

Biochemistry and Molecular Biology – PhD
Department of Biochemistry and Molecular Biology

			Evaluation Opportunities								
Specific Competencies	Learning Opportunities		Course Work/Exam	Written Comps	Department Preliminary Orals	School Preliminary Orals	Thesis	Final Defense	Public Thesis Presentation	Non-Thesis Research	Seminars, Journal Club
1. Master the knowledge base of current biochemistry, molecular biology, and cellular physiology											
Describe current knowledge in metabolic transformations conducted by living cells, and their integration	M360.728	Pathways and Regulation	X	X	X	X					
Outline the current understanding of the structure, function and regulatory circuits in eukaryotic cells	M110.726 M110.727 M340.703	The Nucleus The Cytoskeleton Cell Structure and Dynamics	X	X	X	X	X			X	
Apply the principles of Mechanistic Organic Chemistry to selected biological problems	M330.709 M330.710	Organic Mechanisms in Biology Mechanisms in Bioorganic Chemistry	X	X		X					
Describe in detail the current state of research on the molecular bases of heredity, gene regulation and development	120.624 M260.709 M260.708 M260.710 M260.711 M340.704	Mechanisms for Preservation of Genome Integrity Molecular Biology and Genomics Genetics Epigenetics Transcription Mechanisms Developmental Biology	X	X	X	X	X				
Identify the physical principles and limitations of current methods for analyzing macromolecules	M100.709 M100.710 M100.711 M360.731	Macromolecular Structure and Analysis Biochemical and Biophysical Principles Structure Determination Single Molecule Biophysics	X	X	X	X					

M = School of Medicine course described at <http://www.hopkinsmedicine.org/som/students/academics>
M360.728 is offered by Department of Physiology, graduate program <http://physiology.bs.jhmi.edu/coursework.asp>
M110.726, 110.727, 340.703 are offered by Cell Biology
M330.709, 330.710 are offered by Pharmacology and Molecular Sciences
M260.708 is offered by Department of Physiology, graduate program <http://physiology.bs.jhmi.edu/coursework.asp>
M260.709 is offered by Molecular Biology and Genetics
260.710, 260.711, M340.704 are required for SOM Biological Chemistry degree
M100.709-11 are offered by Biophysics and Biophysical Chemistry
M360.731 is offered by Department of Physiology, graduate program <http://physiology.bs.jhmi.edu/coursework.asp>

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2. Develop and demonstrate breadth of knowledge in biomedical sciences and in public health											
Recognize the scope of modern public health investigations, and the role of the molecular sciences in them	550.865 Public Health Perspectives on Research Departmental Seminars		X			X					X
Describe human health across the lifespan, identify the major root and proximate causes of morbidity and mortality, and effective strategies for promoting health and preventing disease in human populations	120.615 Molecular Biology of Carcinogenesis 550.865 Public Health Perspectives on Research		X	X	X	X				X	
Identify the scientific methods used in public health research and practice	550.865 Public Health Perspectives on Research Departmental Seminars		X			X			X		X
Discuss the interface between science and policy	306.665 Research Ethics and Integrity 550.860 Research Ethics 550.865 Public Health Perspectives on Research Departmental Seminars		X			X			X		X

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2a. Develop and demonstrate breadth of knowledge in biomedical sciences and in public health with emphasis on the cancer problem and its relationship to the environment										
Specific Competencies	Learning Opportunities									
Discuss and evaluate current laboratory research in carcinogenesis and cancer biology	120.615 Molecular Biology of Carcinogenesis 120.624 Mechanisms For Preserving Genome Integrity Short Courses in the Oncology Center – Hopkins Hospital Departmental Seminars and Journal Clubs Electives in School of Public Health*	X	X	X	X	X		X		X
Identify the mechanisms of action of selected environmental genotoxins, and describe how such agents are activated and inactivated	120.615 Molecular Biology of Carcinogenesis 180.601 Environmental Health 187.610 Principles of Toxicology Departmental Seminars and Journal Clubs Electives in School of Public Health*	X		X	X	X		X		X

*Students must take 18 credits in another department of the School of Public Health

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2b. Develop and demonstrate breadth of knowledge in biomedical sciences and in public health with emphasis on reproductive biology										
Specific Competencies	Learning Opportunities									
Identify and describe the processes of male and female gametogenesis, fertilization, and gestation in mammals and in humans	120.620 Fundamentals of Reproductive Biology 120.625 Reproductive Biology For Biomedical Scientists Departmental Seminars and Journal Clubs Thesis	X	X	X	X	X	X	X		X

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Describe the current status of research in hormonal regulation in reproductive physiology. Relate these findings to the underlying molecular alterations	120.621 120.622	Molecular Endocrinology Molecular And Cellular Mechanisms of Reproduction Departmental Seminars, Journal Clubs, Laboratory Meetings Thesis	X	X	X	X	X				X
Outline the current state of knowledge of the aging of the mammalian reproductive system	120.621 120.622	Molecular Endocrinology Molecular And Cellular Mechanisms of Reproduction Departmental Seminars, Journal Clubs, Laboratory Meetings Electives in School of Public Health*	X	X		X	X	X			X

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3. Use sequence and structural data repositories, other databases, and publication archives essential to the field											
Specific Competencies		Learning Opportunities									
<ul style="list-style-type: none"> Identify the principal sources of published data and information in molecular bioscience Use search engines to find information 		M440.717 Overview of Bioinformatics and Genomics M260.709 Molecular Biology and Genomics 120.852 Current Research Literature Departmental Seminars and Journal Clubs Thesis	X	X		X	X			X	X
<ul style="list-style-type: none"> Use computer facilities to explore and display sequences and structures Identify uses and limitations inherent in current methods for comparing sequence and structure data 		M800.707 Computational Biology and Bioinformatics Departmental Seminars Thesis	X	X		X	X	X			X
Develop a program for reading the current literature in the area of interest and using these materials in research work		Consultations with Adviser and Thesis Committee Thesis					X	X	X	X	

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M800.707 is offered by Biophysics and Biophysical Chemistry

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Read and critically evaluate the primary literature in the area of thesis research	Thesis		X	X	X	X	X			X
Read and critically evaluate the primary literature in at least one area not directly relevant to current research interests	120.861	Special Topics in Biochemistry: Molecular Regulation of Cellular Aging	X	X						
	120.862	Special Topics in Biochemistry: Nuclear Structure and Function								
	120.863	Special Topics in Biochemistry: Structural Basis of Macromolecular Machines								
		Departmental Seminars Thesis Applying for Post-Doc Position								
Read and critically evaluate the primary literature in the area of thesis research	Thesis Research Directed Reading Preliminary Exam Preparation Independent Study		X	X	X	X	X			
Read and critically evaluate the primary literature in at least one area not directly relevant to current research interests	Special Topics In Biochemistry and Molecular Biology Seminar Thesis Research Directed Reading Preliminary Exam Preparation Independent Study Seminars Planning a Post-Doctoral Period		X	X						

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4. Conduct independent scholarly and experimental investigations in an area of interest										
Specific Competencies	Learning Opportunities									
Develop familiarity with research themes of current interest	120.850 Biochemical Techniques Departmental Seminars, Journal Clubs, Laboratory Meetings	X		X	X					X
In consultation with faculty preceptor, design an experimental approach to a research problem suitable for a thesis study	Consultation with Faculty		X	X	X	X	X	X		
Design an experimental approach to a research problem in an unfamiliar area	Independent Study		X	X						

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5. Meet the legal and ethical requirements for research in biomedical areas										
Specific Competencies	Learning Opportunities									
Follow the ethical and legal regulations and principles that constitute responsible research conduct	550.860 Research Ethics or 306.665 Research Ethics and Integrity: US and International Issues Academic Ethics Module	X		X	X	X				X
Qualify for permission to use radioisotopes, animals, and human materials as appropriate to research	186.645 Radiation Safety and Dosimetry Animal Care and Use on-line Training Course HIPAA Training Module Committee on Human Research on-line Training Module	X			X					X

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6. Communicate the results of scholarship and research clearly and professionally										
Specific Competencies	Learning Opportunities									
Present research findings in a professional fashion	120.850 Biochemical Techniques Departmental Seminars and Journal Club Faculty Guidance Informal Presentations Presentation at Professional Meetings								X	X
Write up research results in proper form for publication in appropriate journals	Readings in the Literature Written Reports and Summaries Preparing Manuscripts for Submission Thesis		X			X	X	X		

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7. Develop and use the skills of a competent experimental biochemist										
Specific Competencies	Learning Opportunities									
Maintain an acceptable professional laboratory notebook	120.850 Biochemical Techniques	X				X			X	X
Prepare reagents for experimental work	120.850 Biochemical Techniques Published Methods Prior Experience Laboratory Instructions	X				X			X	X

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Practice the safe use of radioactive materials, corrosive and toxic chemicals, biohazardous materials, and any special compounds used in active research	186.645 Radiation Safety and Dosimetry Animal Care and Use on-line Training Course HIPAA Training Module Laboratory instructions and guidelines Prior experience and knowledge	X			X	X				X
Practice the rules and principles for appropriate use of experimental subjects, both human and animal	550.860 306.665 Research Ethics or Research Ethics and Integrity: US and International Issues Academic Ethics Module Animal Care and Use on-line Training Course HIPAA Training Module Committee on Human Research on-line Training Module Instruction in laboratory	X				X			X	X
Use reagents and materials to obtain reliable and reproducible experimental results	Instruction, demonstrations Published methods Consultation					X			X	X