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| C:\Users\User\AppData\Local\Microsoft\Windows\INetCache\Content.Word\received_600294190599331.png**ZSCMST.bmp** | Republic of the PhilippinesZAMBOANGA STATE COLLEGE OF MARINE SCIENCES AND TECHNOLOGYFort Pilar, Zamboanga City**Tel No. 992-3092/Tel No: (062) 991-0643 Telefax: (062) 991-0777 website: http:www.zscmstedu.ph** | ZSCMST-VPAA-3.0-14Date Adopted: 6-2014Revision Status: \_\_2\_\_Revision Date: 7-2020 |

**COLLEGE OF FISHERIES AND MARINE SCIENCES**

**BACHELOR OF SCIENCE IN FOOD TECHNOLOGY**

**OUTCOMES-BASED (OBE) COURSE SYLLABUS IN**

**CHEMISTRY 4**

**(BIOCHEMISTRY)**

|  |  |  |  |
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| Prepared by: | Reviewed by: | Approved by: | Date of Effectivity: |
| **CHRISTIAN C. ALATAN****.**  | **VICTORIA L. LIM, MST** | **OLIVER D. TITO, Ph.D.** | **August 2021** |
| Instructor | Area Chair, Chemistry Department | Dean  |  |

**I. COLLEGE**

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| --- | --- |
| **Vision:**  | A world-class institution for higher learning, research, development and innovation in fisheries, marine sciences, maritime education, and technology by 2024. |
| **Mission:**  | Provide quality education and relevant research and extension to produce globally competitive human capital for fisheries and marine-based industries. |
| **Core Values:** | **CARE - C-**Commitment **A-**Attitude **R-**Relationship **E-**Excellence |

**II. PROGRAM: BACHELOR OF SCIENCE IN FOOD TECHNOLOGY**

**III. INSTITUTIONAL GOALS**

1. Develop a breed of qualified graduates with high standards of work ethics and with specialized skills in the field of fisheries, natural and applied sciences;
2. Enhance faculty expertise in their respective disciplines and upgrade instructional facilities;
3. Provide degree fellowship/training opportunities to faculty and research staff on the following areas of concern: computer-based stock assessment methodologies and research analysis, ecological systems modeling, environmental impact assessment, fish genetics, fish/food nutrition, development of research tools, technical writing, bio-assay, bio-technology, socio-economic research and research management;
4. Initiate/spearhead the rational exploitation of the region’s fisheries and marine resources thru the necessary leadership in multi and inter-disciplinary research undertakings, training and development programs;
5. Promote environmental protection and rehabilitation of identified marine ecosystem by developing and implementing an effective resource management program;
6. Coordinate with concerned government and private institution in the monitoring, evaluation and documentation of the fishery and other marine resources in the primary service area;
7. Conduct basic and applied researches to generate the much needed information and technology for the fishery/food sector and ecosystem management

**IV. INSTITUTIONAL OBJECTIVES**

1. Equip students with the appropriate knowledge and skills (technical and managerial and critical thinking) in the sustainable/responsible fisheries and ecosystem management;
2. Enhance the capability of students on the areas of research, extension and production;
3. Enhance the students value of commitment, attitude, relationships and excellence;
4. Enhance the students understanding and appreciation of the arts and culture;
5. Strengthen linkages with the fishery/food/environmental industry/sector for OJT and job placement;
6. Increase the passing rate of BSFi students in the FisheriesTechnologist Board Examination and;
7. Improve the employment rate of graduates.

**V. PROGRAM OUTCOMES**

**The graduates have the ability to:**

1. articulate and discuss the latest developments in the specific field of practice;
2. effectively communicate orally and in writing using both English and Filipino;
3. work effectively and independently in multi-disciplinary and multi-cultural teams.
4. act in recognition of professional, social, and ethical responsibilities;
5. preserve and promote “Filipino historical and cultural heritage”
6. generate and share knowledge relevant to agriculture;
7. formulate and implement plans and programs in food technology in support to agriculture
8. demonstrate communication skills (i.e. oral and written) that lead to success in a food technology career including preparation of proposals, position papers, technical reports, communicating technical information to a nontechnical audience, making formal and informal presentations;
9. explain the functionality of different kind of food ingredients and chemical changes occurring during post ̶ harvest handling, preparation, processing, packaging and storage, including reactions involving carbohydrates, protein, and fats;
10. understand the international and local registrations required for the manufacture , distribution and sale of food products, either fresh or processed;
11. understand and apply the role of microorganisms in post – harvest handling, preparation, processing and preservation, packaging and storage with respect to pathogenic, spoilage, and fermentative microorganisms;
12. understand and apply the principles of engineering as they relate to converting agricultural commodities to the finished products;

 m) understand and apply the principles and various facets in food technology, including sensory evaluation, in practical situations, problem solving and environmental sustainability

 n. understand and apply the basic elements of sanitation and quality assurance programs to assure food safety:

 o. evaluate the microbiological, physical, chemical, sensory and functional properties of food; and

 p. create new product ideas, concepts and procedures leading to innovative food technologies;

**VI. COURSE SPECIFICATION**

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| **Course Name**  | **BIOCHEMISTRY** |
| **Course Credits**  | 5 units (2unit lecture; 3 units laboratory) |
| **Course Description**  | Biochemistry focus on the fundamental chemical concepts and principles that covers the atomic and hybrid orbital to predict the character of covalent bond present in organic molecules, naming and structure of organic molecules, stereochemistry, reaction involving biochemistry. |
| **Contact Hours/week**  | 5 hours (2 hours lecture; 3 hours laboratory) |
| **Pre-requisite**  | Organic Chemistry (Chem.3) |
| **Co-requisite** | None |

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| COURSE OUTCOME | COURSE MAP |
|  | a | b | C | d | e | f | g | h | i | j | k | l | m | n | o | p |
| At the end of this course the students should be able to : |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Recognize, write formulas, and describe the chemical structures that make up the component of living matter: proteins, carbohydrates, lipids, and nucleic acids |   L |  |  | O  |  | L | L | P | L |  |  |  | L |  | O |  |
| Describe the interactions of these components that give rise to the organized supramolecular structures, cells, and multicellular organisms.  |  L |  |  | O  |  | L | L | P | L |  |  |  | L |  | O |  |
| Apply key concepts in biochemistry to explain its practical applications in the field of agriculture, medicine, pharmacy, and allied fields.  |   L |  |   | O  |  |  O | L | P | L |  |  |  | L |  | O |  |
| Present awareness of major issues at the forefront of biochemistry | L |  |  | O |  | O | O | P | O |  |  |  | L |  | O |  |
| Use computers as information and research tools in biochemistry | L |  |  |  O |  | L | L | P | O |  |  |  | L |  | O |  |
| Evaluate, use, and properly document sources of biochemical information | L |  |  | O |  | O | O | P | P |  |  |  | L |  | O |  |
|  |

*Legend: L- facilitates learning of competency; P- allows student to practice competency (no input, but competency is evaluated); O-opportunity for development (no input or evaluation but competency is practiced)*

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| **COURSE OUTLINE AND TIMEFRAME** | **TOPICS** |
| **Week 1** | Orientation: Vision, Mission, Goals of the college & ZSCMST Core values.  |
| **Week 1** | Functions of the different Chemistry glass wares, Apparatus, equipment |
| **Week 1** | A. Introduction to Cells |
| **Week 2** | B. Water and The Solvent for Biochemical Reactions |
| **Week 3-4** | C. Carbohydrates |
| **Week 5-6** | D. Lipids |
| **Week 7-8** | E. Protein |
| **Week 9** | **MIDTERM EXAM** |
| **Week 10-11** | E. Enzymes  |
| **Week 12 ̵ 13** | F. Nucleic acid |
| **Week 14-15** | G. Metabolism |
| **Week 16-17** | H. Introduction to Nutrition |
| **Week 18** | **FINAL EXAM** |

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| **Course Objectives** | **Summative Assessment Task** | **Details** |
| Recognize, write formulas, and describe the chemical structures that make up the component of living matter: proteins, carbohydrates, lipids, and nucleic acids.Describe the interactions of these components that give rise to the organized supramolecular structures, cells, and multicellular organisms. Apply key concepts in biochemistry to explain its practical applications in the field of agriculture, medicine, pharmacy, and allied fields. Present awareness of major issues at the forefront of biochemistryUse computers as information and research tools in biochemistryEvaluate, use, and properly document sources of biochemical information | Interactive Discussion and Oral PresentationOral PresentationLaboratory ActivityOral PresentationWritten reportWritten examination | Students are expected to recognize and to gain skills on the major topics in Biochemistry. They are to do an oral presentation on the chemical structures that makes up the components of living matter.A rubric for oral presentation will be used.Students are expected to learn and acquire knowledge on Biochemistry focusing on the interaction of the components of matter.Students are expected to learn to apply basic laboratory skills and apply key concepts in biochemistry to prepare them in the practice of their profession. A written laboratory report will be acquired for their assessment.A rubric on laboratory activity and report will be used.Students are expected to do oral presentations: Discussing/ assimilating concepts in Biochemistry.Students are expected to submit a written report to apply technical skills for their research.This task is given to evaluate students’ knowledge and understanding of the concepts and principles of the course content in Biochemistry. These are given to evaluate the results of their practical activities |

**Alignment of Course Outcomes with Summative Assessment Tasks**

The teacher will present the college vision, mission, goals, and objectives.

 Present course requirements grading system of Biochemistry **Synchronous e-learning**

**Asynchronous e-learning**

 The teacher will send an electronic module through Learning Management System (LMS)

* Video clip of the college VMGO from facebook page and ZSCMST website

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 Also present Laboratory Policies,Apparatuses and Safety Rules.

**LEARNING PLAN**

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| --- | --- | --- | --- | --- | --- | --- |
| **Desired Learning Outcomes (DLO)** | **Course Content/ Subject Matter** | **Textbooks/ References** | **Flexible Learning Modalities** | **Assessment Tools in Flexible Learning**  | **Resource Materials** | **Time Table** |
| At the end of each lesson, the students must have:* Identified ZSCMST Curricular programs related to the vision and mission.
* Explained the course description, grading system and course requirements
 | **Mission, Vision, ZSCMST Rules and Regulations of the College****Teacher’s Policies and Students’ Roles****Chemistry Laboratory Policies and Safety Rules****Course Requirements Grading System****Lecture and Laboratory Requirements** | Student Handbook |   | * Oral recitation through a phone call, zoom, gmeet, and etc.
* Workheet Activity about Laboratory Policies, Apparatuses, and Safety Rules. (Synchronous/Asynchronous)
* Summative Assessmnent through google docs, google class, and etc.
 | * Desktop
* Laptop
* Cellphone
* Tablet
* Module
 | **2hrs.** |
| 1.1 Define and differentiate biochemistry from the other branches of chemistry1.2 Differentiate a prokaryotic cell from a eukaryotic cell in terms of its structural features and the organisms in which these cells are found1.3 Identify the organelles found in cells1.4 Give the function of each cell organelle1.5 Identify a virus in terms of its structural features and how it exists | **A. Introduction to the cell**1.1 Definition of Biochemistry1.2 Overview of the Biomolecules1.3 The Cell:1.3.1 Types of cell: Prokaryotic and Eukaryotic1.3.2 Cell organelles and its Functions1.4 Viruses | McMurry, John and Mary E. Castellion. Fundamentals of General, Organic and Biochemistry, 4th Ed. Pearson Education, Inc | **Synchronous e-learning**The teacher will present through lecture method via powerpoint presentation in any online platform. **Asynchronous e-learning** The teacher will send an electronic module through Learning Management System (LMS)Also provide links of video clips for the four (4) topics. | * Oral recitation through a phone call, zoom, gmeet, and etc.
* Summative Assessmnent through google docs, google class, and etc.
* Workheet Activity about Cell and Virus (Synchronous/Asynchronous)

  | * Desktop
* Laptop
* Cellphone
* Tablet
* Module
 | **5hrs.** |
| 2.1 Review on the properties of water and buffers particularly the Henderson – Hasselbach equation | **B. Water: The Solvent for Biochemical Reactions** 2.1 Review on the properties of water2.2 Buffers2.2.1 Mechanism of Action of buffers2.2.2 Choosing a Buffer in the Laboratory2.2.3 Henderson – Hasselbach equation2.2.4 Examples of buffers in the living system | McMurry, John and Mary E. Castellion. Fundamentals of General, Organic and Biochemistry, 4th Ed. Pearson Education, Inc. | **Synchronous e-learning**The teacher will present through lecture method via powerpoint presentation in any online platform. **Asynchronous e-learning** The teacher will send an electronic module through Learning Management System (LMS).Also provide links of video clips for the four (5) topics. | * Oral recitation through a phone call, zoom, gmeet, and etc.
* Workheet Activity about Buffers (Synchronous/Asynchronous)
* Summative Assessmnent through google docs, google class, and etc.
 | * Desktop
* Laptop
* Cellphone
* Tablet
* Module
 | 3hrs. |
| 3.1. Define Carbohydrates in terms of its structure.3.2 Classify carbohydrates according to: the number of sugar units, number of carbon atoms, the functional group/s present3.3 Illustrate the Fisher and Hayworth projection of monosaccharides3.4 Explain the physical properties of carbohydrates based on its structure3.5 Give the composition and functions of common monossacharides, disaccharides, and polysaccharides3.6 identify some biologically important monosaccharides, disaccharides, and polysaccharides3.7 Conduct laboratory experiment on the different tests for carbohydrates. | **E. Carbohydrates**3.1 Monosaccharides 3.1.1 Structures, stereochemistry and sources3.1.2 Reactions of Monosaccharides* Formation of Glycosides
* oxidation-reduction reactions of sugars
* amino sugars: an important sugar derivative

3.1.3 Important Oligosaccharides: Sucrose, Lactose, Maltose, and Cellobiose 3.1.4 Structure and Functions of Polysaccharides: Cellulose, Starch, Glycogen, Chitin, and bacterial cell wall. | McMurry, John and Mary E. Castellion. Fundamentals of General, Organic and Biochemistry, 4th Ed. Pearson Education, Inc | **Synchronous e-learning**The teacher will present through lecture method via powerpoint presentation in any online platform. Also present procedures of laboratory exercises.* The teacher will conduct lab activity/experiment about the Tests for Carbohydrates.

**Asynchronous e-learning** The teacher will send an electronic module through Learning Management System (LMS).Also provide links of video clips for carbohydrates topics and laboratory activity/experiment | * Oral recitation through a phone call, zoom, gmeet, and etc.
* Summative Assessmnent through google docs, google class, and etc
* Workheet Activity about Carbohydrates (Synchronous/Asynchronous)
* Synthesis Paper about laboratory acitivity that was done by the teacher.
* (Synchronous/Asynchronous)

  | * Desktop
* Laptop
* Cellphone
* Tablet
* Module
 | 10 hrs. |
| 4.1 Define Lipids4.2 Classify lipids as: Saponifiable or non-saponifiable4.3 Define and identify fatty acids4.4 Classify fatty acids as: saturated or unsaturated, essential or nonessential4.5 Define triacylglycerols (or triglycerides) and classify as simple or mixed4.6 Differentiate fats and oils4.7 Give examples of fats and oils and identify their major triacylglycerol components4.8 Define waxes and cite their uses4.9 Draw and name structures of waxes4.10 Compare and contrast phosphoacylglycerol and sphingolipids based on their: backbone component, fatty acid components and sources4.11 Define Glycolipids and illustrate it with a structural formula4.12 Define Steroids4.13 Differentiate Cholesterol and ergosterol4.14 Explain the function of fat-soluble vitamins4.15 Define Prostaglandines, Leukotrienes, and ketone bodies4.16 Give the biological functions of prostaglandines and leukotrienes. | **F. Lipids**4.1 Definition of Lipids4.2 Types of Lipids and their Nature4.2.1 Fatty acids4.2.2 Triacylglycerols4.2.3 Phosphoacylglycerols4.2.4 Waxes and Sphingolipids4.2.5 Glycolipids4.2.6 Leukotrienes and Prostaglandines4.2.7 Ketone Bodies4.3 Biological Membranes: Structure and Compositions4.4 Lipid-Soluble vitamins and Their Functions | McMurry, John and Mary E. Castellion. Fundamentals of General, Organic and Biochemistry, 4th Ed. Pearson Education, Inc.   | **Synchronous e-learning**The teacher will present through lecture method via powerpoint presentation in any online platform. Also present procedures of laboratory exercises.* The teacher will conduct lab activity/experiment about the Tests for Lipids.

**Asynchronous e-learning** The teacher will send an electronic module through Learning Management System (LMS).Also provide links of video clips for lipids topics and laboratory activity/experiment. | * Oral recitation through a phone call, zoom, gmeet, and etc.
* Summative Assessmnent through google docs, google class, and etc
* Workheet Activity about Lipids (Synchronous/Asynchronous)
* Synthesis Paper about laboratory acitivity that was done by the teacher.
* (Synchronous/Asynchronous)
* Research Activity about the different properties of Lipids (Online/Offline)
 | * Desktop
* Laptop
* Cellphone
* Tablet
* Module
 | 15hrs. |
| 5.1 Explain the importance of knowing the primary structure of protein5.2 Identify and describe the levels of protein structure: Primary, secondary, tertiary, quaternary5.3 Classify proteins according to: Biological function, shape, composition, Solubility properties5.4 Illustrate and explain the importance of conformation, exemplified by the relationship between the three dimensional structure of proteins and their biological activity5.5 Explain protein reactivity and function in relation to its structure: native proteins, denatured proteins5.6 Conduct laboratory experiment on the test for proteins. | **C. Proteins**5.1 Composition, function and sources 5.1.1 Identify essential amino acids 5.1.2 Formation of peptide bonds5.2 Primary Structure of proteins and its Importance5.3 Secondary structure and its characteristics* ɑ-helix and β-pleated sheet
* Collagen: an example
* Types of Protein conformation: Fibrous and Globular

5.4 Tertiary Structure of proteins and its characteristics* Myoglobin: An example
* Denaturation and Refolding

5.5 Quaternary Structure of protein and its characteristicsHemoglobin: An example | McMurry, John and Mary E. Castellion. Fundamentals of General, Organic and Biochemistry, 4th Ed. Pearson Education, Inc.   | **Synchronous e-learning**The teacher will present through lecture method via powerpoint presentation in any online platform. Also present procedures of laboratory exercises.* The teacher will conduct lab activity/experiment about the Tests for Proteins.

**Asynchronous e-learning** The teacher will send an electronic module through Learning Management System (LMS).Also provide links of video clips for protein topics and laboratory activity/experiment. | * Oral recitation through a phone call, zoom, gmeet, and etc.
* Summative Assessmnent through google docs, google class, and etc
* Workheet Activity about Protiens(Synchronous/Asynchronous)
* Synthesis Paper about laboratory acitivity that was done by the teacher.
* (Synchronous/Asynchronous)
* Research Activity about the different properties of Protiens (Synchronous/Asynchronous)
 | * Desktop
* Laptop
* Cellphone
* Tablet
* Module
 | 12hrs. |
| **MIDTERM EXAM** |  |  | **Synchronous e-learning**The teacher will give the midterm examination via google docs or in google class while in a zoom meeting or google meet.**Asynchronous e-learning** The teacher will send the midterm examination through Learning Management System.  | * Multiple choice exam
* Modified True or False
* If and Then questions
* Problem solving
* Essay Type
 |  |  |
| 6.1 Describe the chemical nature of enzymes6.2 Describe the six classes of enzymes based on the type of chemical reactions they catalyze6.3 Provide the systematic and common name of an enzyme given a chemical reaction6.4 Discuss the factors that affect enzyme activity6.5 illustrate the Michelis-Menten Equation6.6 Discuss the theories behind stereospecificity of enzyme action6.7 Differentiate the types of enzymes inhibitions namely competitive, uncompetitive and noncompetitive6.8 Illustrate the composition of most enzymes with more emphasis on the apoproteins and the coenzymes. | **D. Enzymes**6.1 Naming and Classification of enzymes6.2 Enzymatic actions6.3 Theories involving Enzyme actions: Lock and Key theory and Induced fit theory6.4 Enzyme Inhibition | McMurry, John and Mary E. Castellion. Fundamentals of General, Organic and Biochemistry, 4th Ed. Pearson Education, Inc.  | **Synchronous e-learning**The teacher will present through lecture method via powerpoint presentation in any online platform. Also present procedures of laboratory exercises.* The teacher will conduct lab activity/experiment about the Tests for Enzymes.

**Asynchronous e-learning** The teacher will send an electronic module through Learning Management System (LMS).Also provide links of video clips for protein topics and laboratory activity/experiment. | * Oral recitation through a phone call, zoom, gmeet, and etc.
* Summative Assessmnent through google docs, google class, and etc
* Workheet Activity about Enzymes (Synchronous/Asynchronous)
* Synthesis Paper about laboratory acitivity that was done by the teacher.
* (Synchronous/Asynchronous)
 | * Desktop
* Laptop
* Cellphone
* Tablet
* Module
 | 5 hrs. |
| 7.1 Draw and name the structural formulas of the nitrogenous bases found in DNA and RNA7.2 Show at which point of the bases hydrogen bondig can be formed7.3 Define nucleosides7.4 Draw and name structures of nucleosides7.5 Define nucleotides7.6 Compare and contrast DNA and RNA in terms of: nitrogenous bases, structures, biological functions, location in the cell7.7 Draw a structure of a portion of DNA and RNA7.8 Describe the three dimensional structure of DNA and its denaturation7.9 Identify and give the function of the different types of RNA | **G.** **Nucleic acid**7.1 Types of Nucleic acids: DNA and RNA7.2 Covalent Structure of Polynucleotide7.2.1 Structure and component of nucleotides7.2.2 Formation of nucleic acids from Nucleotides7.3 Structure and denaturation of DNA7.4 The principal kinds of RNA and their characteristics | McMurry, John and Mary E. Castellion. Fundamentals of General, Organic and Biochemistry, 4th Ed. Pearson Education, Inc.  | **Synchronous e-learning**The teacher will present through lecture method via powerpoint presentation in any online platform. Also present procedures of laboratory exercises.* The teacher will conduct lab activity/experiment about the Tests for Nucleic Acids.

**Asynchronous e-learning** The teacher will send an electronic module through Learning Management System (LMS).Also provide links of video clips for protein topics and laboratory activity/experiment. | * Oral recitation through a phone call, zoom, gmeet, and etc.
* Summative Assessmnent through google docs, google class, and etc
* Workheet Activity about Nucleic Acids (Synchronous/Asynchronous)
* Synthesis Paper about laboratory acitivity that was done by the teacher.
* (Synchronous/Asynchronous)
 | * Desktop
* Laptop
* Cellphone
* Tablet
* Module
 | 10 hrs. |
| 8.1 Define metabolism8.2 Differentiate the two metabolic reactions: Catabolism and Anabolism8.3 Describe the purpose of the common catabolic pathway8.4 State the purpose of the citric acid cycle8.5 Write the equation representing the overall reactions of the citric acid cycle8.6 Account the energy yield that enters the citric acid cycle8.7 Describe how carbohydrates, lipids and proteins fulfill the body’s energy needs and provide the raw materials needed to build the compounds8.8 Draw schematic diagram of the convergence of the specific pathways of carbohydrate, fat and protein catabolism into the common catabolic pathway.8.9 Identify the reaction steps of Glycolysis8.10 Describe Glycolysis in a molecular level8.11 Define fermentation8.12 Conduct a laboratory experiment for wine preparation8.13 Identify reactions involved in beta-oxidation of fatty acids8.14 Describe how plants synthesize carbohydrates8.15 Explain the dark and light reactions of photosynthesis8.16 Describe the mechanism in the metabolism of carbohydrates8.17 Explain fatty acids and biosynthesis of amino acids. | **G. Metabolism**8.1 Metabolic reactions 8.1.1Citric acid cycle 8.1.2Energy yields 8.1.3Common catabolic  pathways8.2 Glycolysis8.3 Fermentation8.4 Beta-oxidation of fatty acids8.5 Fatty acids and bio synthesis of amino acids | McMurry, John and Mary E. Castellion. Fundamentals of General, Organic and Biochemistry, 4th Ed. Pearson Education, Inc | **Synchronous e-learning**The teacher will present through lecture method via powerpoint presentation in any online platform. **Asynchronous e-learning** The teacher will send an electronic module through Learning Management System (LMS). | * Oral recitation through a phone call, zoom, gmeet, and etc.
* Summative Assessmnent through google docs, google class, and etc
* Workheet Activity about Metabolism (Synchronous/Asynchronous)
* Break out rooms via zoom meeting (Synchronous e-learning)
 | * Desktop
* Laptop
* Cellphone
* Tablet
* Module
 | 18hrs. |
| **FINAL EXAM** |  |  | **Synchronous e-learning**The teacher will give the midterm examination via google docs or in google class while in a zoom meeting or google meet.**Asynchronous e-learning** The teacher will send the midterm examination through Learning Management System.  | * Multiple choice exam
* Modified True or False
* If and Then questions
* Problem solving
* Essay Type
 |  |  |

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| **Suggested Readings and References** | 1. McMurry, John and Mary E. Castellion. Fundamentals of General, Organic and Biochemistry, 4th Ed. Pearson Education, Inc.
2. H.Stephen Stoker. Biochemistry (3rd Edition). 2017.C and E Publishing, Inc.
3. Bettelhim, Frederick A, et.al, Introduction to General,Organic, and Biochemistry(10th ed.). 2013.Brooks/Cole20 Davis DriveBelmont, CA 94002-3098 USA.
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| **Course Requirements** | Compilation of Assessment Task/ Laboratory experiment  |
| **Grading System** | 40% (Quizzes/Oral Examination/Research Work/Output) + 30% (Mid Term Exam/Final Term Exam) + 30% (Laboratory)Final Grade = Mid-Term Grade + Final Grade 2 |