BIO-1040: THE CELL AND DNA

Cuyahoga Community College

Viewing: BIO-1040: The Cell and DNA

Board of Trustees:
2018-03-22

Academic Term:
2018-08-27

Subject Code
BIO - Biology

Course Number:
1040

Title:
The Cell and DNA

Catalog Description:
Designed for non-science majors. Considers cell structure, function, and metabolism, cell division, DNA structure and function, Mendelian and molecular genetics. Scientific method and reasoning are emphasized. To fulfill laboratory science requirements, students should enroll in the related laboratory course.

Credit Hour(s): 3

Lecture Hour(s): 3

Lab Hour(s): 0

Other Hour(s): 0

Requisites

Prerequisite and Corequisite
ENG-0990 Language Fundamentals II, or appropriate score on English Placement Test.

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/. Blackboard accessibility information is available athttp://access.blackboard.com.
Eastern (216) 987-2052 - Voice
Metropolitan (216) 987-4344 – Voice. (216) 987-4048 – TTY.
Western (216) 987-5079 – Voice. (216) 987-5117 – TTY.
Westshore (216) 987-3900 – Voice. (216) 987-4048 – TTY.
Brunswick (216) 987-5079 – Voice. (216) 987-5117 – TTY.
Off-Site (216) 987-5079 - Voice

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 concealed 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):
Relate the process of science to the study of living organisms.
Objective(s):
1. List and explain the steps of the scientific method.
2. Define and distinguish among variables, controls, hypotheses, observations, and inferences.
3. Identify the criteria used to characterize life by describing the characteristics common to all living things.
4. Distinguish between scientific thinking and other ways of gaining knowledge.

Course Outcome(s):
Analyze the chemical basis for cell structure and function.

Objective(s):
1. Describe the structure and components of an atom using the Bohr Model.
2. Describe the properties of elements using the Periodic Table of the Elements.
3. Differentiate between types of chemical bonds and explain how specific elements are able to form chemical bonds to create compounds.
4. Evaluate the role of carbon as an integral element in the building blocks of living cells.
5. Explain the properties of water that make it critical to life on Earth.
6. Describe the chemical makeup and functions of the biomolecules that make up all cells.

Course Outcome(s):
Analyze the structure and function of cells and integrate cell structure with signaling and metabolism.

Objective(s):
1. Explain the Unified Cell Theory.
2. Compare and contrast the components of eukaryotic and prokaryotic cells.
3. Identify common eukaryotic organelles in plant and animal cells and describe their functions.
4. Describe the structure of cell membranes and how they function in transport and signaling.

Course Outcome(s):
Compare and contrast the mechanisms by which cells generate, expend, and transfer energy based on the Laws of Thermodynamics.

Objective(s):
1. Distinguish between potential, kinetic, and chemical energy and integrate the First and Second Laws of Thermodynamics with energy transfer in cells.
2. Outline the process of glucose catabolism in cells by summarizing the reactions and products involved in glycolysis.
3. Compare and contrast the metabolic differences between aerobic and anaerobic respiration.
4. Explain how the Citric Acid Cycle and electron transport chain function in generating energy-yielding products in eukaryotic cells.
5. Compare and contrast the reactants and products of cell respiration and photosynthesis.
6. Describe how the structure of chloroplasts relates to the function of harvesting energy from the sun.
7. Summarize the metabolic steps of the Light Reaction and explain how the products are used in the Calvin Cycle.
8. Summarize the metabolic steps of the Calvin Cycle, including how sugar molecules are generated.

Course Outcome(s):
Compare and contrast the methods by which different types of cells divide and integrate the process of meiosis in eukaryotic cells with sexual reproduction and inheritance.

Objective(s):
1. Explain the basic principles of cell division that apply to all dividing cells.
2. Evaluate the cell cycle as it occurs in eukaryotic cells and integrate cell cycle regulation with aberrant cell growth.
3. Analyze the process of mitosis by interpreting the important cellular events that occur in each phase, including cytokinesis.
4. Compare and contrast cell division as it occurs in eukaryotic and prokaryotic cells.
5. Analyze the process of mitosis by interpreting the important cellular events that occur in each phase, and compare and contrast the meiosis and mitosis.
6. Apply the mechanisms and products involved in meiosis to the chromosomal basis of genetic inheritance.

Course Outcome(s):
Analyze the chromosomal and molecular models of genetics as they pertain to inheritance, the flow of genetic information, gene expression, and modern advances in molecular technology.

Objective(s):
1. Evaluate Mendel's theory of particulate inheritance, including its extensions and exceptions, and apply the concept of inheritance patterns to monohybrid and dihybrid genetic crosses.
2. Analyze the structure and function of DNA and RNA and integrate their functions with the Central Dogma of Biology.
3. Evaluate the processes of transcription and translation and apply them to the process of generating polypeptides from DNA sequences.
4. Evaluate the processes by which prokaryotic and eukaryotic cells regulate gene expression.
5. Analyze the important historical and modern innovations in molecular genetics that have enabled scientists to develop and implement tools to study and manipulate genetic material and apply those tools to agriculture and medicine.

**Methods of Evaluation:**
1. Examinations and quizzes
2. Participation in group learning activities
3. Written reports
4. Assignments relating to the topics presented

**Course Content Outline:**

**Scientific thinking**
1. Science as a process
   a. Observation
   b. Scientific questions
   c. Hypotheses
   d. Predictions
   e. Experiments
   f. Controls
   g. Data
   h. Inferences Independent and dependent variables

2. Chemistry of biology
   a. Matter
   b. Energy
   c. Atoms and subatomic particles
   d. Bohr model and valence
   e. Chemical bonding and compounds
   f. Organic molecules and functional groups
   g. Carbohydrates, lipids, nucleic acids, proteins
   h. Water

3. Cells
   a. Prokaryotic vs. eukaryotic cell structure
   b. Plasma membrane
      i. Fluid mosaic model
      ii. Passive transport
         1. Chemical concentration gradients
         2. Simple diffusion
         3. Osmosis
         4. Facilitated diffusion
      iii. Active transport
         1. ATP-dependent solute pumping
         2. Exocytosis
         3. Phagocytosis
         4. Pinocytosis
         5. Receptor-mediated endocytosis
   c. Organelles
      i. Nucleus
      ii. Endoplasmic reticulum
      iii. Golgi apparatus
      iv. Ribosomes
      v. Mitochondria
      vi. Cytoskeleton
      vii. Eukaryotic cilia and flagella
viii. Bacterial flagellum
ix. Conjugation pili
d. Photosynthesis
   i. Cellular respiration
   ii. Photosynthesis
4. Cell division
   a. Mitosis
   b. Meiosis
   c. Spermatogenesis
d. Oogenesis
5. DNA
   a. Structure of DNA
   b. Structure of RNA
c. DNA replication
d. Transcription
e. Protein synthesis/translation
6. Genetics
   a. Classical genetics
      i. Mendel's work
      ii. Terminology
      iii. Genetics problems
   b. Molecular genetics
      i. Current techniques
      ii. Applications
      iii. Ethical considerations

Resources
BSCS. *Biological Perspectives*. Preliminary ed. BSCS, 1996.


Instructional Services
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