

Lyman Briggs College Intended Learning Outcomes

COLLEGE

The student will:

- understand how the core disciplines of LBC (i.e., Biology; Chemistry, History, Philosophy, and Sociology of Science; Mathematics and Statistics; Physics) relate to each other.
- appreciate the value of being part of an active and inclusive community of scholars.
- excel at effective and cooperative teamwork (i.e., team building, communication, leadership).
- excel at communication aimed at a variety of audiences important for scientists including: critical reading, listening, writing, and verbal communication; graph interpretation and building; evaluating and using evidence-based arguments.
- design appropriate research studies to collect and analyze data, and correctly interpret the results and their limitations
- evaluate and interpret the value of fundamental and applied research and the scientific method.
- develop analytical, quantitative, and qualitative reasoning skills to solve a wide range of problems using appropriate approaches.
- exhibit analytical thinking on the historical trajectories, philosophical foundations, and sociological dynamics of science, technology, environment, and medicine.

ADVISING

The student will:

- develop skills and knowledge to successfully transition to life and learning at LBC and MSU.
- become lifelong learners and effective citizens.
- identify and use appropriate contacts and resources at LBC and MSU.
- employ critical thinking regarding academic and life goals to develop and adapt educational plans to meet those goals.
- demonstrate independent learning and self-advocacy.
- justify LBC, MSU, and major requirements as they relate to their plan of study.
- relate the uniqueness and personal significance of a LBC experience.

DISCIPLINE-SPECIFIC

Biology

The student will:

- understand, describe, and provide examples of how selection (and other mechanisms) acts on individuals and leads to the evolution of populations.
- explain, demonstrate, and diagram how cellular, chromosomal, and genetic reproduction leads to variation among individuals.
- understand, describe, and provide examples of how interactions among organisms and the environment determine individual survival and reproduction.
- understand, describe, and provide examples of how the interaction of the processes underlying heredity (genetics) with the surrounding environment (ecology) leads to evolution and the diversity of biological organisms observed on this planet
- understand, describe, and provide examples of how the persistence of an allele in a population is dependent on natural selection and other evolutionary processes.

- understand, describe, and provide examples of how information in DNA -> becomes (transcribed) "info" in RNA -> becomes (translated) "info" in form of proteins that determine structure.
- understand, describe, and provide examples of how the three-dimensional structure of a biological molecule determines its function (and functional constraints influence the evolution of structure).
- understand, describe, and provide examples of how photosynthetic cells transform energy (photons) from the sun* into chemical energy that can be used by cells to drive processes and build carbon/organic structures using CO₂.
- understand, describe, and provide examples of how small organic molecules (nucleotides, amino acids, lipids, carbohydrates) polymerize and associate to create large super structures that provide cellular surfaces and compartments with which to perform biochemical processes (called life).
- understand, describe, and provide examples of how changes in DNA (mutations that lead to new alleles) result in changed RNA that may lead to changed protein (structure) that lead to changed functions

Chemistry

The student will:

- Develop analytical and quantitative reasoning skills to solve a wide range of problems, including previously unseen problem types, using logical problem-solving approaches such as concept maps and unit conversions.
- Quantify mass and energy changes during chemical reactions, and use these changes to determine the stoichiometry of chemical reactions and net energy releases or absorptions.
- Use descriptions of quantum and molecular level processes to explain macroscopic physical observations.
- Develop chemical intuition by linking the molecular structure of compounds to their physical properties and chemical reactivity.
- Use mechanistic reasoning to predict what products, if any, will be produced from a chemical reaction
- Effectively communicate about chemistry in oral, written, and poster formats.
- Acquire chemical laboratory skills, become familiar with the usage of modern instrumentation, and design experiments in an inquiry-based environment
- Understand the implication of the precision and accuracy of instruments and measurements, taking these into account in interpreting data.

History, Philosophy, Sociology of Science

The student will:

- assess and analyze problems in science, technology, and medicine by placing them in broader historical, philosophical, and sociological contexts.
- explore the similarities and differences (historical, philosophical, and sociological) between the various branches/disciplines in science, technology, and medicine.
- have an awareness of how race, gender, ethnicity, class, sexual orientation and/or disability issues have intersected with science and medicine in historical and contemporary contexts.
- understand some of the many ways science and medicine have been practiced historically and today in various locations including lab and field.

- be able to identify and synthesize multiple kinds and sources of evidence, both primary and secondary.
- practice integrated reasoning across disciplines, bridging the sciences and the humanities.
- be able to formulate and communicate original arguments both verbally and in writing.
demonstrate critical understanding of how science interacts with its global, national, and local contexts.
engage in effective citizenship by examining the role of ethics and integrity in scientific practice, and by pursuing ideals of fairness, equality, and diversity in science and beyond.

Mathematics and Statistics

The student will:

- develop proficiency in course-specific computational techniques.
- interpret problems stated in written or graphical formats into well-formulated mathematical problems.
- set up complex multi-step problems and synthesize the results.
- apply mathematical and statistical knowledge to further understanding of major concepts in the natural and/or social sciences.
- interpret and express mathematical ideas in non-technical language (written and/or spoken).
- develop the ability to reason abstractly and gain proficiency in reading and processing abstract mathematical constructions.
- analyze statistical studies, particularly regarding sampling and experimental design.

Physics

The student will:

- possess a working understanding of fundamental physical concepts in mechanics, electricity and magnetism, thermodynamics, and modern physics, and use these concepts to explain physical phenomena.
- effectively practice quantitative problem-solving in a wide range of physical situations.
- understand and be able to explain the nature of models and approximations, and be able to construct and verify simple models.
- understand and be able to explain the role of experiments in determining physical laws and relationships, and the limitations and uncertainty in these experiments.
- understand and appreciate the role of physics in the sciences, in society, and in their chosen profession.
- discuss physics-related problems and concepts with their peers using appropriate and accurate terminology.