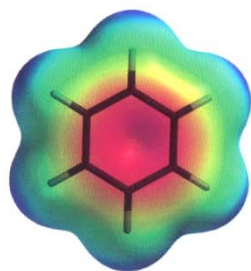
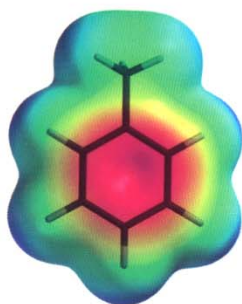


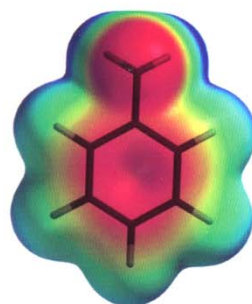
Guide to the Chemistry Major at Johns Hopkins



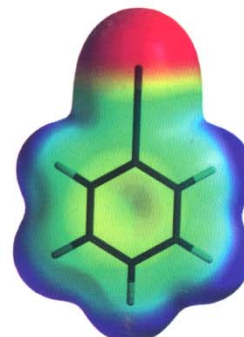
Benzene



Toluene



Aniline



Benzonitrile

Welcome to the Chemistry Major at Johns Hopkins. Chemistry is a broad field that encompasses both physics and biology with traditional areas of chemistry in the middle. As such, it is considered the central science and many research opportunities can be found in our department. Because the field is broad, most students can find topics that are interesting, challenging, and rewarding. This booklet is designed to introduce you to the Chemistry Major and to provide some specific details about navigating the major, courses, and faculty research. Specific information about a Professor's research program is available through faculty web sites and from overview presentations given early each fall semester. If you want to know more, do not hesitate to talk to your advisor or a professor about the program, their research, and career opportunities once you graduate.

The Chemistry Curriculum and Degree Requirements (starting 2013)

For the BA degree, 120 credits are required. For an ACS approved degree, the Chemistry of Inorganic Compounds, 030-449, 030.204, or an equivalent course, and an approved Biochemistry or Biology-related course should be taken as electives.

Chemistry¹

030.101 Intro Chemistry I	3		
030.105 Intro Chemistry Lab I	1		
030.102 Intro Chemistry II	3		
030.106 Intro Chemistry Lab II	1		
030.205 Intro Organic Chem I	4		
030.206 Intro Organic Chem II	4		
030.225 Intro Organic Lab	3		
030.228 Intermed. Organic Lab	3		
030.356 Advanced Inorganic Lab	3		
030.301 Physical Chem I	3		
030.305 Physical Chem Lab I	3		
030.302 Physical Chem II	3		
030.306 Physical Chem Lab II	3		

Physics²

171.101 (103) General Physics I	4		
173.111 General Physics Lab I	1		
171.102 (104) General Physics II	4		
173.112 General Physics Lab II	1		

Mathematics³

110.106 or 110.108 Calculus I	4		
110.107 or 110.109 Calculus II	4		

6 Credits of Advanced Chemistry Electives beyond 030-305-306^{4,5}

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9 Credits of Advanced Chemistry or Science Electives at the 300-400-level or Mathematics beyond Calculus II⁶

	3		
	3		
	3		

Note: Research may not be used in the 6 or 9 credit categories

Distribution Requirements⁴

12 Credits of S, H, Q or E

18 Credits of S and/or H

Courses that are writing intensive (12 Credits)⁷

General Electives (to get to 120 Credits)

Notes 1-7: see next page

The Chemistry Curriculum and Degree Requirements (starting 2014)

For the BA degree, 120 credits are required. For an ACS approved degree, The Chemistry of Inorganic Compounds, 030-449, 030.204, or an equivalent course, and an approved Biochemistry or Biology-related course should be taken as electives.

Chemistry¹

030.101 Intro Chemistry I	3		
030.105 Intro Chemistry Lab I	1		
030.102 Intro Chemistry II	3		
030.106 Intro Chemistry Lab II	1		
030.205 Intro Organic Chem I	4		
030.206 Intro Organic Chem II	4		
030.225 Intro Organic Lab	3		
030.228 Intermed. Organic Lab	3		
030.356 Advanced Inorganic Lab	3		
030.301 Physical Chem I	3		
030.305 Physical Chem Lab I	3		
030.302 Physical Chem II	3		
030.306 Physical Chem Lab II	3		

Distribution Requirements⁴

9 Credits of N, Q or E

9 Credits of H

9 Credits of S

Physics²

171.101 (103) General Physics I	4		
173.111 General Physics Lab I	1		
171.102 (104) General Physics II	4		
173.112 General Physics Lab II	1		

Mathematics³

110.106 or 110.108 Calculus I	4		
110.107 or 110.109 Calculus II	4		

Courses that are writing intensive (12 Credits)⁷

6 Credits of Advanced Chemistry Electives beyond 030-305-306^{4,5}

9 Credits of Advanced Chemistry or Science Electives at the 300-400-level or Mathematics beyond Calculus II⁶

	3		
	3		
	3		

General Electives (to get to 120 Credits)

Note: Research may not be used in the 6 or 9 credit categories

Notes 1-7: see next page

The Chemistry Curriculum and Degree Requirements (starting 2016)

For the BA degree, 120 credits are required. For an ACS approved degree, The Chemistry of Inorganic Compounds, 030-449, 030.204, or an equivalent course, and an approved Biochemistry or Biology-related course should be taken as electives.

Chemistry¹

030.101 Intro Chemistry I	3		
030.105 Intro Chemistry Lab I	1		
030.102 Intro Chemistry II	3		
030.106 Intro Chemistry Lab II	1		
030.204 Chemical Bonding	4		
030.205 Intro Organic Chem I	4		
030.206 Intro Organic Chem II	4		
030.225 Intro Organic Lab	3		
030.228 Intermed. Organic Lab	3		
030.356 Advanced Inorganic Lab	3		
030.301 Physical Chem I	3		
030.305 Physical Chem Lab I	3		
030.302 Physical Chem II	3		
030.306 Physical Chem Lab II	3		

Physics²

171.101 (103) General Physics I	4		
173.111 General Physics Lab I	1		
171.102 (104) General Physics II	4		
173.112 General Physics Lab II	1		

Mathematics³

110.106 or 110.108 Calculus I	4		
110.107 or 110.109 Calculus II	4		

3 Credits of Advanced Chemistry Elective beyond 030-305-306^{4,5}

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9 Credits of Advanced Chemistry or Science Electives at the 300-400-level or Mathematics beyond Calculus II⁶

	3		
	3		
	3		

Note: Research may not be used in the 6 or 9 credit categories

Distribution Requirements⁴

9 Credits of N, Q or E

9 Credits of H

9 Credits of S

Courses that are writing intensive (12 Credits)⁷

General Electives (to get to 120 Credits)

Notes 1-7: see next page

Advising Notes (from previous page)

1. If you have received AP credit for the first year of chemistry (a 5 on the AP exam) and two years of lab experience, you should consider taking Organic Chemistry I (030.205) or Applied Chemical Equilibrium and Reactivity (with Lab) (030.103). If you have had only 1 year of laboratory experience, 030.103 is suggested with 030.205 as a possibility. With a 4 on the AP exam, you may consider taking 030.103 as your first chemistry course. The 030.103/204 sequence replaces the 030.101/102 (lectures) and 030.105/106 (labs) in the first year. The 030.204 (Chemical Structure and Bonding) may also be taken by students starting with organic chemistry.
2. Either physics sequence counts. Physics 171.101-102 is the physical science sequence and 171.103-104 is the biological science sequence.
3. Either calculus sequence counts. The 110.106-107 has social and biological science examples.
4. By finishing the physics and organic sequences in the sophomore year, flexibility is gained in scheduling both chemistry and other electives.
5. Required courses for the major do not count in this category. For student who started before 2016, you may count AS.030.204 in this category.
6. Approval of science courses by an advisor is required.
7. Writing intensive courses are typically 3 credits but there are some exceptions. Intro to expository writing 060.100 is for less experienced 1st-year students only. Expository writing 060.113 or 060.114 may be taken twice with a different topic covered in each course.

Honors in Chemistry

To recognize exceptional performance, both in formal course work and in research, chemistry majors can receive a degree with honors. Honors in Chemistry may be achieved by one of two paths. 1: A student with a GPA of 3.75 or higher in (N) and (Q) courses or 2: A student with a 3.5 GPA in (N) and (Q) courses and with at least 2 semesters of research with a Chemistry faculty member or an approved research advisor. These students must write a summary of their research, approved by their advisor to the Director of Undergraduate Studies.

A Representative Academic Plan

Semester 1	Semester 2
Introductory Chemistry I 030.101 Introductory Laboratory I 030.105 (030.103 may substitute for 030.101/105) Calculus I 110.106 Elective Elective	Introductory Chemistry II 030.102 Introductory Laboratory I 030.106 (030.204 if 030.103 was taken) Calculus II 110.107 Elective Elective
Semester 3	Semester 4
Organic Chemistry I 030.205 Intro. Organic Chemistry Lab 030.225 General Physics I 171.101 General Physics Lab 173.111 Elective	Organic Chemistry I 030.205 Intermed. Organic Chemistry Lab 030.228 General Physics II 171.102 General Physics Lab 173.112 Elective
Semester 5	Semester 6
Physical Chemistry I 030.301 Physical Laboratory I 030.305 Biochemistry 030.315 (or elective) Biochemistry Laboratory 020.315 or Electives Research	Physical Chemistry II 030.302 Physical Laboratory II 030.306 Elective Research
Semester 7	Semester 8
Inorganic Laboratory 030.356 Electives or more Biology courses Chemistry of Inorganic Compounds 030.449 Research	Electives Research

Schedule of Courses

Note: some upper-level courses are offered in different semesters. Check the course catalogue for current listings.

Course	Summer	Fall	Spring
030.101	X	X	
030.102	X		X
030.103		X	
030.105	X	X	
030.106	X		X
030.204			X
030.205	X	X	
030.206	X		X
030.225	X	X	X
030.228			X
030.301		X	
030.302			X
030.305		X	
030.306			X
030.315		X	
030.316			X
030.345			X
030.356		X	
030.441		X	
030.442			X
030.449		X	
030.451		X	
030.452		X	
030.453		X	
030.601			X
030.605		X	
030.610		X	
030.612			X
030.614			X
030.615		X	
030.617		X	
030.619		X	
030.620			X
030.625		X	
030.626			X
030.677		X	
030.678			X

Brief Course Descriptions

030.101: An introduction to the fundamental principles of chemistry. The main topics to be covered are atomic and molecular structure at the level of dot structures and VSEPR geometries, the periodic table, stoichiometry and the balancing of chemical equations, the gas laws, the law of mass action and chemical equilibrium, acids and bases, and elementary chemical thermodynamics.

030.102: Continuation of 030.101 emphasizing chemical kinetics, chemical bonding. Topics: energy levels and wavefunctions for particle-in-a-box and hydrogen atom and approximate wavefunctions for molecules including introduction to hybrid orbitals.

030.103: Applied Equilibrium and Reactivity w/Lab Prerequisite: 030.101, 030.102, 030.105, and 030.106 or 4 or 5 on the AP exam. Chemical equilibrium, reactivity and bonding will be covered. These topics will be explored through the use of laboratory experiments and problem solving, and the use of these principles in current research areas will be discussed.

030.105-106: First-year chemistry laboratories. Students will develop laboratory skills and learn about topics that complement the lectures.

030.204: Chemical Structure and Bonding with Laboratory. Prerequisite: 030.103 or a 5 on the AP exam. An introduction to the synthesis, structure, and reactivity of materials and inorganic compounds. Modern approaches to chemical bonding, including molecular orbital, ligand field, and crystal field theories, will be applied to understanding the physical and chemical properties of inorganic materials. Other topics to be discussed include magnetic properties, electronic spectra, magnetic resonance spectra, and reaction kinetics. The integrated laboratory will cover synthetic, measurement, and calculation methods of inorganic chemistry, and include hands-on exposure to state of the art materials research

030.205: Introduction to Organic Chemistry. Prerequisite; 030.102 or 030.103 or equivalent. Concepts taught in CHEM 205 include bonding, molecular orbital theory, valence bond theory, hybridization, Lewis acids and bases, isomers, functional groups and their reactivity, organic reaction mechanisms, electrophiles, nucleophiles, electrophilic addition reactions, nucleophilic substitutions, elimination reactions, stereochemistry, and aromaticity. The chemistry of alkenes, alkynes, alkyl halides, dienes, aromatic molecules, alcohols, and ethers is covered.

030.206: Prerequisite: 030.205. A continuation of 030.205. Carbonyl compounds, their chemistry and utility are the first major topic. With carbonyl group group, the course has a greater emphasis on synthesis, synthetic approaches, and organic mechanisms. Other topics include the synthesis and reactions of amines, synthetic polymers, and pericyclic reactions. The structure and organic chemistry of biomolecules is introduced during the last part of the course. Topics that are potentially covered include carbohydrates, amino acids, and nucleic acids.

030.212: Advanced Organic Chemistry. Prerequisite: 030.205 with a B+ or higher. Second semester undergraduate organic chemistry from an advanced and rigorous prospective. Enrollment limited to, and highly recommended for, students who have done well in the first semester (AS.030.205). Topics include 2D NMR, synthesis with a stress on modern methods, chiral molecules, and mechanistic analysis. Students will be required to access

the primary literature and to use molecular modeling programs such as Spartan. Students may not simultaneously enroll for AS.030.212 and AS.030.206.

030.225: Introductory Organic Chemistry Laboratory. Prerequisite: concurrent 030.205. Techniques for the organic chemistry laboratory including methods of purification, isolation, synthesis, and analysis. Chemistry majors should take this course in the fall semester.

030.228: Intermediate Organic Chemistry Laboratory. Prerequisite: 030.225. Lab skills already acquired (030.225) will be further developed for synthesis, isolation, purification, and identification of organic compounds. Spectroscopic techniques, applications will be emphasized.

030.301: Physical Chemistry I. Prerequisite: 030.102 or 030.103 (or equivalent), 2 semesters of calculus, and general physics. The laws of thermodynamics, their statistical foundation, and application to chemical phenomena.

030.302: Physical Chemistry II. Prerequisite: 030.301. Introduction to quantum mechanics, its application to simple problems for which classical mechanics fails. Topics: Harmonic oscillator, hydrogen atom, very approximate treatments of atoms and molecules and theoretical basis for spectroscopy.

030.305: Physical Chemistry Instrumentation Laboratory I. Co or Prequisite: 030.301. This course is designed to illustrate the principles of physical chemistry and to introduce the student to techniques and instruments used in modern chemical research.

030.306: Physical Chemistry Instrumentation Laboratory II. Co-requisite: 030.302. Continuation of 030.305.

030.315: Biochemistry I. Prerequisite: 030.206. Foundation for advanced classes in Biophysics and other quantitative biological disciplines. Topics include chemical, physical, and energetic principles of biochemistry. Lecture and computer laboratory. Co-listed with Biophysics 250.315.

030.316: Biochemistry II. A continuation of 030.315 (250.315). Prerequisite: 030.315. Molecular basis of gene regulation, signal transduction and control of cell metabolism, with an emphasis on physical concepts and mechanisms. Format will include lectures and class discussion of readings from the literature. Co-listed with Biophysics 250.316.

030.345: Chemical Applications of Group Theory. The theory of the representations of finite and continuous groups will be applied to problems in chemistry

030.356: Advanced Inorganic Laboratory. Prerequisite: 030.228. This laboratory is designed to illustrate the principles and practice of inorganic chemistry through the synthesis and characterization of transition metal and organometallic compounds. Methods used include vacuum and inert atmosphere techniques. Instrumental approaches and modern spectroscopic techniques are applied to the characterization of compounds generated.

030.402: Experimental Methods in Physical Chemistry. This course introduces the student to experimental methodologies used in gas phase physical chemistry. Topics to be covered include vacuum technology, charged particle optics, lasers, mass spectrometry, data acquisition, detectors, measurement of temperature and pressure, and design and

fabrication of scientific apparatus. These topics will be tied together with examples of specific experimental studies.

030.403: Optoelectronic Materials and Devices: Synthesis, Spectroscopy, and Applications. This course provides an introduction to the vast chemistry and physics of solid-state materials. The course begins with a fundamental description of bonding in crystalline solids and calculation of electronic band structure. We then extend our discussion to methods for the synthesis of low-dimensional materials and hierarchical structures, including quantum dots (0D), nanowires (1D), graphene and graphene analogs (2D), and thin-film superlattices. An in-depth discussion of spectroscopic and characterization techniques for solid-state materials will follow and focus on some of the foundational studies of quantum devices and cooperative phenomena. At this stage we will describe recent advances in electron-microscopy (e.g. aberration-corrected and energy filtered TEM, atom-probe tomography) that are revolutionizing the structural, compositional, and electronic characterization of materials. The course will conclude with a survey of contemporary topics in solid-state and nanomaterials science, including functional devices and circuits, assembly, energy conversion and catalysis, and biological sensing. Recommended Course Background: AS.030.301 and AS.030.402 are preferred, but instructor approval may be granted in lieu of these courses.

030.404: Electrochemical Systems for Energy Conversion and Storage. This course will be focused on the fundamentals and applications of electrochemical methods in catalysis, charge transport, and energy conversion and storage. Topics that will be covered are basic electrochemical techniques, homogenous and heterogeneous (photo)electrocatalysis, fuel cells, and charge storage devices. The class will conclude with a group report and presentation on a recent development in the field of energy catalysis, conversion, and storage. Course topics include: 1) Fundamentals of electrochemistry, 2) Potential sweep methods and current-controlled techniques, 3) Impedance analysis, 4) Electrochemistry coupled with other characterization methods, 5) Electrocatalysis and photoelectrochemical catalysis, 6) Basics in fuel cells and current technologies (alkaline, polymer exchange membrane, solid oxide...), 7) Basics in batteries and current technologies (Pb acid, Li-based, other metals...) Recommended Course Background: AS.030.204 or AS.030.449 or AS.030.472, or instructor approval for undergraduate students. No pre-requisites for graduate students

030.441: Spectroscopic Organic Structure Determination. The course provides fundamental theoretical background for and emphasizes practical application of ultraviolet/visible and infrared spectroscopy, ^1H and ^{13}C nuclear magnetic resonance and mass spectrometry are used to determine the structures of organic compounds.

030.442: Organometallic Chemistry. Co- or Prerequisite: 030.449 or equivalent. An introduction to organometallic chemistry beginning with structure, bonding and reactivity and continuing into applications to fine chemical synthesis and catalysis.

030.443: Bioinorganic Chemistry. Co- or Prerequisite: 030.449. This course covers the chemistry of metal ions in biological systems. The structure and function of metalloproteins and metalloenzymes will be addressed. The principles of synthesis (organic and inorganic) for the design and characterization of small-molecule analogs of these systems will be discussed. Physical/spectroscopic methods (e.g., EPR, RR, Mossbauer, XAS) will be introduced as appropriate for understanding both the biological and synthetic inorganic systems.

030.449: Chemistry of Inorganic Compounds. Physical and chemical properties of inorganic, coordination and organometallic compounds are discussed in terms of molecular orbital, ligand field and crystal field theories. The emphasis is on structure and reactivity of these inorganic compounds. Other topics: magnetic properties, electronic spectra, magnetic resonance spectra, reaction kinetics.

030.451: Spectroscopy. Prerequisite: 030.301 and 030.302. The spectroscopy and structure of molecules starting from rotational, vibrational, and electronic spectra of diatomic molecules and extending to polyatomic molecules.

030.452: Materials and Surface Characterization. The chemistry associated with surfaces and interfaces as well as a molecular level understanding of their essential roles in many technological fields. The first half of this course addresses various analytical techniques used to study surfaces including X-ray, photoelectron spectroscopy, and scanning tunneling microscopy. The second half of this course uses a number of case studies to illustrate the application of surface analytical techniques in contemporary research.

030.453. Intermediate Quantum Chemistry. Prerequisite: 030.302 or equivalent. The principles of quantum mechanics are developed and applied to chemical problems.

030.601: Statistical Mechanics. Prerequisite: 030.301. An introduction to the statistical mechanics of cooperative phenomena using lattice gases and polymers as the main models. Covered topics include phase transitions and critical phenomena, scaling laws, and the use of statistical mechanics to describe time dependent phenomena.

030.605: Mechanistic Metallo-enzymology. Mechanistic metallo-enzymology is explored.

030.610: Chemical Kinetics. The molecular mechanism of elementary physical and chemical rate processes will be studied. Topics such as elastic scattering, collisional vibrational and rotational energy transfer, chemically reactive collisions, and the theory of unimolecular decay will be covered.

030.615: Special Topics in Bioinorganic Chemistry. Prerequisite: 030.301- 302 or the equivalent; some background in biochemistry or inorganic chemistry is helpful but not required. This course is concerned with the chemistry of metals in biological systems. Major emphasis is placed on metalloproteins in which a transition metal is known to occupy the active site of the protein. Chemical approaches to modeling bioinorganic systems also are discussed. The lectures illustrate how chemical, spectroscopic, and structural methods have been used to understand the structure and function of metals in biology.

030.617: Topics in Special Inorganic Chemistry. Special topics in inorganic chemistry will be reviewed.

030.619: Chemical Biology I 030.206 or equivalent. Parts I and II constitute the core course of the Chemistry- Biology Interface (CBI) Program. An introduction to the structure, synthesis, reactivity, and function of biological macromolecules (proteins, nucleic acids, carbohydrates, and lipids) will be provided using the principles of organic and inorganic chemistry. Discussion will incorporate a broad survey of molecular recognition and mechanistic considerations, and introduce the tools of molecular and cellular biology that are utilized in research at the interface of chemistry with biology and medicine.

030.620: Chemical Biology II. Prerequisite: Chemical Biology I or Permission. Required. Selected topics of current importance in chemical biology are covered. They include protein engineering and proteomics, cell signaling, protein-nucleic acid interactions (e.g. replication, transcription, DNA repair), catalytic RNA and the ribosome, biosynthesis of natural products, mechanisms of drug action, combinatorial chemistry and chemical genetics, and *in vitro* selection.

030.625: Advanced Mechanistic Organic Chemistry I. Prerequisite: 030.205-206. Limit 20 The course covers the application of techniques in physical chemistry to the study of organic reaction mechanisms. Topics include chemical bonding and structure, stereochemistry, conformational effects, molecular orbital theory, methods to determine reaction mechanisms, reactive intermediates, and photochemistry.

030.626: Advanced Mechanistic Organic Chemistry II. Prerequisite: 030.205-206. This course covers advanced organic reactions and their mechanisms. Emphasis is given both to methods of postulating mechanisms for rationalizing reaction results and to the use of mechanistic thinking for designing reactions and reagents. This course is intended to be taken in sequence with 030.625.

030.677: Advanced Organic Synthesis I. The reactions and principles involved in the synthesis of simple and complex organic compounds. A discussion of famous natural product syntheses and practice in developing rational designs for organic syntheses will be presented. Problems in the design of syntheses and in the use of chemical literature are also given.

030.678: Advanced Organic Synthesis II. Prerequisite: 030.677. An advanced discussion of organic stereochemistry & its application to problems in asymmetric reactions and catalysis will be presented. Emphasis will be placed on the latest reports in the literature, especially with respect to the development of new catalytic, asymmetric processes.

030.691: Solid State Chemistry. Prerequisite: 030.449 or equivalent or instructor's approval. The course is designed to provide the essential principles and concepts underlying the modern study of the structure and properties of solids in bulk crystals, thin films, and nanoscale objects. Topics include basic crystallography, structure determination by x-ray, neutron, and electron diffraction, fundamental concepts of bonding in solids, lattice dynamics, electronic band structure, magnetism, and strongly correlated electron behavior. Particular emphasis is placed on the impact of the structure, dimensionality, and electron count on electrical and magnetic properties (electric conduction, superconductivity, thermoelectricity, etc). Cross-listed with Physics and Astronomy.

AS.030.693: Methods in Time-Resolved Spectroscopy. A survey of common time-resolved spectroscopic methods used to interrogate the dynamic and static properties of chemical systems. Exploration of theoretical treatments both of key molecular processes (e.g. radiative and non-radiative transitions, solvation, coherence dephasing) and the spectroscopic tools used to interrogate them. The technical developments that capture events that occur at faster timescales (currently down to the attosecond regime), and across the electromagnetic spectrum (from X-rays to Terahertz), will be presented. Previous or concurrent concentrated study of Quantum Mechanics (graduate level or from a physics course) would be helpful, but not strictly required. Recommended Course Background: AS.030.301-AS.030.302

Advanced Courses Commonly Taken by Undergraduates

Upper-level courses that are typically taken by undergraduates include: 030.441 Spectroscopic Organic Structure Determination, 030.442: Organometallic Chemistry, 030.451: Spectroscopy, 030.615: Special Topics in Bioinorganic Chemistry, 030.619, Chemical Biology, 030.625: Advanced Mechanistic Organic Chemistry I, 030.677: Advanced Organic Synthesis I. Special topics advanced courses are also commonly taken.

Recommended Courses for Medical School

Listed below are some of the courses you may want to consider taking to prepare for medical school. These are courses that are not required for the Chemistry Major. You should make an appointment with the Preprofessional Programs and Advising office early in your academic career to make sure that you can develop the appropriate long-term schedule. Specific medical schools may have additional requirements; you should check with these programs to ensure that you are meeting all requirements. Do not feel that you must take all of the subjects that are part of the first-year medical school curriculum but you may want to gain exposure to some of the topics. Also, it is recommended that you have some exposure to topics on the new MCAT.

Biochemistry 030.315 and 030.316

Cell Biology 020.306

Genetics 020.330

Enzymes and Proteins 020.331

Human Anatomy 020.375

Developmental Biology 020.303

Micro pathogenesis 020.349

Introduction to Psychology 200.101

Foundations of Brain, Behavior, and Cognition 200.141

Introduction to Sociology 230.101

Medical Sociology 230.341

Also, you might want to consider courses in statistics, public health, and a foreign language (Spanish). A basic course in finance might also be useful. You must do well on your MCAT exam (≥ 9 , 10 on each section, i.e., in the upper half of those taking the exam). NOTE: the MCAT is changing format in 2015 and sections on psychology/sociology are now included. A new emphasis on Biochemistry is part of this exam. Experience in the health care industry is important as well as demonstrated leadership in your extracurricular activities. See the Pre-professional Programs and Advising web site: <http://web.jhu.edu/prepro> for more information.

Research in the Chemistry Department

Undergraduate research is strongly encouraged for chemistry majors. Most students graduate with several semesters of experience with a research group in our department or with a professor in another related department on the Homewood or Medical School campus. There is no rule about when you should start but typically students begin after they have some organic lab experience. Some students elect to do research over the summer to enhance the work they began during the semester.

Research is important for chemistry majors who are going to graduate school, professional schools, or industry. You will gain valuable laboratory experience, learn new techniques, and reinforce your knowledge of chemical principles. You will learn the need for persistence and for patience when conducting research. You will gain confidence in your course work, perspective on your career choice, and an important letter of recommendation. In some cases, your work will lead to a publication, a noteworthy accomplishment.

Brief descriptions of research of the faculty in the department are listed below. For more complete descriptions, visit the Chemistry Department's web site:

Arthur Bragg: Experimental Physical Chemistry/Ultrafast Spectroscopy
<http://sites.krieger.jhu.edu/bragg-lab/>

Kit Bowen: Experimental Chemical Physics
<http://pages.jh.edu/~chem/bowen/>

Lan Cheng: Theoretical and Computational Chemistry
<http://sites.krieger.jhu.edu/cheng/>

Paul Dagdigian: Experimental Chemical Physics
<http://chemistry.jhu.edu/directory/paul-dagdigian/>

Howard Fairbrother: Surface Chemistry/Environmental Chemistry
<http://pages.jh.edu/~chem/fairbr/index.html>

David Goldberg: Inorganic/Bioinorganic Chemistry
<http://goldberggroup.johnshopkins.edu/>

Marc Greenberg: Organic and Bioorganic Chemistry
<http://sites.krieger.jhu.edu/greenberg/>

Rigoberto Hernandez: Theoretical and Computational Chemistry, Chemical Physics, Physical Chemistry. <http://rh.jhu.edu/>

Kenneth Karlin: Inorganic/Bioinorganic Chemistry
<http://chemistry.jhu.edu/directory/kenneth-karlin/>

Thomas Kempa: Solid-State and Materials Chemistry, Energy Science, Experimental Physical Chemistry. <http://kempa.chem.jh.edu/>

Rebekka Klausen: Inorganic and Materials chemistry

<http://pages.jh.edu/~chem/klausen/>

Thomas Lectka: Fluorine, Organic, Computational and Inorganic chemistry

<http://lectka.chemistry.jhu.edu/>

Tyrel McQueen: Solid State and Inorganic Chemistry; Design of New Materials and Reaction Mechanisms; Emergent Phenomena and Condensed Matter Physics

<https://occamy.chemistry.jhu.edu/>

Steven Rokita: Bioorganic Chemistry and Biochemistry

<http://chemistry.jhu.edu/directory/steven-rokita/>

Harris Silverstone: Theoretical Chemistry

V. Sara Thoi: Inorganic and Materials Chemistry

<http://pages.jh.edu/chem/thoi/>

Joel Tolman: Biophysical Chemistry

<http://chemistry.jhu.edu/directory/joel-r-tolman/>

John Toscano: Organic Chemistry

<http://pages.jh.edu/~chem/toscan/index.html>

J. D. Tovar: Organic and Materials Chemistry

<http://sites.krieger.jhu.edu/tovar-group>

Craig Townsend: Organic and Bioorganic Chemistry

<http://pages.jh.edu/~chem/townsend/>

David Yarkony: Theoretical Chemical Physics

<http://sites.krieger.jhu.edu/yarkony-group>

Student Affiliate of the American Chemical Society

The Student Affiliates of the American Chemical Society (SAACS) program was developed for undergraduate students interested in learning more about the chemical sciences. The ACS, the world's largest scientific society, is committed to providing Student Affiliates with benefits that will help move them into a rewarding career. As a Student Affiliate, you will have the opportunity to build your organizational, leadership and professional skills. Should you decide to formally join the ACS as a dues-paying member, you will receive the weekly trade magazine "Chemical and Engineering News" and gain access to online job databases for chemical professions. You will also receive "in Chemistry," a quarterly magazine that highlights careers, graduate schools and work at other SAACS chapters. You will be able to seek out advice from the ACS Department of Career Services for résumé writing or other tips and browse through the ACS-published "Directory of Experience Opportunities" that lists available co-ops, internships and other summer work openings. Student Affiliates also receive discounted rates to attend national and regional ACS meetings across the nation and have opportunities to obtain travel grants to defray attendance costs. However, you need not be a dues-paying member to be active with the Hopkins SAACS chapter.

SAACS chapters are incredibly active in a variety of different pursuits. Outreach is a major component of this including tutoring sessions for introductory chemistry courses, hands-on demos for the community and local schools, judging science fairs or neighborhood clean-ups. Other activities include hosting lectures for the Hopkins chemistry community by scientific dignitaries, organizing career talks from leading chemical industries, or coordinating site visits to chemical plants. Local SAACS chapters also cooperate amongst themselves to organize larger scientific and social events throughout the year. The Student Affiliates program is a great way to get your foot into the door of the chemical community in order to establish networks of service and leadership that will help both job hunters and prospective postgraduate students alike.

Contact Professor Tyrel McQueen mcqueen@jhu.edu

Resources

The Undergraduate Student Handbook:

http://eng.jhu.edu/wse/asen_undergraduate_handbook/2011_2012_academic/introduction

Academic Ethics for Undergraduates:

http://www.jhu.edu/design/oliver/academic_manual/ethics.html

Preprofessional Advising:

<http://web.jhu.edu/prepro>

Academic Calendar:

<http://www.jhu.edu/registrar/calendar1011.html>

Academic Advising Home Page:

<http://www.advising.jhu.edu/>

Counseling Center:

<http://www.jhu.edu/~ccenter/>

Student Life:

<http://web.jhu.edu/studentlife>

Student Disabilities Services:

<http://web.jhu.edu/disabilities>

Tutoring:

<http://www.jhu.edu/advising/tutor.html>

Study Consulting:

http://www.jhu.edu/advising/study_consult.html#course_schedule

Scholarships:

<http://www.jhu.edu/~advising/scholarships/index.html>

Study Abroad:

<http://www.jhu.edu/advising/Programs.htm>

Useful Sites

Department of Chemistry, Johns Hopkins University:

<http://www.chemistry.jhu.edu/>

American Chemical Society:

<http://www.acs.org/content/acs/en.html>

American Chemical Society Journal List:

<http://pubs.acs.org/action/showPublications?display=journals>

The Journal of the American Chemical Society:

<http://pubs.acs.org/journal/jacsat>

Science:

<http://www.sciencemag.org/>

Nature:

<http://www.nature.com/>

About.com (Chemistry around the web):

http://chemistry.about.com/?COB=home&PID=2821&PM=64_904_T

Periodic Table:

<http://www.webelements.com/>