DLSHSI
DE LA SALLE HEALTH SCIENCES INSTITUTE
Nurturing Life

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1345 (Dept. of Integrated Humanities and Sciences)
1408 (Dept. of Chemistry)
1115 (Chemistry Lab) | 1405 (Biology & Physics Lab)

COURSE SYLLABUS

DEPARTMENT	:	**CHEMISTRY DEPARTMENT**
COURSE CODE/TITLE	:	**CHEM 120a – ORGANIC CHEMISTRY (for CRS & CMLS)**
NUMBER OF UNIT/S	:	5.0 (54 hours lecture & 108 hours laboratory)
PRE-REQUISITE	:	CHEM 110
ROOM	:	_____
INSTRUCTOR/PROFESSOR	:	_____
CONSULTATION TIME	:	_____

COURSE DESCRIPTION

This course will familiarize you to the basics of organic chemistry, which deals with the properties, reactions, and applications of carbon-containing compounds. This course includes the nomenclature, physical and chemical properties, reactivity, and stereochemistry of functional groups, in order of increasing complexity, with discussion on basic reaction mechanisms. It also covers an introduction to the biological molecules and basic metabolism. Course activities such as problem solving and laboratory experiments are designed to help develop analytical and critical thinking skills. Emphasis is also given on the practical applications of organic chemistry in health and medicine. This course would also give a new appreciation of the role of chemistry in both the human body and the larger world around us.

EXPECTED LASALLIAN GRADUATE ATTRIBUTES (ELGA)	LEARNING OUTCOMES BASED ON ELGA At the end of this course, the students shall manifest the ELGA by:
GOD-LOVING	○ imparting to the public and making them realize the amazing works of God in our world and society through chemistry and ○ demonstrating the love of God by showing to the public how chemistry can change and improve the lives of people in our society.
PATRIOTIC PROFESSIONALS	○ developing ways on how to increase the awareness of the public to the common health and environmental problems in our country through chemistry.
PERSON-ORIENTED	○ extending help to the community by increasing the awareness of the public to the common health and environmental problems in the society or in the community through chemistry.

LEARNING OUTCOMES

LO 1. Higher levels of comprehension
LO 2. Proficient and effective communication
LO 3. Understanding of basic concepts across the domains of knowledge
LO 4. Critical, analytical, and creative thinking
LO 5. Application of different analytical modes in tackling problems methodically
LO 6. Ability to contribute personally and meaningfully to the country's development
LO 7. Capacity to reflect critically on shared concerns and think of innovative, creative solutions guided by ethical standards
LO 8. Working effectively in a group
LO 9. Problem-solving
LO 10. Basic work-related skills and knowledge

PRELIMINARY PERIOD LEARNING PLAN

TOPICS	LEARNING OBJECTIVES At the end of each topic, the students should be able to:	TEACHING STRATEGIES	ASSESSMENT
Chapter 11. Introduction to Organic Molecules and Functional Groups 11.1 Introduction to Organic Chemistry 11.2 Characteristic Features of Organic Compounds 11.3 Shapes of Organic Molecules 11.4 Drawing Organic Molecules 11.5 Functional Groups 11.6 Properties of Organic Compounds: Polarity and Solubility FE: Environmental Pollutants FHM: Vitamins	• recognize the characteristic features of organic compounds; • predict the shape around atoms in organic molecules; • use shorthand methods to draw organic molecules; • recognize the common functional groups and understand their importance; • distinguish organic compounds from ionic inorganic compounds; • determine whether an organic compound is polar or nonpolar; • determine solubility properties of organic compounds; and • determine whether a vitamin is fat soluble or water soluble.	• Lecture Discussion • Video Presentation • Group Discussion	• Formal Examinations • Recitations • Board Work • Seat Work • Problem Set
Chapter 12. Alkanes 12.1 Introduction 12.2 Simple Alkanes	• identify and draw acyclic alkanes and cycloalkanes; • identify constitutional isomers;	• Lecture Discussion • Video Presentation • Group Discussion	• Formal Examinations • Recitations • Board Work

12.3 An Introduction to Nomenclature FHM: Naming New Drugs 12.4 Alkane Nomenclature 12.5 Cycloalkanes FE: Fossil Fuels 12.7 Physical Properties FE: Combustion	• name alkanes using the IUPAC system of nomenclature; • predict the physical properties of alkanes; and • write equations for the complete and incomplete combustion of alkanes.		• Seat Work • Problem Set
Chapter 13. Unsaturated Hydrocarbons 13.1 Alkenes and Alkynes 13.2 Nomenclature of Alkenes and Alkynes 13.3 Cis–Trans Isomers FHM: Saturated and Unsaturated Fatty Acids 13.4 Interesting Alkenes in Food and Medicine FHM: Oral Contraceptives 13.6 Reactions of Alkenes FHM: Margarine or Butter? 13.8 Polymers—The Fabric of Modern Society 13.9 Aromatic Compounds 13.10 Nomenclature of Benzene Derivatives FHM: Aromatic Drugs, Sunscreens, and Carcinogens FHM: Phenols as Antioxidants 13.13 Reactions of Aromatic Compounds	• identify the three major types of unsaturated hydrocarbons—alkenes, alkynes, and aromatic compounds; • name alkenes, alkynes, and substituted benzenes; • recognize the difference between constitutional isomers and stereoisomers, as well as identify cis and trans isomers; • identify saturated and unsaturated fatty acids and predict their relative melting points; • draw the products of addition reactions of alkenes; • draw the products of reactions that follow Markovnikov's rule; • explain what products are formed when a vegetable oil is partially hydrogenated; • draw the structure of polymers formed from alkene monomers; and • draw the products of substitution reactions of benzene.	• Lecture Discussion • Video Presentation • Group Discussion	• Formal Examinations • Recitations • Board Work • Seat Work • Problem Set
Chapter 14. Organic Compounds That Contain Oxygen, Halogen, or Sulfur 14.1 Introduction 14.2 Structure and Properties of Alcohols 14.3 Nomenclature of Alcohols 14.4 Interesting Alcohols 14.5 Reactions of Alcohols FHB: Oxidation and Blood Alcohol Screening FHM: Ethanol, the Most Widely Abused Drug	• identify alcohols, ethers, alkyl halides, and thiols; • classify alcohols and alkyl halides as 1°, 2°, or 3°; • determine the properties of alcohols, ethers, alkyl halides, and thiols; • name alcohols, ethers, alkyl halides, and thiols;	• Lecture Discussion • Video Presentation • Group Discussion	• Formal Examinations • Recitations • Board Work • Seat Work • Problem Set

14.7 Structure and Properties of Ethers FHM: Ethers as Anesthetics 14.9 Alkyl Halides FE: Alkyl Halides and the Ozone Layer 14.10 Organic Compounds That Contain Sulfur	• draw the products of the dehydration of alcohols; • determine the products of alcohol oxidation; and • convert thiols to disulfides.		
PRELIMINARY PERIOD ASSESSMENT			

MIDTERM PERIOD LEARNING PLAN

TOPICS	LEARNING OBJECTIVES At the end of each topic, the students should be able to:	TEACHING STRATEGIES	ASSESSMENT
Chapter 15. The Three-Dimensional Shape of Molecules 15.1 Isomers—A Review 15.2 Looking Glass Chemistry—Molecules and Their Mirror Images 15.3 Chirality Centers 15.4 Chirality Centers in Cyclic Compounds FHM: The Unforgettable Legacy of Thalidomide 15.5 Focus on Health & Medicine: Chiral Drugs 15.6 Fischer Projections 15.7 Optical Activity 15.8 Compounds With Two or More Chirality Centers FHB: The Sense of Smell	• recognize whether a molecule is chiral or achiral; • identify chirality centers; • draw two enantiomers in three dimensions around the chirality center; • explain why some chiral drugs have very different properties from their mirror images; • draw Fischer projection formulas; • recognize the difference between enantiomers and diastereomers; • compare the physical properties of enantiomers; and • explain the relationship between the shape and odor of a molecule.	• Lecture Discussion • Video Presentation • Group Discussion	• Formal Examinations • Recitations • Board Work • Seat Work • Problem Set
Chapter 16. Aldehydes and Ketones 16.1 Structure and Bonding 16.2 Nomenclature 16.3 Physical Properties FHM: Interesting Aldehydes and Ketones 16.5 Reactions of Aldehydes and Ketones 16.6 Reduction of Aldehydes and Ketones FHB: Biological Reductions FHB: The Chemistry of Vision	• identify the characteristics of aldehydes and ketones; • name aldehydes and ketones; • give examples of useful aldehydes and ketones; • draw the products of oxidation reactions of aldehydes; • draw the products of reduction reactions of aldehydes and ketones;	• Lecture Discussion • Video Presentation • Group Discussion	• Formal Examinations • Recitations • Board Work • Seat Work • Problem Set

16.8 Acetal Formation	• explain the basic reactions involved in vision; and • identify and prepare hemiacetals and acetals.		
Chapter 17. Carboxylic Acids, Esters, and Amides 17.1 Structure and Bonding 17.2 Nomenclature 17.3 Physical Properties 17.4 Interesting Carboxylic Acids in Consumer Products and Medicines FHM: Skin Care Products FHM: Aspirin and Anti-Infl ammatory Agents 17.5 Interesting Esters and Amides 17.6 The Acidity of Carboxylic Acids FHM: Aspirin 17.8 The Conversion of Carboxylic Acids to Esters and Amides 17.9 Hydrolysis of Esters and Amides FHM: Olestra, a Synthetic Fat 17.10 Synthetic Polymers in Modern Society—Polyamides and Polyesters FHM: Dissolving Sutures FE: Polymer Recycling FHM: Penicillin	• identify the characteristics of carboxylic acids, esters, and amides; • name carboxylic acids, esters, and amides; • give examples of useful carboxylic acids; • give examples of useful esters and amides; • draw the products of acid–base reactions of carboxylic acids; • explain how soap cleans away dirt; • discuss the acid–base chemistry of aspirin; • convert carboxylic acids to esters and amides; • draw the products of the hydrolysis of esters and amides; • draw the structures of polyesters and polyamides; and • explain how penicillin works.	• Lecture Discussion • Video Presentation • Group Discussion	• Formal Examinations • Recitations • Board Work • Seat Work • Problem Set
Chapter 18. Amines and Neurotransmitters 18.1 Structure and Bonding 18.2 Nomenclature 18.3 Physical Properties FHM: Caffeine and Nicotine 18.5 Alkaloids—Amines from Plant Sources 18.6 Amines as Bases FHM: Ammonium Salts as Useful Drugs 18.8 Neurotransmitters FHB: Epinephrine and Related Compounds FHM: Histamine and Antihistamines	• identify the characteristics of amines; • name amines; • give examples of common alkaloids; • draw the products of acid–base reactions of amines; • identify and name ammonium salts; • discuss the function of neurotransmitters and explain how neurotransmitters and hormones differ; • discuss the role of dopamine and serotonin in the body; • give examples of important derivatives of 2-phenylethylamine; and	• Lecture Discussion • Video Presentation • Group Discussion	• Formal Examinations • Recitations • Board Work • Seat Work • Problem Set

	• discuss the chemistry of histamine, antihistamines, and anti-ulcer drugs.		
MIDTERM PERIOD ASSESSMENT			

FINAL PERIOD LEARNING PLAN

TOPICS	LEARNING OBJECTIVES At the end of each topic, the students should be able to:	TEACHING STRATEGIES	ASSESSMENT
Chapter 19. Lipids 19.1 Introduction to Lipids 19.2 Fatty Acids 19.3 Waxes 19.4 Triacylglycerols—Fats and Oils FHM: Fats and Oils in the Diet 19.5 Hydrolysis of Triacylglycerols FHB: Metabolism of Triacylglycerols 19.6 Phospholipids 19.7 Cell Membranes FHM: Cholesterol, the Most Prominent Steroid 19.9 Steroid Hormones FHM: Fat-Soluble Vitamins FHM: Prostaglandins and Leukotrienes	• describe the general characteristics of lipids; • classify fatty acids and describe the relationship between melting point and the number of double bonds; • draw the structure of a wax and identify the carboxylic acid and alcohol components; • draw the structure of triacylglycerols and describe the difference between a fat and an oil; • draw the hydrolysis products of triacylglycerols; • identify the two major classes of phospholipids; • describe the structure of a cell membrane, as well as different mechanisms of transport across the membrane; • recognize the main structural features of steroids like cholesterol, and describe the relationship between blood cholesterol level and cardiovascular disease; • define what a hormone is and list several examples of steroid hormones; • identify fat-soluble vitamins; and • discuss the general structural features and biological activity of prostaglandins and leukotrienes.	• Lecture Discussion • Video Presentation • Group Discussion	• Formal Examinations • Recitations • Board Work • Seat Work • Problem Set

Chapter 20. Carbohydrates 20.1 Introduction 20.2 Monosaccharides 20.3 The Cyclic Forms of Monosaccharides 20.4 Reduction and Oxidation of Monosaccharides FHM: Monitoring Glucose Levels 20.5 Disaccharides FHM: Lactose Intolerance FHM: Sucrose and Artificial Sweeteners 20.6 Polysaccharides FHB: Useful Carbohydrate Derivatives FHB: Blood Type	• identify the three major types of carbohydrates; • recognize the major structural features of monosaccharides; • draw the cyclic forms of monosaccharides and classify them as **α** or **β** anomers; • draw reduction and oxidation products of monosaccharides; • recognize the major structural features of disaccharides; • describe the characteristics of cellulose, starch, and glycogen; • give examples of some carbohydrate derivatives that contain amino groups, amides, or carboxylate anions; and • describe the role that carbohydrates play in determining blood type.	• Lecture Discussion • Video Presentation • Group Discussion	• Formal Examinations • Recitations • Board Work • Seat Work • Problem Set
Chapter 21. Amino Acids, Proteins, and Enzymes 21.1 Introduction 21.2 Amino Acids 21.3 Acid–Base Behavior of Amino Acids 21.4 Peptides FHB: Biologically Active Peptides 21.6 Proteins FHB: Common Proteins 21.8 Protein Hydrolysis and Denaturation 21.9 Enzymes FHM: Using Enzymes to Diagnose and Treat Diseases	• identify the general structural features of amino acids; • describe the acid–base properties of amino acids; • draw simple peptides from individual amino acids, and label the N- and C-terminal amino acids; • give examples of simple biologically active peptides; • describe the characteristics of the primary, secondary, tertiary, and quaternary structure of proteins; • describe the features of fibrous proteins like **α**-keratin and collagen; • describe the features of globular proteins like hemoglobin and myoglobin; • draw the products of protein hydrolysis; • describe protein denaturation; • describe the main features of enzymes; and	• Lecture Discussion • Video Presentation • Group Discussion	• Formal Examinations • Recitations • Board Work • Seat Work • Problem Set

	• describe the use of enzymes to diagnose and treat disease.		
Chapter 22. Nucleic Acids and Protein Synthesis 22.1 Nucleosides and Nucleotides 22.2 Nucleic Acids 22.3 The DNA Double Helix 22.4 Replication 22.5 RNA 22.6 Transcription 22.7 The Genetic Code 22.8 Translation and Protein Synthesis 22.9 Mutations and Genetic Diseases 22.10 Recombinant DNA FHB: DNA Fingerprinting FHM: Viruses	• draw the structure of nucleosides and nucleotides; • draw short segments of the nucleic acids DNA and RNA; • describe the basic features of the DNA double helix; • outline the main steps of replication; • list the three types and functions of RNA molecules; • explain the process of transcription; • describe the basic elements of the genetic code; • explain the process of translation; • define the terms "mutation" and "genetic disease"; • describe the basic features of recombinant DNA, the polymerase chain reaction, and DNA fingerprinting; and • describe the main characteristics of viruses.	• Lecture Discussion • Video Presentation • Group Discussion	• Formal Examinations • Recitations • Board Work • Seat Work • Problem Set
FINAL PERIOD ASSESSMENT			

LEVELS OF ASSESSMENT

Lecture Components (60%)		**Laboratory Components (40%)**	
• Long Exam 1	15%	• Practical Exam	10%
• Long Exam 2	15%	• Major Exam	20%
• Major Exam	25%	• Laboratory Performance & Others	5%
• Others	5%	• Laboratory Reports a. Experiment Sheets b. Results & Discussion Reports (RDR)	5%
Total	**60%**	**Total**	**40%**

COMPUTATION OF GRADES

- $\text{TERM GRADE } (100\%) = \frac{\left[\text{Lecture Grade } (60\%) + \text{Laboratory Grade } (40\%)\right]}{100} \times 50 + 50$
- $\text{AVERAGE ACAD PERFORMANCE GRADE} = \left[\frac{\text{Prelim Period Grade} + \text{Midterm Period Grade} + \text{Final Period Grade}}{3}\right] \times 0.95$
- $\text{FINAL OUTPUT GRADE} = \left[\frac{\text{Score}}{\text{Perfect Score}} \times 100\right] \times 0.05$
- $\text{FINAL GRADE} = \text{Average Acad Perf Grade} + \text{Final Output Grade}$
- $\text{PASSING GRADE} = 75\%$

REFERENCES

Textbook

- Smith, J. (2012). *General, organic, and biological chemistry* (2nd ed.). Boston: McGraw-Hill Companies.

Other References

- Bettelheim, F., Brown, W., Campbell, M., Farrell, S., and Torres, O. (2013). *Introduction to general, organic, and biochemistry* (10th ed.). Singapore: Cengage Learning.
- Denniston, K., Topping, J., and Caret, R. (2007). *General, organic, and biochemistry* (5th ed.). Boston: McGraw-Hill Companies.
- Timberlake, K. (2011). *Chemistry: an introduction to general, organic, and biological chemistry* (11th ed.). Upper Saddle River, New Jersey: Prentice Hall, Inc.

COURSE POLICIES

- Students are allowed 20% of the total number of schooldays of absences inclusive of tardiness. All absences after that shall mean excessive absences, which will merit a grade of 0.00.
- Home works will be due at the beginning of the class. No home works will be accepted thereafter.
- The students will be given a score of zero (0) with corresponding grade of zero percent (0%) in a requirement which is not submitted under the following conditions:
    - They are given a chance to make-up for the said requirement.
    - They are given enough time to work on the make-up requirement.
- The students will be given a score of zero (0) with corresponding grade of zero percent (0%) in a quiz which is given during their absence under the following conditions:
    - The absent is unexcused.
    - They are offered a make-up quiz and still fail to appear during the given time.
    - They are given enough time to prepare for the make-up quiz.
- In case the students submitted a requirement given by the instructor/professor to make-up for their lost grade, a certain percent will be deducted on their actual grade.

- Special major exams are scheduled one week after the administration of the major exams. No special exams will be given thereafter EXCEPT IN SPECIAL SITUATIONS.
- Students must be honest at all times; cheating and plagiarism in any form will merit a grade of 0.00.
- Cellular/Mobile phones should always be in silent mode during class hours; the use of cellular phones is prohibited in class unless a special permission is sought. Cellular phones cannot also be used as calculator during examination.
- Borrowing of calculators and modern periodic table of elements during examination is strictly prohibited.
- Wearing of laboratory gowns and safety goggles during experiments will be strictly implemented. No lab gown and safety goggles, no experiment.
- The laboratory instructor will not be held legally responsible to accidents due to student's unawareness of safety measures and non-compliance with experimental guidelines.
- Any complaints (teaching, grades, etc.) against the teacher or against classmates (relative to the class) should be properly addressed to the subject-teacher for appropriate action. Students may seek the help and guidance of their academic/registration adviser in resolving the issue with the subject–teacher.

All policies (attendance, tardiness, decorum, grievances, etc.) will be subject to the provisions of the latest revision of the Student Handbook.

Endorsed:

Tabitha L. Amora, RCh, PhD
Program Director

Approved:

Margel C. Bonifacio, RCh, PhD
Dean