

# **CSM**

## **Chemistry BS, BA Programs**

### **Student Outcomes Assessment Plan (SOAP)**

#### **I. Mission Statement**

The mission of the Department of Chemistry is to provide students with the appropriate level of modern and comprehensive chemical education required for life and work in our technologically advanced society. To accomplish this the department offers courses for students planning to be professional chemists, for students planning careers in the medical professions and careers in teaching, for students requiring a basic chemical science background for other majors, and for students fulfilling their general education science requirements.

The mission of the BS Chemistry degree program is to provide students interested in pursuing careers in chemical research, industry, and education with a strong foundation of theory, practical lab skills, and research experiences across analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, and physical chemistry.

The mission of the BA Chemistry degree program is to provide students interested in pursuing careers in medicine, pharmacy, dentistry, and other health professions with a broad background in chemistry, biochemistry, and biology related to human health.

#### **II. Goals and Student Learning Outcomes**

The Department of Chemistry's expectations for student learning are based on the six accreditation standards outlined for undergraduate programs in chemistry by the American Chemical Society (ACS) and their curriculum requirements.

BS Chemistry Students will develop competence in broad areas of chemistry, biology, physics, and mathematics with emphasis in organic, analytical, physical, inorganic, and biochemistry and demonstrate the application of these concepts and theories in meeting these learning outcomes:

BA Chemistry Students will develop competence in broad areas of chemistry, biology, physics, and mathematics with emphasis in organic, biochemistry, and cellular and molecular biology and demonstrate the application of these concepts and theories in meeting these learning outcomes:

1. Students will apply their understanding of terminology, concepts, theories, and skills to solve problems by defining problems and research questions clearly, formulating testable hypotheses, designing and conducting experimental tests of hypotheses, analyzing and interpreting data, and drawing appropriate conclusions within professional ethical guidelines. (ACS Standards 7.1 & 7.6)
2. Students will demonstrate the ability to conduct laboratory work of high quality including handling chemicals and other laboratory hazards in a safe, ethical, and socially responsible manner, keeping accurate, clear, concise, and complete records of their laboratory work in a notebook, properly using standard laboratory equipment and instruments, and evaluating the

reliability and significance of laboratory data, all within professional ethical guidelines. (ACS Standards 7.1, 7.3, 7.6)

3. Students will complete a literature search in one or more of the five chemical sub disciplines by using common literature search techniques and tools to find recent journal articles from the peer-reviewed literature, critically read these articles to extract relevant information, and communicate the significance of these articles in written or oral formats within professional ethical guidelines. (ACS Standards 7.2 & 7.6)
4. Students will demonstrate the ability to clearly and effectively communicate their scientific results and opinions using written formats while following professional style and format conventions within professional ethical guidelines. (ACS Standards 7.4 & 7.6)
5. Students will demonstrate the ability to clearly and effectively communicate their scientific results and opinions using oral formats while following professional style and format conventions within professional ethical guidelines. (ACS Standards 7.4 & 7.6)
6. Students will demonstrate the ability to function effectively in collaborative and group work environments including the ability to work on a component of a larger project and connect work with previous results within professional ethical standards. (ACS Standard 7.5 & 7.6)

### III. Curriculum Map (Matrix of Courses X Learning Outcomes)

#### BS Chemistry Program Curriculum Map

This table provides information regarding how the outlined student learning outcomes are introduced (I), developed (D), and mastered (M) as students progress through the curriculum. Primary points of assessment are marked (\*).

	1Alec	1ALab	1Blec	1Blab	128A	128B	129A	129B	102	110A	110B	111	123	124	155A	106
1	I	D	I	D	I	D	D	D	D	D	D	M*	D	M*	D	M*
2		I		I			D	D	D			M*		M*		M*
3	I	I	I	I	I	I	D	M	D	D	D	M*	M	M*	D	M
4				I				D	D			M*	D	M*		M*
5				I				D				M*		M*		M*
6		I		D								M*		M*		M*

## BA Chemistry Program Curriculum Map

This table provides information regarding how the outlined student learning outcomes are introduced (I), developed (D), and mastered (M) as students progress through the curriculum. Primary points of assessment are marked (\*).

	1Alec	1Alab	1Blec	1Blab	128A	128B	129A	129B	102	108	155A	155B	156
1	I	D	I	D	I	D	D	D	D	D	D	D	M*
2		I		I			D	M*	D				M*
3	I	I	I	I	I	I	D	M*	D	D	D	D	M*
4								D	D				M*
5				I				D					M*
6		I		D							D		M*

## IV. Assessment Methods

### Direct Measures

A set of common rubrics will be used for both grading and assessment at the program level. The intent is to use rubrics to help students understand departmental expectation, to gauge student progress over time, and to provide a basis for faculty discussions concerning possible areas for program improvement. In most cases these rubric lines will be incorporated into a course specific rubric that contains additional elements specific to the course learning outcomes and expectations.

**A1. Laboratory Report Rubric** – This rubric will be used to assess full laboratory reports for the quality of writing (section 1) and experimental design and data analysis (section 2). When used for program assessment, a minimum of 15% of the class or four students (whichever is less) are scored by two or more faculty members to ensure consistent application of the rubric. Each student passing the course is expected to earn an average of 1.5 of 3 with no more than one poor (0) score.

**A2. Laboratory Notebook Rubric** – This rubric will be used by instructors to provide feedback to students and assess the quality of the students' laboratory notebooks and record keeping. It may be applied to individual laboratories or to the notebook as a

whole. When used for program assessment, a minimum of 15% of the class or four students (whichever is less) are scored by two or more faculty members to ensure consistent application of the rubric. Each student passing the course is expected to earn an average of 1.5 of 3 with no more than one poor (0) score.

- A3. Instructor Evaluation Rubric – This rubric will be applied primarily in laboratory courses as a check on the quality and ethics of student laboratory work along with their ability to function in teamwork and collaborative assignments. When used for program assessment, a minimum of 15% of the class or four students (whichever is less) are scored by two or more faculty members to ensure consistent application of the rubric. Each student passing the course is expected to earn an average of 1.5 of 3 with no more than one poor (0) score.
- A4. Literature Search Rubric – This rubric outlines expectations for a literature search and review that may be completed as an independent assignment or as part of larger written reports or oral presentations. When used for program assessment, a minimum of 15% of the class or four assignments (whichever is less) are scored by two or more faculty members to ensure consistent application of the rubric. Each student passing the course is expected to earn an average score of 1.5 of 3 with no more than one poor (0) score.
- A5. Undergraduate Student Presentation Rubric – This rubric will be used to provide feedback on oral and poster presentations. When used for program assessment, a minimum of 15% of the class or four students (whichever is less) are scored by two or more faculty members to ensure consistent application of the rubric. Each student passing the course is expected to earn an average score of 1.5 of 3 with no more than one poor (0) score.

#### Indirect Measures

- B1. On a periodic basis the department will solicit feedback on graduate skills from alumni and their employers using either surveys or focus groups. These mechanisms may allow the department to reevaluate the target student outcomes to match changing needs in the chemistry community. The department expects that all numerical responses on this survey will be a 3 or higher and that written responses will be generally positive, yet constructive in improving department programs.
- B2. The department will ask for feedback from graduating students using surveys or focus groups to evaluate their perception of whether the degree has adequately prepared them for their chosen career. This may include job placement and graduate/professional school admission rates. The department expects that all numerical responses on this survey will be a 3 or higher and that written responses will be generally positive, yet constructive in improving department programs.
- B3. The department will periodically hold a focus group with existing chemistry majors and chemistry club members. This will provide an opportunity to identify emerging problems quickly before they show up in tracked data. The department expects that

student responses will be generally positive, yet constructive in improving department programs.

B4. The department will periodically collect feedback from faculty and instructors on their perceptions of student strengths and weaknesses.

## **V. Student Learning Outcomes X Assessment Methods Matrix**

This table provides information regarding how the outlined student learning outcomes will be assessed. Methods that provide direct (D) or indirect (I) evidence are indicated.

		A1 – Laboratory Report Rubric (Sec 1)		A1 – Laboratory Report Rubric (Sec 2)		A2 – Laboratory Notebook Rubric		A3 – Instructor Evaluation Rubric		A4 – Literature Search Rubric		A5 – Student Presentation Rubric		B1 – Alumni and Employers		B2 – Graduating Students		B3 – Current Students		B4 – Faculty and Instructors
1		D										I		I		I		I		I
2			D	D								I		I		I		I		I
3					D							I		I		I		I		I
4	D											I		I		I		I		I
5							D					I		I		I		I		I
6					D							I		I		I		I		I

## **VI. Timeline for Implementation of Assessment Methods and Summary Evaluations**

The majority of data is collected on an annual basis with the exception of methods B1-B3 which are conducted as outlined below. Data is reviewed by the department assessment committee on a timeline based on the department's external program review cycle, repeating each five to seven years beginning with the year following the completion of the department's self-study.

### **First Year (AY 2012-2013) – Writing Skills**

Method A1 – Laboratory Report Rubric (section 1)

Method B3 – Current Students Focus Group

Method B4 – Faculty Feedback on Writing Skills

**Second Year (AY 2013-2014) – Presentation Skills**

Method A5 – Undergraduate Student Presentations Rubric

Method B4 – Faculty Feedback on Oral Presentation Skills

**Third Year (AY 2014-2015) – Experimental Design**

Method A1 – Laboratory Report Rubric (section 2)

Method B2 – Graduating Students Focus Group

Method B4 – Faculty Feedback on Experimental Design

**Fourth Year (AY 2015-2016) – Laboratory Skills, Recordkeeping, and Teamwork**

Method A2 & A3 – Laboratory Notebook and Instructor Evaluation Rubrics

Method B1 – Employer Focus Group

Method B4 – Faculty Feedback on Laboratory Performance

**Fifth Year (AY 2016-2017) – Literature Review Rubric**

Method A4 – Literature Review Rubric

Method B4 – Faculty Feedback on Literature Review

Method B4 – Faculty Self Study including Full Curriculum Review

## **VII. Process for Closing the Loop**

The Assessment Committee will be responsible for collecting and summarizing assessment data each semester. Assessment results will be reported at regular department meetings. Near the end of each spring semester, a department meeting will be dedicated to reviewing assessment results, determining what changes, if any, the results suggest, and adjusting the next year's assessment activities as needed. The minutes of this meeting will provide the basis for the department chair's annual report on assessment activities.

## **VIII. Appendix and Supporting Documents**

Appendix A1 – Laboratory Report Rubric

Appendix A2 – Laboratory Notebook Rubric

Appendix A3 – Instructor Evaluation Rubric

Appendix A4 – Literature Search Rubric

Appendix A5 – Undergraduate Student Presentations Rubric

Appendix B1 – Alumni & Employer Survey Questions

Appendix B2 – Graduating Students Survey Questions

Appendix B3 – Example Current Students Focus Group Questions

## Appendix A1 – Laboratory Report Rubric

### 1. Writing Mechanics

#### 1A. Grammar and Structure

*Excellent (3 pt.):* The report is free of grammar and spelling errors. Paragraph structure is appropriate and provides clear organization and transitions.

#### 1B. Style Conventions

*Excellent (3 pt.):* The report closely follows professional style conventions for the use of verb tenses, passive voice, 1<sup>st</sup> or 3<sup>rd</sup> person, and chemical nomenclature.

#### 1C. Clarity and Accuracy

*Excellent (3 pt.):* Word choice and sentence structures make the writing both clear and concise while providing an accurate and unambiguous description of what was done and its significance.

#### 1D. Organization Using Report Sections

*Excellent (3 pt.):* Report content is organized using conventional report headings appropriate to the sub discipline (e.g. Abstract, Introduction, Methods, Results, Conclusions, and References) and each section contains the appropriate content.

#### 1E. Figures and Tables

*Excellent (3 pt.):* Figures and tables are included when appropriate. Labels and captions follow style conventions. All figures and tables are referenced and discussed in the text of the report.

### 2. Experimental Design and Data Analysis

#### 2A. Background and Hypothesis

*Excellent (3 pt.):* The introduction provides appropriate background for the topic leading to a clearly defined research problem or question with a clear and testable hypothesis.

#### 2B. Experimental Design

*Excellent (3 pt.):* Appropriate experimental or computational methods have been selected / designed to test the hypothesis. The strengths and limitations of the selected methods have been discussed and addressed using complementary methods or appropriate quality control samples (standards, blanks, ...) to ensure the accuracy of results.

#### 2C. Data Collection and Quality

*Excellent (3 pt.):* Careful experimentation and record keeping has provided data of high quality and reliability capable of standing up to rigorous review. *<Instructor: add assignment specific expectations on how this will be evaluated such as linearity of calibrations, accuracy determined using unknowns, or precision of data. >*

#### 2D. Data Processing and Reporting

*Excellent (3 pt.):* Raw data is processed (calculations, statistics, etc.) appropriately, key results have been identified, and presented clearly using text, tables, or graphs. The handling and reporting of data meet professional style and ethical guidelines.

#### 2E. Data Analysis and Conclusions

*Excellent (3 pt.):* The significance and limitations of the reported results are discussed in a way that the conclusions are clear, supported by the experimental data, and not misleading or subject to misinterpretation.

## Appendix A2 – Laboratory Notebook Rubric

### 1. Organization

#### 1A. Required Elements

*Excellent (3 pt.):* Every page contains an appropriate title, date, student name, consecutive page numbers, and a signature at the bottom of the page.

#### 1B. Entries

*Excellent (3 pt.):* All entries are in ink, made at the time work was conducted (not transcribed), and errors are corrected using single line strikeouts rather than erasure, whiteout, or obliteration.

#### 1C. Sections

*Excellent (3 pt.):* Each laboratory entry is divided clearly into titled pre-, in-, and post-lab sections with appropriate subsections as required in the course lab policies or the laboratory instructions. The table of contents includes entries for the laboratory and these sections.

### 2. Content

#### 2A. Pre-Laboratory Preparation

*Excellent (3 pt.):* The pre-lab is well written, organized, and neat. It contains all required elements: title, introduction, chemicals table, equations/reactions, and anticipated procedure. Appropriate references including MSDS, CRC, and other sources have been used and cited for chemical and safety information.

#### 2B. Procedure (In-Lab)

*Excellent (3 pt.):* The in-lab section contains a thorough and clear procedure that describes the *actual* experience in the laboratory. Deviations, modifications, and errors are recorded in a chronological sequence of events. Any in-laboratory calculations, such as adjustments to the amount or reagents to use are shown clearly.

#### 2C. Observations (In-Lab)

*Excellent (3 pt.):* Observations are plentiful and clearly noted for each experiment with details including color changes, precipitation, temp., etc. Data is recorded directly into the laboratory notebook and is both organized and clearly labeled.

#### 2D. Calculations and Conclusions

*Excellent (3 pt.):* All required calculations are complete and correct including the evaluation of experimental error or uncertainty. A written conclusion is present that shows a thorough and accurate analysis of the data and its significance. This includes evaluation of the question or hypothesis tested in the experiment. This conclusion includes answers to any post-lab questions.

*Note: the level of organization and grammar and spelling expected in a notebook entry is not the same as the level expected in a written report. It is critical that you record information directly into your notebook and not recopy it at home after the lab. In writing a report you have the opportunity for revision.*

## **Appendix A3 – Laboratory Instructor Evaluation**

### **1. Citizenship**

#### **1A. Punctuality & Preparation**

*Excellent (3 pt.):* The student consistently arrives for the laboratory on-time and prepared for work and then stays until their work and preliminary calculations are complete.

#### **1B. Use of Shared Chemicals and Equipment**

*Excellent (3 pt.):* The student is a good citizen in the use of shared materials by avoiding taking excess of the materials, returning containers to their proper location, refilling reagents as needed, emptying waste as needed, leaving shared equipment clean and orderly, and leaving their work area clear and clean at the end of the laboratory period.

#### **1C. Contribution to Group Work and Problem Solving**

*Excellent (3 pt.):* The student is supportive of the instructor and other students. They work effectively with other students on group work and tasks by both contributing and allowing others to contribute to the project. They participate meaningfully in helping address problems that arise during the laboratory period.

### **2. Chemical Knowledge and Safety**

#### **2A. Attire and Personal Protective Equipment (PPE)**

*Excellent (3 pt.):* The student consistently dresses appropriately for lab work and wears the required PPE, particularly safety glasses, at all times.

#### **2B. Clean and Safe Work Area**

*Excellent (3 pt.):* The student keeps their work area free of chemical spills and hazards such as undue clutter, properly secured reaction setups, appropriate labeling of chemicals, and prompt disposal of waste.

#### **2C. Chemical Handling and Waste Disposal**

*Excellent (3 pt.):* The student demonstrates an understanding of the chemicals they are using through their handling of the chemicals and the proper disposal of chemicals and reaction waste.

### **3. Laboratory Technique**

#### **3A. Technique**

*Excellent (3 pt.):* The student develops and demonstrates good laboratory technique including the efficient and effective use of laboratory glassware and instrumentation.

## Appendix A4 – Literature Search Rubric

Student's Name: \_\_\_\_\_ Faculty's Name: \_\_\_\_\_ Date \_\_\_\_\_

### 1. Articles

#### 1A. Sources

*Excellent (3 pt.):* Student has cited **five** or more sources including current articles from the peer-reviewed literature and appropriate reference books. Textbooks and instrument manuals are not acceptable.

#### 1B. Citations

*Excellent (3 pt.):* All citations use appropriate style and formatting conventions including in text attribution of sources and the formatting of the references list.

#### 1C. Scope and Viewpoint

*Excellent (3 pt.):* Cited sources provide an appropriate survey of different viewpoints on the topic and collectively address key aspects of the research question. Articles generally come from different research groups, are typically from different journals, and each contribute something new (not duplicate studies).

#### 1D. Coherence

*Excellent (3 pt.):* All cited sources are clearly relevant to the research question and connected to each other.

### 2. Interpretation

#### 2A. Analysis

*Excellent (3 pt.):* Student has identified salient features and results of the articles related to the student's research question and has not simply relied on the authors' interpretation and conclusion.

#### 2B. Significance and Synthesis

*Excellent (3 pt.):* Student has identified the key differences between each article, their individual significance to the topic, and synthesizes the information in each article to draw appropriate overall conclusions.

## Appendix A5 – Undergraduate Student Presentations – Faculty Evaluation Rubric

Student's Name: \_\_\_\_\_ Faculty's Name: \_\_\_\_\_ Date \_\_\_\_\_

### 1. Content

#### 1A. Background

- Excellent (3 pt.):* The presenter clearly explains the broader context of the topic and its relationship to the presentation. It lays the foundation for the audience to understand the significance and purpose of what follows.
- Good (2 pt.):* The broader context of the presentation topic is explained.
- Satisfactory (1 pt.):* The presenter provides some background to the presentation, but connections to the topic are not clearly made.
- Poor (0 pt.):* The context of the presentation is not explained.

Student Score: \_\_\_\_\_

Written Comments by Evaluating Faculty: \_\_\_\_\_

#### 1B. Statement of Purpose

- Excellent (3 pt.):* The purpose of presentation is clear. Supporting ideas maintain exceptional focus on the topic.
- Good (2 pt.):* Topic of the presentation is clear. Content consistently supports the purpose.
- Satisfactory (1 pt.):* Presentation lacks clear direction.
- Poor (0 pt.):* No clear focus.

Student Score: \_\_\_\_\_

Written Comments by Evaluating Faculty: \_\_\_\_\_

#### 1C. Organization of Material

- Excellent (3 pt.):* Information/ideas are presented in a consistently logical sequence. Transition/connections are eloquent. A strong sense of wholeness is conveyed. The presentation ends with accurate conclusions showing thoughtful, strong evaluation of the evidence presented.
- Good (2 pt.):* Important ideas and information are identified for the audience. Information/ideas are presented in a logical sequence with few lapses. Transitions and connections are made. Closing effectively summarizes the presentation.
- Satisfactory (1 pt.):* Irrelevant, unnecessary information detracts. Big ideas are not specifically identified. There are significant lapses in the order of ideas. Transitions are inconsistent and weak or missing. Closing demonstrates an attempt to summarize.
- Poor (0 pt.):* No clear organization. Ideas do not connect with one another. There are no clear transitions. No closing is evident.

Student Score: \_\_\_\_\_

Written Comments by Evaluating Faculty: \_\_\_\_\_

## Appendix A5 – Undergraduate Student Presentations – Faculty Evaluation Rubric

### 1D. Literature Review & Citation

- Excellent (3 pt.):* Literature review is from appropriate scientific journals, covers the topic in depth, and demonstrates the ability to extract the salient features of the articles.
- Good (2 pt.):* Literature review is from appropriate scientific journals but gives a shallow survey of the literature.
- Satisfactory (1 pt.):* Literature review is from appropriate scientific journals but very few articles are presented.
- Poor (0 pt.):* No scientific journals have been surveyed, only an internet search of popular magazines and sites (e.g. Wikipedia)!

**Student Score:** \_\_\_\_\_

Written Comments by Evaluating Faculty: \_\_\_\_\_

### 2. Presentation

#### 2A. Speaking Ability

- Excellent (3 pt.):* Poised, clear articulation; proper volume; steady rate; enthusiasm; confidence; speaker is clearly comfortable in front of the group. Correct, precise pronunciation of terms. Selects rich and varied words for context and uses correct grammar. Maintains eye contact. Seldom returning to notes. Presentation is like a planned conversation.
- Good (2 pt.):* Clear articulation but not as polished; slightly uncomfortable at times. Student pronounces most words correctly. Selects words appropriate for context and uses correct grammar. Student maintains eye contact most of the time but frequently returns to notes.
- Satisfactory (1 pt.):* Audience occasionally has trouble hearing the presentation. Seems uncomfortable. Student incorrectly pronounces terms. Some eye contact, but not maintained and at least half the time reads from notes or visual aids.
- Poor (0 pt.):* Presenter is obviously anxious and cannot be heard or monotone with little or no expression. Student mumbles, pronounces terms incorrectly. Selects words inappropriate for context. Uses incorrect grammar. Student reads all or most of report with no eye contact.

**Student Score:** \_\_\_\_\_

Written Comments by Evaluating Faculty: \_\_\_\_\_

## **Appendix A5 – Undergraduate Student Presentations – Faculty Evaluation Rubric**

### **2B. Communication Aids (Slides, Poster etc.)**

*Excellent (3 pt.):* Visual aids are readable, attractive and appropriate for the venue. Graphics are clear and professional looking, enhancing the message. Citations are clearly given for the material taken out of scientific literature.

*Good (2 pt.):* Visual aid readable. Graphic is neat. Appropriate graphics are chosen to convey the message.

*Satisfactory (1 pt.):* Visual aid is not completely accessible to all audience members. Graphic may be messy. Visual may not be most appropriate to support presentation.

*Poor (0 pt.):* Visual aid undecipherable. Graphic detracts from message. Messy or inappropriate visuals.

**Student Score:** \_\_\_\_\_

Written Comments by Evaluating Faculty: \_\_\_\_\_

### **2C. Questions & Answers**

*Excellent (3 pt.):* Speaker understands the specific question asked and responds to it concisely. Expands upon previous statements. Cites additional examples to answer a question. Conveys a thorough knowledge of subject.

*Good (2 pt.):* Thoughtful, concise response. Conveys reasonable knowledge of subject.

*Satisfactory (1 pt.):* Response not clear or did not add to comprehension of the listener.

*Poor (0 pt.):* Could not answer questions or answers are irrelevant.

**Student Score:** \_\_\_\_\_

Written Comments by Evaluating Faculty: \_\_\_\_\_

## **Appendix B1 – Employer and Alumni Survey**

*Your confidential survey will be seen by the departmental administrator only. Aggregate data and transcribed comments will be forwarded to the department assessment committee for program improvement purposes.*

Circle one or more:      Employer      Alumni: MS Chem BS Chem BA Chem BA NatSci

Your Name: \_\_\_\_\_

Your Title: \_\_\_\_\_

Your Employer: \_\_\_\_\_

Address: \_\_\_\_\_

E-mail: \_\_\_\_\_ Home Phone: \_\_\_\_\_

Work Phone: \_\_\_\_\_ Cell Phone: \_\_\_\_\_

Number of Fresno State Chemistry Graduates you have worked with: \_\_\_\_\_

Number of Fresno State Chemistry Graduates currently at your company: \_\_\_\_\_

### **QUESTIONS: Rating scale 1 - 5**

*[excellent -5; very good -4; good-3; fair-2; poor-1; or not applicable -NA]*

How do rate the preparation of Fresno State Chemistry graduates in the following areas:

1. Understanding of Chemical Concepts and Information \_\_\_\_\_
2. Ability to Solve of Chemical Problems \_\_\_\_\_
3. Ability to Read and Understand the Chemical Literature \_\_\_\_\_
4. Writing of Chemistry Papers and Reports \_\_\_\_\_
5. Presenting (orally) of Chemistry Papers and Reports \_\_\_\_\_
  
6. Ability to Select Appropriate Experimental Methods \_\_\_\_\_
7. Ability to Read and Follow Procedures or Protocols \_\_\_\_\_
8. Safe and Ethical Handling of Chemicals \_\_\_\_\_
9. Laboratory Skills \_\_\_\_\_
10. Analysis and Understanding of Chemical Data \_\_\_\_\_
  
11. Communicating with Peers and Supervisors \_\_\_\_\_
12. Working in Teams \_\_\_\_\_
13. Working Independently \_\_\_\_\_
14. Ability to Function in Your Company Culture \_\_\_\_\_
  
15. Overall Preparation \_\_\_\_\_

## **Appendix B1 – Employer and Alumni Survey**

What are the strengths of a Fresno State Chemistry degree?

What are the weaknesses of our preparation of students?

What can we improve about the preparation of our graduates?

## **Appendix B1 – Employer and Alumni Survey**

## **Appendix B2 – Graduating Students Survey**

*Your confidential survey will be seen by the departmental administrator only. Aggregate data and transcribed comments will be forwarded to the department assessment committee for program improvement purposes.*

Your Name: \_\_\_\_\_

Current Address: \_\_\_\_\_

Future Address: \_\_\_\_\_

E-mail: \_\_\_\_\_ Home Phone: \_\_\_\_\_

Work Phone: \_\_\_\_\_ Cell Phone: \_\_\_\_\_

Degree Program: \_\_\_\_\_

Research Mentor (if applicable): \_\_\_\_\_

Number of Semester(s) required to complete program: \_\_\_\_\_

Graduation Term: \_\_\_\_\_

### **QUESTIONS: Rating scale 1 - 5**

*[excellent -5; very good -4; good-3; fair-2; poor-1; or not applicable -NA]*

#### Assessing your learning

How do you rate yourself in the following areas:

16. Understanding of Chemical Information \_\_\_\_\_

17. Solving of Chemical Problems \_\_\_\_\_

18. Designing Experiments to Answer Questions \_\_\_\_\_

19. Searching of Chemical Literature \_\_\_\_\_

20. Reading of Chemical Literature \_\_\_\_\_

21. Writing of Chemistry Papers and Reports \_\_\_\_\_

22. Presenting (orally) of Chemistry Papers and Reports \_\_\_\_\_

23. Communicating with faculty and fellow students \_\_\_\_\_

24. Working in teams on projects or labs \_\_\_\_\_

#### Assessing the quality of the MS program

25. The curriculum is \_\_\_\_\_

26. The availability of courses is \_\_\_\_\_

27. The quality of instruction is \_\_\_\_\_

28. The classroom facilities are \_\_\_\_\_

29. The opportunities for interactions with Faculty are \_\_\_\_\_

30. The opportunity for research is \_\_\_\_\_

31. The research facilities are \_\_\_\_\_

32. The research laboratory space is \_\_\_\_\_

33. The overall quality of the program is \_\_\_\_\_

34. The career advising is \_\_\_\_\_

35. The preparation for your intended career is \_\_\_\_\_

## **Appendix B2 – Graduating Students Survey**

What is your plan after graduation?

What is the best educational experience you received in the department?

What is the worst educational experience you received in the department and how the department could have done to improve your departmental experience?

What are the strengths of the department, the staff, the program, the faculty, the courses, and the research facility?

What are the weaknesses of the department, the staff, the program, the faculty, the courses, and the research facility?

Are you satisfied with your educational experience in the chemistry department? Please elaborate.

Can you make suggestions for improvement to the department, the staff, the program, faculty, courses, and facility?

## **Appendix B2 – Graduating Students Survey**

### **Appendix B3 – Example Current Students Focus Group Questions**

1. Do the Chemistry Department faculty care about your success?
2. Do you find Chemistry Faculty to be approachable and available for your questions?
3. Have you received helpful and accurate advising on selecting your degree program when you arrived at Fresno State?
4. Have you received helpful and accurate advising on selecting courses?
5. Have you received helpful and accurate career advising?
6. What is the best educational experience you received in the department?
7. What is the worst educational experience you received in the department and how the department could have done to improve your departmental experience?
8. What are the strengths of the department, the staff, the program, the faculty, the courses, and the research facility?
9. What are the weaknesses of the department, the staff, the program, the faculty, the courses, and the research facility?
10. Are you satisfied with your educational experience in the chemistry department? Please elaborate.
11. Can you make suggestions for improvement to the department, the staff, the program, faculty, courses, and facility?