Chemistry Assessment Report 2014 – 2015

Introduction

Chemistry is the science which examines the composition, structure, properties and reactions of matter, especially of atomic and molecular systems. Chemists seek to understand, explain, and utilize the diversity of materials (chemicals) we find around us. Chemistry is an experimental science, and most of its progress has been due to application of the scientific method through systematic research. Learning about the benefits and risks associated with these materials (chemicals) will help the student be an informed citizen, able to make intelligent choices concerning the world around us. Chemistry teaches the student to solve problems and communicate with others in an organized manner. These skills are helpful in any career. Ultimately, the efforts of successful chemists advance the frontiers of knowledge and at the same time contribute to the well-being of humanity.

Chemistry is often divided into the following five sub disciplines: organic chemistry, inorganic chemistry, analytical chemistry, physical chemistry, and biochemistry. Organic chemistry deals with the chemistry of compounds containing carbon. Inorganic chemistry deals with all the elements and with the compounds not defined as organic. Analytical chemistry involves finding which elements or compounds are present in a sample and/or how much of each is present. Physical chemistry deals with the properties, especially quantitative properties, of substances. Biochemistry deals with the chemistry of living things. These subdivisions of chemistry are somewhat arbitrary. A chemist specializing in any one of these five often uses all five specializations.

Mission & Goals

The mission and goals for the area of chemistry include but are not limited to the following:

1. To provide the student with knowledge that leads to wisdom to prepare the student for their life and career.
2. To provide the student with a broad knowledge of chemistry to prepare the student for chemistry graduate school, professional school, or a career as a professional chemist.
3. To help the students develop a clear and concise thought process to solve an exam question or to solve a laboratory problem.
4. To inform and encourage the student to partake in summer undergraduate research at other universities.
5. To be able to use the library and the Internet to research a chemical question.
6. To provide non-science majors with a basic understanding of chemistry.
7. To provide chemistry courses to science majors in other areas (pre-engineering, biology, and pre-professional).
8. To serve the local community with problems or questions related to chemistry.
9. To work in harmony with the other members of the division to give the students the best education possible.

Learning Outcomes and Assessment

Learning Outcomes

Undergraduate students upon graduation with a B.S. degree in chemistry:

1. Have firm foundations in the fundamentals and application of current chemical and scientific theories.
2. Are able to design, carry out, record and analyze the results of chemical experiments.
3. Are able to use modern instrumentation and classical techniques, to design experiments, and to properly record the results of their experiment.
4. Are skilled in problems solving, critical thinking and analytical reasoning.
5. Are able to identify and solve chemical problems and explore new areas of research.
6. Are able to use modern library searching and retrieval methods to obtain information about a topic, chemical, chemical technique, or an issue relating to chemistry.
7. Knows the proper procedures and regulations for safe handling and use of chemicals and can follow the proper procedures and regulations for safe handling when using chemicals.
8. Are able to communicate the results of their work to chemists and non-chemists.
9. Find gainful employment in industry or government, be accepted at graduate or professional schools.
10. Have a nationally competitive chemistry degree.

Assessment

Undergraduate students who earn a B.S. degree in chemistry will be able to demonstrate that they:

1. Have attained a firm foundation in the fundamentals and application of current chemical and scientific theories.
2. Are able to design, carry out, record and analyze the results of chemical experiments.
3. Are able to use modern instrumentation and classical techniques, to design experiments, and to properly record the results of their experiment.
4. Are able to use modern instrumentation and classical techniques, to design experiments, and to properly record the results of their experiment.
5. Are able to identify and solve chemical problems and explore new areas of research.
6. Are able to use modern library searching and retrieval methods to obtain information about a topic, chemical, chemical technique, or an issue relating to chemistry.
7. Knows the proper procedures and regulations for safe handling and use of chemicals and can follow the proper procedures and regulations for safe handling when using chemicals.
8. Are able to communicate the results of their work to chemists and non-chemists.
9. In order to measure Outcome 9, "find gainful employment in industry or government, be accepted at graduate or professional schools," our department surveys the senior chemistry majors each spring, and asks them where they will be working, where they are going to graduate

school, professional school, etc. upon completion of their degree. We keep a record of where our undergraduate chemistry majors are working. Alumni send feedback via email or visit. This "survey" is an informal assessment but is helpful in knowing how prepared alumni were upon entering their job or graduate study. We have compiled data from all alumni since 1996 in the results section.

10. In order to measure Outcome 10, all chemistry majors must take the ETS Major Field Test. This year we had 9 chemistry majors take the test. The median score was 148 which is in the 53rd percentile. We have compiled data from all alumni since 1996 in the results section.

Results of Assessment:

The Major Field Test results follow: We are still looking for the data from 2006.

Year/Student	Physical	Organic	Inorganic	Analytical	Total	Median	%
'15 1	33	49	46	31	139	148	53
'15 2	30	66	56	45	149		
'15 3	42	42	40	42	142		
'15 4	33	34	34	33	132		
'15 5	42	55	46	33	146		
'15 6	42	60	52	45	152		
'15 7	33	73	40	39	148		
'15 8	54	73	62	54	164		
'15 9	58	66	52	47	160		
'14 6	74	63	62	66	167	162	79
'14 5	54	66	66	60	162		
'14 4	48	78	66	45	161		
'14 3	39	52	49	36	145		
'14 2	67	78	59	69	170		
'13 8	61	71	59	47	164	149	55
'13 7	33	55	56	54	151		
'13 6	36	57	56	47	149		
'13 5	30	52	46	57	145		
'13 4	51	63	62	66	162		
'13 3	30	44	49	39	140		
'13 2	39	60	52	33	149		
'12 6	74	76	72	72	176	162	79
'12 3	45	49	56	45	149		
'12 4	67	86	69	69	177		
'12 5	61	68	56	54	162		
'12 2	27	44	37	31	133		
'11 1	49	68	45	53	158	155.5	
'11 2	56	86	73	59	174		
'11 3	30	46	34	28	133		

’11 4	49	58	57	44	152		
’11 5	30	40	38	28	132		
’11 6	46	77	69	50	164		
’11 7	60	80	65	65	171		
’11 8	49	65	61	41	153		
’10 1	70	83	69	59	174	148	55
’10 2	46	46	34	41	140		
’10 3	46	58	38	50	148		
’09 1	42	42	61	44	146	150.5	60
’09 2	46	68	61	33	155		
’08 1	36	49	45	41	142	159	85
’08 2	49	74	53	50	159		
’08 3	49	58	73	44	159		
’07 1	33	61	38	31	140	149	55
’07 2	49	65	61	47	159		
’07 3	33	61	61	39	149		
’07 4	49	65	42	53	151		
’07 5	33	55	49	23	140		
’05 1	39	53	41	41	144	152	65
’05 2	69	84	76	71	180		
’05 3	39	56	51	52	152		
’04 1	33	56	48	36	145	145	40
’04 2	53	56	51	39	153		
’04 3	33	63	38	33	143		
’04 4	53	66	58	49	159		
’04 5	26	38	27	30	128		
’04 6	66	84	65	84	176		
’04 7	23	28	24	39	125		
’03 1	33	50	44	39	140	149	55
’03 2	26	69	48	30	144		
’03 3	49	50	65	46	154		
’03 4	63	81	72	71	175		
’02 1	53	74	86	48	171	171	95
’01 1	53	74	58	61	164	164	90
’00 1	53	58	54	61	158	160	85
’00 2	49	74	54	55	162		
’99 1	67	65	36	71	160	149.5	60
’99 2	42	52	47	52	149		
’99 3	53	46	54	52	150		
’99 4	42	46	47	42	144		
’98 1	32	52	33	55	139	140.5	25
’98 2	39	36	43	29	135		
’98 3	42	46	47	48	144		
’98 4	53	39	50	52	150		
’98 5	35	49	47	39	142		

’98 6	49	52	29	39	139		
’97 1	28	33	33	39	131	142	30
’97 2	28	30	43	52	135		
’97 3	42	36	50	55	145		
’97 4	46	39	61	45	146		
’97 5	32	49	50	39	142		
’96 1					168	168	90

One interesting result of the “alumni survey of 2010” was that one alumnus noted the lack of a quantitative analysis course in our curriculum. Partly as a result of this, and also due to the coincidental addition of the Forensic Chemistry concentration, a Quantitative Analysis course has been added.

Since 1996, all Chemistry graduates have been placed in graduate school pre-professional school or the workforce. Listed in parentheses is the alumni’s known place of employment or graduate school.

QU Chemistry Graduates Since 1996

1996 [redacted] (Anheuser Busch)
[redacted] (NW Indiana managing the metals, microbiology, and wet chemistry departments for Microbac Laboratories Chicagoland division)

1997 [redacted] (University of Missouri, Ph. D.; Assistant Professor of Chemistry at Clarion University of Pennsylvania) [redacted]

1998 [redacted] (Purdue, Ph.D, Assistant Professor at University of Iowa),
[redacted] (Masters in chemistry Northern Illinois University),
[redacted] (Blessing Hospital Nurse),
[redacted] (Lonza Inc Sales and Business Development Manager, NJ)
[redacted],

1999 [redacted] (Baylor medical school, MD for US Air Force),
[redacted] (self-employed, insurance),
[redacted] (nursing school; works for Quincy Medical Group),
[redacted] (Green America Recycling, Hannibal, MO),
[redacted], Susan Philo, Curt Sparling,

2000 [redacted] (University of Missouri grad school),
[redacted] (Northwestern grad school, Seton Hall grad school Counseling)

2001 [redacted] (Wayne State, Ph.D, University of Michigan research)

2002 [redacted] (Prince Manufacturing),
[redacted] (University of Missouri PhD Inorganic Chemistry, Monsanto, St. Louis)

2003 [redacted] (Loyola medical school MD, Michigan),
[redacted] (PhD IUPUI Physical Therapy)

2004 [redacted] (Ph. D. University of Iowa, postdoctoral research associate Washington University)
[redacted] (Prairie Analytical Systems, Springfield IL)
[redacted] (Henckel Corporation/Chemist, Naperville IL),
[redacted] (Severn Trent Labs, St. Louis)
[redacted]

2005 [redacted] (Ph. D. University of Iowa, Teaches at Maryville University in St. Louis),
[redacted] (Master's Degree from QU, 2014),
[redacted] (Carnegie Mellon grad school),
[redacted] (Midwestern University grad school),
[redacted] (Chemia Corp, Troy MO)

2006 [redacted] (Carbondale medical school),
[redacted] (St. Louis University medical school),
[redacted] (Indianapolis/industry)

2007 [redacted] (medical school),
[redacted] (UMSL optometry school),
[redacted] (SIU Edwardsville pharmacy school),
[redacted] (Charles River Laboratories, Massachusetts)

2008 [redacted] (Ph. D. University of Illinois),
[redacted] (University of Missouri medical school),
[redacted] (SLU grad school)
[redacted] (Prince Manufacturing)
[redacted]

2009 [redacted] (SIUC grad school)
[redacted] (IUPUI grad school)

2010 [redacted] (UMSL optometry school, graduated May 2014), [redacted] (applying to pharmacy schools),

2011 [redacted] (CLS school in St. Louis) [redacted] (OU pharmacy school), [redacted] chemistry graduate school), [redacted] (chemistry graduate school Washington University), [redacted] (SIUE dental school), [redacted]

2012 [redacted] (Pharmacy School St. Louis College of Pharmacy), [redacted] (Physician's Assistant school at Saint Louis University), [redacted] (Logan Chiropractic School).

2013 [redacted], [redacted] (Roquette), [redacted] (Roquette), [redacted] (U of Iowa, Pharmaceutical Chemistry).

2014 [redacted], Stephanie Foster (completing her BS in Mathematics at QU), [redacted] Tennessee Pharmacy School), [redacted] (completing her BS in Biological Sciences at QU), [redacted] (U of IL Chicago, Chemistry Grad School).

2015 [redacted]

Analysis of Assessment Results

The results of the alumni survey are extremely encouraging. Students have been able to be placed in graduate school out of our program very easily. We have only heard from about 80% of past graduates, but all of these are employed in their field. Every person we have heard from is gainfully employed, either in graduate school or in a job related to their field. One is self employed in business and two are choosing to be stay-at-home Moms, but previously held jobs in their area. We are still trying to find current information for about 10 out of 62 graduates.

Also in the survey, we hear from many students who are not Chemistry majors (usually Chemistry minors) that many of our students scored very well in the chemistry portions of the MCAT, OAT, and P-CAT. Most recently one scored in the 88% of the General Chemistry portion of the Optometry test. The top accomplishment of a QU chemistry student was 2011 when Tyler Grawe scored in the 99^{th} percentile on the chemistry portion and 96^{th} percentile overall on the Pharmacy-CAT.

The ETS Exam

The results of this exam are always interesting but it is only one test. In general, Quincy University chemistry majors score slightly higher than the chemistry majors at other colleges and universities. The A students do the best and the C students do the worst, but within acceptable ranges. This actually shows that the grades in QU chemistry classes are pretty accurate to what the students have learned.

The median scores are more or less constant over the years. It is very difficult to do a numerical analysis and get any valuable insight out of it because the sample size is so small. It is interesting to see the raw scores vs. percentiles, which come from ETS, and it gives some meaning to the scores. The possible scores for the total are 120 – 200. However, each year the percentiles change. The highest scoring individuals (174, 174, 175, 176, 180) from the last several years have scored well into the 95% percentile.

I. Planned Program Changes

The most recent change was the addition of Dr. Caitlin Deskins of the Quantitative Analysis/Forensic Chemistry course. This was implemented because of the new Forensic Science major, but the Quantitative part of the course fits in well and meets a need we had. Some of the alumni in graduate school had mentioned that we didn't have Quantitative Analysis in our curriculum and should have it.

The goal is to have at least 3 graduating senior chemistry majors each year. The ETS exam results are always relative (again, it is just one test), but a goal for this assessment is to score at least 140 for all test takers, and most QU chemistry majors should score 150 or better.

A goal is to continue encouraging more students to do summer undergraduate research. A student who has this on their transcript is almost guaranteed placement into graduate school. We succeeded in this goal. In the summer of 2010, four Quincy University chemistry majors were doing summer undergraduate research at other institutions. I was unable to get students to engage in summer undergraduate research for the past few summers. I will continue to encourage the student to do summer undergraduate research.

Finally, a continued goal for the program is to have 100% placement, whether it be in a job or professional school. Currently the professor's input into this is somewhat limited, but ongoing discussions with the chemistry majors will help to ensure that they are working on placement. The major influence that faculty have on placement is the letter of recommendation.