BIO-1100: INTRODUCTION TO BIOLOGICAL CHEMISTRY

Cuyahoga Community College

Viewing: BIO-1100: Introduction to Biological Chemistry
Board of Trustees:
2016-05-26

Academic Term:
Spring 2019

Subject Code
BIO - Biology

Course Number:
1100

Title:
Introduction to Biological Chemistry

Catalog Description:
Basic principles of inorganic chemistry, organic chemistry and biochemistry necessary for study of human physiology. Physiological applications of the chemical processes of cellular transport, communication and metabolism emphasized. Laboratory includes use of metric system, basic chemistry techniques and physiological applications.

Credit Hour(s):
3

Lecture Hour(s):
2

Lab Hour(s):
2

Other Hour(s):
0

Requisites

Prerequisite and Corequisite
MATH-0955 Beginning Algebra or appropriate score on Math 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 (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 federal 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 courses 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 fundamental knowledge of Inorganic Chemistry to succeed in preparatory coursework for the healthcare professions or other scientific studies.
Objective(s):
1. Describe the similarities and differences between the states of matter.
2. Discuss the role of energy in chemical reactions.
3. Distinguish between solutions, colloids, and suspensions.
4. Apply the concept of tonicity to osmosis and dialysis.
5. Describe the properties of acids and bases; use the pH scale.
6. Apply knowledge of buffers to physiological systems.
7. Identify important physiological electrolytes.
8. Relate the gas laws to human respiration.
10. Use the Periodic Chart of elements to locate atomic number and atomic mass, to determine the charge of an ion, to determine the molar mass of an element, and to calculate formula mass of a molecule or compound.
11. Differentiate between covalent and ionic compounds based on composition and chemical and physical properties.
12. Explain the difference between ionic, covalent, and hydrogen bonding.
13. Recognize and name ionic compounds.
14. Properly combine ions to form a balanced ionic formula.
15. Compare and contrast the properties of molecules and compounds.
16. Distinguish between polar and nonpolar covalent bonds and relate polarity to properties such as solubility and dissociation.
17. Write and balance a chemical equation using appropriate symbols and recognize major types of chemical reactions.

Course Outcome(s):
Apply fundamental knowledge of Organic Chemistry to succeed in preparatory coursework for the healthcare professions or other scientific studies.

Objective(s):
1. List the major classes of organic molecules.
2. Define a functional group.
3. Identify major organic functional groups and explain the properties of each.
4. Discuss how the properties of a functional group alter the chemical properties of an organic molecule.
5. Using the International Union of Pure and Applied Chemistry (IUPAC) nomenclature, properly name simple organic compounds.
6. Using the International Union of Pure and Applied Chemistry (IUPAC) nomenclature, provide the suffix for each class of organic molecule.
7. Explain the difference between a structural isomer and a stereoisomer.
8. Define chirality and how it affects the chemical nature of organic molecules.

Course Outcome(s):
Apply fundamental knowledge of Biological Chemistry to succeed in preparatory coursework for the healthcare professions or other scientific studies.

Objective(s):
1. Describe the cellular functions and physical properties of carbohydrates, lipids, proteins, and nucleic acids.
2. Describe the cellular functions and physical properties of common monosaccharides, disaccharides and polysaccharides.
3. Define a glycosidic bond.
4. Identify the major classes of lipids.
5. Discuss the nature by which lipids form cellular membranes.
6. Compare and contrast the primary, secondary, tertiary and quaternary protein structure.
7. Define a peptide bond.
8. Compare and contrast the structure of DNA and RNA.
9. Describe the processes of DNA replication, transcription and translation.
10. Use the genetic code to determine an amino acid sequence from a sequence of DNA nucleotides.
11. Explain how enzymes work and relate the importance of enzymes to the chemistry of a living cell.
12. Differentiate between digestion and metabolism.
13. Identify the following metabolic pathways: glycolysis, gluconeogenesis, glycogenesis, glycogenolysis, lipogenesis, beta-oxidation, deamination, protein synthesis, TCA cycle, and electron transport.

Course Outcome(s):
Apply problem solving skills to succeed in preparatory coursework for the healthcare professions or other scientific studies.

Objective(s):
1. Solve problems using Avogadro's number and the mole concept.
2. Solve problems involving concentration of solutions.
3. Examine the relationship between pressure, temperature, volume, and moles as defined by the gas laws.
4. Analyze results from laboratory-based experiments by applying concepts of chemistry.
Methods of Evaluation:
1. Written exams
2. Quizzes
3. Assigned homework problems
4. Participation
5. Lab reports
6. Lab practicals

Course Content Outline:
1. The chemistry of life
   a. Atoms
   b. Ions
   c. Isotopes
   d. Radioactive isotopes
2. Compounds and molecules
   a. Inorganic
   b. Organic
3. Bonding
   a. Ionic bonds
   b. Covalent bonds
      i. polar
      ii. nonpolar
   c. Hydrogen bonds
4. Chemical reactions
   a. Writing and balancing chemical equations
   b. Types of reactions
   c. Energy in chemical reactions
5. Water and solutions
   a. Properties of water
   b. Functions of water in the body
   c. Mixtures
      i. solutions
      ii. colloids
      iii. suspensions
   d. Concentration
   e. Fluid and electrolyte balance
6. pH and buffer systems
   a. Electrolytes
   b. pH scale
   c. Acids
   d. Bases
   e. Neutralization
   f. Buffer systems
7. Organic molecules
   a. Hydrocarbons
   b. Functional groups
   c. Types of organic reactions
   d. Carbohydrates
   e. Lipids
   f. Protein/enzymes
   g. Nucleic acids
8. The cell
   a. Plasma membrane
      i. structure
      ii. receptors
      iii. transport
b. Organelles
   c. Metabolism (chemical reactions in cells)
      i. cellular energy - ATP
      ii. anabolic reactions
      iii. catabolic reactions
9. Additional physiological applications
   a. Chemical digestion
   b. Respiration and gas laws
   c. Blood gases
10. Laboratory topics
    a. Metric system
    b. Matter and energy
    c. Chemical reactions
    d. Solutions: solubility and concentrations
    e. pH: acids, bases, and buffers
    f. Organic molecules
    g. Carbohydrates
    h. Lipids
    i. Proteins
    j. Enzymes
    k. DNA
    l. The microscope and the cell
    m. Diffusion, osmosis, and dialysis
    n. Gas laws

Resources


Instructional Services
OAN Number:
TMNS

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