BIO-104L: THE CELL AND DNA LABORATORY

Cuyahoga Community College

Viewing:BIO-104L : The Cell and DNA Laboratory

Board of Trustees:
2018-03-22

Academic Term:
2018-08-27

Subject Code
BIO - Biology

Course Number:
104L

Title:
The Cell and DNA Laboratory

Catalog Description:
Laboratory course examines the scientific method, cell structure and function, cell division, DNA structure and function, and Mendelian and molecular genetics. Includes microscope work, models, and various experiments designed to illustrate concepts covered in the lecture course.

Credit Hour(s):
1

Lecture Hour(s):
0

Lab Hour(s):
3

Other Hour(s):
0

Requisites
Prerequisite and Corequisite
Concurrent enrollment in BIO-1040 The Cell and DNA is strongly recommended.

I. ACADEMIC CREDIT

Academic Credit According to the Ohio Department of Higher Education, one (1) semester hour of college credit will be awarded for each lecture hour. Students will be expected to work on out-of-class assignments on a regular basis which, over the length of the course, would normally average two hours of out-of-class study for each hour of formal class activity. For laboratory hours, one (1) credit shall be awarded for a minimum of three laboratory hours in a standard week for which little or no out-of-class study is required since three hours will be in the lab (i.e. Laboratory 03 hours). Whereas, one (1) credit shall be awarded for a minimum of two laboratory hours in a standard week, if supplemented by out-of-class assignments which would normally average one hour of out-of-class study preparing for or following up the laboratory experience (i.e. Laboratory 02 hours). Credit is also awarded for other hours such as directed practice, practicum, cooperative work experience, and field experience. The number of hours required to receive credit is listed under Other Hours on the syllabus. The number of credit hours for lecture, lab and other hours are listed at the beginning of the syllabus. Make sure you can prioritize your time accordingly. Proper planning, prioritization and dedication will enhance your success in this course.

The standard expectation for an online course is that you will spend 3 hours per week for each credit hour.

II. ACCESSIBILITY STATEMENT

If you need any special course adaptations or accommodations because of a documented disability, please notify your instructor within a reasonable length of time, preferably the first week of the term with formal notice of that need (i.e. an official letter from the Student Accessibility Services (SAS) office). Accommodations will not be made retroactively.
For specific information pertaining to ADA accommodation, please contact your campus SAS office or visit online athttp://www.tri-c.edu/accessprograms (http://www.tri-c.edu/accessprograms/). Blackboard accessibility information is available athttp://access.blackboard.com.

III. ATTENDANCE TRACKING

Regular class attendance is expected. Tri-C is required by law to verify the enrollment of students who participate in federal Title IV student aid programs and/or who receive educational benefits through other funding sources. Eligibility for federal student financial aid is based in part on enrollment status.

Students who do not attend classes for the entire term are required to withdraw from the course(s). Additionally, students who withdraw from a course or stop attending class without officially withdrawing may be required to return all or a portion of their financial aid based on the date of last attendance. Students who do not attend the full session are responsible for withdrawing from the course(s).

Tri-C is responsible for identifying students who have not attended a course before financial aid funds can be applied to students’ accounts.

Therefore, attendance is recorded in the following ways:

- For in-person and blended-learning courses, students are required to attend the course by the 15th day of the semester (or equivalent for terms shorter than five weeks) to be considered attending. Students who have not met all attendance requirements for in-person and blended courses, as described herein, within the first two weeks or equivalent, will be considered not attending.
- For online courses, students are required to login at least two times per week and submit one assignment per week for the first two weeks of the semester, or equivalent to the 15th day of the term. Students who have not met all attendance requirements for online courses, as described herein, within the first two weeks or equivalent, will be considered not attending.

At the conclusion of the first two weeks of a semester or equivalent, instructors report any registered students who have “Never Attended” a course. Those students will be administratively withdrawn from that course. However, after the time period in the previous paragraphs, if a student stops attending a class or wants or needs to withdraw, for any reason, it is the student’s responsibility to take action to withdraw from the course. Students must complete and submit the appropriate Tri-C form by the established withdrawal deadline.

Tri-C is required to ensure that students receive financial aid only for courses that they attend and complete. Students reported for not attending at least one of their registered courses will have all financial aid funds held until confirmation of attendance in registered courses has been verified. Students who fail to complete at least one course may be required to repay all or a portion of their federal financial aid funds and may be ineligible to receive future federal financial aid awards. Students who withdraw from classes prior to completing more than 60 percent of their enrolled class time may be subject to the required federal refund policy.

If illness or emergency should necessitate a brief absence from class, students should confer with instructors upon their return. Students having problems with coursework due to a prolonged absence should confer with the instructor or a counselor.

IV. LEARNING OUTCOMES ASSESSMENT

Occasionally, in addition to submitting assignments to their instructors for evaluation and a grade, students will also be asked to submit completed assignments, called ‘artifacts,’ for assessment of course and program outcomes and the College's Essential Learning Outcomes (ELOs). The artifacts will be submitted in Blackboard or a similar technology. The level of mastery of the outcome demonstrated by the artifact DOES NOT affect the student’s grade or academic record in any way. However, some instructors require that students submit their artifact before receiving their final grade. Some artifacts will be randomly selected for assessment, which will help determine improvements and support needed to further student success. If you have any questions, please feel free to speak with your instructor or contact the Learning Outcomes Assessment office.

V. CONCEALED CARRY STATEMENT

College policy prohibits the possession of weapons on college property by students, faculty and staff, unless specifically approved in advance as a job-related requirement (i.e., Tri-C campus police officers) or, in accordance with Ohio law, secured in a parked vehicle in a designated parking area only by an individual in possession of a valid conceal carry permit.

As a Tri-C student, your behavior on campus must comply with the student code of conduct which is available on page 29 within the Tri-C student handbook, available athttp://www.tri-c.edu/student-resources/documents/studenthandbook.pdf. You must also comply with the College’s Zero Tolerance for Violence on College Property available athttp://www.tri-c.edu/policies-and-procedures/documents/3354-1-20-10-zero-tolerance-for-violence-policy.pdf

Outcomes

Course Outcome(s):
Apply the scientific method to laboratory investigations and observations made in everyday life.
Objective(s):
1. List and explain the steps of the scientific method.
2. Distinguish between observations and inferences.
3. Explain the concept of a variable, including how variables influence experiments, and differentiate between independent and dependent variables.
4. Evaluate sample experimental designs using the scientific method.
5. Formulate hypotheses that can be tested by designing and conducting experiments.
6. Analyze the results of scientific experiments and state inferences based upon the outcomes of experiments.

Course Outcome(s):
Use laboratory equipment to make observations and take precise metric measurements of mass, length, volume, and temperature.

Objective(s):
1. Use electronic balances to take measurements of mass.
2. Record temperatures in Celsius using a thermometer.
3. List and describe the functional components of a compound light microscope.
4. Demonstrate the ability to convert between units in the metric system.
5. Use a variety of tools to record linear measurements.
6. Use volumetric instruments to take measurements of volume.

Course Outcome(s):
Analyze the chemical building blocks that make up a living cell.

Objective(s):
1. Describe the chemical makeup of proteins, carbohydrates, lipids, and nucleic acids.
2. Describe the reactions that occur in cells to build and break down macromolecules.
3. Conduct lab experiments that test for the presence of specific biomolecules in solutions.

Course Outcome(s):
Describe the form and function of eukaryotic and prokaryotic cells.

Objective(s):
1. Prepare wet mount samples of live cells and view them under a compound light microscope.
2. Identify important cellular components in bacterial cells.
3. Compare and contrast bacterial cells with plant and animal cells.
4. Apply proper tissue staining techniques to view animal and plant organelles under a compound light microscope.
5. Explain the processes of diffusion and osmosis as they occur in living cells, and differentiate between passive diffusion and active transport.
6. Conduct an experiment to simulate the process of diffusion using a semipermeable membrane.
7. Observe osmosis in living cells by preparing live tissue slides and viewing them under a compound light microscope.

Course Outcome(s):
Observe specific chemical reactions that occur in cells and explain their role in contributing to the metabolic functioning of cells.

Objective(s):
1. Describe the general structure and function of an enzyme.
2. Investigate factors that can influence enzyme activity by conducting experiments using enzymatically active cells.
3. Explain the differences between aerobic and anaerobic respiration.
4. Summarize the chemical reactions involved in cellular respiration and fermentation.
5. Use experimental procedures to study the processes of cellular respiration and fermentation.
6. Compare and contrast the generalized reactions for cellular respiration and photosynthesis.
7. Summarize the chemical reactions involved in the light reaction of photosynthesis and explain the importance of the products formed in the reaction.
8. Explain the role of plant pigments in photosynthesis by studying the structure of chloroplasts and investigating the process of chromatography.
9. Examine the light-dependent and light-independent reactions of photosynthesis by conducting experiments using live plants.

Course Outcome(s):
Describe the ways in which cells divide by explaining the eukaryotic cell cycle and the processes of mitosis and meiosis.
Objective(s):
1. List and describe the stages of the eukaryotic cell cycle.
2. List and describe the phases of mitosis.
3. Use preserved tissue samples of plant and animal cells to identify and visualize cells as they appear in different stages of the cell cycle and mitosis.
4. Compare and contrast cell division as it occurs in plant and animal cells.
5. Explain the important phases of meiosis and describe how the process differs from mitosis.

Course Outcome(s):
Apply Mendel's theory of particulate inheritance to Genetic Crosses.

Objective(s):
1. Define and distinguish among the following terms in the context of Mendelian patterns of inheritance: gene, genetic locus, allele, genotype, phenotype, homozygous, heterozygous, dominant, and recessive.
2. Use a Punnett square to predict the outcome of a monohybrid cross.
3. Use one or more examples from model organisms to test the predictions for monohybrid crosses.
4. List and briefly describe alternatives or exceptions to Mendelian inheritance.

Course Outcome(s):
Describe the structure of DNA and use models and experimentation to explain its function in cells.

Objective(s):
1. Identify the components of DNA nucleotides, including purine and pyrimidine bases.
2. Describe the important steps involved in DNA replication.
3. Explain how complementary base pairing occurs in a DNA strand.
4. Use experimental procedures to isolate and/or sequence live or synthetic DNA.

Methods of Evaluation:
1. Quizzes
2. Laboratory practical examinations
3. Written reports
4. Participation in laboratory activities

Course Content Outline:
1. The Process of Science
   a. Steps of the scientific method
   b. Observations
   c. Hypotheses
   d. Inferences
   e. Experimental variables
   f. Controls
2. Metric Measurement
   a. Metric units and conversions
   b. Measuring Mass
   c. Measuring Length
   d. Measuring Volume
   e. Measuring Temperature
3. Microscopy
   a. Parts of a compound light microscope
   b. Using a compound light microscope
   c. Preparing slide samples
   d. Measuring field of view
   e. Measuring depth of field
4. Biological Molecules
   a. Monomers and polymers
   b. Proteins
   c. Carbohydrates
   d. Lipids
e. Nucleic acids
f. Dehydration and hydrolysis reactions

5. Cell Structure and Function
   a. Structure of prokaryotic cells
   b. Microscopic identification of cells
   c. Comparing eukaryotic and prokaryotic cells
   d. Organelles of animal cells
   e. Organelles of plant cells
   f. Cell membrane structure and function
   g. Diffusion and osmosis
   h. Analyzing diffusion experimentally
   i. Tonicity in cells

6. Enzymes
   a. Enzyme structure and function
   b. Measuring enzyme activity
   c. Examining factors that influence enzyme activity

7. Cellular Respiration
   a. Glycolysis
   b. Fermentation
   c. Aerobic respiration

8. Photosynthesis
   a. Chloroplast structure
   b. The light reaction
   c. The Calvin Cycle
   d. Pigments and chromatography

9. Cell Division
   a. The eukaryotic cell cycle
   b. Phases of mitosis
   c. Phases of meiosis

10. Mendelian Genetics
    a. Dominant and recessive alleles
    b. Genotypes and phenotypes
    c. Genetic crosses and Punnett Squares
    d. Autosomal dominant and recessive traits
    e. Sex-linked traits

11. DNA Structure and Function
    a. Nucleotides
    b. Base pairing
    c. DNA replication
    d. DNA technology

Resources


Instructional Services

OAN Number:
TMNS

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