

The Teaching of Chemistry in
Universities and Colleges

by John Edwin Coe

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SPresented to the Department of Chemistry by
John Edwin Coe, as thesis for the Masters
Degree at the University of Kansas, Summer 1912

Thesis.

**Subject :- The Teaching of Chemistry in Universities
and Colleges., An Inquiry into the size and
character of the Faculties, the character of the
Courses of Study, and the Text Books used
in the Chemistry Departments of 125 American
Universities and Colleges.**

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Introduction and Summary.

The aim of this paper is to make a series of comparisons of the Departments of Chemistry in the more prominent Educational Institutions of this country. After some study of the question, it was seen that among the Universities and Colleges there are two fairly distinct groups. The first of these contains thirty-five schools, and includes practically all the large institutions, (i.e. those with enrollments of over 2,000) and a few of the smaller schools which by their strength of faculty and resources or because of their location, hold a prominent place in the teaching of Chemistry. The second group includes seventy-one of the smaller Universities and Colleges. Other sub-ordinate groups are the Agricultural Colleges, the Women's Colleges and the Trade Schools. These were chosen so as to be as widely representative as possible. However only a few of the very small Colleges, those with enrollments of under four hundred are included in the list.

In securing the data various sources of information were consulted. The location and enrollment of the schools was taken from the Worlds Almanac of 1911; the number and degrees of the faculties and the character of the courses of study were taken from the latest available catalogs of the institutions. These are kept on file in the office of the Chancellor of the University, and access to their use was kindly granted. The lists of text books used in general, analytical, organic, and physical chemistry and their laboratories were secured from the various schools during the spring of 1912, by sending out to the various departments of chemistry, letters containing blanks for the insertion of the information sought. Answers to something more than half of these were received, and the data listed. The names of the text books used in some nine or ten other schools were gained from their catalogues. Finally the lists of authors, publishers, and costs of the various texts were compiled by reference to the text itself when found in the library of the chemistry department of the university. The data for those not found there were compiled from the trade lists of the various publishing houses which are kept on file in the General Library of the University.

In our lists of schools of the first class, we find only four with enrollment under one thousand: they are Amherst, Johns Hopkins, North Carolina, and Louisiana. Of the others eleven are between one and two thousand in enrollment, seven between two and three thousand, three between three and four thousand, three between four and five thousand, and seven of over five thousand in enrollment.

Among these schools the smallest number of courses presented in the catalogues are at Amherst and Johns Hopkins, with twelve each.

As in any such classification of schools, there are no hard and fast lines, so here we find by referring to our lists of schools of the second class that some of them have listed more than twenty courses, notably the Universities of Maine, Lehigh, Arkansas, and Colorado. The division was made in this case because of the strength of the faculties, those of the smaller schools being superior. Amherst has four Professors, and Johns Hopkins, seven, while Arkansas has only two, Colorado one, Lehigh two, and Maine one, showing that in proportion to the number of students the teaching forces of the latter are considerably smaller. There being no easily available sources of determining the number of pupils taking chemistry, these figures may in some cases be unjust. In the College of the City of New York, no graduate work is given, so the institution is placed in the second class. Another instance is Northwestern University, which with its large total enrollment has in its Arts course only 1,020 students.

Since this inquiry has primarily to do with students in Colleges of Liberal Arts and Sciences, with students Majoring in Chemistry, and with Chemical Engineers, the Faculties and courses in Medicine, Agriculture, Pharmacy, and Metallurgy have been excluded thruout, thus placing the schools upon a fairer basis for the comparison of the courses in chemistry. The largest number of courses offered is at Chicago where sixty-six are listed. This should probably be reduced to forty-four because of Chicago's somewhat peculiar method of dividing the school year into three terms instead into the usual two semesters. Columbia comes next with sixty-two courses, then follow Illinois, Iowa, Yale, Michigan, Kansas, and Cornell. Of course in these large schools the amount of research work is almost unlimited as far as equipment is concerned yet on the other hand the courses offered and maintained each year are a fairly good evidence of the presence of adequate teaching force and equipment.

As to total teaching force counting Professors, Instructors, and Assistants, Cornell ranks first with forty-one, Massachusetts Institute of Technology second with thirty-eight, and Yale third with twenty-eight.

In searching for a good standard for comparison of the schools according to their faculties, it soon became evident that a comparison of the total faculties was entirely unjust. It would give a school like Cornell with its few Professors and great number of Assistants a higher rank than Yale or Columbia where the faculties are numerically weaker but of higher order. After some deliberation it was decided to count each Full Professor four, each Associate Professor three, each Assistant Professor two, and each Instructor one, and not to count the number of Assistants in making this comparison.

This gives Massachusetts Institute of Technology first place with fifty-one points, Columbia second with forty, Wisconsin third with thirty-five, and Yale and Illinois fourth with thirty-two, Michigan sixth with twenty-six, Pittsburg and Kansas seventh with twenty-five.

It is evident that a numerical comparison of the strength of the faculties, such as this does not take into consideration the important question of the relative efficiency of the different faculties, and upon this factor, we have no access to reliable data.

A sectional comparison of the schools shows the East with a total of 333 points or dividing by the number of schools, fourteen, an average efficiency of twenty-four; the Central states with 290 points and fifteen schools have an average of nineteen points; the Western with 45 points and three schools, an average of sixteen; the Southern with 42 points and three schools an average of fourteen points. Showing that the schools of the East come first, with those of the Central States second, then those of the West and South.

Of the faculties of these schools 62 % of the total excluding the Assistants hold the Doctors Degree, 18 % the Masters, and 17 % the Bachelors. Of the total faculties of 319, 30% are Professors, 8 % Associate Professors. 22 % Assistant Professors, and 40 % Instructors. 76 % of the Professors, 91 % of the Associate Professors, 73 % of the Assistant Professors, 39 % of the Instructors hold the Doctors Degree.

An examination of the courses of study shows several methods of grouping the subjects as (a) Inorganic and General Chemistry, Analytical, Organic, and Physical; (b) Lecture and Laboratory, (c) Primarily for Undergraduates, and For Undergraduates and Graduates, and For Graduates.; (d) Foundation Courses in Chemistry, General and Physical Chemistry, Analytical and Applied Chemistry, Organic Chemistry.

Only one or two schools make an attempt to duplicate the work each semester. Some work by the individual plan, the pupils making as many hours work over a minimum as they wish and have the time and ability. In a few schools the laboratory work is considered as separate courses and need not be taken at the same time as the corresponding class room work.

Because of their difference in entrance requirements the schools may be divided into five classes:- (1) those that give full half year credit for secondary school chemistry, (2) those schools where the pupils with credit carry a parallel course with fewer hours during the first year, (3) those where he is given an advanced course but without advanced credit, (4) where no recognition is given to entrance Chemistry, (5) In a very few schools preparatory chemistry is a prerequisite as entrance credit.

The usual course in elementary chemistry consists of recitations, lectures, demonstrations, and laboratory work: an average of four hours laboratory and two lectures per week thruout the year. The advanced inorganic chemistry with Chemistry I or High School chemistry as a prerequisite usually requires three hours lecture and six hours laboratory thruout the year. Various shorter and advanced courses are offered in inorganic chemistry.

The work in Qualitative Analysis usually is one hour recitation and four hours laboratory thruout the year. Not much advanced work in Qualitative Analysis is given. Special Courses in Spectre, and Micro-Chemical Analysis are found in a few schools, and also a few maintain shorter courses for special groups of students. The work in Quantitative Analysis after the introductory course in simple salts, is the most varied of any of the courses; some courses offering as many as 125 hours credit. The elementary course consists usually of one hour conference and five two-hour laboratory periods par year.

Elementary, and Advanced Organic Chemistry and Organic Preparations are the courses practically universally offered. Many special courses are found, depending upon the needs of the localities in which the schools are situated, as for instance the study of Road Oils and Tar at Washington State University, and the study of Sugar and Cotton Seed Oil at Tulane.

Physical chemistry is not taught in many of the smaller schools. In all it is closely allied with Inorganic Chemistry and forms a favorite field of research. A reading knowledge of French and German is the usual requisite for advanced work.

Special courses in Chemistry include the seminars and club meetings, the various courses in Technology, Factory Management, Visits to Industrial Plants, courses in History of Chemistry, Glass Blowing, Photography, Photo-Engraving, Byslag, Chemical Hazards, and Teachers Training.

The next part of our discussion deals with the smaller and the special schools.

Of a total of 122 Professors in the 71 smaller schools listed, 77 held the Doctors Degree, an average of some 65%, which is about 10% lower than in the larger schools.

The courses of study in the smaller schools give usually some eight or ten courses which include the Elementary General Chemistry, Qualitative and Quantitative Analysis, and Organic Chemistry. There is usually some opportunity of doing Graduate or research work.

Chemistry Courses in the best Womens Colleges are stronger than those in many small colleges. In Agricultural and Trade Schools the work is elementary, and always in the form of applied chemistry. The schools of the Army and Navy teach only one year of Chemistry. Tuscegee offers no Chemistry.

The text books of General Chemistry, where there is an elementary and an advanced course are usually McPharson and Henderson for the elementary course, and Smiths College text for the advanced. In the laboratory work nearly all the schools use their own texts. Smith and Hale is used in thirteen schools; the text of W. A. Noyes is the most popular in Qualitative Analysis, and that of Talbot in Quantitative Analysis. Remsen is the preferred text in Organic Chemistry, while Cohen is a close second. Gattermanns laboratory text in Organic Chemistry is almost universally used. The same is true of Walker and Findlay in Physical Chemistry and Laboratory, but to a less degree. Many schools use the texts of their own Professors in one or more classes, and others use the Library Reference Plan. Harvard is a good example of the latter.

In an inquiry into the character of the requirements in Chemistry for the entrance to the various Medical Schools disclosed the fact that there are no uniform requirements. The average is about one year of College Chemistry.

Some data were also gathered as to the requirements for the Master and Doctors Degrees in the various schools.

S chools of the First Class.

	Name	Location	Enrollment	Course	Faculty		
					A	B	C
1	Amherst	Amherst Mass	502	12	4	0	4
2	Armour Inst.'Tech	Chicago Ill	1,400	20	4	1	5
3	California	Berkeley Cal	3,450	40	5	7	12
4	Carnegie Tech	Pittsburg Pa	2,224	26	2	3	5
5	Chicago	Chicago Ill	6,007	66	5	16	21
6	Cincinnati	Cincinnati O	1,337	35	4	7	11
7	Columbia	Manh'n Boro N Y	7,463	62	10	13	23
8	Cornell	Ithaca N Y	5,194	45	6	35	41
9	George Washington	Washington D C	1,387	24	7	1	8
10	Harvard	Cambridge Mass	4,046	35	5	10	15
11	Illinois	Urbana Ill	5,096	55	9	7	16
12	Indiana	Bloomington Ind	2,103	32	5	6	11
13	Iowa State Coll.	Ames Iowa	1,650	30	4	8	12
14	Iowa	Iowa City Iowa	2,352	54	3	6	9
15	Johns Hopkins	Baltimore Md	785	12	7	4	11
16	Kansas	Lawrence Kans	2,500	45	7	10	17
17	Leland Stanford	Stanford U. Cal	1,617	22#	5	12	17
18	Lousiana	Baton Rouge La	620	24	3	2	5
19	Mass.Inst.' Tech.	Boston Mass	1,481	44	16	22	38
20	Michigan	Ann Arbor Mich	5,383	49	7	18	25
21	Minnesota	Minneapolis Minn	5,369	32#	5	13	18
22	Missouri	Columbia Mo	2,903	28	3	10	13
23	New York	New York City	4,040	25	3	3	6
24	North Carolina	Chapel Hill N C	821	26	5	8	13
25	Ohio	Columbus Ohio	1,597	40	6	7	13
26	Pennsylvania	Phila. Penn	5,343	20#	7	7	14
27	Penn. State Coll.	State Coll. Penn.	1,557	44	6	9	15
28	Pittsburg	Pittsburg Pa	1,369	24	9	6	15
29	Princeton	Princeton N J	1,400	27	4	6	11
30	Purdue	Lafayette Ind	1,867	23	5	9	14
31	Syracuse	Syracuse N Y	3,300	29	5	3	8
32	Tulane	New Orleans La	2,469	15	4	3	7
33	Washington	Seattle Wash	2,156	27	3	4	7
34	Wisconsin	Madison Wisc	4,500	44	5	6	11
35	Yale	New Haven Ct	3,287	48	12	16	28

In the preparation of this table and the following, three things have been taken into consideration, namely, the total enrollment, the number of courses outlined, and the strength of the Faculty. The data were derived from these sources, the total enrollment from the Worlds Almanac of 1911; the Faculty and Courses of Study from the latest available Catalogue of the Institution. Under Faculty, (A) includes Professors and Adjunct, Associate, and Assistant Professors, while (B) includes Instructors, Assistant Instructors, Laboratory Assistants, and Demonstrators. In both lists, Faculties of Medicine, Agriculture, Pharmacy, and Metallurgy have been excluded. List (C) is the sum of the other two. (#) indicates that Courses in the Graduate School are not listed.

In making a comparison of the schools as to their efficiency, the enrollment, the size and character of the faculties, the equipment and apparatus for teaching, the character of the courses offered, and to a certain extent at least, the spirit and reputation of the school, would have to be considered.

In considering the various departments of chemistry, the size and character of the faculties, and of the courses offered, are essential. For the other elements, altho of no less importance, will in a general way correspond. A school with a large faculty of high character must necessarily have a large enrollment and superior equipment.

Referring to the table of schools of the first class, we find that Chicago lists 66 courses, Columbia 62, Illinois 55, Iowa 54, Michigan 49, Yale 48, Cornell and Kansas 45, and Mass. Tech. 44.

As to faculty Mass. Tech. gives fifteen Professors, Yale twelve, Columbia ten, Illinois eight, Pittsburg eight, Cornell gives thirty-five Instructors and Assistants, Mass. Tech. twenty-one, Yale eighteen, Michigan sixteen, Columbia thirteen, Minnesota thirteen. In total faculties Cornell has forty-one, Mass. Tech. thirty-six, Yale thirty, Michigan twenty-four, Columbia twenty-three, Chicago twenty, Kansas nineteen, Harvard and Minnesota eighteen.

Estimating each Professor as four points, each Associate Professor as three, each Assistant Professor as two, and each Instructor as one, Mass. Tech. stands first with fifty-one points, Columbia second with forty, Wisconsin third with thirty-five, then follow, Yale, Illinois, Michigan, and Kansas.

Of the thirty-five schools fifteen are eastern, fourteen central, three western and three southern.

The Eastern schools are, Amherst, Carnegie Tech., Columbia, Cornell, Geo. Washington, Harvard, Johns Hopkins, Mass. Tech., New York, Pennsylvania, Penn. State College, Pittsburg, Princeton, Syracuse, and Yale. The Central are Armour, Chicago, Cincinnati, Illinois, Indiana, Iowa State College, Iowa, Kansas, Michigan, Missouri, Ohio, Purdue, and Wisconsin. The Western, California, Leland Stanford, and Washington. The Southern are Louisiana, North Carolina, and Tulane.

The Eastern schools headed by Mass. Tech., Yale, Columbia, and Cornell are first, with the Central schools, Wisconsin, Michigan, Chicago, Illinois, Kansas, and Minnesota a close second. The schools of the West and South are distinctly inferior.

The average enrollment of these schools is 2,846, the average number of courses offered 39, the average number of Professors six, number of Instructors and Assistants six, and average faculty fifteen.

**Institutions Listed according to Size
of the Faculties.**

	A	B	C	D	Weight	
1	Mass. Inst. of Tech.	6	1	8	8	51
2	Columbia	6	1	3	7	40
3	Wisconsin	5	0	3	9	35
4	Yale	4	0	7	2	32
5	Illinois	4	0	4	8	32
6	Michigan	3	0	4	6	26
7	Kansas	2	2	3	5	25
8	Pittsburg	2	0	6	5	25
9	Cornell	4	0	0	8	24
10	Johns Hopkins	3	3	0	2	23
11	Leland Stanford	5	0	1	1	23
12	Penn. State	1	1	4	8	23
13	Pennsylvania	1	0	4	10	22
14	Minnesota	2	0	3	8	22
15	Ohio	4	1	0	2	21
16	Chicago	3	0	2	4	20
17	George Washington	2	0	6	0	20
18	Harvard	3	0	2	4	20
19	Princeton	4	0	0	2	18
20	Purdue	3	1	1	1	18
21	North Carolina	2	3	0	1	18
22	Iowa State	1	1	1	8	17
23	Tulane	3	1	0	1	16
24	Indiana	2	1	2	0	15
25	Amherst	2	2	0	0	14
26	California	1	0	5	0	14
27	Missouri	3	0	0	2	14
28	Syracuse	2	1	1	1	14
29	Armour	2	1	0	1	12
30	Cincinnati	1	1	2	1	12
31	Iowa	1	0	2	4	12
32	Washington	1	1	1	2	11
33	New York	1	1	1	0	9
34	Carnegie	1	0	1	3	9
35	Louisiana	1	0	2	0	8

In this table as in the succeeding ones, Faculties of Agriculture, Medicine, Metallurgy, and Pharmacy have been excluded. Column (A) is the number of Professors and a value of four was given to each in counting efficiencies. Column (B) is that of Associate Professors, with a value of three, Column (C) Assistant Professors with a value of (2), Column (D) ,Instructors with value of one.

**Faculties of Schools of the First Class,
includes, Professors, Associate, & Assistant Professors.**

Amherst,

Harris, Elijah Peabock	Ph.D.	Emeritus
Hopkins, Arthur John	Ph.D.	Inorganic
*Holl, Elliott Snell	Ph.D.	Quantitative
*Doughty, Howard Waters	Ph.D.	Qual. & Organic

Armour Institute of Technology,

McGermack, Harry	U.S.	Engineering
*Froud, Benjamin Ball	B.S.	Organic
*Gill, Eugene Edward	Ph.D.	General

California,

Lewis, Gilbert H.	Ph.D.	Physical
O'Neill, Edmund	Ph.D.	Inorganic
Green, Franklin Theodore	Ph.D.	Emeritus
Wendell, William Theodore	Ph.D.	Analytical
*Blasdale, Walter Charles	Ph.D.	Organic
*Diddle, Henry Chalmers	Ph.D.	Physical
*Sherrill, Miles S.	Ph.D.	Teachers
*Horgan, William Conger	Ph.D.	Physical
*Cottrell, Frederick G.	Ph.D.	Qualitative
*Booth, Edward	Ph.D.	

Carnegie Institute of Technology,

Jones, Joseph H.	Ph.D.	Engineering
*Sill, Herbert P.	Ph.D.	General

Chicago,

Hoff, John Ulric	Ph.D.	Organic
Stieglitz, Julius	Ph.D.	Analytical
McCoy, Herbert Newby,	Ph.D.	Physical
*Monsiee, Alan W.C.	Ph.D.	Inorganic
*Schlesinger, Herman Irving	Ph.D.	Inorganic

Cincinnati,

Jones, Lander William	Ph.D.	Organic
*Fry, Harry Shipley	Ph.D.	Inorganic
*Geottsch, Henry Max	Ph.D.	Industrial
*Tolman, Richard G.	Ph.D.	Phys. & Quant.

Columbia,

Chandler, Charles P.	Ph.D.	Emeritus
Begert, Marston Taylor	LL.D.	Organic
Morgan, J. Livingston Rutgers	Ph.D.	Physical
Sherran, Henry G.	Ph.D.	Food
Whitaker, Milton C.	M.S.	Engineering
Smith, Alexander	Ph.D.	Inorganic
*Reiner, Marie	Ph.D.	Barnard
*Tucker, Samuel A.	Ph.D.	Electro-
*Netsger, Floyd J.	Ph.D.	Analytical
*Beane, Hal Truman	Ph.D.	

Cornell,

Dennis, Louis Monroe	B.S.	Inorganic
Ornderff, William Ridgely	Ph.D.	Organic
Banereft, Wilder Dwight	Ph.D.	Physical
Chesot, Emily Mennin	Ph.D.	Sanitary
Browne, Arthur Wesley	Ph.D.	Inorganic

George Washington,

Munroe, Charles Edward	Ph.D.	General
Clark, Frank Wigglesworth	Ph.D.	Research
*Hopkins, Nevil Monroe	Ph.D.	Electrical
*Hill, Edwin Alston	Ph.D.	Steres-
*McNeil, Hiram Colver	Ph.D.	Physical
*Seest, Otis Dew	M.S.	Qual. & Organic
*Price, Thomas Maleson	Ph.D.	Quantitative

Harvard,

Jackson, Charles Loring	A.M.	Inorganic
Sanger, Charles Robert	Ph.D.	Qualitative
Richards, Theodore William	Ph.D.	Physical
*Baxter, Gregory Paul	Ph.D.	Quantitative

Illinois,

Moyes, William Albert	Ph.D.	Inorganic
Parr, Samuel Wilson	M.S.	Technological
Bartee, Edward	Ph.D.	Analysis
*Curtice, Richard Sidney	Ph.D.	Organic
*Balke, Clarence Williams	ph D.	Inorganic
*Washburn, Edward Wight	Ph.D.	Physical
*McFarland, David	Ph.D.	General

Indiana,

Lyons, Robert Edward	Ph.D.	Inorganic
Davis, Louis Sherman	Ph.D.	Qualitative
*Brown, Oliver W.	A.M.	Quant. & Physical
*Mathers, Frank Curry	Ph.D.	Advanced Inorganic.
*May, Clarence Earl	Ph.D.	Organic

Iowa State College,

Bennett, Albert Allen	M.S.	
*Placeway, Lela Anne	B.S.	
*Geever, Winifred Ferrest		
*Fowler, Chester Charles	B.S.	

Iowa,

Reckwood, Elbert Williams	Ph.D.	Inorg. & Foods
*Karslake, William J.	Ph.D.	Quant. & Organic
*Pearce, Jesse Weston	Ph.D.	Physical

Johns Hopkins,

Hansen, Ira	Ph.D.	
Nerse, Harnen Northerp	Ph.D.	Analytical
Jones, Harry Clary	Ph.D.	Physical
*Acres, Selsman Parley	Ph.D.	
*Gilpin, Joseph Elliott	Ph.D.	
*Levelace, Benjamin Franklin	Ph.D.	
*Holland, William West,	Ph.D.	

Kansas,

Bailey, Edgar H.S.	Ph.D.	General
Cady, Hamilton Perkins	Ph.D.	Inorganic & Qual.
"Bushong, Francis William	Sc.D.	Industrial
"Dains, Frank Burnett	Ph.D.	Organic
'Jackson, Henry Louis	B.S.	Foods
'Young, Clifford Candy	A.B.	Water Analysis
'Allen, Herman Camp	A.M.	Quantitative

Leland Stanford, Jr.,

Stillman, John Maxson	Ph.D.	Gen. & Organic
Lenox, Lionel Remond	Ph.B.	Qualitative
Franklin, Edward Curtis	Ph.D.	Organic
Young, Stewart Woodford	B.S.	Physical
'Mitchell, John Pearce	Ph.D.	Gen. & Inorganic
Swain, Robert Eekles,	Ph.D.	Organic

Louisiana,

Coates, Charles E.	Ph.D.	General & Sugar
'Menville, Raoul L.	B.S.	Organic
'Odell, Allan F.	D.Sc.	Qual. & Physical

Mass. Inst. of Tech.

Talbot, Henry P.	Ph.D.	Inorg. & Anal.
Noyes, Arthur A.	Ph.D.	Theoretical
Pope, Thomas E.	A.M.	Inorganic
Walker, William H.	Ph.D.	Industrial
Fay, Henry	Ph.D.	Analytical
Gill, Augustus H.	Ph.D.	Technical Anal.
Whitney, Willis R.	Ph.D.	Research
"Moore, F. Jewett	Ph.D.	Organic
'Bardwell, Fred L.	B.S.	Inorganic
'Thorp, Frank H.	Ph.D.	Industrial
'Milliken, Samuel P.	Ph.D.	Organic Research
'Sherrill, Miles g.	Ph.D.	Theoretical
'Woodman, Alpheus G.	S.B.	Food Analyst
'Blanchard, Arthur A.	Ph.D.	Inorganic
'Spear, Ellinwood B.	Ph.D.	Inorganic
'Lewis, Warren K.	Ph.D.	Industrial

Michigan,

Johnson, Otis Coe	A.M.	Qualitative
Campbell, Edward DeMille	B.S.	Analyst
Gomberg, Moses	Sc.D.	Organic
Bigelow, S. Lawrence	Ph.D.	General & Physical
'Lichty, David Martán	Ph.D.	General
'Hale, William Jay	Ph.D.	General
'Sneaton, William Gibb	A.B.	General

Minnesota,

Frankforter, George B.	Ph.B.	Organic
Sidenar, Charles F.	B.S.	Quantitative
'Nicholson, Edward E.	M.A.	Qualitative
'Harding, Everhart P.	Ph.D.	
'Derby, Ira H.	B.S.	Physical

Missouri,

Brown, William George	Ph.D.	Technology
Calvert, Sidney	A.M.	Organic
Schlundt, Herman	Ph.D.	Physical

New York,

Lamb, Arthur B.	Ph.D.	General
*Hill, Arthur E.	Ph.D.	General & Anal.
*Simmons, John P.	So.B.	

North Carolina,

Venerable, Francis Preeton	Ph.D.	
Herts, Charles Helmes	Ph.D.	Gen. & Indust.
*Wheeler, Alvin Sawyer	Ph.D.	Organic
*Bell, James Munnie	Ph.D.	Physical
*Hall, Robert Anderson	Ph.D.	General

Ohio,

Norton, Sydney Augustus	Ph.D.	Emeritus
McPherson, William	Ph.D.	Organic
Henderson, William Edwards	Ph.D.	Gen. & Physical
Faulke, Charles William	B.A.	Quantitative
*Evans, William Lloyd	Ph.D.	Inorganic
*Withrow, James Reznick,	Ph.D.	Inorg., Qual., & Ind.

Pennsylvania,

Smith, Edgar P.	Ph.D.	Vice-President
*Shinn, Oren L.	Ph.D.	
*Taggart, Walter T.	Ph.D.	
*McGutcheon, Thomas P.	Ph.D.	

Pennsylvania State College,

Pend, George Gilbert	Ph.D.	Chem. Lab.
*Churchill, Jesse Briggs	M.S.	Industrial
*Keith, Walter J.	Ph.D.	Organic
*Legs, Victor L.	B.S.	Quantitative
*Potter, Paul D.	M.A.	Physical
*Kaufman, Fred J.	M.S.	Qualitative

Pittsburg,

Duncan, Robert Kennedy	A.B.	Industrial
Phillips, Francis Clifflord	Ph.D.	Organic & Anal.
Kohman, Henry Adolph	Ph.D.	Organic
*Silverman, Alexander	M.S.	Qual. & Food
*Hoffman, Charles	Ph.D.	Organic
*Pratt, Lester Albert	M.S.	Qualitative
*Schels, Samuel Ray	Ph.D.	Industrial
*Shively, Robert Rex	B.S.	Qualitative
*Vogt, Clarence Charles	Ph.D.	Inorg. & Physical

Princeton,

McGay, Leroy Wiley	D. Sc.	Quantitative
Weber, Fred	A.M.	Organic
Hallett, George Augustus	Ph.D.	Physical
Foster, William	Ph.D.	General & Qual.

Purdue,

Evans, Percy Kerton,	Ph.D.	Chem. Lab.
Peffer, Harry Croughton	M.S.	Engineering
Ransom, James Hervey	Ph.D.	General
*Mekin, Edward G.	Ph.D.	
*Middleton, Arthur Renwick	Ph.D.	

Syracuse,

Pattce, Ernest Noble	M.S.	Organic
Smith, Henry Monmouth		General
*Cooper, Horron Charles	Ph.D.	Physical
*Archibald, Eben H.	Ph.D.	Quantitative
*Brunnel, Roger Frederic	Ph.D.	Organic

Tulane,

Caldwell, John Willimcen,	M.D.	Women's
Wilkinson, Levi Washington	M. Sc.	
More, Ann	A.M.	
*Caldwell, Benjamin Palmer	Ph.D.	

Washington,

Byers, Horace G.	Ph.D.
*Bensen, Henry Kreitzer	Ph.D.
*Ross, Robert Evestafieff	Ph.D.

Wisconsin,

Daniells, W. W.	Sc.D.	Emeritus
Fischer, Richard	Ph.D.	Org. Quant. & Ind.
Kahlinberg, Louis F.	Ph.D.	General
Lenker, V.	Ph.D.	Research
*Keelker, William Frederick	Ph.D.	Organic
*Walton, James Henri Jr.	Ph.D.	Physical

Yale,

Mixter, William Gilbert	M.A.	Elem. & Phys.
Wells, Horace Lemuel	Sc.D.	Analytical
Boltwood, Bertran Borden,	Ph.D.	Radio-
Gooch, Frank Austin	Ph.D.	Organic, Kent
*Walden, Percy Talbot	Ph.D.	
*Fecht, Harry Ward	Ph.D.	Physical
*Johnson, Treat Hedin	Ph.D.	Organic
*Dean, Arthur Lyman	Ph.D.	Industrial
*Johne, Carl Oscar	Ph.D.	Organic
*Browning, Philip Fabyury	Ph.D.	
*Van Name, Ralph Gibbs	Ph.D.	Physical

Professors and their Degrees.

	Year	Ph.D.	So.D.	Ed.D.	M.A.	M.S.	B.A.	B.S.	B.Ph.	Total
Anherst	11	2	-	-	-	-	-	-	-	2
Armour	12	-	-	-	-	1	-	1	-	2
California	10	-	-	-	-	-	-	-	1	1
Carnegie	11	1	-	-	-	-	-	-	-	1
Chicago	12	3	-	-	-	-	-	-	-	3
Cincinnati	12	1	-	-	-	-	-	-	-	1
Columbia	12	5	-	-	-	1	-	-	-	6
Cornell	11	3	-	-	-	-	-	1	-	4
Geo. Washington	12	1	1	-	-	-	-	-	-	2
Harvard	12	2	-	-	1	-	-	-	-	3
Illinois	10	3	-	-	-	1	-	-	-	4
Indiana	11	2	-	-	-	-	-	-	-	2
Iowa State	12	-	-	-	-	1	-	-	-	1
Iowa	12	-	-	-	-	-	-	-	-	1
Johns Hopkins	12	3	-	-	-	-	-	-	-	3
Kansas	12	2	-	-	-	-	-	-	-	2
Leland Stanford	11	3	-	-	-	-	-	1	1	5
Louisiana	12	1	-	-	-	-	-	-	-	1
Mass. Tech.	10	5	-	-	1	-	-	-	-	6
Michigan	11	1	1	-	-	-	-	1	-	3
Minnesota	11	1	-	-	-	-	-	1	-	2
Missouri	12	2	-	-	1	-	-	-	-	3
New York	12	1	-	-	-	-	-	-	-	1
N. Carolina	12	2	-	-	-	-	-	-	-	2
Ohio	11	3	-	-	-	-	1	-	-	4
Penn. State	12	2	-	-	-	-	-	-	-	2
Pennsylvania	11	1	-	-	-	-	-	-	-	1
Pittsburg	12	2	-	-	-	-	-	-	-	2
Princeton	11	2	1	-	1	-	-	-	-	4
Purdue	12	2	-	-	-	1	-	-	-	3
Syracuse	12	1	-	-	-	1	-	-	-	2
Tulane	11	-	-	1	1	1	-	-	-	3
Washington	12	1	-	-	-	-	-	-	-	1
Wisconsin	11	3	1	-	-	-	H.N. 1	-	-	5
Yale	11	2	1	1	1	-	-	-	-	4

Of the 92 Professors, 70 or 76 % hold the Doctors Degree, 13 or 14 % the Masters, and 5 or 5% the Bachelors.

**Associate and Adjunct Professors
and their Degrees.**

	Year	Ph.D.	So.D.	M.D.	M.S.	M.A.	B.S.	D.A.	B.Ph.	Total
Amherst	11	2	-	-	-	-	-	-	-	2
Armour	12	1	-	-	-	-	-	-	-	1
California	10	-	-	-	-	-	-	-	-	0
Carnegie	11	-	-	-	-	-	-	-	-	0
Chicago	12	-	-	-	-	-	-	-	-	0
Cincinnati	12	1	-	-	-	-	-	-	-	1
Columbia	12	1	-	-	-	-	-	-	-	1
Cornell	11	-	-	-	-	-	-	-	-	0
Geo. Washington	12	-	-	-	-	-	-	-	-	0
Harvard	12	-	-	-	-	-	-	-	-	0
Illinois	10	-	-	-	-	-	-	-	-	0
Indiana	11	-	-	-	-	1	-	-	-	1
Iowa	12	-	-	-	-	-	-	-	-	0
Iowa State	12	-	-	-	-	-	1	-	-	1
Johns Hopkins	12	3	-	-	-	-	-	-	-	3
Kansas	12	1	1	-	-	-	-	-	-	2
Leland Stanford	11	-	-	-	-	-	-	-	-	0
Louisiana	12	-	-	-	-	-	-	-	-	0
Mass. Inst.	10	1	-	-	-	-	-	-	-	1
Michigan	11	-	-	-	-	-	-	-	-	0
Minnesota	11	-	-	-	-	-	-	-	-	0
Missouri	12	-	-	-	-	-	-	-	-	0
New York	12	1	-	-	-	-	-	-	-	1
N. Carolina	12	3	-	-	-	-	-	-	-	3
Ohio	11	1	-	-	-	-	-	-	-	1
Pennsylvania	11	-	-	-	-	-	-	-	-	0
Penn. State	12	1	-	-	-	-	-	-	-	1
Pittsburg	12	-	-	-	-	-	-	-	-	0
Princeton	11	-	-	-	-	-	-	-	-	0
Purdue	12	1	-	-	-	-	-	-	-	1
Syracuse	12	1	-	-	-	-	-	-	-	1
Telane	11	1	-	-	-	-	-	-	-	1
Washington	12	1	-	-	-	-	-	-	-	1
Wisconsin	11	-	-	-	-	-	-	-	-	0
Yale	11	-	-	-	-	-	-	-	-	0

Only seventeen schools of the thirty-five have Professors of this rank. Of the twenty-three Associate Professors only two held other Degrees than that of Doctor.

Assistant Professors and their Degrees.

	Year	Ph.D.	Sc.D.	M.D.	M.A.	M.E.	B.A.	B.S.	B.Ph	Total
Amherst	11	-	-	-	-	-	-	-	-	0
Armour	12	-	-	-	-	-	-	-	-	0
California	10	4	-	-	-	-	-	1	-	5
Carnegie	11	1	-	-	-	-	-	-	-	1
Chicago	12	2	-	-	-	-	-	-	-	2
Cincinnati	12	2	-	-	-	-	-	-	-	2
Columbia	12	2	-	-	-	-	1	-	-	3
Cornell	11	-	-	-	-	-	-	-	-	-
Geo. Washington	12	4	-	1	-	1	-	-	-	6
Harvard	12	1	-	-	-	1	-	-	-	2
Illinois	10	4	-	-	-	-	-	-	-	4
Indiana	11	2	-	-	-	-	-	-	-	2
Iowa State	12	-	-	-	-	-	-	1	-	1
Iowa	12	1	-	-	-	1	-	-	-	2
Johns Hopkins	12	-	-	-	-	-	-	-	-	0
Kansas	12	-	-	-	1	1	-	1	-	3
Leland Stanford	11	-	-	1	-	-	-	-	-	1
Louisiana	12	-	1	-	-	-	-	1	-	2
Mass. Tech.	10	6	-	-	-	-	-	2	-	8
Michigan	11	3	-	-	-	-	1	-	-	4
Minnesota	11	1	-	-	1	-	-	1	-	3
Missouri	12	-	-	-	-	-	-	-	-	-
New York	12	-	1	-	-	-	-	-	-	1
N. Carolina	12	-	-	-	-	-	-	-	-	0
Ohio	11	-	-	-	-	-	-	-	-	0
Pena. State	12	1	-	-	1	1	-	1	-	4
Pennsylvania	11	4	-	-	-	-	-	-	-	4
Pittsburg	12	3	-	-	-	1	-	2	-	6
Princeton	11	-	-	-	-	-	-	-	-	0
Purdue	12	1	-	-	-	-	-	-	-	1
Syracuse	12	1	-	-	-	-	-	-	-	1
Tulane	11	-	-	-	-	-	-	-	-	0
Washington	12	1	-	-	-	-	-	-	-	1
Wisconsin	11	3	-	-	-	-	-	-	-	3
Yale	11	7	-	-	-	-	-	-	-	7

Of the 79 Assistant Professors 55 held the Doctors Degree, 9 the Masters, and 12 the Bachelors. Nine Schools have no Professors of this Rank.

Instructors and their Degrees.

	Year	Ph.D.	Ss.D.	M.D.	M.A.	M.S.	B.A.	B.S.	B.Ph.	Total
Amherst	11	-	-	-	-	-	-	-	-	0
Armour	12	-	-	-	-	-	-	1	-	1
California	10	-	-	-	-	-	-	-	-	0
Carnegie	11	2	-	-	-	-	-	-	-	3
Chicago	12	3	-	-	-	-	1	-	-	4
Cincinnati	12	1	-	-	-	-	-	-	-	1
Columbia	12	6	-	-	1	-	-	-	-	7
Cornell	11	2	-	-	2	-	3	1	-	8
Ge. Washington	12	-	-	-	-	-	-	-	-	0
Harvard	12	3	-	-	1	-	-	-	-	4
Illinois	10	8	-	-	-	-	-	-	-	8
Indiana	11	-	-	-	-	-	-	-	-	0
Iowa State	13	-	-	-	-	-	-	5	-	5
Iowa	12	1	-	-	-	1	-	-	-	2
Johns Hopkins	12	2	-	-	-	-	-	-	-	2
Kansas	12	-	-	-	3	-	-	-	-	3
Leland Stanford	11	-	-	-	1	-	-	-	-	1
Louisiana	12	-	-	-	-	-	-	-	-	0
Mass. Tech.	10	3	1	-	1	-	-	3	-	8
Michigan	11	4	-	-	-	-	1	1	-	6
Minnesota	11	-	-	-	2	4	1	-	-	7
Missouri	12	-	-	-	2	-	-	-	-	2
New York	12	-	-	-	-	-	-	-	-	0
W. Carolina	12	-	-	-	-	-	-	1	-	1
Ohio	11	1	-	-	1	-	-	-	-	2
Penn. State	12	-	-	-	1	2	2	2	1	8
Pennsylvania	11	3	-	-	3	-	-	3	-	9
Pittsburg	12	-	-	-	2	-	1	2	-	5
Princeton	11	2	-	-	-	-	-	-	-	2
Purdue	12	-	-	-	1	-	-	-	-	1
Syracuse	12	-	-	-	-	-	-	1	-	1
Tulane	11	-	-	-	-	1	-	-	-	1
Washington	12	1	-	-	-	1	-	-	-	2
Wisconsin	11	4	-	-	1	2	-	-	-	7
Yale	11	1	-	-	-	1	-	-	-	2

Of the 124 Instructors, 47 have the Doctors Degree,
34 the Masters, and 30 the Bachelors: three have engineering
degrees and nine have no degree.

Summary of the Degrees of the Faculties

	Degree	Master	Bachelor	Engineer	None	Total	%
Professor	70	15	8	1	0	92	30
Associate Prof.	21	1	1	0	0	25	8
Assistant Prof.	58	9	12	0	0	79	22
Instructors	49	34	30	2	9	125	40
Totals	198	57	51	4	9	319	100
% of "	62	18	17	1	2	100	

Courses of Study.

In an examination of the courses of study several methods of grouping the subjects are found.

Cornell, Columbia, and Iowa, group the work as Inorganic and General, Analytical, Organic, and Physical.

Leland Stanford as Lecture Courses & Laboratory Courses.

Chicago, Wisconsin, Harvard, and Cincinnati as, (a) Primarily for Undergraduates, (b) For Undergraduates, and Graduates, (c) Primarily for Graduates.

Michigan and Ohio as, (a) Foundation Courses in Chemistry, (b) General and Physical Chemistry, (c) Analytical and Applied Chemistry, and (d) Organic Chemistry.

The following differences in Organization are unusual:-

At Michigan nearly all the work is duplicated each semester.

At Newdein, nearly all the courses are conducted upon an individual plan, with conferences, each man making as much time as he sees fit beyond the minimum requirement of five hours.

At Vassar, Laboratory work is required in all courses, but it is not counted towards a degree but is regarded as study.

At Leland Stanford, the pupil enrolls for advanced and special courses under (x) giving the name of the Professor under whom the work is to be done.

The character of the work in Introductory Inorganic Chemistry depends, upon whether Preparatory School Chemistry is required, is optional, or no consideration is given it; also upon whether Medical, Pharmaceutical, Engineering, and Domestic Science Departments are connected with the school. As a rule pupils specializing in chemistry (Chemicals), have the same work as Chemical Engineers.

In regard to Preparatory Chemistry we can divide the schools into five classes:-

(1) Those that give full credit to it.

At Kansas, a special five hour course is given during the first semester, to which those who have had preparatory chemistry are not admitted with credit.

At Chicago, those without elementary credit take the course thru the three quarters of the first year, while those who have entrance credit take either one or two quarters, depending upon preparation and ability; in exceptional cases Qualitative Analysis being substituted for the second quarters work.

A similar condition is found at Columbia, Yale, Minnesota, Pittsburg, Washington, and Carnegie.

At Cornell, credit is given only upon examination.

At Michigan, advanced standing in a two hour course of lectures and recitations is determined by examination during the first month.

(2) This group includes those schools where pupils with High School credit carry a parallel course, but one requiring fewer hours, during the first year.

At Leland Stanford, such pupils enroll for a two hour instead of a three hour lecture course.

At Iowa they may do advanced work in Laboratory.

At Illinois, beginners take a five hour introductory course, while others take one of four hours.

(3) Group three includes those schools where the pupil with entrance credit does the same number of hours advanced work but with the same credit. This is true at Iowa altho elective. At Harvard such students, "receive more advanced instruction and have an opportunity to carry on a course in inorganic preparations in place of a portion of the regular laboratory work." Yale and Mass. Tech. are included here.

(4) Includes those schools where no recognition is given entrance chemistry. Such schools are Princeton, Johns Hopkins, Tulane, Ohio, North Carolina, Cincinnati, and Wisconsin, altho it is quite possible that some provision not mentioned in the prospectus may hold in these schools.

(5) This group would include those schools where Preparatory Chemistry is an entrance requisite, as at Armour and Missouri. California offers elementary chemistry only at the summer session.

The course in Elementary Inorganic Chemistry is usually similar to that given in the preparatory school, except that it usually requires less time. The course consists of recitations, lectures, demonstrations, and laboratory work. Armour and California offer no elementary Chemistry in the regular term. At Cornell, Princeton, Mass. Tech., New York, Pennsylvania, North Carolina, and Wisconsin Elementary and advanced are the same or parallel courses.

Summary of Inorganic (Elementary) Chemistry.

Chicago,	class room 3, laboratory 6 hrs. per week for year.	
Kansas,	5 hrs. rec. lab. & lect. semester, credit 5	
Leland Stanford,	2 or 3 lect. 2 lab periods year.	
Michigan,	2 lect. & rec. 2 lab. 1 discuss. year	8
Minnesota,	2 lect. 4 hrs. lab. for year	6
Princeton,	Exp. lect. & Rec. 3 hrs. week year.	
Pittsburg,	1 lect., 1 quiz, & 6 lab. year	8
Ohio,	1 lect., 1 quiz, & 6 lab. year	8
Washington,	2 lect. and 6 hrs. laboratory year	
Yale,	3 rec., lect. & lab. 4 1/2 hrs 2/3 year	

In the first College or Advanced Chemistry the requirements are very similar.

School	Prereq.	Credits per term.	Lect. & Rec.	Lab.	Terms of 1/2 yr.
California	H.S.	5	3	6	2 inc. Qual.
Cincinnati	Chem. I		3	2-3hr	2
Chicago	H.S. Mj.		3	6	1 or 2 Quarters
Columbia	H.S.		3 & 1		2 No lab.
Cornell	none	3	3 & 1	2- 2.30	2
Geo. Washington			3	2-3hr	2
Harvard	none		2 & 1	2 hrs	2
Illinois	Chem. I.	2			1
Iowa		3 or 3 1/2	4 or 5	3	2

School	Prereq.	Credit	Lect. & Rec.	Laboratory	Terms
Iowa State			3	2	2
Johns Hopkins			3	6	2
Kansas	H.S.	5	2	3-2hr	1
L. Stanford Chem. I		5	3	2	2
Mass. Tech.	H.S.		2 & 2	4	2
Michigan			3		2
Minnesota	H.S.	3	2	4	2
Ohio	none	4	3 & 1/2	1 - 2hr	2
New York	none		3	6	2
N. Carolina		3			2
Penn. State		6	4	5	2
Princeton		3	2 & 1	1 - 4hr	2
Pittsburg	H.S.	3	1 & 1 quiz	3	3/2
Syracuse		3		1- 3 hr	1
Washington	H.S.	4	2	6 hrs	2
Wisconsin			2	2 - 2hr	2
Yale	H.S.		3	4 1/2	3/2

Other courses in Inorganic Chemistry are either shorter special courses or courses for advanced students and graduates.

Wisconsin offers a two hour lecture, and two-two hour laboratory periods for the year for engineers, and for Pharmacy a three hour lecture course.

At Ohio the B.S. people take a longer course than A.B. or Ph.D. students.

Illinois has a short four hour course for Engineers.

Michigan one for Homeopathic Medicine, Dentistry, & Pharmacy, another for Engineers.

Iowa State has special short courses for Home Economics, Agriculturalists, and Veterinary Students.

Chicago offers a course in Inorganic Prep, where German is a prerequisite, and a course in Advanced Inorganic of lectures on Selected Topics.

Cornell, three courses in Advanced Inorganic, a year of Group Properties of the Elements, with Rare Elements and Earths, a years work in Inorganic Prep. and Rare Elements Laboratory, and a year of experimental lectures on selected topics.

Columbia offers research work for the Master and Doctors Degrees in Inorganic Chemistry.

The Course in Qualitative Analysis.

Qualitative Analysis usually occupies the first half of the second year. If more time is devoted to it there are usually fewer hours per week.

At Kansas the course consists of five hours a week, two recitations and three two-hour laboratory periods throught one semester.

At Minnesota the course is one recitation and four hours laboratory thru the year.

At California, the laboratory work of the Qualitative Analysis is used as an aid in teaching the general inorganic chemistry, with which it co-ordinates.

At Missouri, there is a brief survey of Analytical Chemistry, giving the methods of Qualitative and Quantitative Analysis, required of students of Agriculture, but elective for those in Arts, Foods, Economics, and Medicine.

Syracuse, Pennsylvania, and George Washington have short courses for Engineers,

Leland Stanford, one for Medical Students.

In North Carolina, the course may be taken with Chemistry I.

Arneur, offering no beginning Chemistry, makes a special review of Inorganic in the course in Qualitative.

Chicago has a course in elementary spectrum analysis, both emission and absorption.

Columbia, Pennsylvania, and Ohio offer a variety of courses in Qualitative Analysis, varying from three to ten hours.

Pittsburg offers Micro-Chemical Analysis.

Johns Hopkins a course in Graduate Qualitative Analysis.

The Course in Quantitative Analysis.

The elementary course consists usually of a half year's work, of one weekly lecture and five two-hour laboratory periods during the second half of the Sophomore year. After the initial course in simple salts, the pupil has a wide choice of subjects. Here different lines of work are offered here than in any other branch of Chemistry.

At Kansas, for instance, the pupil may take up any one of the following specialties, Cement, Sugar, Glass, Packing-House, Gass, Electro, or Rock Analysis. Water, Fuel, and Feed Analysis are also given in a variety of forms.

At Pittsburg we find Microscopical Examination of Feeds.

At Louisiana, Analysis of Fats and Oils, and the Chemistry of Cane Sugar and Its By-Products.

At Princeton, a special course in Methods for Complicated Substances.

At Illinois, Analysis of Paints and Oils, and the Analysis of Glasses and Glases.

Many of the schools have special courses in Chemical Calculations to accompany the work in Analysis.

The Course in Organic Chemistry.

Many of the schools are placing the work in elementary organic chemistry in the Undergraduate School, and making it a prerequisite for Graduate Study. The course at Missouri is a fair type of the work in Organic. It consists of Elementary Organic, a three hour lecture and laboratory course, Organic Chemistry three hours, lecture, recitation, and laboratory, Organic Preps, laboratory synthetic chemistry two or three credits, Preparation of Organic Compounds and Organic Analysis, three, four or five hours, and Advanced Organic Chemistry, consisting of Lectures on selected topics, readings, and reports two or three hours credit. In addition to this there is usually a course in Organic Research. The laboratory work in elementary organic chemistry consists of the preparation of from twenty-five to thirty simple organic compounds as types.

California gives a course in chemistry of the Alkaloids and Dye Stuffs.

Ohio Steres-Chemistry, a two hour course,
Organic Chemistry of Nitrogen, two hours,
Determination of Radicals in Organic Chemistry, a two or three hour laboratory course.

Indiana, Research work in the Alkaloids.

Many of the schools give short courses in Organic Chemistry, especially courses for students of Medicine, and Pharmacy; Others in Industrial Organic, using Thorp as a text.

Michigan has courses in Heterocyclic Derivatives, Organic Dyes, and Organic Synthesis, and Ultimate Analysis.

Wisconsin in Proximate Chemical Analysis,
Chicago in Organic Nitrogen Derivatives.

The Course in Physical Chemistry.

Many of the smaller schools and the Agricultural Colleges do not give this subject. As would be expected it is closely connected with the course of General Theoretical Chemistry. The second half of the year is usually devoted to Electro-Chemistry.

Indiana gives a course in Storage Batteries,
Missouri, and others in Radio Activity,
Ohio, courses in Chemical Statics and Dynamics, Phase Rule, and Theory of Solutions.

Syracuse in Physics-Chemical Analysis.
Johns Hopkins in Physical Chemical Methods.
Princeton, in High Temperature Measurements.
Michigan in Physics-Chemical Measurements.
Chicago in Vapour Pressure,
Mass. Tech. in Thermo Chemistry, and Chemical Equilibrium.

Research work in Physical Chemistry is quite usually offered, and for all the Graduate Courses, a reading knowledge of French and German are general prerequisites. A very few of the schools give short courses for Engineers and Agricultural students.

Practically all the larger schools make provision for Chemical Seminars, Club Meetings, or Reviews of Chemical Literature. This work usually takes one period a week thruout the year, sometimes with credit but more usually without.

At Indiana the Seminar is divided by terms into Inorganic, Organic, and Electro.

At Iowa State , Topic Reading is required of all.

Chemical Technology is also a quite common course. Sometimes the Course is divided into Organic and Inorganic Technology. Therp's "Outlines in Industrial Chemistry", is in almost universal use. Closely connected with this course are such as that at Harvard in Industrial and Technical Analysis. Many of the schools have a Professor in charge of the work in Technology, and at Kansas , and Pittsburg, and some of the Schools of Technology special departments are devoted to this work. These workers are sometimes given the position of Assistant Professor in the Department of Chemistry, and as at Pittsburg , do some teaching. Another division of this work are courses like those at Wisconsin in Chemical Machines and Appliances , Chemical and Industrial Manufacture, or Iowa State's course in Municipal Chemistry. Still others are Courses in Factory Management and Inspection, given at several schools. Schools such as Kansas, Pennsylvania, Colorado, Chicago, and others make a specialty of numerous visits to Industrial Plants, sometimes as many as twenty or twenty-five during the year, and a report is usually required with one or two hours credit. In some schools these visits are required for graduation in Chemistry and a regular course and itinery followed during the Junior and Senior years.

The following are the plants visited by the students at the Armour Institute of Technology during, the year:-

Albert Schwill Malting Company
 Allis-Chalmers Company
 Armour & Co. Fertilisera, Glue, Glycerine, & Soap Werks.
 Barrett Manufacturing Company
 By-Produete Coke Company
 Carter White Lead Company
 Chicago Carbonic Company
 Crane Company Walleable Company
 Corn Products Company
 Columbia Tool Steel Company
 Grasselli Chemical Company
 Great Western Smelting and Refining Company
 Hammond Distilling Company
 Heath and Milligan Paint Company
 Illinois Steel Company, South Works
 Iroquois Iron Company, Blast Furnaces
 Matthisen Hegler Zinc Company, La Salle, Ill.
 Murphy Varnish Company
 National White Lead Werks
 Schoenhofen Brewing Company
 Senour Paint Manufacturing Company
 Sheldon-Foster Glass Company
 Simonds Saw Company
 Standard Oil Company , Refinery.
 Universal Gas Company, & Wahl Institute of Fermentology.

The following list of Plants and Engineering works are visited by the pupils at the University of Pittsburg each year.

Phippe Power Plant
 Westinghouse Machine Company
 National Tube Company
 Power Plant, Pittsburg Railways Company
 Ritter-Gealey Manufacturing Company
 Jones & Laughlin Steel Company
 Pressed-Steel Car Company
 Pittsburg & Lake Erie Repair Shops
 Pittsburg Water-Filtration Plant
 Fort Pitt Bridge Works
 Beaver Bridge
 Sewickley Bridge
 Electrically-operated Coal Mines
 Mesta Machine Company
 Westinghouse Electric & Manufacturing Company
 Pennsylvania Water Company (Filtration Plant)
 H.J. Heinz Plant
 Sewage Disposal Plants of the Allegheny Co. Work Houses
 Shelby Steel-Tube Company
 United Engineering & Foundry Co.
 American Bridge Company
 Carnegie Steel Company, Homestead Works
 Universal Portland Cement Company
 United States Government Testing-Laboratories
 McClinton-Marshall Construction Company
 Union Switch and Signal Company
 Brunot's Island Power-Plant

Another course given in the majority of schools is the one for teachers, which is intended as a preparation for the teaching of chemistry in the secondary schools. A Course in History of Chemistry, usually a two hour course for Graduates is also quite common.

Pittsburg gives a course in Laboratory Equipment and Supplies.

Other special courses are at:-

Missouri, Glass Blowing
 Louisiana, Glass Blowing and Chemical Technique,
 Harvard, Kansas, Minnesota, Photography
 Minnesota, Photo-Engraving and Three Color Work
 Washington, Road Oils and Tars
 Mass. Tech., Textile Coloring
 George Washington, Explosive Substances
 Maine, Dyeing
 Chicago, Debatable Questions in General Chemistry
 Radio-Activity and Nature of Matter
 Chemistry of Photography

Armour, Chemical Hazards.

Several schools give courses in the Chemistry of Explosives, and of Inflammable substances and the Control of Fires, these courses being found chiefly in the schools located in the large Cities.

As to research work, the larger schools give the opportunity in all branches of chemistry. However the emphasis usually depends upon the Professor in charge of the Graduate Work, who is generally interested in some one subject, as for instance the Determination of Atomic Weights.

The following are the subjects of the thesis of the Doctorates conferred in Chemistry at the various Universities for the year 1912. The list was taken from "Science" of August 2, 1912.

Chicago,

- John Foote Norton, "Simultaneous Reactions in Amide Formation."
 Paul David Potter, "Hydrates of Arsenic Pentoxide."
 Harlan Leo Trumbull, "The Molecular Rearrangement of Acid Chloramides, and the Ionization of their Salts."
 Leroy Samuel Weatherby, "The 'Salt Effects' of the Nitrates and Sulphonates in the Catalysis of Imide Esters."
 Franklin Lorenzo West, "Physical and Chemical Properties of Organic Amalgams."

Columbia,

- Harry Linn Fisher, "Preparation and Properties of 5-Amino - 6 Quinolin- Carboxylic Acid and Some Compounds Derived Therefrom."
 Marston Lovell Hanlin, "The Preparation of the Two Derivatives of Glucosamine, Spigeline, an Alkaloid of Spigellia Marilandica, Derivatives of 4-Hydroxy-5-Nitro-Quinazoline."
 Henry Howard Warvin, "Selective Transmission and the Dispersion of Liquid Chlorides."
 Frederick William Zones, "A New Method, Volumetric, for the Determination of Thorium in the Presence of Other Rare Earths, and its Application to the Analysis of Monesite Sand."

Cornell,

- Herman Camp Allen, "The Reduction of Nitro-benzene by Means of Ferrous Hydroxide."
 Emmet Francis Hitch, "Tetrachlorfluorocoin and Some of its Derivatives."
 George Jackman Sargent, "Electrolytic Chromium."

Johns Hopkins,

- Joseph Chandler, "On the Reaction of Thiourazole and Thiourazole Salts. I. A Study of the Reaction between Sodium 1-Phenyl 5 Thiourazol and Ethyl Iodide. II. A Study of 1, 4 - Diphenyl 5- Thiourazole."

- Paul Bell Davis, "Conductivity and Negative Viscosity Coefficients of Certain Rubidium and Ammonium Salts in Glycerol, and in Mixtures of Glycerol with Water from 20 to 75 degrees."
- Felton Samuel Dengler, " I. The Detection and the Determination of Minute Quantities of Glycerol. II. The Volume of Weight Normal Cane Sugar Solution at Different Temperatures."
- Henry Otto Eysell, " The Detection of Mannite in Alkaline Solution of Copper Sulphate. II. A Determination of the Volume of Weight Normal Solution of Cane Sugar at 15, 20, 25, & 30 Degrees."
- Julia Pouchy Harrison, " On the Reversible Addition of Alcohols to Nitriles Catalyzed by Sodium Ethylate."
- Samuel Francis Howard, "The Conductivity, Temperature Coefficient Of Conductivity, and Dissociation of Certain Electrolytes in Aqueous Solutions at 35, 50, and 65 degrees".
- John William Nowell, "A Study of the Steric Hinderance Effect of various Substituent Groups in the Ortho Position in the Carboxyl: On the Reaction which takes place when Parasulphamino-benzole Acids are heated to 220 degrees."
- Alfred Springer, Jr., "A Study of the Conductivity and Dissociation of Certain Acids in Aqueous Solution at Different Temperatures."
- Lloyd Van Doren, "A Comparative Study of the Semi-permeable Membranes of Copper Ferrocyanide and Nickel Ferrocyanide."

Yale,

- Philip Lee Blumenthall, "The Separation and Estimation of Chlorine Salts by the Differential Action of Oxidizers."
- Charles Andrew Brautlecht, "Synthesis of Thio-tyrosine."
- Gerald Burnham, "Sulphur Combinations in Proteins-- Thio polypeptides."
- Charles Raymond Downs, "Water Gas Tar, its Composition, and Commercial Possibilities."
- Frank Loyal Haight, "On Certain Physical Properties of the Alkali Nitrates, Chlorides, and Sulphates."
- Charles Hoffman, " A New Method of Synthesizing Alpha-Amino Acids: Halogen Derivatives of Tyrosine."

Harvard,

- Roger Adams, " A Study of the Solution in Aqueous Alkalis of Various Hydrosens of Certain Aromatic Ortho-hydroxyaldehydes and Ketones. II. Nonanes. III. A New Bottling Apparatus. "

- Gustavus John Essalen, Jr., "Studies on Benzhydrols. I. The resolution of p-amine benzhydrol into its optical isomers. II. The Splitting of Benzhydrols by the action of Bromine."
- Augustus Henry Piske, "I. On Certain Nitro Derivatives of Vicinal Tribrom benzol. II. Decomposition of Tetrabrom orthoquinone. III. Hydrates of Sodium Carbonate and their Temperatures of Transition."
- Fred Ford Flander, "The Determination and Metabolism of Benzoic and Hippuric Acid."

Illinois,

- Stuart Jeffrey Bates, "The Iodine Coulometer and the Value of the Faraday."
- James Everett Egan, "Observations on the Rare Earths, Yttrium Chloride and the Atomic Weight of Yttrium."
- Leonidas Rosser Littleton, "Molecular Rearrangements in the Campher Series. Derivatives of Isocamphoric Acid. Isocamphoronic Acid and its Decomposition Products."
- Earl Kenneth Strachan, "The Equilibrium between Arsenious Acid and Iodine in Aqueous Solution."

Wisconsin,

- Oscar Leonard Barnaby, "Reactions of the Rare Earths in Non-aqueous Solvents."
- Hornce Grove Deming, "Some Compounds of Cellulose."
- Melvin Edison Diemer, "A Study of Aurous Compounds."
- Emil Oscar Ellingson, "Abietic Acid and Some of its Salts."
- Alfred Edward Koenig, "A Study of Some of the Salts of Fatty Acids."
- James Nelson Lawrence, "Efficiency of the Gas Coulometer."
- Carl Ferdinand Nelson, "Studies in Osmosis."

California,

- Victor Birekner, "The Oxidations and Cleavage of Glucose, Yeast Glucose, and a new Glucolytic Ferment."

Pennsylvania,

- Newcomb Kinsey Chaney, "The Electrolytic Preparation of Antimony."

Michigan,

- Harvey Clayton Brill, "A Study of the Formation of Pyrimidines by use of Nitromaleic Aldehyde."
- Clarence Jay West, "The Salts of the Oryxanthones. (A contribution to the chemistry of Imino Carbonium Salts.)"

Princeton,

- Garrett Davis Buckner, "Studies on the Silver Coulometer."
- Joseph Stanley Laird, "A Study of the Inclusions of Electrolytic Silver, and their effect on the Electro chemical Equivalent of Silver, and the Electro Chemical Equivalent of Cadmium."

Mass. Inst. of Technology,
Norman Levi Bowen, "Binary System".
Arthur Edgar, "The Equilibrium between Nitric Acid, Nitrous Acid, and Nitric Oxide."
Frank Finch Rupert, "The Free Energy of Concentrated Solutions."
Merle Randall, "Studies in Free Energy."

Ohio State,
Cecil Ernest Board, "The Action of Substituted Hydrazones upon Orthoquinones. -A Contribution to a Study of the Constitution of Orthohydroxyase Complex."
David Raymond Kellogg, "The Hydrolysis of Ethyl Acetate by Neutral Salt Solutions."
George Weatherworth Stratton, "The Action of Substituted Tertiary Hydrazines upon Quinones."
Edgar John Witzemann, "Oxidation of Propylene Glycol."

Brown,
Robert Foster Chambers, "A Study of Symmetrical Tribrom Phenyl Propionic Acid."

Bryn Mawr,
Minnie Almira Graham, "A Study of the Change from Violet to Green in Solutions of Chromium Sulphate."

George Washington,
A. L. Kibler, "Mercury Fulminate."

Minnesota,
Francis Cowles Frary, "Equilibria in Systems Containing Alcohols, Salts, and Water, including a new method of Alcohol Analysis."

Catholic University of America,
Ignatius Albert Wagner, "The Condensation of Acetone by Means of Calcium Carbide."

From a consideration of the subjects of these theses given above, it will be seen that the work at Columbia, Johns Hopkins, Michigan, and Ohio State is chiefly directed to Organic Chemistry, while Cornell, Yale, Illinois, and Princeton are concerned principally with General and Physical Chemistry.

Schools of the Second Class.

	Name	Location	Enroll. Course		Faculty		
					A	B	C
1	Alabama	Tuscaloosa Ala	615	17	2	1	3
2	Allegheny	Meadville Pa	350	13	1	1	2
3	Arizona	Tucson Ariz	200	12	2	1	3
4	Arkansas	Fayetteville Ark	1,540	27	2	0	2
5	Baker	Baldwin Kans	661	14	1	1	2
6	Beloit	Beloit Wisc	410	13	1	1	2
7	Berea	Berea Ky	1,221	8	1	0	1
8	Bethany	Lindsborg Kans	898	14	1	0	1
9	Boston	Boston Mass	1,566	9	1	0	1
10	Boodain	Brunswic Me	398	9	1	1	2
11	Brown	Provincs R I	993	20	2	5	7
12	Clark	Atlanta Ga	551	2	1	6	7
13	Celgate	Hamilton N Y	540	8	2	0	2
14	Collage City N Y	Manh'a Boro N Y	3,736	17	3	1	4
15	Colorado Coll.	Colorado Spg's Col	715	13	1	1	2
16	Colorado U.	Boulder Col	1,300	24	1	4	5
17	Creighton	Omaha Neb	855	5	1	0	1
18	Dartmouth	Hanover N H	1,229	11	3	1	4
19	Denver	Univ.Park Col	1,324	17	1	2	3
20	Dickinson	Carlisle Pa	545	9	1	0	1
21	Drake	Des Moines Ia	1,843	11	2	1	3
22	Florida	Gainesville Fla	190	17	1	3	4
23	Ferdham	Ferdham N Y C	825	3	1	0	1
24	Georgetown	Washington D C	1,165	2	1	0	1
25	Georgia	Athens Ga	501	17	2	2	4
26	Grinnoll	Grinnell Iowa	620	12	1	1	2
27	Hamilton	Clinton N Y	187	10	1	0	1
28	Haverford	Haverford Pa	150	7	1	1	2
29	James Milliken	Decatur Ill	1,110	12	1	1	2
30	Kentucky	Lexington Ky	721	10	3	1	4
31	Kenyon	Gambier Ohio	135	10	1	1	2
32	Knox	Galoesburg Ill	651	10	1	0	1
33	Lafayette	Haston Pa	500	17	2	3	5
34	Lehigh	E. Bethlehem Pa	615	27	2	6	6
35	Louisville	Louisville Ky	900	9	1	0	1
36	Maine	Orono Maine	845	29	1	3	4
37	Marietta	Marietta Ohio	411	8	1	1	2
38	Marquette	Milwaukee Wisc	1,638	7	1	0	1
39	Miami	Oxford Ohio	1,178	12	2	4	6
40	Mississippi	Oxford Miss	490	14	2	1	3
41	Nebraska	Lincoln Neb	3,992	24	2	2	4
42	North Dakota	Grand Forks N D	989	15#	2	1	3
43	Northwestern	Evanston Ill	4,160	16	2	3	5

	Name	Location	Enroll.	Courses	Faculty		
44	Notre Dame	Notre Dame Ind	1,005	20	1	0	1
45	Oberlin	Oberlin Ohio	1,832	15	2	1	3
46	Ohio Wesleyan	Delaware Ohio	1,248	13	1	1	2
47	Oklahoma	Norman Okla	692	20	3	1	4
48	Oregon	Eugene Ore	1,130	17	3	1	4
49	Rechester	Rechester N Y	430	14	2	1	3
50	Simpson	Indianola Ia	564	10	1	0	1
51	South, U. of the	Sewanee Tenn	291	8	1	0	1
52	Southern California	Los Angeles Cal	1,621	24	2	4	6
53	St. Louis	St Louis Mo	1,247	10	2	2	4
54	Swartmore	Swartmore Pa	359	12	1	4	5
55	Temple	Philadelphia Pa	3,620	14	1	4	5
56	Tennessee	Knoxville Tenn	1,577	17	2	1	3
57	Trinity	Hartford Ct	230	11	1	1	2
58	Texas	Austin Texas	3,043	24	3	2	5
59	Tufts	Medford Mass	1,140	12	2	2	4
60	Union	Schenectady N Y	336	11	1	1	2
61	Valparaiso	Valparaiso Ind	5,437	10	1	2	3
62	Vanderbilt	Nashville Tenn	1,007	18	2	2	4
63	Vermont	Burlington Vt	520	16	3	2	5
64	Wabash	Crawfordsville Ind	384	11	1	1	2
65	Washburn	Topeka Kans	811	10	1	0	1
66	Washington & Lee	Lexington Va	609	14	1	3	4
67	Washington State	Pullman Wash	1,371	30	3	1	4
68	Washington	St Louis Mo	1,024	22	2	7	9
69	Western Reserve	Cleveland Ohio	1,065	14	2	1	3
70	Williams	Williamston Mass	560	10	2	2	4
71	Wooster	Wooster Ohio	625	10	1	3	4

Womens Colleges.

1	Bryn Mawr	Bryn Mawr Pa	425	19	2	1	3
2	Radcliff	Cambridge Mass	465	#			
3	Smith	Northampton Mass	1,620	12	3	2	5
4	Vassar	Poughkeepsie Pa	1,057	19	2	4	6
5	Wellesley	Wellesley Mass	1,375	14	2	2	4

Technical Schools.

1	Case School App.Sci	Cleveland Ohio	499	21	3	3	6
2	Polytec. Inst.	Brocklyn N Y	532	22	2	8	10
3	Pratt Institute	Brocklyn N Y	3,772	12	1	3	4
4	Rensselaer Poly. I	Troy N Y	626	13	3	5	8
5	Rens Poly. Inst.	Terre Haute Ind	190	7	1	1	2
6	Tuscegee Inst.	Tuscegee Ala	1,662	0	0	0	0
7	Worcester Poly. I.	Worcester Mass	524	43	2	2	4

Agricultural Colleges.

1	Colorado	Fort Collins Col	878	18#	2	1	3
2	Kansas	Manhattan Kans	2,305	18	4	3	7
3	Michigan	E. Lansing Mich	1,500	18	2	4	6
4	Oregon	Cornwallis Ore	1,592	27	2	5	7
5	Utah	Logan Utah	1,044	18	3	2	5

Courses in Agricultural Colleges include Agricultural Chemistry. Radcliff has the Faculty of Harvard.

Faculties in Schools of the Second Class.

Alabama,	Leveland, Benjamin F. Ph.D. Lloyd, Stewart J. Ph.D.	
Allegheney,	Lee, Edwin M. Sc.	
Arizona,	Guild, Frank Nelson M.S. 'Benner, Raymond G. Ph.D.	
Arkansas,	Carroll, Charles Geiger Ph.D. 'Tibbale, Charles Austin Ph.D. 'Marren, Hugh Ellis B.S.A.	Gen.&Physical Analytical Qual. A Org.
Bakar,	Randall, David Lindsey Ph.D.	
Beloit,	Smith, Erastus Gilbert Ph.D.	
Berea,	Ruxold, Christian F. A.B.	
Bothany,	Weline, John Eric D. Sc.	
Boston,	Newell, Lyman G. Ph.D.	
Bowdoin,	Oram, Marshall Perley Ph.D.	
Brown,	Appleton, John Howard Sc.D. 'Busher, John Emery Ph.D.	Indust.& Anal. Gen. & Organic
Clark,	Peterson, John E. A.B.	
Colgate,	McGregory, Joseph Frank D. Sc. 'Smith, Roy Burnett M.S.	
College City of New York,	Baskerville, Charles 'Moody, Herbert P. 'Freedburg, L. Henry	General & Qual. Anal. & Ind. Organic
Colorado College,	Streiby, William A.B.	
Colorado,	Ekeley, John Bernard Ph.D.	
Creighton,	Hickey, David F. S.J.	
Dartmouth,	Bartlett, Edwin Julius M.D. 'Bolser, Charles Ernest Ph.D. 'Richardson, Leon Burr A.M.	
Denver,	Engle, Wilbur Dwight Ph.D.	
Dickinson,	Shadinger, Guy Howard Ph.D.	

Drake,	Kinney, Charles Noyes M.S. 'Ball, Theodore Ralle B.S.	
Florida,	Flint, Edward F. Ph.D.	
Ferdham,	Risacher, Clement R.H. S.J.	
Georgetown,	Martin, Rev. Richard S.J.	
Georgia,	White, Henry Clay Ph.D. 'Black, Homer Van Valkenburgh Ph.D.	
Grinnell,	Hendrixsen, Walter Scott Ph.D.	
Hamilton,	Saunders, Arthur Percy Ph.D.	
Haverford,	Hall, Lyman Beecher Ph.D.	
James Millikan,	Hessler, John C. Ph.D.	
Kentucky,	Tuttle, Franklin Elliott Ph.D. Maxson, Ralph Nelson Ph.D. 'Daniels, Lloyd Cadie Ph.D.	
Ksnyen,	Weida, Rev. George Francis Ph.D.	
Knox,	Griffith, Herbert Eugene B.S.	
Lafayette,	Hart, Edward Ph.D.	
Lehigh,	Scheber, William B. Ph.D. 'Babacinion, Vahan S. Ph.D.	
Louisville,	Goodman, Harry W. 'Wyeer, Henry B.S.	
Maine,	McKee, Ralph Harper Ph.D.	
Marietta,	Merriam, Edmund Sawyer Ph.D.	
Miami,	Hughes, Raymond Mollyneaux M. Sc.	
Mississippi,	Muckeafase, Anthony Meultrie Ph.D. 'Kennon, William Lee Ph.D.	
Nebraska,	Dales, Benton Ph.D. 'Fessler, Mary Louise A.M. 'Avery, Samuel Ph.D. 'Berreman, George A.M.	Anal. & Physical Organic Organic Analytical
North Dakota,	Abbott, George Alense Ph.D. Sabcock, Earle Jay B.S.	Industrial
Northwestern,	Young, Abrian Van Epps Ph.B. Hinds, Murray Arnold Ph.D.	
Notre Dame,	Hicwland, Juline G.S.G.	

Oberlin, Jewett, Frank Fanning A.M.
 "Chapin, William Henry Ph.D.
 "McCullough, James Caldwell M.S.

Ohio Wesleyan, Higley, George Gevin Ph.D.

Oklahoma, De Barr, Edwin M.S.
 "Williams, Guy Randall M.S.
 "Rue, John Davidson A.M.

Oregon, Binswanger, Otto Sely Ph.D.
 "Shinn, Frederick Lafayette Ph.D.
 "Stafford, Grim Fletcher M.A.

Rochester, Lattimers, Samuel Allen Ph.D.
 Chambers, Victor John Ph.D.

Simpson, Baker, Jesse A. M.S.

South, U. of the Mackall, Colin McKensie B.S.

South. California, Stabler, Laird Joseph M.S.
 Graves, Ethel W. A.M.

St. Louis, Schwitalla, Alphense M. S.J.

Swartmore, Allenan, Gilbert Ph.D.
 "Ward, H. Lee Ph.D.

Temple, Kafke, Harry C. B.S.

Tennessee, Wait, Charles Edmund Ph.D.
 Hill, Charles Otis M.S.

Trinity, Riggs, Robert Baird Ph.D.

Texas, Harper, Henry E Winston M.D.
 Bailey, James Robinson Ph.D.
 Scheeh, Eugene Paul Ph.D.

Tufts, Durkee, Frank Williams A.M.
 Cobb, Phillip Howard Ph.D.

Union, Ellery, Edward Ph.D.
 "Bradley, Theodore J. Ph.G.

Valparaiso, Gary, Charles A.

Vanderbilt, Dudley, William L. M.D.
 McGill, J.T. Ph.D.

Vermont,

Merrill, Nathan Frederick Ph.D.
 'Burrows, George Howard B.S.
 'Kern, Charles Allen B.S.

General
 Physical
 Gen.&Qual.

Wabash,

Garner, James Bert Ph.D.

Washburn,

Tague, Edward Lemuel A.M.

Washington and Lee,

Howe, James Lewis Ph.D.

Washington State College,

Fulmer, Elton A.M.
 Todd, Clare Chrisman B.S.
 Paterson, Alice Grace A.B.

Washington University, of Saint Louis,

Keiser, Edward Harrison Ph.D.
 'McMaster, Leroy Ph.D.

Western Reserve,

Gruener, Hippolyte Ph.D.
 Tower, Olin Freeman Ph.D.

Williams,

Mears, Leverett Ph.D.
 'Mears, Brainerd Ph.D.

Wooster,

Bennett, William Z. Ph.D.

Degrees of Faculties of the Smaller Schools.

In this list of seventy-one smaller schools there are ninety-one Professors, nine Associate Professors, and twenty Assistant Professors.

Of the Professors, fifty hold the degree of Ph.D. or fifty-three per cent: nine hold the degree of D. Sc.: three that of M.D., or a total of 62 with the Doctors Degree, or in all 64 %. Fourteen hold the Masters Degree, or fifteen percent.

Of the nine Associate Professors, five have the Doctors Degree, and of the twenty Assistant Professors, ten have the Doctors Degree.

Of the total of 120 Professors, Associate, and Assistant Professors, 77 have the Doctors Degree.

Course of Study in the Smaller Schools.

The course in the smaller schools is limited by the smaller size of the faculties, and the smaller facilities for teaching the subject. It ranges from the essentials, General, Qualitative, and Quantitative Analysis, and Organic Chemistry, as at Dickinson and Trinity, to courses of twelve subjects as at Swartmore, and twenty at Lehigh. At nearly all these institutions, limited opportunity is given advanced pupils to do higher work.

Chemistry in Womens ' Colleges.

In Chemistry, the Woman's Colleges Wellesley, Bryn Mawr, and Vassar offer a stronger course than the average small college.

At Wellesley the Course is, General Chemistry six hours, Advanced General Chemistry six hours, Qualitative and Quantitative Analysis, each three hours, Air, Water, and Food Analysis, Organic Chemistry six hours, Theoretical Chemistry three hours, Selected Subjects in Theoretical and Analytical Chemistry with Laboratory two hours, Advanced Laboratory in Organic Preparations, Food Analysis, and Advanced Analytical three hours: History of Chemistry three hours, and a special course in Elementary Inorganic Chemistry for Students in Physical Education three hours.

At Bryn Mawr, the work is divided into Major, Post Major, and Graduate Courses. The Major Course includes , Introductory General, Organic, Qualitative, Theoretical Inorganic and Organic Chemistry. The Post Major Course includes advanced work in both Inorganic and Organic Chemistry: the Graduate, various Seminars, Advanced Organic and Physical Chemistry, and a Chemical Journal Club.

At Vassar, besides the elementary courses there are Organic Preparations, Advanced Inorganic Chemistry, History of Chemical Theory, Analysis of Foods, Volumetric Analysis, Elementary Physiological, and Theoretical Chemistry.

At most of the great State Universities, work in the Department of Chemistry is open to women, and where women are not admitted there is usually a Woman's Annex, as Radcliff at Harvard, Barnard at Columbia, and Newcomb at Tulane, in which strong courses of chemistry are offered. The women at Radcliff may take any of the courses offered at Harvard and have the privileges of the Harvard Laboratories. It is the usual thing to find one or more women on the Faculties of the great state schools that admit both sexes.

Chemistry in Agricultural Colleges.

In these schools we find special emphasis upon Agricultural, Food, Household, Dairying, Human and Animal Nutrition, Physiological, Water, Feed, Soils, Insecticides, Mineral, Economic, Pharmaceutical, and Engineering Chemistry.

In general not much attention is given to purely theoretical Chemistry. Many of the schools give special short courses during the Winter for farmers. As the students have little training in Theoretical Chemistry many of the courses are given in a very elementary way. In some of the state the College of Agriculture is a Department of the State University, as at Cornell, and Missouri, and in these cases the students get the advantage of the strong courses of Technical Chemistry.

Chemistry of Trade Schools.

We have already spoken of the courses in Chemistry in Mass. Tech., Armour, and Carnegie in that they are on a par with that of the Universities and Colleges of the First Class, and indeed Mass. Tech. is probably ahead of any other school in the country. There is a growing class of Polytechnic Schools such as Worcester, Brooklyn, Rensselaer, Rose, and Pratt, which like the Agricultural Schools aim at giving a short course, usually covering two years work, in applied Chemistry. At Worcester the course is equivalent to that given at Universities like Iowa, and Ohio.

Chemistry in Government Schools.

At West Point and at Annapolis the equivalent of preparatory chemistry is given in a years course of Physics and Chemistry.

Chemistry at Tuscogee.

Tuscogee Institute offers no chemistry.

**Entrance Requirements of the Medical Schools
in Chemistry.**

There seems to be no great uniformity in the entrance requirements of the Medical Schools. There are no requirements beyond the Secondary Schools at George Washington. One year College is required at Cincinnati, New York, North Carolina, and Pittsburg. Two at Harvard, Indiana, Johns Hopkins, Kansas, Michigan, Missouri, and Syracuse, and three at Leland Stanford.

One year College Chemistry is required in practically all these schools. At Harvard the requirements are General, Qualitative, and Organic Chemistry.

At Kansas, either Preparatory Chemistry or one half year College Chemistry in General Chemistry, one half year of Qualitative Analysis and after 1913 Elementary Organic Chemistry.

At New York, High School and one whole year College Chemistry are required.

At North Carolina, General, Qualitative, and Quantitative Analysis,

At Pittsburg, one half year High School and one year of College Chemistry.

Text Books Used in the Schools.

For this part of the discussion, the data were secured from letters of the Heads of the Departments of Chemistry in the various schools. This information together with that secured from the Catalogues of nine other schools is given on the following pages.

It will be seen that in General Chemistry twenty-six schools are using Smith's "General Chemistry", and two others his "Introduction to Inorganic Chemistry". Eleven are using Newell's "Inorganic Chemistry for Colleges.", and ten Kniesbergs, "Outlines of Chemistry."

Most of the schools have a special course for pupils entering without credit in Chemistry. The most popular text is McPherson and Henderson, which is used in seven schools. Steddards text is used in three schools. Four are using McPherson and Henderson followed by Smith; two use Newell and Smith. Nine schools use their own text, in General Chemistry, and three the library reference plan. Harvard has an innovation in a published synopsis of the Lectures.

In the laboratory work in inorganic there is as would be expected a wide variation of texts, some thirty-seven of the schools using their own text. Again Alex. Smith and W. J. Hales text, "Laboratory Outlines in General Chemistry" is the most widely used, being found in thirteen schools. McPhersons text is found in five schools, Remsen in four.

In Qualitative Analysis, W.A. Noyes' text is used in thirteen schools, Baskerville and Curtan in eight, A.A. Noyes in seven. Sixteen schools use their own text in whole or in part. In Quantitative Analysis Talbot is used in twenty-nine schools, Treadwell and Hall in thirteen, Olsen in twelve, and Fouk in eight. Eleven use their own texts and five the library plan.

In Organic Chemistry, Remsen is used in twenty-three schools, Cohen in twenty, Perkin and Kipping in thirteen, and Helleman in nine. Four use their own texts and five the library plan. In laboratory work in Organic Chemistry, Gattermann's text is used in twenty-one schools, Jones in twelve, and Cohen in eight. Eleven use their own texts.

Walkers Physical Chemistry is used in twenty schools, Jones in twelve, Bigelow in six, and six use their own text. Twenty schools of the list have no Physical Chemistry. Pindlays Laboratory Text, used in fifteen schools is the most popular. Fourteen use their own text,

Texts Used in the Various Schools.

Name	General	Laboratory	Qualitative	Quantitative
1 Alabama	Kahlenberg	#Kahlenberg	Kahlenberg & Walten	Treadwell
2 Alleghany	#	#	#	Olsen & Sutton
3 Amherst	#	#Hopkins	W.A.Noyes & Smith	Talbot
4 Armour	McPherson & Smith	Henderson &	A.A.Noyes	Treadwell & Talbot
5 Baker	Newell	Randall	Cooh & Browning	Lincoln & Walten
6 Beloit	Stoddard	#	#	#
7 Berea	Rensen	Rensen	Fresenius	A.A.Noyes
8 Bethany	McPh. & Hend. Newell Ostwald	Hessler & Smith Alex. Smith	Bailey & Gady Stieglitz	Newth Lincoln & Walten
9 Bowdoin	Smith		Tower	Lincoln & Walten
10 California	Morgan # Smith		# Morgan & Booth	#Morgan & Booth Olsen Talbot
11 Carnegie	Newell	#James & Schaeffer	Scott	Treadwell & Hall
12 Case	Newth	#Bardwell	Preseott & Johnson Noyes	# Easy
13 Chicago	Smith & O	#Smith & Hale	Stieglitz Noyes & Bray	O
14 Colorado	Holleman	#Wakley	Treadwell	Talbot
15 Col. Agr.	Kahlenberg		Green & Valderkleed	Lincoln & Walten
16 Dartmouth	Newth	#Bartlett	#Bolser & Richardson	O :
17 Dickinson	McPh. & Hend.	#	W.A.Noyes	Talbot
18 Drake	Newth	#Kinney	Newth Fresenius	Glowes & Coleman
19 Florida	Rensen	Newell	A.A.Noyes	Olsen Evans
20 Georgia	Rensen Holleman			Stoddard Olsen
21 Geo. Wash.	O	#Cook	W.A.Noyes Fresenius	Sutton Fresenius Talbot
22 Grinnell	Smith	#	A.A.Noyes	#
23 Hamilton	Smith	#Saunders	Beetger A.A.Noyes	Olsen Fresenius Glowes & Coleman
24 Harvard	Uses no regular texts.		Library References.	

Name	General	Laboratory	Qualitative	Quantitative
25	Haverford Smith	Smith & Hale	W.A.Noyes	Treadwell Talbot Fresenius
26	Illinois Smith #Werner	Smith & Hale	#Noyes & Smith	Treadwell Linc. & Walt. Stieglitz
27	Indiana Kahlenberg		#Lyons & Davis	Talbot Fresenius Sutton
28	Iowa			Treadwell
29	K.S.A.G. Newell	McPherson	McPherson W.A.Noyes	Lincoln & Walton
30	Kansas Newell Gady	: 10	# Bailey & Gady	Talbot
31	Lehigh Rensen Newth	Rensen #	Treadwell Bask.& Curt.	Treadwell Allen
32	Leland Kahlenberg Stanford	#Swain & Mitchell	Mendicus	Treadwell #
33	Louisiana Newell	Hillyer	Sellers Treadwell	Gleen Treadwell Talbot
34	Louisville Stoddard Smith	#	Morgan	Talbot
35	Lower Smith California	Morgan	Prescott & Johnson	Talbot
36	Maine Rensen	Smith & Hale	Baskerville Curtman	Fouk
37	Marquette Rensen		A.A.Noyes	Talbot
38	Mass.Tech.Smith	#Speer	A.A.Noyes	Talbot
39	Miami McPh.&Hend. Smith	McPherson	Tower Bask.& Curt.	Fouk Talbot
40	Michigan Smith	Smith & Hale	Prescott & Johnson	#Campbell Fouk Hinds
41	Mississippi McPher.& Hend. Smith		Newth Prescott & Johnson W.A.Noyes	Talbot Heres
42	Missouri Kahlenberg Smith	#Schlundt	Stieglitz #Gibson	Fouk
43	Nebraska Newell	#Rensen	Browning	Talbot
44	New York Baskerville#	# Bask. & Curt.	#Bask.& Curt.	#Bask.& Moody Talbot
45	N. Dakota Rensen	#	#Bask.& Curt.	Fouk
46	Northwestern #Young	#Young	Boetger	Talbot
47	Notre Dame Kahlenberg	#	Perkin	Talbot
48	Oberlin Smith	#Jewett	Prescott & Sullivan	Talbot
49	Ohio McPherson & Henderson Smith		A.A.Noyes & Bray McPherson	Fouk
50	Ohio Wesleyan Smith	Smith & Hale	Perkin Scott	Fouk

Name	General	Laboratory	Qualitative	Quantitative
51 Oklahoma	Kahlenberg			
52 Ore. Agr.	Smith	Smith & Hale	Baskerville & Curtman	Talbot
53 Oregon	Newell	#	W.A.Noyes Bask.&Curt.	Talbot Olsen Treadwell
54 Penn. State	#Pond		#Harris & Pond	
55 Pennsyl- vania	Richter #E.F.Smith	#Smith & Keller	Medicus Prescott & Johnson	#
56 Princeton	Newell Smith Dobbin & Walker			Fresenius
57 Purdue	Smith	#Blanchard & Ransome	W.A.Noyes	Olsen
58 Rose Poly.	Smith Newth	Smith & Hale	Perkin	Sutton Treadwell
59 Swartmore	Smith	Smith & Hale	A.A.Noyes Gooch & Browning Treadwell	Evans Olsen O Talbot Olsen Treadwell
60 Syracuse	Holleman	Holleman		
61 Temple	Heesler & Smith	Rensen	Medicus	Treadwell
62 Union	Smith	#Ellery	Prescott & Johnson	Olsen
63 Trinity	Smith	Smith & Hale	W.A.Noyes	Stieglitz Hinds W.I.D.
64 Valaparaíso	Newell Newth	#Newell	Newth Prescott & Johnson Treadwell	Newth Sutton Cobl. & Vori. Clowes & Coleman
65 Vassar	Newell	#Vassar Notes	Tower	Talbot
66 Washburn	Smith	Smith & Hale	Perkins	Foulk
67 Washington S. U.	Smith	Smith & Hale	#Byers & Knight	Olsen
68 Wash. S. Coll.	Kahlenberg	#Hopkins	Bask.&Curt.	#
69 Wash. & Lee	#Howe	#Howe	#Howe	Talbot
70 Wellesley	Newell Smith	#	W.A.Noyes	Talbot
71 Western Reserve	Smith	#	#O.F.Tower	O
72 Wooster	McPher. & Newth	Henderson #W.Z.Bennett	W.A.Noyes	Foulk
73 Worcester	Kahlenberg	#	A.A.Noyes Treadwell	Treadwell

	School	Organic	Laboratory	Physical	Laboratory
1	Alabama	Remsen	Gattermann	Walker	0
2	Alleghany	Cohen	Gattermann Cohen Ornderff	Jones	Findlay Ostwald Traube
3	Amherst	Cohen	Cohen	----	----
4	Armour	Remsen	Jones	----	----
5	Baker	Cohen	Good & Phelps	----	----
6	Berna	Remsen	0	----	----
7	Boleit	#	#	#	#
8	Bethany	Moore	Moore	----	----
9	Bowdoin	Remsen	Gattermann	Jones	#
10	California	Remsen #Biddle	Biddle	Arrhenius Miller Findlay	Findlay
11	Carnegie	Holleman	Jones	Walker	Ewell
12	Case	#Perkins & Kipping Holleman	Gattermann	Bigelow	#
13	Chicago	#Richter 0	#Jones Fischer	#Walker	0 #
14	Colorado	Holleman	Gattermann	Lupke Morgan	Smith Roth
15	Col. Agr.	Perkin & Kipping			
16	Dartmouth	Cohen	0	----	----
17	Dickinson	Remsen	Jones	----	----
18	Drake	Berenthsen	Fischer	----	----
19	Florida	Remsen	Ornderff	----	----
20	Georgia	Remsen	0	Walker	0
21	Geo. Wash.	Richter	Appleton Gattermann	0	0
22	Grinnell	Remsen	#Saunders	Ostwald Nernst 0	
23	Hamilton	W.A. Noyes	0	----	----
24	Harvard	0	#	0	#
25	Haverford	Remsen	Jones	----	----
26	Illinois	#Noyes Moore	#Noyes	#	#
27	Indiana	Richter Holleman	Gattermann	Walker	#
28	Iowa	Cohen	Jones	Jones Senter Morgan	Findlay Ewell
29	K.S.A.G.	Remsen Cohen	0	----	----
30	Kansas	Cohen Perkin & Kipp.	Jones	Walker	Findlay
31	Lehigh	Berenthsen	Heinle Gatterman	Walker	Findlay Ostwald

(#) signifies that the school is using its own text. (0) that it uses Library References, and (----) that the course is not given.

	School	Organic	Laboratory	Physical	Laboratory
32	Leland Stanford	Remsen	Jones	Ewell	#Young
33	Louisiana	Remsen	Holleman	Ewell	#
34	Louisville	Cohen	Gattermann	Walker	
35	Lower Calif.	Perkin & Kipping	Jones	----	----
36	Maine	Holleman Moore	Jones Moore	Walker	Findlay
37	Marquette	----	----	----	----
38	Mass. Tech.	Perk. & Kipp. Holleman	Gattermann	#A.A.Noyes & Sherrill	#Goodwin
39	Miami	Perk. & Kipp.	Gattermann	Jones, Nernst Senter, Walker	Le Blanc
40	Michigan	Perk. & Kipp.	Gattermann	# Bigelow	#
41	Mississippi	Remsen		Walker	
42	Missouri	Cohen Moore	Cohen	Bigelow	Findlay
43	Nebraska	Holleman	#	Walker	Bigelow
44	New York	Holleman	Gattermann Lasser-Cohn	Walker	Findlay
45	N. Dakota	Remsen O	Gattermann O Ornderff	Walker O	#
46	Northwestern	Moore	Moore	Senter	Senter
47	Notre Dame	Remsen Richter	Gattermann	Jones	Findlay Jones Lupke
48	Oberlin	Remsen	Cohen	----	----
49	Ohio	Perk. & Kipp. Cohen	Gattermann	Bigelow	O
50	Ohio Wesleyan	Cohen	Jones	Bigelow	O
51	Oklahoma	Perk. & Kipp. Prescott		Walker	
52	Ore. Agr.	Moore	Moore	----	----
53	Oregon	Perk. & Kipp.	Gattermann	Morgan	Ewell, Traube ; O Ostwald
54	Penn. State.	Remsen Bernthsen			
55	Penn.	Cohen Bernthsen Findlay	#	Senter	Findlay
56	Princeton			Walker Nernst	Ostwald Findlay
57	Purdue	Perk. & Kipp.	#Garrett & Harden	Jones	Findlay
58	Rice Poly.	Cohen	Levy, Noyes Ornderff	Jones	Ostwald O
59	Swartmore	Remsen Perk. & Kipp.	Gattermann	Jones	Jones
60	Syracuse	Remsen Bernthsen	Gattermann Ornderff	Jones	Findlay
61	Temple	Cohen	Cohen	Walker	Findlay
62	Tulane	Cohen	Cohen	Jones Thompson	Findlay
63	Union	Cohen	Cohen	Jones	

	School	Organic	Laboratory	Physical	Laboratory
64	Valparaiso	Rensen	#	----	----
65	Vassar	Cohen		Walker	
66	Washburn	Cohen	Cohen	----	----
67	Wash. S.U.	Berntsen	Sudborough	Morgan	Lehfeldt
68	Washington State Coll.	Cohen Rensen	Ornderff	----	----
70	Wash. & Lee	Noyes	Noyes	Walker	0
71	Wellesley Perk. & Kipp.		Jones	Jones Bigelow	#
72	Western Reserve	Rensen	#	Walker	#
73	Wecster	Cohen	Gattermann	----	----
74	Worcester	Holleman	Gattermann	Ewell	Ewell

TEXTS in GENERAL CHEMISTRY.

Authors	School	Name	Publisher	Price
31 Smith, Alex	Chicago	Gen. Chem. for Colleges	Century	2.15
12 Newell, Lyman O	Boston	Inorg. Chem. for Coll.	Heath	2.00
10 Kahlenberg, L	Wisconsin	Outlines of Chemistry	McMillan	2.60
7 Newth, G.S.	London	Inorganic Chemistry	Longmans	1.75
7 Rensen, Ira	Johns Hop. Coll.	Text Book of Chem.	Holt	2.25
7 McPherson, Wm	Ohio State &			
	Henderson, W.E.	"Elem. Study of Chem.	Ginn	1.25
3 Hellenan, A.F.	Groningen &			
	Geoper, H.C. Syracuse	Text Book Inorg. Chem.	Wiley	2.50
2 Mergan, W.C.	California &			
	Lyman, J.A.	Inorganic Chemistry	McMillan	1.25
2 Steddard, J.T.	Smith	Int. to Inorg. Chem.	McMillan	1.60
2 Smith, Alex.	Chicago	Int. to Inorg. Chem.	Century	2.25
	Backerville, Chas N. York	Gen. Inorg. Chem.	Heath	1.50
	Cady, H.P. Kansas	Prin. of Inorg. Chem.		
	Debbin, Leonard	&		
	Walker, Jas Dundee	Chem. Theory for Beg.	McMillan	.50
	Heesler, J.C.	&		
	Smith, A.L.	Essentials of Chem.	Sanbourn	1.05
	Howe, James L. Wash. & Lee	Inorg. Chem for Sch. & Col	Chemical	3.00
	Ostwald, William Leipzig	&		
	Findley, Alex. Birm.	Prin. of Inorg. Chem.	McMillan	6.00
	Richter, Victor Von Breslau	&		
	Smith, E.F. Penn.	Inorganic Chemistry	Blakiston	1.75
	Smith, Edgar P. Penn	Elements of Chemistry		
	Young A.V.E.			

Laboratory Texts in General Chemistry.

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	Author	School	Name Text	Publisher
23	Smith, Alex.	Chicago & Hale, W.J. Michigan,	Lab. Outlines of Gen. Chem,	Century
3	Rensen, Ira,	Johns Hopkins, & Randall, W.W.	Laboratory Manual	Holt
2	McPherson, Wm,	Ohio & Henderson, Wm.E. Ohio,	Lab. Ex. in Chem.	Ginn
2	Newell, Lyman C.	Boston	Experimental Chem.	Heath
2	Hillyer, H.W.		Lab. Manual of Chem.	McMillan
#	Bardwell F.L.	Mass. Tech. & Speer, E.B. " "	Lab. Exp. in Gen. Chem.	Author
	Bartlett, E.J.	Dartmouth	Lab. Exercises	Author
	Baskerville, Chas.	N. Y. & Curtis, R.W. N.Y.	Lab. Exercises	Heath
	Blanchard, A.A.	Purdue	Synthetic Inorganic Chem.	Wiley
	Ekoley, J. B.	Colorado	Lab. Man. of Inorg. Chem.	Wiley
	Hessler, J.C.	Jas. Millika & Smith, A.L.	Lab. Manual	Sanborne
	Kahlenberg, L.	Wisconsin	Lab. Exer. in Gen. Chem.	Author
	James, Joseph H.	Carnegie & Schaefer, J.A. "	Exp. for Eng. Stu. in Gen. Chem.	McGraw
	Lee, Richard E.	Alleghany	Text Book of Exp. Chem.	Blakist
	Morgan, Wm C.	California	Qual. Anal. as Basis Gen. Inorg.	McMill
	Ransom, J.H.	Purdue	Exp. Gen. Chem.	McGraw
	Schlundt, H.	Missouri	Lab. Exp. in Gen. Chem.	Author
	Smith, E.F.	Penn. & Keller,	Exp. for Student in Gen. Chem.	Blakist
##	Bennett, W.Z.	Wooster	Laboratory Exercises	
	Coeke, J.P.	Geo. Washington	Laboratory Practice	
	Ellery, Edward	Union	Quant, Exp. in Gen. Chem	
	Fulmer, E.	Wash. State Coll.		
	Hopkins, A.J.	Amherst	Laboratory Exercises	
	Howe, James Lewis	Wash. & Lee	Lab. Notes in Inorg. Chem.	
	Jewett, F.F.	Oberlin		
	Saunders, A.H.	Hamilton		
	Swain & Mitchell,	Leland Stan.		
	Young, A.V.E.	Northwestern		

Reported by one school only.
by addressing the Author.

Can probably be secured

	Author	School	Name Text	Publisher	Price
14	Noyes, W.A.	Illinois	Elem. of Qual. Anal.	Holt	1.10
10	Noyes, A.A.	Mass. Inst.	Qual. Chem. Anal.	McMillan	1.25
5	Treadwell, F.P.	Zurich & Hall, Wm. H. Mass. Inst.	Anal. Chem. Vol. I.	Wileys	3.00
6	Baskerville, Jas.	New York, & Curtman, L.J. " "	Course in Qual. Chem. Anal.	McMillan	1.40
5	Stieglitz, J.O.	Chicago	Elem. Of " " "	Century	3.60
4	Newth, G. S.	London	Chemical Analysis	Longmans	1.75
4	Perkin, F.M.	Boro Poly. London	Qual. Chem. Anal.	"	1.50
3	Tower, Ollin F.	Western Reserve	Course of Qual Chem. A.	Blakiston	1.00
3	Fresenius, C.R.	Wiesback, & Welle	Manual of Qual. Chem. Anal.	Wileys	5.00
3	Morgan, Wm. C.	California	Qual. Anal. as Lab. Basis.	McMillan	1.90
2	Medicus, Ludwig	Wursburg, & Marshall, Penn.	Qual. Anal.	Lippincott	1.50
2	Boettger,		" "	Blakiston	2.00
2	Geoch, F.A.	Yale & Browning, P.E. Yale	Outlines of Qual. Chem. A.	Wiley	1.25
2	McPherson, Wm	Ohio	Elem. Treat. on Qual. Anal.		
2	Scott, W.W.	Baldwin Loc. Works	Qual Chem. Anal.	Van Nostrand	1.50
2	Hinds, W.I.D.		" " "	Wiley	2.00
2	Bailey, E.H.S.	Kansas & Cady, H.P. "	Lab. Guide to Study of Q.C.A.	Blakis.	1.25
2	Byers, H	Washington, & Knight			
	Belser,	&			
	Richardson				
	Prescott, A.B.	Michigan & Sullivan, E.C.	First Book in Qual. Anal.	Van Nostr.	1.50
	Kahlenberg, L.	Wisconsin & Walten, J.H. "	Qual. Chem. Anal.	Author	1.25
	Booth,		" " "		
	Gibson, R.B.		Lab. Notes in Qual.		
	Sellers,	Louisiana			
	Lyons, R.E.	Indian, & Davis, L.S. "			

TEXTS in QUANTITATIVE ANALYSIS.

	Author	School	Name Text	Publisher	Price
26	Talbot, H.P.	Mass. Tech.	Intr. Course of Quant, C.A.	McMillan	1.50
14	Treadwell, F. P.	Zurich			
	Hall, W.H.	Mass. Tech.	Analytical Chem. Vol. II	Wiley	4.00
13	Olson, J.C.		Tex. Book of Quant. Chem. An.	Van Nostrand	4.00
14	Foulke, O.W.		Intr. Notes on Quant. CH. Anal.	McGraw	2.00
6	Lincoln, A.T.	Illinois,			
	Walton, J.H.	"	Ex. in Elem. Quant. Ch. A.	McMillan	1.50
6	Sutton, Francis		Handbook of Volumetric Anal.	Blakist.	5.50
4	Newth, G.S.	London	Chemical Analysis (Qual. & Quant)	"	1.75
4	Fresenius, G. Remigius	Wiesbaden, &			
	Cohn, Alfred I.		Quant. Chem. Anal. 2 vol.	Ginn	12.50
2	Neyes, A. A.	Mass. Inst.	" " "	McMillan	1.25
2	Evans, Percy N.	Purdue	" " "	Ginn	.50
2	Clowes, F.	&	" " "		
	Coloman, J.B.		" " "	Blakiston	3.50
	Baskerville, Jas.	New York	Quantitative Analysis		
	Campbell, E. D.	Ann Arbor &			
	Willard, H.H.	" "	Lab. Notes on Quant.		
	Coblentz	&			
	Terisek		Man. of Vol. Anal.	Blakiston	1.75

Texts on Ore Analysis, Electrolytic, Engineering, Gas & Fuel and Organic Analysis have been omitted in the above list since only a few schools reported on their use.

	Author	School	Name of Text	Publisher	Price
19	Cohen, J.B.	Leeds	Theor. Org. Chem.	McMillan	1.50
16	Remsen, Ira	Johns Hopkins	Organic Chemistry	Heath	1.20
15	Parkin, W. H.	Leeds & Kipping, F.S. Nottingham	Organic Chemistry	Lippinc.	2.00
12	Helleman, A.F.	Groningen, & Walker & Mett, Derby	Text Book of Organic Chem.	Wiley	2.50
9	Barntheon A	& Sudborough, Aberystwyth	Organic Chemistry	Van Nostr.	2.50
7	Moore, F.J.		Outlines of Organic Chem.	Wiley	1.50
4	Richter, Victor Von,	Breslau & Smith, Phila.	Organic Chem. 2 vol.	Blakist.	6.00
3	Neyes, Wm.A	Illinois	Organic Chemistry	Holt	1.50
2	Prescott, A.B.		Organic Analysis	Van Nostr.	5.00
	Keane, C.A.		Modern Organic Chemistry	Scribners	1.50
	Sadtler, S.P.		Handbook Ind. Org. Chem.	Lippin.	5.00

Laboratory Texts in Organic Chemistry.

23	Gattermann, L	Freiberg, & Schoeber, W.B. Lehigh	Pract. Meth. in Org. Chem.	McMill.	1.60
11	Cohen, J.B.	Leeds	Pract. Org. Chem.	McMill.	.80
11	Jones, L.W.	Cincinnati	Lab. Out. of Gen. Org. Chem.	Century	1.20
6	Orndorff, W.R.	Cornell	Lab. Man. of Org. Chem.	Heath	.35
4	Moore, F. J.		Exp. in Org. Chem.	Wiley	.50
2	Neyes, W.A.	Illinois	Organic Chem for the Lab.	Chemical	2.00
2	Fischer, Emil		Int. to Prep. of Org. Chem.	Van Nostr.	1.25
2	Helleman, A.F.	Groningen & Walker, A.J. Derby	Lab. Man. of Org. Chem.	Wiley	1.00
	Lasser-Cohn,	Koningsberg & Smith, A.	Lab. Man. of Org. Chem.	McMillan	2.25
	Sudborough, J.J.,	Aberystwyth & James, T. G.	Pract. Org. Chem.	Blackie	5 s
	Appleton, J.H.		Easy Exp. in Org. Chem.		
	Biddle,	Lab.	Lab. Man. of Org. Chem.		
	Henle, F.W.	Strassburg	"Practicum"	Steckert.	
	Lavy,				

Texts in Physical Chemistry.

	Author	School	Name Text	Publisher	Price
19	Walker, Jas.	Dundee	Introduction to Phys. Chem.	McMillan	3.25
14	Joussé, H.O.	Johns Hopkins	Elements of Phys. Chem.	McMillan	4.00
7	Bigelow, S.L.	Michigan	Physical Chemistry	Century	3.00
5	Morgan, J.L.R.	Columbia	Theor. & Physical Chem.	Wiley	3.00
4	Senter, G.		Outline of Phys. Chem.	Van Nostr.	1.75
3	Ewell, A. W.	Worcester	Text Book of Phys. Chem.	Blakiston	2.25
2	Nernst, W.	Gottingen	Theo. Chem.	McMillan	5.00
	Findlay, Alex	Birmingham	Phase Rule & its Application	Longmans	1.60
	Van Deventer, Chas. M.	Boltwood	Phys. Chem. for Beginners	Wiley	1.50
	Dobbin,				
	Walker, Jas.	Dundee	Chemical Theory for Beginners		
	Miller,		Chemistry Dynamics		
	Le Blanc, Max,	Leipzig			
	Whitney, W.R.	Mass. Tech.	Text Book of Electro Chem.	McMillan	2.60
	Arrhenius, Svante	Stockholm			
	Moore,	Oxford	Electro Chemistry	Longmans	3.50
	Lupke, R.				
	Muir,		Elements of Electro Chemistry	Lippincott	2.50
	Lehfeldt, R.A.	Transvaal,			
	Moore,	Oxford	Electro Chemistry	Longmans	1.60
	Thompson, M. de Kay,	Mass. Inst.	Applied Electro-Chem.	McMillan	2.10

Texts Books used in Physical Chemistry Laboratory.

15	Findlay, Alex.	Birmingham	Practical Physical Chemistry	Longmans	
4	Ewell,				
2	Ostwald, Wm.	Leipzig			
	Luther		Physico-Chemical Measurements	McMillan	2.25
	Lupke, R.				
	Muir,		Elements of Electro Chem.	Lippincott	2.50
	Reth, W.A.		Exp. in Physical Chem.	Van Nostr.	2.00

NAMES & ADDRESSES of PUBLISHING COMPANIES.

1	Appleton, D. & CO.	29-35 W. 32 St.	New York
2	Blackie Son, Ltd.	50 Old Bailey E. C.	London
3	Blakiston	1012 Walnut St.	Philadelphia
4	Century Company	33 E. 17th St.	New York
5	Chapman & Hall Ltd.	11 Henrietta St.	London
6	Chemical Publishing Company	Boston	Pa.
7	Ginn & Co.	2301-2311 Prairie Ave.	Chicago
8	Harper & Brothers	Franklin Square	New York
9	Heath, D.C. , & Co.	120 Belyeton St.	Boston
10	Hill Publishing Co.	505 Pearl St.	New York
11	Holt, Henry, & Co.	34 W. 33rd St.	" "
12	Houghton, Mifflin & CO.	16 E. 40 th St.	" "
13	Lippincott, J.B.	E. Washington Square	Phila.
14	Louquans Green & Co.	443-449 Fourth Ave	New York
15	McGraw, Hill Book Co.	239 W. 39th St.	" "
16	McMillan Co.	64-66 5th Ave.	" "
17	Sanborn, Benj. H. & Co.	120 Belyston St.	Boston
18	Scribners Sons, Chas.	153-157 5th Ave.	New York
19	University of Chicago Press		Chicago
20	Van Nostrand	33 Murray & 27 Warren St.	New York
21	Wileys Sons	43-45 E. 19th St.	" "

Importers.

G. E. Stechert & Co. 151 - 165 West 25th St. New York.

This subject may be divided into the following heads:-
the Requirements for Admission to Candidacy, the Course, and
the Examination.

Requirements for Admission to Candidacy.

The usual requirements which must be fulfilled before being admitted as a Candidate for the Doctors Degree are the possession of the Bachelors Degree from some school of good standing, and credit in certain Undergraduate Courses which include the elementary work in General, Analytical, and Organic Chemistry, if the work is to be in Chemistry.

At Cornell these subjects are :- introductory inorganic chemistry, elementary qualitative and quantitative analysis, advanced quantitative analysis, spectroscopic chemical analysis, gas analysis, elementary organic analysis, microchemical methods, and elementary physical chemistry.

A knowledge of French and German are usually required. In most cases however both these requirements may be met at the end of the first year of graduate work.

At Indiana, the student must satisfy the Professor in charge of the work of his ability to use French and German for the purposes of investigation, at least two years before the granting of the Degree.

At Syracuse, he must have a knowledge of two Modern Languages besides English.

The Course.

Besides the elementary work required before being admitted to candidacy, other advanced courses are usually specified.

At Harvard they are, Carbon Compounds, Physical Chemistry, Elementary Theoretical Chemistry, Advanced Quantitative Analysis, and Gas Analysis.

At Cornell, the courses mentioned above as requisites for admission to candidacy, and other advanced courses may be taken in partial fulfillment of the requirements for the advanced degree.

At Chicago, the course is arranged with a portion of the work specified, which all candidates must take, and other lists of courses for those working in each field of Chemistry, so that the student gains a wide knowledge of Advanced Qualitative Analysis, Special Methods in Quantitative Analysis, Organic Chemistry, Organic and Inorganic Preparations, and Physico-Chemical Measurements, as well as in lecture course in Theoretical Chemistry. The History and Teaching of Chemistry are elective.

The work is usually arranged in the form of a Major and two Minors, one of which must be closely connected with the subject of the Major, altho in another division of the same subject. The second Minor should usually be in some other subject.

The work where the Major is in some other subject with a Minor in Chemistry is much less exacting, and the requirements are lower.

The point is usually emphasized that the time requirements are wholly secondary, and that the degree is not conferred in consequence of the fulfillment of any time requirement, but that its granting depends almost entirely upon the character and results of the investigation and the value of the thesis.

The chief part of the work lies, therefore, in some form of research work, for which the above named courses are only preparatory and the thesis upon this work constitutes the chief grounds for the granting of the degree. This thesis must be an actual contribution to the sum of human knowledge, and must show a high quality of work and a mastery of the method of research.

At Chicago this work requires from four to six quarters.

For the completion of the work, usually three years are required, altho in exceptional cases it may be completed in two. The last year must be in residence at the University where the degree is granted, while the others may usually be spent at other institutions.

At Iowa, two of the three years must be in residence.

At Geo. Washington the Major is studied thru the whole three years and the Minors one year each.

At Harvard and Princeton the attendance upon twenty weekly lectures on the Trend of Philosophical and Scientific Thought, and reports upon assigned readings are required.

From one hundred to one hundred and fifty copies of the thesis are required to be deposited with the Librarian of the Institution within one year and bond is usually given that this will be done.

The Examination.

After the thesis has been accepted the candidate must appear at some appointed time for examination. This is usually attended by the members of the Graduate School Faculty, and is given by the members of the faculty under whom the work was done, or a committee representing them. This final examination must show a general knowledge of the subject and a detailed knowledge of the branch in which the work is done. It is usually oral, but may be preceded by a written examination if the examiners so desire.

At Kansas this examination is held before the Faculty of the Graduate School where the pupil may be required to defend his thesis.

At Syracuse, the examination is written on the part of the work not covered by the thesis, and oral on both thesis, and

Major and Minor Subjects.

At Harvard, the examination is given orally in the presence of the Faculty and cannot be divided. The oral examination may be preceded by a written, if the committee so wish.

At Princeton also the examination cannot be divided and may be preceded by a written examination.

At Harvard, where the work is in Physical Chemistry the examination will include Higher Mathematics.

Requirements for the Masters Degree.

The requirements are somewhat similar to those of the Doctors Degree. One years residence is required, and a majority of the work must be strictly Graduate in character. The work here also is divided into a Major and two Minors, but considerable more latitude is allowed in the choice of Minors. Written examinations are usually required, together with a Thesis on some subject of research. A few schools require a reading knowledge of French and German. Many of them also allow "In Absentia" work, especially for students whose Bachelor's Degree was taken at the Institution.