GROSSMONT COLLEGE

COURSE OUTLINE OF RECORD

Curriculum Committee Approval: 11/30/2021

GCCCD Governing Board Approval: 12/14/2021

CHEMISTRY 102 – INTRODUCTION TO GENERAL, ORGANIC, AND BIOLOGICAL CHEMISTRY

1. Course Number Course Title Semester Units

Chemistry 102 Introduction to General, Organic and

Biological Chemistry 5

Semester Hours

4 hours lecture: 64-72 hours 128-144 outside-of-class hours 3 hours lab: 48-54 hours

240-270 total hours

2. Prerequisites

A “Pass” grade in MATH 090 or equivalent or appropriate mathematics placement.

Corequisite

None

Recommended Preparation

None

3. Catalog Description

A one-semester course covering the basic principles of general, organic and biochemistry as needed to understand the biochemistry, physiology and pharmacology of the human body. This course is intended for students planning to transfer to a California State University nursing program. Students with a “C” grade or higher in Chemistry 115 and 116 are not eligible for this class.

4. Course Objectives

Students will:

In the lecture:

a. Explain selected facts and principles of general chemistry and their applicability to the field of health care by:

1) Identifying the difference between ionic and covalent compounds and writing their names and formulas.

2) Differentiating; evaluating and employing units of measurement and concentration as they relate to drug administration.

3) Calculating medication dosages and IV drip rates utilizing dimensional analysis and ratio and proportion while carrying the proper number of significant figures.

4) Explaining the concepts of pH, buffers, acids and bases and calculating pH.

5) Distinguishing the properties of solids gases and liquids and show working knowledge of intermolecular forces.

6) Solving problems utilizing gas laws.

b. Interpret a variety of concepts governing organic chemistry by:

1) Categorizing the nomenclature and write equations for the preparation and important reactions through the use of functional groups.

2) Formulating how the properties of functional groups dictate the chemical and physical properties of organic compounds.

3) Constructing names and structures of the major classes of organic compounds.

4) Identifying and evaluating the classes of organic molecules that play important roles in human health.

c. Relate the principles of biochemistry to the major classes of biomolecules (carbohydrates, lipids, proteins, nucleic acids) by:

1) Appraising the chemical and physical properties of each system of biomolecule.

2) Comparing and contrasting the major metabolic and catabolic pathways.

d. Categorize the structure and function of drugs in relation to the biochemistry of the human body, nutrition, and the pathophysiology of diseases.

e. Relate the principles of biochemistry to the major classes of biomolecules (carbohydrates, lipids, proteins, nucleic acids) by:

1) Appraising the chemical and physical properties of each system of biomolecule.

2) Comparing and contrasting the major metabolic and catabolic pathways.

f. Categorize the structure and function of drugs in relation to the biochemistry of the human body, nutrition, and the pathophysiology of diseases.

g. Assemble their knowledge of general, organic and biochemistry to evaluate relevant issues in the field of health care.

In the laboratory:

a. Demonstrate the ability to use basic laboratory skills such as taking and recording observations of both inorganic, organic and biochemical systems.

b. Analyze and evaluate both qualitative and quantitative observations by applying the theoretical principles being studied.

5. Instructional Facilities

* 1. Standard classroom and laboratory.
  2. Wall mounted Periodic Chart.
  3. Individual student drawers containing standard laboratory equipment including but not limited to beakers, Erlenmeyer flasks, graduated cylinders, filter flasks, Buchner funnels, glass funnels, pipets, test tubes, test tube racks, glass sample vials, drying tubes, and assorted scoopulas, stir rods and spatulas.
  4. Laboratory classroom including but not limited to drying ovens, fume hoods, hot plates, magnetic stir plates, triple beam balances, analytical balances, Bunsen burners and microburners, and UV-vis spectrometer.
  5. Facilities for lecture demonstrations, including a lecture table with gas, air, water, vacuum and sink.

6. Special Materials Required of Student

a. Scientific calculator with exponential and logarithmic functionality.

b. Approved safety glasses or goggles.

c. Laboratory apron or jacket.

7. Course Content

Lecture

1. Atoms and Elements.
2. Compounds and their Bonds.
3. Measurements.
4. Chemical Reactions and Quantities.
5. Nuclear chemistry.
6. Gases.
7. Solutions.
8. Acids and Bases.

i. Organic Compounds.

1) Hydrocarbons.

2) Stereochemistry.

3) Functional Groups

j. Carbohydrates.

k. Lipids.

m. Metabolic Pathways and Energy Production.

n. Amino Acids, Proteins and Enzymes.

o. Nucleic Acids.

p. The Chemistry of Drugs.

Lab

a. Atoms and Elements vs Compounds

b. Covalent and ionic bonding

c. Measurements, measurement systems (metric apothecary and English)

d. Chemical reactions

1) Kinetics

2) Thermochemistry

3) Mole concept

e. Nuclear chemistry

1) Radiation particles

2) Half-lives

f. Gases

g. Solutions

1. Acids and bases

i. Organic compounds

1) Hydrocarbons

2) Stereochemistry

3) Functional Groups

j. Biomolecules

1) Carbohydrates

a) Biosynthesis

b) Catabolism

2) Lipids

a) Biosynthesis

b) Catabolism

3) Amino acids

a) Biosynthesis

b) Catabolism

k. Enzymes- structure and function

l. Metabolism

1) Anabolic and catabolic pathways

2) Energy production

m. Nucleic acids

n. The chemistry of drugs

8. Method of Instruction

1. Lecture. Use of several of the following: PowerPoint, whiteboard, handouts.
2. Discussion. Small-group problem solving and conversation.
3. Demonstrations, videos, etc. Use of model kits and chemical/lab demonstrations.
4. Inquiry‑based laboratory experiences.
5. Peer presentations.

9. Methods of Evaluating Student Performance

1. Written exams and final exam which may include fill-in-the-blank, short answer, multiple choice, and essay questions.
2. Laboratory reports (for example descriptions and analysis of characteristic chemistry of functional groups or enzyme activity).
3. Laboratory techniques to include proper safety procedures, use of laboratory equipment, and complete documentation of data.
4. Essays/presentations on topics such as experimental results, descriptive chemistry or current issues in chemistry.
5. Homework and various assignments are used to teach and emphasize content including, but not limited to reading texts, watching videos, solving problems out of the textbook or computer aided instructional exercises.

10. Outside Class Assignments

1. Laboratory reports (for example descriptions and analysis of characteristic chemistry of functional groups or enzyme activity).
2. Essays/presentations on topics such as experimental results, descriptive chemistry or current issues in chemistry.
3. Homework and various assignments used to teach and emphasize content including, but not limited to taking notes on texts, videos, solving problems out of the textbook or computer aided instructional exercises.

11. Representative Texts

a. Representative Text(s)

1. Frost, Laura D., S. Todd, and Karen C. Timberlake., *General, Organic, and Biological Chemistry*, 4th Edition. Prentice Hall, 2020.
2. Olmstead, Tom *Chem 102 Laboratory Manual*, 3rd edition, El Cajon, California: Grossmont College, 2019.

b. Supplementary texts and workbooks:

None.

Addendum: Student Learning Outcomes

Upon completion of this course, our students will be able to do the following:

1. Demonstrate a working knowledge of the language of organic chemistry and biological chemistry.
2. Employ concepts of organic functional groups to predict both chemical and physical properties of organic molecules.
3. Apply the concept of structure and function to predict the properties and behavior of biomolecules.
4. Employ laboratory techniques to collect, analyze, and evaluate experimental data.