incomplete understanding of results is still evident. Not all Tables, graphs, figures placed after a written introduction to them.	Almost all results have been correctly interpreted, are discussed, only minor improvements are needed. Tables/graphs/figures placed after written introduction.	All important trends and data comparisons to larger bodies of work have been interpreted correctly and discussed, good understanding of results is conveyed. Tables/graphs/figures placed after written introduction.	
Discussion Conclusions/Error analysis	Discussion mostly missing or missing many important points Error analysis very weak or missing.	Discussion regarding major points drawn, but are misstated, indicating a lack of understanding. Errors stated, but minor & do not state how things would change.	All important conclusions have been drawn, could be better stated. Errors explained but weakly state how results might change	All important conclusions have been clearly made, student shows good understanding. Errors explained and state how results might change	
Spelling Grammar Sentence structure	Frequent grammar and/or spelling errors, writing style is rough and immature	Occasional grammar/spelling errors, generally readable with some rough spots in writing style. Overuse of "I", "we"	Fewer grammar/spelling errors, mature, readable style. Some use of "I", "we"	All grammar/spelling correct and very well-written. No use of personal pronouns "I", "we"	
Appearance Formatting (heading, sections, page # and font/margins) Documented LINEST appendix.	Sections out of order, too much handwritten copy, sloppy formatting, pages are not numbered	Sections in order, contains the minimum allowable amount of handwritten copy, page numbers could be missing, formatting is rough but readable. **LINEST not as appendix**	All sections in order, pages are numbered, formatting generally good but could still be improved. Mostly documented LINEST appendix.	All sections in order, well-formatted, pages are numbered, very readable. **Fully documented LINEST appendix**	
References: only 2 styles accepted; superscript[1] or bracket citations [1]. Numbered list at end.	Did not include any information from other sources ["do not reference lab handout"]	Included information from only one additional source other than lab manual or lab book	Included information from multiple additional sources other than lab manual or lab book but formatting is inconsistent or not in an accepted style	Included information from multiple sources other than lab manual or lab book and formatting is consistent and appropriate	

Grading Rubric for Lab Project 1 **Student Name: _____**

I. Introduction (one paragraph, no background or theory needed for short report)
   A. State the purpose of your experiments (what question are you trying to answer and by what methods?).
   B. Do a general search and find one interesting journal article/application of QDs. In 1-2 paragraphs summarize the application you found and why it is important. (Provide the reference source formatted with--*superscript # in text = citation; numbered list at end are the references*. This is ACS reference style---look it up!)

II. Experimental Methods (How did you prepare and analyze your quantum dots?)
   A. How where your quantum dots synthesized?
   B. How were your quantum dots analyzed? What instruments did you use? Name, model number, e.t.c.
   C. Past Tense?

III. Results and Discussion (what did you find and what does it mean. Each result will be introduced in complete sentences first)
   A. State how you isolated small particles from large particles and the solvent composition of each of these samples for spectroscopic analysis.
   B. Photos of all products under UV light excitation in some sort of logical order.
      - What did you find?
      - What does it mean?
   C. Overlay of two Emission Spectra of your CsPbX3 preparations (on the same plot): small QDs vs. large QDs.
      - What did you find?
      - What does it mean?
   D. Emission spectra of the five kinds of small QDs on the same plot.
      - What did you find?
      - What does it mean?
   E. Emission spectra of the five kinds of large QDs on the same plot.
      - What did you find?
      - What does it mean?
   F. A summary table of pooled class results: Type of QD in solution, PL peak (nm), Eg (band gap in eV) from PL, and full width at half-height (FWHH) (nm).
   G. For each figure/table, state what you found. Establish correlations between results described in different figures where possible. Do the results support each other?
   H. What is the band gap and what does it tell you about the different quantum dots?
   I. What is the FWHH and what does it tell you about the quality of the samples?
   J. Are there any results that are inconclusive or of poor quality?

IV. Conclusions
   A. Summarize how the composition of the quantum dots affect their spectroscopic/band gap energies. Propose some sort of logical order based on halides.
   B. Summarize other observations made about the quality of the samples.
   C. Highlight areas where data was inconclusive.
   D. Tie your results back to the concept of photovoltaics. In other words, based on the results obtained, which type of QD would you expect to have the best semi-conducting/photovoltaic properties?

V. References Cited Properly

VI. Grammar

CHEM 320_F18

Poster Presentation Evaluation

Group Project Title:

Group Members	
Member 1	
Member 2	
Member 3	
Member 4	

RATINGS	1 = Poor	2 = Fair	3 = Satisfactory	4 = Good	5 = Excellent
Quality of Slides	☐	☐	☐	☐	☐
Comments					
Quality of Content	☐	☐	☐	☐	☐
Comments					
Organization and Cohesiveness	☐	☐	☐	☐	☐
Comments					
Delivery as a Team	☐	☐	☐	☐	☐
Comments					
Quality and Citation of Sources	☐	☐	☐	☐	☐
Comments					
Response to Questions	☐	☐	☐	☐	☐
Comments					
Overall Score *(sum the rating numbers above)*					

Name:

(D range) 60-69	(C range) 70-79	(B range) 80-89	(A range) 90-100
Does not demonstrate knowledge of scientific problem; Isn't set within greater scientific context	Scientific Problem not clearly articulated, and may not be directly linked to the experiment performed; Weak link to greater scientific context	Clearly articulates scientific problem; Provides some link to greater scientific context	Clearly articulates scientific problem; Strong link to greater scientific context
Significant errors in data interpretation	Some errors in data analysis indicating a lack of understanding	Few errors in data analysis indicating good understanding	Data analysis complete, demonstrating significant understanding
Significant data missing and/or confusingly presented	Some data missing or disorganized	Adequate and relatively complete presentation of data	Outstanding presentation of data with few ambiguities
Dominated by stylistic problems ambiguity leading to difficulty in reader understanding	Problems in expression and organization; Portions display ambiguity leading to difficulty in reader understanding of concepts/data	Good style; Clearly organized; Mostly easy to understand explanations of concepts/data	Clear, very well-expressed style; Clearly organized; Consistently easy to understand explanations of concepts/data
Multiple Figures/Schemes missing	Some Figures/Schemes missing and/or do not clearly enhance understanding of text	All Figures/Schemes included and clearly relate to the text; Some errors in Figure/Scheme presentation	Figures/Schemes clearly relate to text; No errors in Figure/Scheme presentation
Dominated by mechanical/careless errors/missing sections/parts	Frequent mechanical/careless errors/missing some sections/parts	Occasional mechanical/careless errors	Few, if any, mechanical/careless errors

FORMAL LAB REPORTS

Peer Review Evaluation

A fair and honest assessment of this report will be of valuable assistance to the author during revision. Place a √ under the 'response scale' that you find most appropriate for each question, then leave some at least one general comment (i.e. strengths & weaknesses) below each section. Your responses will be anonymous to the authors (but not to me). Your peer review report is worth 10% of your course grade. **The formal lab report/full paper you will peer review will be available from me on Monday, April 22nd during my office hours (12:30-2:00). Your Peer Review Evaluation is due Thursday, April 25th by 5:00 in my mailbox in the chemistry office**.

A. Abstract

	Absolutely	Mostly	Somewhat	No	N/A
Is the purpose of the experiment clearly expressed?					
Does it succinctly state the principle result(s) of their experiment(s)?					
Does it clearly state the major conclusion of the experiment?					
Does it have a clear graphical component (i.e., figure) that expresses the purpose of the experiment?					

General comments on the **abstract:**

B. Introduction

	Absolutely	Mostly	Somewhat	No	N/A
Does the introduction discuss a *specific* example of the current interest/importance/utility of the topic to organic chemists and include an appropriate scheme/figure.					
Is the specific scientific purpose (scientific problem) of the experiment(s) clearly communicated?					
Are the synthetic and analysis methods for elucidating the experimental purpose mentioned?					
Are their appropriate references/citations?					
Do all schemes follow the JOC Guidelines (i.e. style, numbering, titles)?					
	Absolutely	**Mostly**	**Somewhat**	**No**	**N/A**

General comments on the **introduction**:

C. Results & Discussion

	Absolutely	Mostly	Somewhat	No	N/A
Are all relevant data included?					
Is each piece of data presented in the most appropriate manner (i.e. plain text, table, graph, figure)?					
Do all tables, figures, schemes, graphs follow JOC Guidelines (i.e. number & caption/title, column headings, etc.)					
Were all spectra appropriately and clearly labeled based on a figure of a chemical structure.					
Were all spectra clearly formatted and, where appropriate, peak picked, integrated, expanded, inset, etc.					
Does a narrative (i.e., written) analysis accompany each piece/set of data?					

General comments on **results & discussion**:

D. Conclusion

	Absolutely	Mostly	Somewhat	No	N/A
Were the compounds synthesized and analysis methods mentioned?					
Was there an assessment of how well the experiment answered the scientific problem?					
Are corrective and/or follow-up experiments suggested?					

General comments on the **conclusion**:

E. Experimental

	Absolutely	Mostly	Somewhat	No	N/A
Does it include a general section with specific information on instruments/NMR solvents and standards, etc.?					
Is it written in the past tense passive voice?					
Are all compounds synthesized included with proper headings that include their name and assigned number (based on the figures)?					
Are the amounts of all materials utilized in the reaction included parenthetically?					
Were moles included for all starting materials and reagents?					
Are the monitoring (typically TLC) and purification methods (i.e., column, recrystallization, etc.) mentioned with appropriate parameters (i.e., solvents)?					
Are all pieces of analytical data reported (MP, IR, NMR, GC)					

General comments on **experimental**:

F. References

	Absolutely	Mostly	Somewhat	No	N/A
Are the references appropriately cited in-text (with superscripts)?					
Are the references appropriately formatted at the end of the paper?					

General comments on **references**:

G. Please also include comments on the clarity of the writing. Was it easy to figure out what the writer was communicating? Was the writing mostly grammatically correct? Was there a significant number of typos and spelling errors?

RUBRIC(S)

CHEM 351 Biochemistry II Capstone Project Rubric

1 Strongly Disagree; 2 Disagree; 3 Neither Agree or Disagree; 4 Agree; 5 Strongly Agree

Student Names: _____

Score (out of 5)

1. **Connections are laid-out between structure, function, and biological role:**
   The presenters clearly explained the relationship between the structural features of the molecule to its function in the context of the biological process and in the associated disease (if relevant). ☐

2. **Overall layout is logical:**
   The presenters focused on the most relevant information (without tangential details) in a logical, concise manner. ☐

3. **Comprehension of main points is evident:**
   The presenters demonstrated appropriate command of the relevant biochemical concepts and tools (explaining structure, biochemical data, answering questions). ☐

4. **Suitable usage of resources:**
   The presenters clearly synthesized information from primary and secondary literature (poster content, presentation, answering questions). ☐

5. **Overall effect:**
   The presenters designed a visually appealing, easy-to-read poster with all appropriate content (text readable, no typos, images clear and scaled appropriately, graphs labeled, references included, etc). ☐

6. **Strengths of the presentation:**

7. **Suggestions for improving the presentation:**

Total score

☐

CHEM 352 Report Rubric

RUBRIC(S)

A lab report will contain some or all of the following information, depending on the lab. The "Lab Report Requirements" section of each lab handout gives specific points about what to include in the lab report regarding data presentation, analysis, and discussion.

1. ***Introduction*** *(10 pts)* – Write one or two paragraphs that explain the relevance, motivation, and background of your experiment. If you cite outside sources in your introduction (or in later sections) use the reference format for a *Biochemistry* journal article.

2. ***Methods*** *(10 pts)* – This section should be written in the style of a *Biochemistry* journal methods section. This means that you will explain clearly and briefly how you carried out your experiments. Your audience is an experienced biochemist who understands basic techniques, thus the Methods section is not a step-by-step, directive protocol. In general, provide enough quantitative detail (how much, how long, when, etc.) about your experimental protocol such that other experienced scientists could reproduce your experiments. Be sure to provide detailed information in cases where you do a bit of your own "experimental design," or if you deviated from the printed procedure or if you need to explain why something did not work as expected. Use third person, past tense, and either active or passive voice.

3. ***Results*** *(20 pts)* – This section should be written in the style of a *Biochemistry* journal results section. This means that you will objectively present your key results, without interpretation, in an orderly and logical sequence using both text and illustrative materials (Tables and Figures). A well-written results section will:

    a. Begin with text that very briefly summarizes the methods used to obtain the results being presented. This text gives context to the section so that it is clear what is being reported even in the absence of an introduction section.

    b. Include text reporting the key results and referring to figures and tables. Text is concise, objective, appropriately sophisticated, and written in the past tense.

    c. Include Tables and/or Figures which present data in a clear, visual manner. Tables and figures are numbered appropriately and are accompanied by titles and figure captions.

4. ***Discussion*** *(10 pts)* —In paragraph form, answer the questions given in the lab handout. You may use online and text resources to help you to answer these questions, but be sure to cite your sources.

CHEM 352 In-class presentations Name of Presenter: _____ Total Score (out of 80): _____

	Meets standard completely	Meets standard almost entirely	Meets standard for a portion of criteria	Does not meet standard	Score
Language Use and Delivery The student communicates ideas effectively (10 points)	○ Effectively uses eye contact ○ Speaks clearly, effectively and confidently using suitable volume and pace ○ Fully engages audience	○ Maintains eye contact ○ Speaks clearly and uses suitable volume and pace ○ Takes steps to engage audience	○ Some eye contact but not maintained ○ Speaks clearly and unclearly in different portions ○ Occasionally engages audience	○ Uses eye contact ineffectively ○ Fails to speak clearly and audibly and uses unsuitable pace ○ Does not engage audience	
Organization and Preparation The student exhibits logical organization and presents clear slides (30 points)	○ Introduces the topic clearly and with ownership ○ Maintains a clear focus on the topic ○ Effectively includes smooth transitions to connect key points ○ Ends with logical, effective and relevant conclusion ○ 5-8 slides, 10-15 minutes long ○ All slides enhance presentation, are easy to read and understand	○ Introduces the topic clearly ○ Maintains a focus on the topic ○ Includes transitions to connect key points ○ Ends with a coherent conclusion ○ 5-8 slides, 10-15 minutes long ○ 80% of the slides are easy to read and understand	○ Introduces the topic ○ Somewhat maintains a focus on the topic ○ Includes some transitions to connect key points ○ Ends with a conclusion ○ 1-2 slides too many or too few ○ 50% of the slides are easy to read and understand; others have too much info, illegible font, or distracting animations	○ Does not clearly introduce the topic ○ Does not establish or maintain focus on the topic ○ Uses ineffective transitions that rarely connect points ○ Ends without a conclusion ○ 2-3 too many or too few slides ○ 80% of the slides are difficult to read and understand; too much info, illegible font, and distracting animations	
Content The student effectively conveys the content and significance of the paper (40 points)	○ Clearly communicates the necessary background for the topic ○ Convincingly explains why the topic is important to study ○ Relates the unknown portions of the topic to the questions addressed by the authors ○ Effectively explains, in appropriate detail, the technique(s) used in generating the data ○ Accurately explains one data figure in great detail ○ Clearly relates how the data support the authors' conclusion(s) ○ Explains why the paper is of interest to the presenter	○ Communicates the necessary background for the topic ○ Defines why the topic is important to study ○ Defines the questions addressed by the authors ○ Explains the technique(s) used in generating the data with partial detail ○ Accurately explains one data figure in adequate detail ○ Includes how the data relates to the authors' conclusion(s) ○ Explains why the paper is of interest to the presenter	○ Communicates some background for the topic ○ Somewhat defines why the topic is important to study ○ Lists the questions addressed by the authors ○ Introduces the technique used in generating the data but does not explain the technique adequately ○ Explains one data figure with some accuracy and partial detail ○ Lists the authors' conclusion(s) but does not explain how data supports the conclusion ○ Does not explain why the paper is of interest	○ Does not include background for the topic ○ Fails to explain why the topic is important to study ○ Does not clearly introduce the questions addressed by the authors ○ Fails to clearly explain the technique(s) used ○ Incorrectly explains the data presented in the figure. ○ Does not relate the data to the authors' conclusion(s) ○ Does not explain why the paper is of interest to the presenter	

CHEM 410 Final Report Rubric

Name:

Report Sections	Points Earned	Points Possible
General Formatting		**10 Total**
Introduction:		**10 total**
Experimental:		**15 total**
Results/Disc./Conclusion:		**45 total**
Style/Grammar/Spelling:		**10 total**
How did it read?		**10 total**
TOTAL		**Out of 100 total**