Academic Program Assessment Report for AY 2019-2020 **Program:** Chemistry

(Due: June 1, 2020) **Date report completed:** 7/1/2020

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Assessment contributors (other faculty involved): Report available for department faculty review

Please describe the 2019-2020 assessment activities and follow-up for your program below. Please complete this form for each undergraduate major, minor, certificate, and graduate program (e.g., B.A., B.S., B.A.S, M.S.) in your department. Please copy any addenda (e.g., rubrics) and paste them in this document, save and submit it to both the Dean of your college/school and to the Executive Director for Assessment as an email attachment by June 1, 2020. You'll also find this form on the assessment website at https://www.csupueblo.edu/assessment-and-student-learning/resources.html. Thank you.

Brief statement of Program mission and goals:

I. Assessment of Student Learning Outcomes (SLOs) in this cycle. Including processes, results, and recommendations for improved student learning. Use Column H to describe improvements planned for 2019-2020 based on the assessment process.

A. Which of the program SLOs were assessed during this cycle? **Please include the outcome(s) verbatim from the assessment plan.**	B. When was this SLO last reported on prior to this cycle? (semester and year)	C. What method was used for assessing the SLO? **Please include a copy of any rubrics used in the assessment process.**	D. Who was assessed? Please fully describe the student group(s) and the number of students or artifacts involved (N).	E. What is the expected proficiency level and how many or what proportion of students should be at that level?	F. What were the results of the assessment? (Include the proportion of students meeting proficiency.)	G. What were the department's conclusions about student performance?	H. What changes/improvements to the program are planned based on this assessment?
Students will exhibit a comprehensive knowledge of the fundamental theories and concepts necessary in the chemical	Data are collected at the end of every semester and assessed annually.	The ACS Exams Institute provides standardized exams that cover all the major sub-disciplines within chemistry. The chemistry program	All students taking core chemistry courses took the ACS exams as available (see explanation in item C).	Faculty expect that students on average will score at or above the 50th percentile on both the ACS and MFAT	**Fall 2019 term** Student results on ACS exams as course number / raw score / percentile / deviation from	Based on the expected knowledge of chemistry established by the American Chemical Society as well as tested by the MFAT exam, student performance at CSU-	Historically areas for improvement in SLO performance has been with students in early chemistry courses, especially General Chemistry. This was acknowledged in the recent grant application to the U.S. Dept. of Education that was awarded and supports the CBASE Program.

sciences.	The SLO was last assessed in Spring 2019.	uses these exams where appropriate (general, organic, physical, analytical, inorganic, and biochemistry). Because of transition to remote delivery in spring 2020 related to COVID-19, secure ACS exams were only available for General Chemistry and Organic Chemistry. Only the General Chemistry exam was used; the Organic Chemistry exam was received too late to be input into Blackboard for online testing. The Major Field Achievement Test (MFAT) is also required of all graduating seniors and is used to assess student knowledge in chemistry. Again related to COVID-19 campus closure, the MFAT has yet to be administered for the 2019-20 AY, but attempt will be made to schedule		standardized exams. However it is normal for courses, especially trailer sections of general chemistry and organic chemistry to be lower. Due to COVID-19 campus closure, the only spring 2020 course assessed using ACS exams was General Chemistry.	national raw score average: 121 / 35 / 49% / -2.13; 122 / 31.4 / 24% / -8.8; 211 / 33.6 / 47% / -0.84; 301 / 32.1 / NA / NA; 302 / 26.2 / 16% / -12.8; 322 / 22.6 / NA / NA. Performance in fall CHEM 122 (trailer course) is usually lower than the spring course, but this score is lower than average. Similar for CHEM 302 (fall course is a trailer section). CHEM 301 and 322 used new ACS exams for which statistics are not yet available. Performance in both organic courses may be due to a recent decline in the number of chemistry majors; non-majors typically score significantly lower on ACS exams. To interpret scores below 50th %ile in CHEM 121 and 211, it may be more revealing to consider the CSU-Pueblo raw	Pueblo for this academic year was in most areas slightly below national norms. Scores on ACS exams in general chemistry, organic chemistry, and biochemistry are typically lower than in the courses predominated by chemistry majors (inorganic chemistry, analytical chemistry, and physical chemistry). While there are exceptions, the lower scores in courses populated by non-majors tends to disappear in higher level courses populated by chemistry majors. Beginning this year, our General Chemistry faculty have taken steps to insure better preparation for student entering Chem 121 through the use of an ACS placement test to verify adequate math skills. It has long been recognized on our campus that student with poor skills in college algebra tend to fail Chem 121.	1. The research program of the CBASE Program is curricular development and piloting of smaller studio style general chemistry coruses, which began F2017. However, cuts to instructional personnel for the 19-20 AY has limited the ability to continue to develop the studio format course with the originally intended scope; decreasing the number of studio sections offered from 2 to 1. 2. Additional efforts to increase active learning strategies have been incorporated into traditional sections of these coruses. Intial data based on DFW rates is very promising. However, this is not necessarily reflected in ACS exam scores. Ultimately, the hope is that better student outcomes at the general chemistry level will lead to improved student outcomes in later courses. If successful, the future of studio style courses will be dependent upon adequate institutional support, which barring a significant turnaround in University finances, is unlikely. Without additional resources, these approaches are not feasible in the future. These approaches could be considered for adaptation to other chemistry courses. 3. Other, simultaneously researched efforts to test the use of a flipped classroom approach to general chemistry, which may be more sustainable for larger class sizes began S2018 and continued through S2019, and looks very promising. Students that successfully complete the

		this before start of fall semester.			score versus the national average raw score. For CHEM 121, the CSU-Pueblo average was 2 questions out of 70 fewer than national average; and for 211, the deviation was less than 1 question on average. **Spring 2020 term** Due to the COVID-related transition to online course delivery for the last half of the semester, it was not possible to administer secure ACS final exams in this semester. For CHEM 121 / 122 / 301 / 302, nonsecure versions for online administration were made available by ACS. But there are no statistics available for these. The MFAT exam has not yet been scheduled from AY 2019-2020 gradduates.		first two years of the chemistry curriculum (CHEM 121/L, 122/L, 301/L, and 302/L) largely succeed in the program and perform well on national exams like the MFAT. However, the department continues to witness a large number of underprepared students in the early chemistry curriculum, which historically leads to high attrition. As noted above, it is likely that some of the best ways to address these student difficiencies are approaches that require more resources, such as smaller sections and hands on experiences integrating lecture and lab courses in the early curriculum. Previous grant funding (PROPEL Grant) demonstrated that smaller class sizes can effectively increase success for students that were previously unsuccessful in a traditional large lecture format. As part of the Chemistry Department Strategic Plan a group of faculty developed two seminar courses intended to address many of the "soft" skills students need to succeed in chemistry. The first of these are intended as an intervention at the introctory level and the other at a more advanced level. These courses have been approved by the CAPB and will become part of the Chemistry curriculum beginning F2019. However, the overall impact on success among students in early chemistry courses will likely be limited because these courses are only required for Chemistry Majors and a majority of students taking General Chemistry and Organic Chemistry are not Chemistry Majors. The Chemistry Department could not add these new courses designed to

							improve student success as prerequesites to impact all intended students because this would impact other majors on campus.
2. Students will exhibit the mathematical and problem-solving skills necessary in the chemical sciences.	Data are collected at the end of every semester and assessed annually. The SLO was last assessed in Spring 2019.	See comments above in this column. Mathematical and problem-solving skills are also assessed by the standard ACS exams.	Course exams and end-of-course ACS in all chemistry courses assess mathematical and/or conceptual problem-solving. In fall 2019, 129 students took ACS exams in their respective courses. Because of COVID restrictions and unavailability of secure ACS exams during the spring 2020 semester, no students took secure ACS exams that term.	Faculty expect that students on average will score at or above the 50th percentile on both the ACS and MFAT standardized exams. However it is normal for courses, especially trailer sections of general chemistry and organic chemistry to be lower.	ACS and MFAT exams include assessment of general chemical knowledge and mathematical and problem-solving skills. See comments above in this column.	See comments in the column above. Similar conclusions were reached specific to mathematical and problem-solving proficiency.	Similar conclusions as SLO 1 stated above.
3. Students will be able to research, review and understand the current chemical literature and be able to critically evaluate, write about and professionally present such material.	Data are collected at the end of every semester and assessed annually. The SLO was last assessed in Spring 2019.	Although aspects of Learning Outcome Three are incorporated into much of the curriculum, assessment of the third learning outcome takes place during the required senior seminar course, Chem 493 and in	Devlopment of the skills required for this SLO occur throughout the curriculum. However, final assessment occurs as part of the CHEM 493-Senior Seminar Course (9 students in fall	Faculty evaluations of the senior seminar are pooled and included in the student's grade for the course which is compiled by the instructor of record. Evaluations are	Enrolled for CHEM 493 during fall 2019 (not offered in spring 2020) were 9 students. Eight of the 9 students enrolled in CHEM 493 course were assessed at the	Generally speaking students have developed the needed skills throughout the chemistry curriculum to meet this SLO. This is demonstrated by performance at or above the expected level of achievement in CHEM 493 as assessed by the department faculty as a whole.	Given the performance in meeting this SLO the aspects of the chemistry curriculum designed to meet it appear appropriate at this time. No changes are deamed necessary at this time.

		other higher level courses. All faculty are expected to attend the student's senior seminar and an evaluation tool is distributed to every member present. Sample evaluation tool included.	2019; the course was not offered in spring 2020).	given on a 100-point scale and faculty expect students to achieve an average of 70 or better for satisfactory performance.	70% mark or better (4 A, 3B, 1C). The other student withdrew; this is the same student who has enrolled in Chem 493 during the prior academic year and did not complete the course then, either. The student has a history of withdrawing from courses and requesting extensions on almost all assignments in all courses.		

Comments on part I:

II. Closing the Loop. Describe at least one data-informed change to your curriculum during the 2019-2020 cycle. These are those that were based on, or implemented to address, the results of assessment from previous cycles.

A. What SLO(s) or other issues did you address in this cycle? **Please include the outcome(s) verbatim from**	B. When was this SLO last assessed to generate the data which informed the change? Please indicate the semester and year.	C. What were the recommendations for change from the previous assessment column H and/or feedback?	D. How were the recommendations for change acted upon?	E. What were the results of the changes? If the changes were not effective, what are the next steps or the new recommendations?

the assessment plan.				
SLO 1 and 2	Data are collected at the end of every semester. The SLO was last assessed in Spring 2019.	Given the low performance in general chemistry courses the faculty are exploring differing pedagogies/course delivery strategies. This was continued in fall 2019 and begun in spring 2020, but interrupted by the COVID lockout. This included one section of of Chem 121 with integrated lecture and lab courses in a studio format with a reduced number of students and larger lecture formats with a weekly flipped classroom component and use of engagement through the use of clickers. Previous success with smaller sections of general chemistry courses using the SAFE Course approach was limited to summer offerings. Beginning 2017 the Department has offered smaller studio courses and data continues to be gathered on the effectiveness of this approach. Traditional lecture options with a flipped classroom component are also being researched/tested. The studio approach was proposed as part of the assessment process 3 years ago, but funding was not available to support a pilot until the CBASE grant program. Other strategies to improve performance were used in the Department's strategic plan resulting in the development of seminar courses that entered the curriculum beginning fall 2019.	Given that the studio approach to General Chemistry requires additional time and effort on the part of the instructor as well as necessitated small class size since the course will have to be offered in a lab setting, grant funding was required to test this approach. One of the two external grant applications proposing the studio approach were submitted, and fortunately one was funded through the U.S. Dept of Education. In addition to the grant funded education research, a simultaneous research project involving a flipped classroom approach to general chemistry is planned.	Initial results are promising, but mixed, for both the studio approach as well as the flipped classroom approach. Historically DWF rates in general chemistry have hovered around 50%. Much of this can be attributed to poor preparation of students enrolled in these courses usually a lack of adequate math skills upon entering the Univresity. Both the smaller setting of the studio setting as well as a flipped approach allows for greater interaction with factuly and peers and greater practice of problems/concepts necessary for success in general chemistry. It is difficult to overcome these deficiencies while still instructing the necessary content, especially during a 14 week semester. It will take some time to have data to assess the effects of the seminar courses on student performance and will be complicated by the fact that while the first seminar course (CHEM 170) is designed to impact performance at the early stages of a student's chemistry career, it could only be required for Chemistry Majors. Therefore, a majority of students enrolled in general chemistry will not be required to complete CHEM 170. This further means that the Department could not make CHEM 170 a prerequisite or corequisite for CHEM 122 or CHEM 121, respectively. Therefore, to assess the effectiveness of CHEM 170 will require tracking individual students and considering the timing in which the course is taken relative to course in the chemistry curriculum.

Comments on part II:

Colorado State University Pueblo

Seminar Score _____

Abstract (%) _____

100 point scale

Seminar Assessment & Comments

CHEM 493

Student Presenter _____

Topic _____ **Date** _____

The objective of the 50 minute talk is to illustrate the student's ability to coherently present information of a specific nature.

Topic: (10 pts) _____

Appropriateness of topic: *narrow enough* to include specific material while having *breadth of interest*? Is it sufficiently *chemical in nature*? Is it of *general interest*? Is it timely?

Content: (35 pts) _____

Is there *sufficient chemistry* in the presentation? Is the material presented *relevant to the topic*, correct, well-documented and current? Is it *clearly* and *logically* presented?

Organization: (20 pts) _____

Does the *introduction* provide a *good overview*? Does each *topic flow naturally* form the previous one? Does the presentation *"tell a story"*? Is the *material appropriate* for the intended audience?

Presentation: (20 pts) _____

Does the presenter maintain *good eye contact*, and use *appropriate strength of voice*, while *engaging listeners*?

(40 min) Start time_____ Stop time _____

Graphics, Diagrams, Figures: (10 pts) _____

Do the visual aids *supplement the presentation* or are they superfluous? Do visual aids fit *logically* into presentation? Are they *discussed in detail*? Are they *easy to read and follow*?

Use of Power Point: (5 pts) _____

How well was the *visual presentation* put together? (general *appearance, clarity, and legibility of slides; effective* use of Power Point).

General Impressions:

American Chemical Society Standardized Final Examination Data — Academic
Year 2004- present

ACS Final (Exam name & year)	Semester Given	Raw Score Average U.S.	Std. Dev.	N =	CSU-P	Std. Dev.	N =	Percentile Average U.S.	CSU-P	Percentile Raw	Difference Weighted
General Chemistry Exams											
1st Term (CHEM 121)											
1st term (2000) DL	Su 05	39.6	11		41.3	11.3	16	51	56	5	80
1st term (2000) LW	Fall 04	39.6	11		44	14	58	51	65	14	812
1st term (1997)LW	Fall 05	39	11	2000	39	12	63	51	48	-3	-189
1st term (1997)LW	Fall 06	39	11	2000	42	11	38	51	57	6	228
1st term (2000)LW	Fall 07	40	11		39	12	73	48	48	0	0
1st term (2005)LW	Fall 08	40	12	4524	38	10	56	48	45	-3	-168
1st term (2000)RF	F08	39.6	11		33.8	9.8	15	51	33	-18	-270
1st term (2000) DL	Su 07	39.6	11		39.1	10.4	16	51	49	-2	-32
1st term (2000) DL	Su 08	39.6	11		42.9	13.2	19	51	61	10	190
1st term (2000) DL	Su 09	39.6	11		45.9	15.1	10	51	70	19	190
1st term (2005) CK	Spring 2010	40.35	12.26	4524	32.05	10.91	65	50	28	-22	-1430
1st term (2009) KP	Spring 2010	37.1	11.4	3827	38.2	11.6	74	51	54	3	222
1st term (2009) RF	F10	37.1	11.4	3827	38.2	12.2	33	51	54	3	99
1st term (2005) DL	Su 10	40.35	12.26	4524	45.08	11.09	22	50	63	13	286
1st term (2009) DD	Su 11	37.13	11.39	3827	36.8	10.3	26	51	50	-1	-26
1st term (2009) CC	F11	37.13	11.39	3827	33.9	11.2	78	51	41.8	-9.2	-717.6
1st term (2009) CC	Sp12	37.13	11.39	3827	34.3	10.7	90	51	42.9	-8.1	-729
1st term (2009) RF	F12	37.13	11.39	3827	37.1	9.1	71	51	50.5	-0.5	-35.5
2nd term (2009) CC	Sp 14	37.13	11.39	3827	34.3	9.4	73	51	43.2	-7.8	-569.4
General Chemistry I 2009 (rev. 2011) CC	F2012	37.13	11.39	3827	36	7.75	17	50	48	-2	-34
General Chemistry I 2009 (rev. 2011)	S2013	37.13	11.39	3827	33.92	9	83	50	42	-8	-664
Gen. Chem. First Term 2009	Fall 2013	37.13	11.39	3827	34.7	9.7	81	51	43.4	-7.6	-615.6
1st term (2009) CC	Sp 14	37.13	11.39	3827	34.3	9.4	73	51	43.2	-7.8	-569.4
1st Term Form 2009 Rev 2011 CC	Fall 2014	37.13	11.39	3827	38.54	12.06	34	51.3	56	4.7	159.8
First Term General Chemistry KP	F2014	40.35	12.26	4524	44.08	10.91	26	50	61	11	286
1st term (2009) KP	Sp 2015	37.13	11.39	3827	34.1	12.2	61	51.3	42	-9.3	-567.3
First Term Form 2009 (CC)	Fall 2015	37.13	11.39	3827	36.78	10.95	74	51.39	50.31	-1.08	-79.92

First Term Form 2005 (CC)	Spring 2016	40.35	12.26		4524	36.69	11.08	64	50.70	41.07	-9.63	-616.32
First Term Form 2009 (KP)	Fall 2016	37.13	11.39	3827		31.69	11.19	35	51	37	-14	-490
First Term Form 2009 (KP)	Spring 2017	37.13	11.39	3827		35.07	10.57	72	51	45	-6	-432
First Term Form 2005 (CC)	Fall 16	40.35	12.26	4524		38.9	11.56	49	50.7	47.7	-3	-147
1st term GC2005 (MC)	F17	40.35	12.26			38.86	9.84	14	50	46.7	-3.3	-46.2
1st term GC2018 trial test (MC)	F17	n.d.	n.d.	n.d.		39	8.7	14	n.d.	48		
2005 Gen Chem 1st Term (RF)	F17	40.35	12.26			46	11.3	18	51	62.8	11.8	212.4
Gen Chem First Term (KP)	Spring 2018	37.13	11.39	3827		33.14	8.80	28	51	40	-11	-308
Gen Chem 1st Term 2005 (MC)	**Spring 2019**	**40.35**	**12.26**	**4524**		**37.24**	**10.19**	**17**	**50**	**42**	**-8**	**-136**
Gen Chem 1st Term 2009 (MC)	**Spring 2019**	**37.13**	**11.39**	**3827**		**36**	**9.80**	**17**	**51**	**48**	**-3**	**-51**
1st Term 2005 (JV)	**Spring 19**	**40.35**	**12.3**		**N/A**	**30.69**	**7.4**	**36**	**49**	**26.4**	**-22.6**	**-813.6**
1st Term 2009 (JV)	**Spring 19**	**37.13**	**11.4**		**3827**	**29.53**	**6.0**	**30**	**49**	**30.1**	**-18.9**	**-567**
GC 1st term, 2009, yellow	F19	37.13	11.39	3827		35	13.4	23	51	49	**-2**	**-46**
GC 1st term, 2020 trial test	F19					33.9	9.66	25		42.5	**42.5**	**1062.5**

Using 200

				Full Year (CHEM 122)							
Full year (1999) LW	Spring 05	40.19	10.03	955	37.5	9.5	48	51	41	-10	-480
Full year (1999) RS	Fall 04	40.19	10.03	955	42	12.7	33	51	59	8	264
Full year concept (2001) LW	Spring 05	33.1	11		31.9	9.9	49	53	48.5	-4.5	-220.5

Full year (1999) DD	Su 05	40.19	10.03		955	34.6	7.6	22	51	35	-16	-352
Full year (1999) RS	Fall 05	40.19	10.03		955	43.4	10.8	34	51	62	11	374
Full year (1999) LW	Spring 06	40.19	10.03		955	37	11	41	51	39	-12	-492
Full year concept (2001) LW	Spring 06	33	10			33	11	39	53	53	0	0
Full year (1999) DD	Su 06	40.19	10.03		955	42.4	9.1	20	51	60	9	180
Full year (2005)LW	Sp 07	35.5	11.5		1858	32.2	9.5	47	52	43	-9	-423
Full year concept (2001) LW	Sp 07	31.2	9.99			32.2	9.5	48	52	56	4	192
Full year (2005)LW	Su 07	35.5	11.5		1858	37.7	12.6	11	52	61	9	99
Full year (2005)LW	Sp 08	35.5	11.5		1858	34	11	27	51	48	-3	-81
Full year concept (2001) LW	Sp 08	31.2	9.99			35	11	26	53	60	7	182
Full year (2005)LW	Sp 09	35.5	11.5		1858	36	11	31	51	54	3	93
Full year concept (2001) LW	Sp 09	31.2	9.99			34	14	31	53	56	3	93
Full year (2005) DL	Su 08	35.5	11.5		1858	33	9.7	21	51	42	-9	-189
Full year (2005) DL	Fall 08	35.5	11.5		1858	34.1	16.4	23	51	48	-3	-69
Full year (2005) CK	Su 09	35.45	11.51		1858	36.85	14.09	20	51	58	7	140
Full year (2005) DD	Su10	35.45	11.51		1858	35	9.8	33	51	51	0	0
Full year (2005) KP	Fall 10	34.76	11.29		3201	34.07	10.9	41	51	51	0	0
Full year (2005) DL	Spring 11	35.5	11.5		1858	33.3	10.2	59	51	46	-5	-295
General Chemistry, 2005 MC	Fall 2012	35.45	11.51		900	30.5	10.33	45	51	35	-16	-720
General Chemistry, 1999 MC	Spring 2013	40.19	10.03		900	36.8	8.12	49	51	39	-12	-588
Full year (2005) KP	Fall 10	35.45	11.51		1858	31.88	10.28	41	51	42	-9	-369
Gen. Chem. 2005 MC	F2013	34.45	11.51			31	8.66	39	54	40	-14	-546
Gen. Chem. Conceptual 2001 MC	Sp2014	31.25	9.99			32.7	8.6	41	51	56	5	205
Gen. Chem. 2005 MC	Sp2014	34.45	11.51			30.5	9.7	41	54	41	-13	-533
Gen. Chem. 1999 MC	Fall 2014	40.19	10.03			32.65	8.55	42	51	30.4	-20.6	-865.2
Gen. Chem. 2001 (Concept) MC	Fall 2014	31.25	9.99			42	17.6	41	51	44	-7	-287
Gen. Chem. 2005 MC	Spring 2015	34.45	11.51			35.97	10.18	35	48	51.2	3.2	112
Gen. Chem. 2001 (Concept) MC	Spring 2015	31.25	10.0			34	7.3	34	51	60	9	306
Gen Chem 1999 (MC)	Summer 2015	40.19	10.03			36.75	8.24	11	51	39	-12	-132
Gen Chem 2005 (MC)	F2015	34.45	11.5			37.92	11.32	35	48	61	13	455
Gen Chem 2001 (concept) (MC)	F2015	31.25	9.99			34	9.2	36	51	61	10	360
Gen Chem 2015 (MC)	Sp2016	41.44	9.38		166	40	8.36	36				
Gen Chem 2017 (MC)	Sp2016					36	7.8	33				
General Chemistry 2015 (prelim norms) MC	F16	41.44	9.4		166	52	13.3	33		46.4		

prelim dat
Trial test,

General Chemistry 2001 (Conceptual) MC	F16	31.25	10.0		52.9	15.4	33		48			
General Chemistry 2015 (prelim norms)	Sp17	41.44	9.38	166	57.4	19.2	42		59.1			
Full Year 2015 (JV)	Fall 2017	39.8	10.7	1080	40.69	3.26	39	49	51.9	2.9	113.1	
Full Year 2005 (JV)	Fall 2017	35.45	11.51		30.64	6.87	39	53	37.6	-15.4	-600.6	
Full Year 2015 (JV)	Spring 2018	39.8	10.7	1080	41.5	9.36	29	49	54	5	145	
Full Year 2019 Trial (JV)	Spring 2018	N/A	N/A	N/A	40	8.3	29	N/A	N/A			
Full year GC2019 trial test	Sp18	n.d.	n.d.	n.d.	36.1	11.8	9	n.d.	43			
Full year GC2015 (Prelim norms)	Sp18	38.3	10.6	431	41	11.8	7	n.d.	53			
Gen Chem Full Year trial test 2019 (MC)	**Fall 2018**				**35.55**	**7.7**	**11**					**trial test,**
Gen Chem Full Year 2001 (MC)	**Fall 2018**	**31.25**	**939.0**		**27**	**5.0**	**11**	**51**	**35**	-16	-176	
Full Year 2015 (JV)	**Summer 18**	**39.8**	**10.7**	**1080**	**36.5**	**6.98**	**6**	**49**	**41**	-8	-48	
Full Year 2019 Trial (JV)	**Summer 18**	**N/A**	**N/A**	**N/A**	**30.2**	**8.98**	**5**	**N/A**	**N/A**			
Full Year 2019 Trial (JV)	**Fall 18**	**N/A**	**N/A**	**N/A**	**31.68**	**6.52**	**26**	**N/A**	**N/A**			
Full Year 2001 Conceptual (JV)	**Fall 18**	**31.25**	**10.0**	**N/A**	**27**	**6.5**	**24**	**49**	**38**	-11	-264	
Full Year 2015 (KP)	**Spring 2019**	**39.5**	**10.8**	**3195**	**40.6**	**8.1**	**47**	**50**	**54**	**4**	**188**	
General Chemistry Form 1999	Fall 2019	40.19	10.03	955	31.39	7.09	31	51	24	**-27**	**-837**	
Non-secure ACS (traditional)	Sp20	39.5	11.7		52.14	3.8	7					Non-secu
Non-secure ACS (conceptual)	Sp20	39.5	11.7		46	4.2	7					Non-secu

					Total Students	3485		Average		-3	0
				Pre-General Chemistry							
Toledo (1998) DL	Su 05	31.5	7.2		31.8	7.2	18	51	51	0	0
Toledo (1998) DL	Su 07	31.5	7.2		32.5	8.2	16	51	54	3	48
Toledo (1998) DL	Su 08	31.5	7.2		35.2	9.4	21	51	70	19	399
Toledo (1998) DL	Su 09	31.5	7.2		34.6	8.1	13	51	67	16	208
Toledo (1998) RF	F08	31.5	7.2		30.3	7.8	21	51	44	-7	-147
Toledo (1998) DL	F09	31.5	7.2		30.6	6	63	51	47	-4	-252
Toledo (1998) RF	F10	31.5	7.2		32	9.1	50	51	54	3	150
Toledo (1998) DL	Su10	31.5	7.2		32.7	6.4	28	51	58	7	196
Toleedo pre-instruction (MC)	**Spring 2019**	**31.5**	**7.2**		**31.3**	**5.8**	**22**	**48**	**48**	**0**	**0**
Toledo post-instruction (MC)	**Spring 2019**	**31.5**	**7.2**		**37.8**	**7.1**	**18**	**48**	**80**	**32**	**576**
					Total Students	270		Average		7	0
				Organic Chemistry							
				CHEM 302							
Organic 2002 DD	F 04	43.28	11.83		34.2	7.7	18	48	23	-25	-450
Organic 2002 DD	S 05	43.28	11.83		36.3	7.3	37	48	29	-19	-703
Organic 2004 DD	F05	39.22	12.16	3592	32	8.8	21	50	32	-18	-378
Organic 2004 DD	S06	39.22	12.16	3592	33.1	7.1	41	50	34	-16	-656
Organic 2004 DD	F06	39.22	12.16	3592	35.9	10.8	29	50	41	-9	-261
Organic 2004 DD	Sp07	39.22	12.16	3592	36.8	12.2	42	50	45	-5	-210

Organic 2004 DD	F07	39.22	12.16	3592		36.7	10.3	21	50	45	-5	-105	
Organic 2004 DD	Sp08	39.22	12.16	3592		34.7	10.8	38	50	39	-11	-418	
Organic 2004 DD	F08	39.22	12.16	3592		35.5	6.9	32	50	41	-9	-288	
Organic 2004 DD	Sp09	39.22	12.16	3592		38.2	10.1	28	50	48	-2	-56	
Organic 2004 DD	F09	39.22	12.16	3592		34.8	11.8	18	50	39	-11	-198	
Organic 2004 DD	Sp10	39.22	12.16	3592		37.4	10.2	35	50	46	-4	-140	
Organic 2002 DD	F12	43.28	11.83			34.3	9	12	51.3	24	-27.3	-327.6	
Organic 2004 DD	Sp12	39.22	12.16	3592		41.1	11.2	38	50	55	5	190	
Organic Chemistry OR04 MD	spring 2013	39	12.16	3592		37.48		40	50	46.5	-3.5	-140	
Organic Chemistry 2004 DD	Spring 2014	39.22	12.16			40.1	12	43	51	52.3	1.3	55.9	
Organic Chem 2004 MD	F14	39.22	12.16	3592				8	51	25	-26	-208	
Organic 2004 DD	Spring 2015	39.22	12.66	3592		38.2	12.8	39	50	47.7	-2.3	-89.7	
Organic 2004 (MD)	Spring 2016	39.22	12.66	3592		32	9	19	50	32	-18	-342	
ORG 2004 (DD)	fall 2015	39.22	12.66		3593	33.25	11.36	12	50	34.8	-15.2	-182.4	
ORG 2004 (DD)	summer 2015	39.22	12.66		3593	33.56	7.02	10	50	35.7	-14.3	-143	
ORG 2004 (MD)	Spring 2017	39.22	12.66		3593	41	10	12	50	55	5	60	
ORG 2004 (DD)	Fall 2016	39.22	12.66		3593	36.1	13.24	24	50	42.3	-7.7	-184.8	
ORG 2004 (CC)	Spring 2018	39	12.16		3592	39.5	10.4	14	50	51.5	1.5	21	
Organic Chemistry 2004 (MD)	**Fall 2018**	**39**	**12.16**		**3592**	**33.6**	**7.4**	**11**	**50**	**35.8**	**-14.2**	**-156.2**	
Organic Chemistry 2004 (MD)	**Spring 2019**	**39**	**12.16**		**3592**	**36.2**	**12.5**	**35**	**50**	**42.6**	**-7.4**	**-259**	
Organic Chemistry 2004	Fall 2019	39	12.16		3592	26.2	7.93	25	50	16	**-34**	**-850**	**Note: No**

CHEM 301

Organic 1st 2006 DD	F06	37.83	9.81			33.8	9.2	48	50	37	-13	-624
Organic 1st 2006 DD	Sp07	37.83	9.81			31.6	6.5	24	50	28	-22	-528
Organic 1st 2006 DD	F07	37.83	9.81			33.4	9	54	50	35	-15	-810
Organic 1st 2006 DD	Sp08	37.83	9.81			29.6	7.2	35	50	22	-28	-980
Organic 1st 2006 DD	F08	37.83	9.81			36.3	7.9	50	50	46	-4	-200
Organic 1st 2006 DD	F09	37.83	9.81	1560		37.7	8.9	58	51	51	0	0
Organic 1st 2006 DD	Sp10	37.83	9.81	1560		32.6	8	29	51.3	31.8	-19.5	-565.5
Organic 1st 2006 DD	F10	37.83	9.81	1560		35.6	9.9	47	51.3	43.4	-7.9	-371.3
Organic 1st 2006 PV	Sp12	37.83	9.81	1560		35.2	10.4	28	51.3	43	-8.3	-232.4
Organic 1st 2006 DD	F11	37.83	9.81	1560		36.3	9.6	58	51.3	51	-0.3	-17.4
1st Term Org Chem (OR06F) DD	spring 2013	37.83	9.81	1560		39	8.19	34	51.3	55	3.7	125.8
1st Term Org Chem (OR06F) DD	fall 2012	37.83	9.81	1560		38.2	10.7	65	51.3	53	1.7	110.5
Organic 1st term 2010 ZL	Sp 14	39.39	11.74			29.3	6.8	23	52.2	21	-31.2	-717.6
Organic 1st term 2010 ZL	Sp 14	39.39	11.74			29.3	6.8	23	52.2	21	-31.2	-717.6
First term organic 2006 DD	Fall 2013	37.83	9.81			37.3	10.3	48	51	49.1	-1.9	-91.2
Organic 1st term 2010 DD	Fall 2014	39.39	11.74	1933		39.8	11.2	48	52	53	1	48
Organic 1st 2006 MD	Spring 2015	37.83	9.81	1560		32		24	51.3	30	-21.3	-511.2
Organic 1st term 2006 (MD)	Fall 2015	37.83	9.81	1560		33	8	35	50	33	-17	-595
ORG 1ST TERM 2010 (DD)	spring 2016	39.39	11.74		1933	34.29	11.75	38	52	38.2	-13.8	-524.4
ORG 1ST TERM 2010 (DD)	spring 2017	39.39	11.74		1933	37.8	22.69	45	52	47.4	-4.6	-207
Adv Organaic **401/501** 2004 (MD)	Fall 2016	39.22	12.66		3593	60	4	3	50	94	44	132
Organic Chemistry, 1st term, 2010	Spring 2018	39.39	11.74		1933	31.1	9.16	40	50	26.3	-23.7	-948
Organic Chemistry OR2017F	Spring 2019					32.8	5.8	27				
Organic Chemistry OR2017F	Fall 2019					32.1	10.2	30				

norms no

Note: No

							Total Students	1616		Average	-10	-9
ACS Final (Exam name & year)	Semester Given	Raw Score Average						Percentile Average		Percentile	Difference	
		U.S.	Std. Dev.	N =	CSU-P	Std. Dev.	N =	U.S.	CSU-P	Raw	Weighted	
Biochemistry (CHEM 412)												
Biochemistry 2003 SB	Spring 04	35.4	9.3		29	5.7	4	50	26	-24	-96	
Biochemistry 2003 SB	Spring 05	35.4	9.3		26	5.8	3	50	17	-33	-99	
Biochemistry 2003 SB	Spring 06	35.4	9.3		31	1	3	50	34	-16	-48	
Biochemistry 2007 SB	Spring 07	32.9	8.9		24	2.7	3	53	18	-35	-105	
Biochemistry 2007 SB	Spring 09	32.9	8.9		30	4.1	7	53	39	-14	-98	
Biochemistry 2007 SB	Spring 10	32.9	8.9	839	38.5	4.5	4	53	72	19	76	
Biochemistry 2013 SB	Spring 12	24.53	6.41		29.1	1.24	4	NA	NA			
Biochemistry 2007 SB	Spring 13-UG	32.9	8.9	839	28.7	4.4	3	53	36	-17	-51	
Biochemistry 2007 SB	Spring 13-G	32.9	8.9	839	36.8	7	5	53	62	9	45	
Biochemistry 2012 SB	Spring 2014	32.9	8.9	839	34.1	8.14	10	53	55.3	2.3	23	
Biochemistry 2012 SF	Spring 2016	32.9	8.9	839	30.4	5.04	9	53	50.73	-2.27	-20.43	
Biochemistry 2012 SB	Spring 2017	34	8.92		35.8	17.6	10	50	51.7	1.7	17	
Biochemistry 2012 SB	Spring 2018	33.96	8.92	n/a	31	7.1	11	33.5	38.5	5	55	
Biochemistry 2012 SB	**Spring 2019**	**33.96**	**8.92**		**27.5**	**10.13**	**8**	**33.5**	**30.5**	**-3**	**-24**	

					Total Students		84		Average	-8	-4
				Physical Chemistry							
P-Chem Comp. (1995) RS	Fall 04	31.3	9.2	442	35.0		1	53	67	14	14
P-Chem Comp. (1995) RS	Fall 04	31.3	9.2	442				53		-53	0
P-Chem Thermo. (1996) RS	Fall 04	21.3	7.1					53		-53	0
				CHEM 322							
P-Chem Quant. (1995) RS	Spring 05	21.6	5.8		18.7	6.2	10	53	34	-19	-190
P-Chem Quant. (1995) RS	Spring 06	21.6	5.8		19.4	7.9	7	53	40	-13	-91
P-Chem Quant. (1995) RF	Fall 08	21.6	5.8		24.8	7.4	17	53	63	10	170
P-Chem Quant. (1995) RF	Fall 09	21.6	5.8		24.9	6.9	13	53	64	11	143
P-Chem Quant. (1995) RF	Fall 10	21.6	5.8		25.6	4.2	8	53	69	16	128

P-Chem Quant. (1995) RF	Fall 12	21.6	5.8		28.9	6.1	10	53	63	10	100
2006 P Chem (Quantum)	F13	29.2	7.8		29.3	6.1	12	51	49.7	-1.3	-15.6
Quantum Mechanics 2006 (RF)	Fall 2015	29.19	7.8	n/a	29.9	5.7	14	51	53.5	2.5	35
Quantum Mechanics 2006 (RF)	Fall 2016	29.19	7.8		29.1	7.6	10	51	51	0	0
Quantum Mechanics 2013 (JV)	Fall 2017	27.11	7.1	354	27.4	13.1	11	54	39.8	-14.2	-156.2
Quantum Mechanics 2006 (RF)	**Fall 2018**	**29.19**	**738/**		**30.4**	**5.3**	**12**	**51**	**52.1**	**1.1**	**13.2**
Quantum Mechanics (2020 Trial, Form B)	Fall 2019	N/A	N/A	**N/A**	22.6	4.05	11	N/A	N/A		

CHEM 321

P-Chem Thermo. (1996) RS	Fall 04	21.3	7.1		20.6	4.3	8	53	51	-2	-16
P-Chem Thermo. (1996) RS	Fall 05	21.3	7.1		18.4	5.4	12	53	40	-13	-156
P-Chem Thermo. (2006) RF	Spring 09	26.4	7.0		26.4	7.2	19	51	51	0	0
P-Chem Thermo. (2006) RF	Spring 10	26.4	7.0		28.2	8.8	18	51	56	5	90
P-Chem Thermo. (2006) RF	Spring 13	26.4	7.0		29.3	6.4	11	53	61.8	8.8	96.8
2006 P Chem (Thermo) RF	S14	26.4	7.0		24.1	4.5	16	52	40.7	-11.3	-180.8
2006 P Chem (Thermo)	Spring 2015	26.4	7.0	n/a	26.7	7.6	14	51	51.4	0.4	5.6
Thermodynamics 2013 (RF)	Spring 2016	27.48	6.5	378	30.31	8.74	16				
Thermodynamics 2013 (RF)	Spring 2017	27.6	6.8		31.6	5.9	9	52	71	19	171
Thermodynamics 2013 (RF)	Spring 2018	27.6	6.8		26.9	5.9	10	52	46	-6	-60
Thermodynamics 2013 (RF)	**Spring 2019**	**27.6**	**6.8**		**25.6**	**6.2**	**9**	**52**	**41.3**	**-10.7**	**-96.3**

*** No nat
students

					Total Students	241		Average	-4	0	
Inorganic Chemistry (CHEM 221)											
1991 Inorganic LW	Spring 05	23.9	8	419	27.8	6.6	4	54	69	15	60
Inorganic (2002) CC	Spring 12	28.4	8.1		31	0	2	52	66	14	28
Inorganic 2009 MC	F2013	31.79	8.95	482	20.6	7.98	18	51	11.8	-39.2	-705.6
Inorganic Chem. 2009 MC	Fall 2014	31.79	8.95		26.13	10.13	15	51	37	-14	-210
Inorg. Chem. Foundations 2016 MC	F2015				31.6	5.8	15				Trial test,
Inorg. Chem. Foundations 2017 MC	Fall 2016	31.8	8395		57.75	26	13		53.5		
Foundations of Inorganic, 2016 (MC)	**F2018**	**33.96**	**10.14**	**122**	**33.5**	**6.65**	**15**				Trial test,
IC Foundations, 2021, trial test	F19	34.4	9	488	33.56	6.62	9	48	47	**-1**	**-9** Use IC Fo
Inorganic Chemistry (CHEM 421)											
Inorganic 2009 MC	Sp2014	31.79	8.95	482	38	7.5	7	51	69.3	18.3	128.1
Inorganic Chem 2009 MC	Spring 2015	31.79	8.95		39.8	7.5	5	51	77	26	130

Inorganic Chemistry 2009 (MC)	Sp2016	31.79	8.95	482	41.7	6.7	3	51	87	36	108
Inorganic Chemistry, 2002 (MC)	**Sp2019**	**28.38**	**8.1**		**36.5**	**2.1**	**2**	**49**	**85**	**36**	**72**
					Total Students		106		Average	7	-4
				Analytical Chemistry (CHEM 317)							
Analytical Chemistry 1994 DC	Fall 04	19.5	6.3	233	18.8	5.3	12	54	51	-3	-36
Analytical Chemistry 1994 DC	Fall 05	19.5	6.3	233	17.9	4.5	18	54	45	-9	-162
Analytical Chemistry 1994 CK	Fall 08	19.47	3.37	233	18.76	4.62	18	51	51	0	0
Analytical Chemistry 2007 CK	Fall 10	27.5	7.1	707	28.8	6.7	16	52	59	7	112
Analytical Chemistry 2007 KP	Fall 10	27.5	7.1	707	33.5	5.6	6	52	81	29	174
Analytical Chemistry 1994 CK	Fall 11	19.47	3.37	233	25.9	5	9	51	88	37	333
Analytical Chemistry 2007 CC	F2012	27.52	7.08	707	28	7.36	10	50	55	5	50
Analytical Chemistry 2007 CK	F 2013	27.52	7.08	707	28.11	6.21	19	52	56	4	76
Analytical Chemistry 2007 KP	Fall 2014	27.52	7.08		26.0	7.3	13	52	44	-8	-104
Analytical Chemistry 2007 CK	F 2015	27.52	7.08	707	25.8	6.5	18	52	42	-10	-180
Analytical Chemistry 2014 KP	Fall 2016	26.14	7.14		28.4	9	8	50	65	15	120
Analytical Chemistry 2014 CK	Fall 2017	26.14	7.14		27.0	5.16	14	50	58	8	112
Analytical Chemistry Form 2013 (CC)	**Fall 2018**	**26.14**	**7.14**	**779**	**25.73**	**4.29**	**11**	**53.7**	**51.38**	**-2.32**	**-25.52**

					Total Students	172		Average	6	3	
				Instrumental Analysis							
Instrumental Analysis 2001 DL	Spring 05	32.8	7.8	237	29.8	6	6	47	37	-10	-60
Instrumental Analysis 2001 DL	Spring 06	32.8	7.8	237	29	11.8	13	47	36	-11	-143
Instrumental Analysis 2001 CK	Spring 07	32.8	7.8	237	30.7	8.2	11	47	38	-9	-99
Instrumental Analysis 2001 CK	Spring 09	32.8	7.8	237	29.2	7.8	15	47	36	-11	-165
Instrumental Analysis 2001 CK	Spring 10	32.8	7.8	237	34.3	7.7	12	47	56	9	108
Instrumental Analysis 2009 DL	Spring 11	24.1	6.6		28.7	8.5	10	51	78	27	270
Instrumental Analysis 2009 DL	Spring 13	24.1	6.6		29.8	5.2	8	51	82	31	248
Instrumental Analysis 2009 KP	Spring 12	24.12	6.6		26.1	6.87	7	51	59	8	57
Instrumental Methods 2009 CK	Spring 14	24.12	6.57		26.4	5.68	18	51	67	16	282
Instrumental Analysis 2009 KP	Spring 15	24.12	6.57		22.3	6.8	12	51	42	-9.5	-114
Instrumental Methods 2009 CK	Spring 16	24.12	6.57		23.0	4.1	21	51	45	-6	-126
Instrumental Analysis 2009 KP	Spring 17	24.12	6.57		29.8	5.81	5	51	82	31	155
Instrumental Methods 2009 CK	Spring 18	24.12	6.57		27.0	3.4	7	51	69	18	126
Instrumental Analysis 2009 KP	**Spring 19**	**24.12**	**6.57**		**26.9**	**5.1**	**11**	**51**	**69**	**18**	**198**
					Total Students	156		Average	7	5	