

The Ohio State University
Department of Chemistry &
Biochemistry

Autumn 2020

Chemistry PhD Program
Incoming Graduate Student
Registration Guide

General Guidelines

The current version of the Chemistry PhD Program's Summary of Procedures and Requirements for Graduate Degrees can be viewed here: <https://go.osu.edu/2019chemgradhandbook>

Overview

During the Autumn semester of their first year in the program, most students will take 3-6 credit hours (this term is abbreviated as "CH" throughout this guide) of core classes in their division, 3-6 credit hours of electives, 1 credit hour of a faculty research presentations course that is a required component of the advisor selection process, 1 credit hour of a safety course, and 1 credit hour of a divisional seminar course. First-year students must register for as near to 18 CH as possible during the Autumn and Spring semester of the first two years of the program. The credit hour requirement for Summer term is reduced to 4 CH for pre-candidacy students appointed as GTAs or GRAs and to 6 CH for pre-candidacy fellowship students.

Most, but not all, lecture classes in the Department of Chemistry & Biochemistry are offered as 7-week, 1.5 CH courses, and there are two 7-week sessions during both Autumn and Spring semesters. A typical Autumn semester schedule for a first-year Chemistry PhD program student will look like this:

AU20 7-wk 1 (8/25/20-10/14/20)	AU20 7-wk 2 (10/18/20-12/17/20)
CHEM 6xxx; in-division (core) [1.5 CH]	CHEM 6xxx; in-division (core) [1.5 CH]
CHEM 6xxx; in-division (core) [1.5 CH]	CHEM 6xxx; in-division (core) [1.5 CH]
Elective(s) (two 1.5 CH or one 3 CH)	
CHEM 6780; Faculty Research Presentations [1 CH]	CHEM 6781; Laboratory Safety [1 CH]
CHEM 889x; Divisional Seminar [1 CH]	
CHEM 8998; Non-thesis Research [register for the number of credits needed to bring your total credit hours to 18 (or as near to 18 as possible)]	

Course Load

In general, 9 credit hours of lecture courses are recommended for the first Autumn, and a minimum of 6 credit hours of lecture courses is required. Students who are supported on a fellowship may consider taking an additional lecture class, but this is not required and the time may be better spent exploring research groups that the student is considering joining.

Based on their results of the Oral Proficiency Assessment and an English composition assessment that will be administered after arriving at OSU, an international student may be required to take classes to establish spoken or written proficiency in English. International students are required to take all recommended English as a Second Language (ESL) courses to achieve spoken English proficiency. These courses may conflict with Chemistry or Biochemistry courses and, while ESL courses often do not involve a lot of homework, they do require a good deal of time spent in class. Consequently, students taking ESL classes should focus on core 6000-level classes in their division and take elective classes in the Spring semester or in their second year. If time conflicts make it impossible to take all of the divisional 6000-level classes, electives can be substituted in their place. Required English composition courses can be deferred to Spring or Summer terms in order to prioritize required Chemistry and spoken English courses.

Core class and elective recommendations for Autumn Semester

Typically, a student will take all of the 6000-level classes offered by their division. Most students will take 3 credit hours of electives of 6000-level classes from another division, but alternatives can be discussed with your temporary advisor. Students will typically take to take two 7-week electives in the same division.

Program Requirements

All students in the Ph.D. program should sign up for the following courses:

- CHEM 6780 Faculty Research Presentations – 7-wk 1; 1 CH
- CHEM 6781 Laboratory Safety, 7-wk 2; 1 CH
- CHEM 8998 Non-thesis Research, approx. 6 CH.
 - You should register for enough credit hours of 8998 so that your total hours are 18 (or as near to 18 as possible. You must register for class number 26368 (Christine M.T. Wade).

ESL Classes

Non-native English speakers who receive a 0-2.75 on the Oral Proficiency Assessment (OPA) generally are recommended to take EDUTL 5040 (4 CH), and students who receive a 3-3.75 generally are recommended to take EDUTL 5050 (3 CH). EDUTL 5060 or EDUTL 5030 may also be recommended at any score level. Chemistry graduate students are required to take all recommended spoken English ESL courses until they achieve full teaching certification (OPA or OPCA score of 4 or greater).

International students may also be required to take EDUTL 5901 (3 CH) and/or EDUTL 5902 (3 CH) to demonstrate written English proficiency. These classes must be completed by the end of the first year. In general, you should defer your written English classes to Spring or Summer. If required, it is best to complete EDUTL 5901 in Spring, because of limited course availability in the Summer. When the option exists, all students are advised to enroll in an in-person section of EDUTL 5901 &/or 5902.

Divisional Requirements

Prior to registering for Autumn 2020 courses, incoming graduate students will be required to declare a division (Analytical, Biological, Inorganic, Organic, Physical) to join when they enroll in the Chemistry PhD Program in Autumn. The courses for which a student registers will be determined based on the course requirements of the division they join. It is possible to switch divisions later, but doing so often increases the number of classes that a student has to take in order to meet the new division's requirements. If a student's research interests straddle two divisions, the student will be eligible to apply for the Multidisciplinary Track (MT) after the student has selected a research advisor. The Multidisciplinary Track allows the student and advisor to create a custom curriculum that combines classes and requirements from two or more divisions. If you are considering labs in two divisions, you could consider registering for elective classes in the non-major division, so that you can create an MT curriculum later in your program.

Analytical Division

The temporary advisors for the Analytical division are:

- Dr. Anne Co; co.5@osu.edu/ 614-688-8333
- Dr. Zachary Schultz; schultz.133@osu.edu / 614-292-5775

Analytical Division Curriculum Requirements

- 18 credit hours of graded (A-E) graduate lecture classes are required, in addition to program requirements, seminar, and research (CHEM 6780, 6781, 6782, 8891, 8998/8999).

CHEM 6780	Faculty Research Presentations	1 CH
CHEM 6781	Laboratory Safety	1 CH
CHEM 6782	Ethics in Scientific Research	1 CH
CHEM 8891	Analytical Chemistry Seminar	1 CH
CHEM 8998	Nonthesis	1-15 CH
CHEM 8999	Thesis Research	1-15 CH

- Required classes: CHEM 6110, 6120 (3 CH)

CHEM 6110	Survey of Instrumental Methods	1.5 CH
CHEM 6120	Analytical Data Treatment	1.5 CH

- Analytical electives: 9 credit hours of CHEM 71xx classes

CHEM 7120	Electrochemistry	3 CH
CHEM 7130	Fundamentals & Techniques of Separation Science	3 CH
CHEM 7140	Analytical Spectroscopy	3 CH
CHEM 7150	Mass Spectrometry	3 CH
CHEM 7160	NMR Spectroscopy	3 CH
CHEM 7170	Analytical Surface Science	3 CH

- Other electives: 6 credit hours of graduate classes outside the Analytical division (6000+)
 - Elective courses outside the division may include, but are not limited to: Biochemistry 6761; Inorganic Chemistry 6320, 6330, 7320, 7360; Organic Chemistry 6440, 7440; Physical Chemistry 6520, 6530, 7520, 7540, 7550

BIOCHEM 6761	Advanced Biochemistry	3 CH
CHEM 6320	Synthetic Principles in Inorganic	1.5 CH
CHEM 6330	Group Theory and Bonding	1.5 CH
CHEM 7320	Organometallic Chemistry	1.5 CH
CHEM 7360	Bioinorganic Chemistry	1.5 CH
CHEM 6440	Intro to Physical Organic Chemistry	1.5 CH
CHEM 7440	Kinetics, Catalysis, & Transition State Theory	1.5 CH
CHEM 6520	Thermodynamics	1.5 CH
CHEM 6530	Kinetics	1.5 CH

CHEM 7520	Advanced Molecular Quantum Mechanics	3 CH
CHEM 7540	Chemical Dynamics	3 CH
CHEM 7550	Statistical Thermodynamics	3 CH

In the first term, students typically enroll in CHEM 6110, 6120, an available 71xx course, and three additional credit hours outside the division.

Other requirements:

Students must complete 12-15 credit hours of lecture courses (graded A-E) during the Autumn and Spring semesters of the first year.

A poster session will be held at the end of the Summer term in which the first year students will have the opportunity to report on their progress and to discuss their research with other students and faculty. All first year students must present a poster. A brief written description of the poster presentation shall be provided, in advance, to the Analytical division secretary.

Biochemistry Division

The temporary advisors for the Biochemistry division are:

- Dr. Venkat Gopalan; gopalan.5@osu.edu / 614-292-1332
- Dr. Kotaro Nakanishi; nakanishi.9@osu.edu / 614-688-2188

Biochemistry Division Curriculum Requirements

- 15 credit hours of graded (A-E) graduate lecture classes are required, in addition to program requirements, seminar, and research (CHEM 6780, 6781, 6782, 8892, 8998/8999).

CHEM 6780	Faculty Research Presentations	1 CH
CHEM 6781	Laboratory Safety	1 CH
CHEM 6782	Ethics in Scientific Research	1 CH
CHEM 8892	Biochemistry Seminar	1 CH
CHEM 8998	Nonthesis Research	1-15 CH
CHEM 8999	Thesis Research	1-15 CH

- Required classes: BIOCHEM 6761, 6762, 6763 (6 CH)

BIOCHEM 6761	Advanced Biochemistry	3 CH
BIOCHEM 6762	Advance Biochemistry: Enzymes	1.5 CH
BIOCHEM 6763	Advance Biochemistry: Membranes and Lipids	1.5 CH

- Biochemistry electives: 6 credit hours of graduate classes should be in the area of Biochemistry or related disciplines. Classes outside the department may count toward this requirement with permission of the division.
 - Recommended Biochemistry electives include: BIOCHEM 6701 Molecular Biology, BIOCHEM 6765 Physical Biochemistry, BIOCHEM 7766 Nucleic Acids, BIOCHEM 7770 Protein Engineering, BIOCHEM 8900 Biomolecular NMR, BIOCHEM 8990 Advanced Topics, CHEM 7360 Bioinorganic Chemistry, MICRO 8050 RNA World.
- Other electives: 3 credit hours of graduate classes must come from outside Biochemistry

In the first term, in addition to BIOCHEM 6761, students with molecular biophysics interests should take CHEM 6520 and 6530 (thermodynamics and kinetics); students with chemical biology interests should take either the physical organic (CHEM 6420 and 6430) or synthetic organic (CHEM 6410 and 6440) classes; and students with molecular biology interests should take BIOCHEM 6701.

CHEM 6520	Thermodynamics	1.5 CH
CHEM 6530	Kinetics	1.5 CH
CHEM 6420	Stereochemistry and Conformational Analysis	1.5 CH
CHEM 6430	Intro to Organic Synthesis	1.5 CH
CHEM 6410	Basic Organic Reaction Mechanisms	1.5 CH
CHEM 6440	Intro to Physical Organic Chemistry	1.5 CH
BIOCHEM 6701	Advanced Biochemistry: Molecular Bio	3 CH

Other requirements:

First year students must participate in three laboratory rotations (approximately 4 weeks each) during the Autumn term with three different professors in the Department. The rotation schedule will be determined by the Biochemistry Division. Students are not required to join the lab of a professor with whom they have completed a rotation.

Inorganic Division

The temporary advisors for the Inorganic division are:

- Dr. Patrick Woodward; woodward.55@osu.edu / 614-688-8274
- Dr. Shiyu Zhang; zhang.8941@osu.edu / 614-688-3630

Inorganic Division Curriculum Requirements

- 18 credit hours of graded (A-E) graduate lecture classes are required, in addition to program requirements, seminar, and research (CHEM 6780, 6781, 6782, 8893, 8998/8999).

CHEM 6780	Faculty Research Presentations	1 CH
CHEM 6781	Laboratory Safety	1 CH
CHEM 6782	Ethics in Scientific Research	1 CH
CHEM 8893	Inorganic Seminar	1 CH
CHEM 8998	Nonthesis Research	1-15 CH
CHEM 8999	Thesis Research	1-15 CH

- Required classes: CHEM 6310, 6320, 6330, 6340 (6 CH)

CHEM 6310	Fundamentals of Coordination Chemistry	1.5 CH
CHEM 6320	Synthetic Principles in Inorganic	1.5 CH
CHEM 6330	Group Theory and Bonding	1.5 CH
CHEM 6340	Physical Methods in Inorganic Chemistry	1.5 CH

- Inorganic electives: 6 credit hours of Inorganic classes at the 7000-level or above (CHEM 7320, 7330, 7340, 7350, 7360, 7370, 8399)

CHEM 7320	Organometallic Chemistry	1.5 CH
CHEM 7330	Solid State Chemistry	1.5 CH
CHEM 7340	Diffraction Models	1.5 CH
CHEM 7350	Inorganic Photochemistry	1.5 CH
CHEM 7360	Bioinorganic Chemistry	1.5 CH
CHEM 7370	Nanochemistry & Nanomaterials	1.5 CH
CHEM 8399	Advanced Topics in Inorganic Chemistry	1.5-3 CH

- Other electives: 6 additional graduate credit hours.
 - 3 credit hours of graduate classes must come from outside the Inorganic division.
 - 3 credit hours must be at the 7000-level or above.
 - 7000+ level electives outside the Inorganic division must be approved by the advisor and division.

In the first Autumn, students should enroll in CHEM 6310, 6320, 6330 and 6340, and 3 credit hours of 6000-level classes outside the Inorganic division. Students with materials, photochemistry, or physical inorganic chemistry interests should take CHEM 6520, 6530, or 6540 (thermodynamics, kinetics, or electronic structure); Organic electives (CHEM 6410, 6420, 6430, 6440) may also be reasonable options for students interested in synthetic inorganic or organometallic chemistry. In the first Spring, students should enroll in 9 credit hours of 7000+ classes.

CHEM 6520	Thermodynamics	1.5 CH
CHEM 6530	Kinetics	1.5 CH
CHEM 6540	Intro to Electronic Structure	1.5 CH
CHEM 6410	Basic Organic Reaction Mechanisms	1.5 CH
CHEM 6420	Stereochemistry and Conformational Analysis	1.5 CH
CHEM 6430	Intro to Organic Synthesis	1.5 CH
CHEM 6440	Intro to Physical Organic Chemistry	1.5 CH

Organic Division

The temporary advisors for the Organic division are:

- Dr. Psaras McGrier; mcgrier.1@osu.edu / 614-688-2108
- Dr. Jon Parquette; parquette.1@osu.edu / 614-292-5886

Organic Division Curriculum Requirements

- 15 credit hours of graded (A-E) graduate lecture classes are required, in addition to program requirements, seminar, and research (CHEM 6780, 6781, 6782, 8894, 8998/8999).

CHEM 6780	Faculty Research Presentations	1 CH
CHEM 6781	Laboratory Safety	1 CH
CHEM 6782	Ethics in Scientific Research	1 CH
CHEM 8894	Organic Chemistry Seminar	1 CH
CHEM 8998	Nonthesis Research	1-15 CH
CHEM 8999	Thesis Research	1-15 CH

- Required classes: CHEM 5420, 6410, 6420, 6430, 6440 (7.5 CH)

CHEM 5420	Spectroscopy of Organic Compounds	1.5 CH
CHEM 6410	Basic Organic Reaction Mechanisms	1.5 CH
CHEM 6420	Stereochemistry and Conformational Analysis	1.5 CH
CHEM 6430	Intro to Organic Synthesis	1.5 CH
CHEM 6440	Intro to Physical Organic Chemistry	1.5 CH

- Electives: Either CHEM 7450 or 7460 is required (1.5 CH).

CHEM 7440	Kinetics, Catalysis, and Transition State Theory	1.5 CH
CHEM 7550	Statistical Thermodynamics	3 CH

- 6 additional graduate credit hours, which may include CHEM 7470, CHEM 8499, or classes outside the Organic division, are required.

CHEM 7470	Computational Chemistry	1.5 CH
CHEM 8499	Advanced Topics in Organic Chemistry	1.5-3 CH

- 3 credit hours of graduate classes must come from outside the Organic division.

In the first term, students should enroll in CHEM 6410, 6420, 6430, and 6440, in addition to 3 credit hours outside the Organic division.

Other requirements:

Organic division students are not *required* to carry out lab rotations, but are *permitted* to do so. Once a mutually agreeable rotation assignment is found, the rotation must be reported to the organic division secretary before beginning. The rotation period is a maximum of 4 weeks. All rotations must be within the department. Students are not required to join a lab in which they have done a rotation.

Physical Division

The temporary advisors for the Physical division are:

- Dr. Philip Grandinetti; grandinetti.1@osu.edu / 614-216-6232
- Dr. Alexander Sokolov; Sokolov.8@osu.edu / 614-688-3636

Physical Division Curriculum Requirements

- 18 credit hours of graded (A-E) graduate lecture classes are required, in addition to program requirements, seminar, and research (CHEM 6780, 6781, 6782, 8895, 8998/8999).

CHEM 6780	Faculty Research Presentations	1 CH
CHEM 6781	Laboratory Safety	1 CH
CHEM 6782	Ethics in Scientific Research	1 CH
CHEM 8895	Physical Chemistry Seminar	1 CH
CHEM 8998	Nonthesis Research	1-15 CH
CHEM 8999	Thesis Research	1-15 CH

- Required classes: CHEM 6510, 6520, 6530, 6540, 7520, 7550 (12 CH)

CHEM 6510	Quantum Mechanics and Spectroscopy	1.5 CH
CHEM 6520	Thermodynamics	1.5 CH
CHEM 6530	Kinetics	1.5 CH
CHEM 6540	Intro to Electronic Structure	1.5 CH
CHEM 7520	Advanced Molecular Quantum Mechanics	3 CH
CHEM 7550	Statistical Thermodynamics	3 CH

- Physical electives: Either CHEM 7530 or 7540 is required (3 CH)

CHEM 7530	Spectra and Structure of Molecules	3 CH
CHEM 7540	Chemical Dynamics	3 CH

- Other electives: 3 credit hours of graduate classes must come from outside the Physical division
 - Typical electives include: physical chemistry classes CHEM 6550, 7580, 7590, 8599, 8699; other chemistry classes CHEM 6110, 7330, 6340, 6420, 6440, 7140, 7150, 7160, 7350, 7380, 7440, 7460, 7470; physics classes PHYS 5300, 5400, 6804, 8804, 8820; math classes MATH 4512, 4551, 4552, 4568, 5101, 5102.

In the first term, students typically enroll in 9 credit hours, including CHEM 6510, 6520, 6530, and 6540.

Students with interests in theory who have not taken a class in linear algebra should enroll in MATH 5101 or another math class recommended by the temporary advisor.

Graduate Courses - Autumn 2020

Full Semester (14 weeks)

Autumn 1 (7 weeks)

Autumn 2 (7 weeks)

Required Courses for all First-Year Students

[CHEM 6780 Faculty Research](#) (Thomas)

TR 5:30-7:30 PM, CBEC 130

[CHEM 6781 Lab Safety](#) (Herrington)

TR 5:30-6:25, CBEC 130

[CHEM 8998](#) (Register under #26368; Christine M.T. Wade (this is Dr. Christine Thomas))

Analytical

[CHEM 7120 Electrochemistry](#) (Co)

TR 12:45PM-2:05PM, LAZENBY 002

[CHEM 6110 Survey of Instrumental Methods](#) (Schultz)

MWF 1:50-2:45 PM, MP 2019

[CHEM 6120 Analytical Data Trtmt](#) (Baker/Olesik)

MWF 1:50-2:45 PM, MP 1046

Biochemistry

[BIOCHEM 6701 Advanced Biochem-Molecular Biology](#) (Jackman)

TR 9:35-10:55 AM, BIO 668

[BIOCHEM 6761 Advanced Biochem-Macromolecular Structure & Function](#) (Ottesen/Musier-Forsyth)

MWF 10:20-11:15 AM, HITCHCOCK 031

Inorganic

[CHEM 6310 Fundamentals of Coordination Chem](#) (Zhang)

MWF 9:10-10:05 AM, EL 2002

[CHEM 6320 Synthetic Principles Inorg Chem](#) (Wade)

MWF 9:10-10:05 AM, EL 2002

[CHEM 6330 Group Theory & Bonding](#) (Wade)

MWF 10:20-11:15 AM, EL 2003

[CHEM 6340 Physical Methods Inorg Chem](#) (Goldberger)

MWF 10:20-11:15 AM, EL 2003

Organic

[CHEM 6420 Physical Organic I/Stereochem & Conf Analysis](#) (McGrier)

MWF 12:40-1:35 PM, EL 2002

[CHEM 6440 Phys Org II/Intro to Phys Org Chem](#) (Bong)

MWF 12:40-1:35 PM, EL 2002

<u>CHEM 6410 Synthesis I/Basic Organic Reaction Mechanisms</u> (Nagib)	<u>CHEM 6430 Synthesis II/Intro to Org Synth</u> (Parquette)
MWF 3:00-3:55 PM, MP 2017	MWF 3:00-3:55 PM, MP 2017
Physical	
<u>CHEM 6520 Thermodynamics</u> (Grandinetti)	<u>CHEM 6530 Kinetics</u> (Allen)
MWF 11:30-12:25 PM, MP 2019	MWF 11:30-12:25 PM, MP 2019
<u>CHEM 6510 Quantum Mechanics & Spectroscopy</u> (Herbert)	<u>CHEM 6540 Intro Electronic Structure</u> (Herbert)
TR 11:10 AM-12:30 PM, DB 049	TR 11:10 AM-12:30 PM, DB 049
<u>CHEM 7580 Lasers, Optics, & Optical Instrumentation</u> (Kohler)	
TR 2:20-3:40 PM, SM 1064	
Seminars	
<u>CHEM 8891 Analytical Seminar</u> (Badu-Tawiah)	
M 4:10-5:20 PM, CBEC 130	
<u>CHEM 8892 Biochem Seminar</u> (Sotomayor)	
R 4:10-5:20 PM, Psychology 006	
<u>CHEM 8893 Inorganic Seminar</u> (Wade)	
W 4:10-5:20 PM, CBEC 130	
<u>CHEM 8894 Organic Seminar</u> (Sevov)	
W 4:10-5:20 PM, CBEC 130	
<u>CHEM 8895 Physical Seminar</u> (Baker)	
M 4:10-5:20 PM, CBEC 130	