

PH.120 (BIOCHEMISTRY AND MOLECULAR BIOLOGY)

PH.120.600. Biochemistry I. 5 Credits.

Course location and modality is found on the JHSPH website (<https://www.jhsph.edu/courses/>).

PH.120.601. Biochemistry II. 5 Credits.

Examines the major metabolic pathways that are central to eukaryotic cell growth and maintenance.

Course location and modality is found on the JHSPH website (<https://www.jhsph.edu/courses/>).

PH.120.602. Concepts of Molecular Biology. 4 Credits.

Discusses synthesis of macromolecules, the genetic code, regulation of gene expression and gene function, and recent advances in biotechnology.

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PH.120.603. Molecular Biology of Pandemic Influenza. 3 Credits.

Explores how molecular biology has been used to define the biological basis of a public health catastrophe, the 1918 Spanish Influenza Pandemic. Students examine the biological basis of the virulence of more recent influenza viruses. Topics include: use of molecular techniques to resurrect the extinct 1918 pandemic virus, the use of molecular techniques to identify why specific mutations in the genome made the 1918 virus so virulent, the use of sequence analysis to identify the origin of new strains of influenza virus, and the analysis of the immune response of an infected host to the 1918 virus. Students also examine the molecular biology of the more recent H1N1 pandemic and the H5N1 bird flu viruses. Students discuss ethical and policy issues that must be considered in managing the response to a pandemic.

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PH.120.604. Introduction to Molecular Biology. 3 Credits.

Molecular biology deals with how nucleic acids and proteins interact within the cell to promote proper growth, division, and development. This course will provide an overview of these processes, including DNA replication, repair, transcription, splicing, protein synthesis, and gene regulation in different organisms. We will also explore many biological tools that have been developed from molecular biology processes, such as DNA sequencing and gene editing (CRISPR-Cas9).

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PH.120.605. Genome Integrity. 3 Credits.

Provides students with a broad base in fundamental principles of genome integrity. Examines connections between genome integrity, organism fitness, and human diseases and disorders. Addresses 1) Homologous recombination, (2) Non-homologous end joining, (3) Mismatch repair, (4) Transposable elements, (5) Topoisomerases, (6) Structural maintenance of chromosomes and (7) Chromosome segregation.

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PH.120.606. Cellular Stress in Physiology and Disease. 3 Credits.

Examines stress sensing and response pathways at the DNA, RNA, and protein levels, covering transcriptional regulation, RNA processing, and protein quality control. Also discusses Organelle-specific stress responses at the level of the endoplasmic reticulum and mitochondria are also discussed. Disseminates course material through formal lectures and discussions of literature. Local JHU scientists highlight each topic by presenting ongoing laboratory research, a "meet the expert" opportunity

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PH.120.608. Gene Editing, therapy and Manipulation. 3 Credits.

Introduces genes and genetics, and their role in the genetic basis of human health and disease. Explores the current status of gene editing and gene therapy technologies both in the context of therapeutics and as tools in the life sciences. A large focus of the class centers on the impact of CRISPR on these technologies. Discuss the ethical implications of these technologies.

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PH.120.610. Introduction to Biochemistry: Protein Structure and Enzyme Catalysis. 3 Credits.

This course will cover the physical and chemical properties of the amino acids, the various elements of protein structure, and the cooperative behavior of multimeric proteins. It will also explore the kinetics of enzyme-catalyzed reactions, and the active site mechanisms of representative classes of enzymes. Finally, this course will describe the molecular basis of action for selected enzyme inhibitor-based drugs.

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PH.120.613. Nucleic Acid Chemistry. 3 Credits.

Describes methods used to synthesize nucleosides, nucleotides, oligo- and polynucleotides, nucleic acid analogs, and various oligonucleotide conjugates. Also discusses chemical reactions that lead to modifications of nucleic acids.

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PH.120.616. Advanced Concepts in Biochemistry, Cell and Molecular Biology. 1 - 2 Credits.

Provides a platform for students, postdoctoral fellows and faculty to present and discuss scientific papers from the current literature that deal with mechanisms underlying disease along with accompanying methods. Explores additional aspects that are relevant to conducting and conveying laboratory research, including study design and statistical analysis, manuscript and grant review, policy and practice, and risk assessment.

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PH.120.620. Fundamentals of Reproductive Biology. 3 Credits.

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PH.120.622. Molecular and Cellular Mechanisms of Reproduction. 4 Credits.

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PH.120.624. Cancer Biology. 3 Credits.

Presents the molecular and cellular mechanisms in the biology of cancer. Topics include Oncogenes and tumor suppressor genes, DNA damage responses, p53 signaling pathway, NF- κ B signaling pathway, chemotherapy and radiotherapy, and several key research fields in major select human cancers. Emphasizes the relevance of these mechanisms to the development and treatment of human cancer.

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PH.120.625. Introduction to Cancer Biology. 3 Credits.

This Cancer Biology course will educate students on the principles of cancer biology, including the various genetic and molecular changes normal cells undergo during transformation into malignant cancer cells. To this end, this course will help students to gain an understanding of cellular and molecular mechanisms that go awry, thereby providing optimal conditions for cancer. We will explore the role of mutations in cancer cells, and how they lead to the dysregulation of essential biological properties like programmed cell death, cell proliferation and differentiation. We will also focus on the interface of cancer and medicine. Classical treatment methods will be compared with newer treatment strategies like targeted therapies. We will also explore the challenges associated with diagnosing cancers, as well as ways in which to prevent cancer.

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PH.120.626. Principles of Cell Biology. 3 Credits.

Course location and modality is found on the JHSPH website (<https://www.jhsph.edu/courses/>).

PH.120.627. Stem Cells and the Biology of Aging and Disease. 3 Credits.

Exposes students to cutting-edge topics in stem cell biology through a combination of lectures and discussions based on primary literature. Topics include basic stem cell biology in a invertebrate and vertebrate systems, including germline, neural, and epithelial stem cells; the regulation of stem cells by physiology and aging; the connection between stem cells, telomerase, and cancer; and ethical issues pertaining to potential therapeutic applications of stem cells.

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PH.120.630. Fellowship Grant Writing for Students and Postdoctoral Fellows in Biomedical Research. 2 Credits.

Provides students and postdoc trainees with an overview of the entire fellowship application process, including how to write an effective research proposal and specific aims, how to prepare a NIH style biosketch and how to formulate an effective personal biography. Discusses the peer review process, how fellowship applications are judged and scored. The students and postdocs will gather to form an in-class study section where trainees have the opportunity to review grants in the style of NIH study sections.

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PH.120.644. BMB SCM Laboratory Rotations. 4 - 8 Credits.

All departmental ScM students spend one to three terms, respectively, participating in the research activities of departmental faculty's laboratories. Students select appropriate rotations in consultation with their academic advisor and the ScM Program Director. The objective is to provide the opportunity for interaction with several faculty members, so that a thesis laboratory may be identified. The course aims to broaden a student's knowledge of laboratory techniques and skills, expose the student to a variety of research areas and to develop the ability to carry out a research project.

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PH.120.720. APPLYING REPRODUCTIVE BIOLOGY LITERACY THROUGH SERVICE-LEARNING. 3 Credits.

Builds from "Fundamentals of Reproductive Biology" in 1st term (120.620.01). In this service-learning course, students have the opportunity to extend beyond hypothetical applications of what they have learned, and apply their "reproductive biology literacy" to help in a professional, real-world setting. The service component of this course is for students to produce deliverable(s) of use/value for a community-based organization (CBO), to be complemented by in-class activities to absorb and learn from these experiences in working with the CBO.

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PH.120.800. MPH Capstone: Biochemistry and Molecular Biology. 2 Credits.

The MPH Capstone is an opportunity for students to work on public health practice projects that are of particular interest to them. The goal is for students to apply the skills and competencies they have acquired to a public health problem that simulates a professional practice experience. Course location and modality is found on the JHSPH website (<https://www.jhsph.edu/courses/>).

PH.120.820. Thesis Research Biochemistry. 1 - 22 Credits.

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PH.120.821. MHS Student Research. 3 Credits.

Acquaints MHS students with basic research in the biomedical sciences through work under the guidance of a faculty member in the Department of Biochemistry and Molecular Biology, and provides an introduction to hands-on experience in laboratory research.

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PH.120.822. Seminars in Research in Biochemistry and Molecular Biology. 1 Credit.

Integrates academic training with current research in biochemistry and molecular biology, reproductive biology and cell and developmental biology. Researchers from JHU and other biomedical research institutions present results of state of the art investigations of problems and issues of public health significance, emphasizing experimental design and methodology for analysis and discussion.

Course location and modality is found on the JHSPH website (<https://www.jhsph.edu/courses/>).

PH.120.825. Advanced MHS Student Research. 5 Credits.

Builds upon existing basic research skills in biomedical sciences and emphasizes more independent hands-on research working under the guidance of a faculty member in the Department of Biochemistry and Molecular Biology or affiliated principle investigator. Provides further experience for future research pursuits at JHU and beyond.

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PH.120.829. Summer Thesis Research. 12 Credits.

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PH.120.830. Postdoctoral Research Biochemistry. 1 - 22 Credits.

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PH.120.840. Special Studies and Research Biochemistry. 1 - 22 Credits.

Course location and modality is found on the JHSPH website (<https://www.jhsph.edu/courses/>).

PH.120.850. Biochemical Techniques. 6 Credits.

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PH.120.852. Core Research Literature. 1 - 2 Credits.

Provides a complement to the BCMB core curriculum. Student reads research papers relating to a core lecture topic. Discussions are led by a student while a faculty member from Biochemistry or MMI act as facilitator. Helps students to develop skills in reading the primary literature and provides an introduction to the experimental paradigms underlying the concepts presented in the core course.

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PH.120.853. Summer Biochemical Techniques. 6 Credits.

Course location and modality is found on the JHSPH website (<https://www.jhsph.edu/courses/>).

PH.120.860. MHS Thesis Preparation. 2 Credits.

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PH.120.861. Special Topics in Biochemistry: X-Ray Crystallography-A Hands on Workshop. 3 Credits.

Enables students to carry out all key steps to successfully solve and refine a protein crystal structure. Theoretical aspects are followed by application to various problem sets. Topics include tricks for data collection, data processing and collection. Touches upon all standard techniques such as molecular replacement, SAD phasing and MAD phasing, both in theory and then applied in practical context with previously collected data. Identification of unknown ligand densities and model refinement lead to the last part of preparing publication quality figures using PyMol.

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PH.120.870. MHS Thesis Reproductive & Cancer Biology. 5 Credits.

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PH.120.871. BMB SCM PREPARATORY INDEPENDENT STUDY/ESSAY. 2 Credits.

Students experience one-on-one independent study with a departmental faculty member who assumes the role of ScM thesis advisor. Prepares students for undertaking an independent research project for the ScM degree. Students independently review papers from the current literature and meet weekly with the faculty advisor to discuss them. Complementary activities may include participation in lab meetings, journal paper discussions, seminars, conferences, research retreats, etc. Culminates with the completion of a written document, either a research proposal based on the intended thesis research and/or a literature review designed to provide the background for the intended research project. Upon completion of this course, students will be able to: (1) summarize and discuss the state of knowledge of specific fields of research that are related to the intended ScM research project, (2) state the rationale, hypothesis and specific aim(s) of the intended ScM research project, and discuss the background studies fundamental to this project, and (3) engage as an active participant in research meetings as a result of acquiring the necessary knowledge foundation.

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PH.120.872. Special Studies-Current Topics in BMB. 1 Credit.

Introduces students to the faculty and to current research being conducted in their respective laboratories within the Department of Biochemistry and Molecular Biology and by other training faculty of the Cancer Biology Training Program. Informs doctoral students about research opportunities in each laboratory and allows them to make informed decisions about their choices for laboratory rotations during their first year. Similarly, informs current MHS students who are considering the ScM Program during the second year about potential research opportunities in laboratories of BMB faculty. Provides time for faculty presentation, student questions and further discussion.

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PH.120.895. MPH Practicum: Biochemistry and Molecular Biology. 1 - 4 Credits.

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