Prepared: Christine Giardino Approved: Bob Chapman

Course Code: Title	CHM191: CHEMISTRY II FOR PADD
Program Number: Name	3065: PRE-HEALTH DIP DGR
Department:	PRE-HEALTH
Semester/Term:	18W
Course Description:	In this course, students will apply fundamental concepts and skills from CHM190 to further examine chemical reactions and systems. This course approaches chemistry from a health and human body perspective and includes topics in organic chemistry, redox reactions, energy changes in chemical and physical processes, chemical kinetics, equilibrium systems, and acids and bases. Laboratory work in this course will focus on applying the scientific method to investigations in chemistry, the human body, and health. The purpose of the lab work is to develop investigative and research skills while gaining a better understanding of the theoretical concepts.
Total Credits:	5
Hours/Week:	5
Total Hours:	75
Prerequisites:	CHM190
Vocational Learning Outcomes (VLO's): **Please refer to program web page for a complete listing of program outcomes where applicable.**	#2. Examine concepts, processes and systems of chemistry, including atomic and molecular structure; quantities in chemical reactions; solutions and solubility; acids and bases; as well as organic chemistry and biochemistry in relation to health and the human body. #6. Investigate health sciences and science-related questions, problems and evidence using the scientific method.
Essential Employability Skills (EES):	#4. Apply a systematic approach to solve problems. #5. Use a variety of thinking skills to anticipate and solve problems. #6. Locate, select, organize, and document information using appropriate technology and information systems. #7. Analyze, evaluate, and apply relevant information from a variety of sources. #8. Show respect for the diverse opinions, values, belief systems, and contributions of others. #9. Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.

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	#10. Manage the use of time and other resources to complete projects. #11. Take responsibility for ones own actions, decisions, and consequences.
Course Evaluation:	Passing Grade: 50%, D
Other Course Evaluation & Assessment Requirements:	Students must achieve an average of 50% on test and exam material, independent of other components, to obtain a passing grade in this course. Students must achieve an average of 50% on lab material, independent of other components, to obtain a passing grade in this course.
Evaluation Process and Grading System:	<table><tr><th>Evaluation Type</th><th>Evaluation Weight</th></tr><tr><td>Final Exam</td><td>20%</td></tr><tr><td>Labs</td><td>35%</td></tr><tr><td>Tests</td><td>45%</td></tr></table>
Books and Required Resources:	General, Organic, and Biological Chemistry: Structures of Life by Karen C. Timberlake Publisher: Pearson Edition: 5 ISBN: 9780321967466
Course Outcomes and Learning Objectives:	**Course Outcome 1.** Identify, classify, and represent organic compounds by name, structure, and chemical formula. **Learning Objectives 1.** Write IUPAC names and structural formulae for saturated, unsaturated, linear, and cyclic hydrocarbons. Draw structural formulae for different isomers, including cis-trans isomers. Recognize some common names for alkanes, alkenes, and alkynes. Describe the resonance in benzene and draw structural formulas for other important aromatic compounds. Write IUPAC (and some common) names and structural formulas for alcohols, phenols, thiols, amines, aldehydes, ketones, carboxylic acids, esters, and amides. Classify alcohols and amines as primary, secondary or tertiary. Identify the functional groups and components of a variety of biomolecules such as carbohydrates, phospholipids, amino acids, nucleotides, ATP, cholesterol, and triglycerides.

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Recognize amino acids based on their functional groups.
Construct models of organic compounds using a molecular modeling kit.

Course Outcome 2.

Describe and compare the properties of organic compounds and use structural formulae to represent chemical reactions.

Learning Objectives 2.

Explain the concept of isomerism in organic compounds and how different isomers can have dramatically different properties.
Compare the physical properties and chemical behaviour of families of organic compounds.
Relate the length of a carbon chain of carboxylic acids to their solubility in water.
Use structural formulae to represent:

- the addition of hydrogen to unsaturated hydrocarbons.
- the formation of alcohols through the addition of water (hydration) to alkenes and the reverse formation of alkenes through a dehydration reaction.
- the formation of ethers through condensation of alcohols.
- the formation of ketones, aldehydes, and carboxylic acids through oxidation reactions.
- the formation of esters through condensation reactions.
- the formation of a peptide bond through a condensation reaction.

Course Outcome 3.

Describe the biological, medical, and environmental significance of organic compounds.

Learning Objectives 3.

Relate some common uses of hydrocarbons (such as solvents and fuels) to their physical and chemical characteristics.
Describe the formation of polymers (such as polypeptides) from monomers such as amino acids, glucose, or ethene and recognize these polymers in substances in our everyday lives (proteins, starch, polyethylene).

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Relate important physical and chemical properties of alcohols to their structure (such as their solubility in water and the ability to dissolve non-polar compounds in liquid drug formulations).
Relate some structural characteristics of biomolecules to their function in organisms (such as the hydrophilic and hydrophobic parts of phosphoglycerides).

Course Outcome 4.

Identify and explain electrochemical processes in biological and technical systems.

Learning Objectives 4.

Apply the appropriate terminology associated with electrochemistry.
Define and provide examples for oxidation and reduction reactions and identify the oxidizing and reducing agent in chemical reactions, particularly biochemical reactions.
Explain the roles of oxygen and hydrogen in biochemical redox reactions.
Identify oxidation and reduction reactions in metabolic pathways.
Introduce the concept of metabolism based on the oxidation sequence of alcohol to aldehyde to carboxylic acid to carbon dioxide.
Explain the transfer of electrons in electrochemical cells.

Course Outcome 5.

Describe, analyze, and calculate energy changes in physical and chemical processes.

Learning Objectives 5.

Apply the appropriate terminology to investigate energy changes.
Contrast the energy changes in endothermic and exothermic reactions.
Relate the quantity of reactants to energy change using the ?H value from a thermochemical equation.
Explain how the mass, heat capacity, and change in temperature of a substance determine the amount of energy gained or lost by a substance.
Calculate the heat (Q = mc?T) lost or gained during a temperature change.

Course Outcome 6.

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Analyze reaction rates and explain the factors that affect the rate of a reaction.

Learning Objectives 6.

Apply the appropriate terminology to investigate rates of reactions.
Explain the kinetics of chemical changes and the relative energy transformations using potential energy diagrams and the particle theory of matter.
Explain the factors that affect the rate of a chemical reaction through the use and application of the collision theory and potential energy diagrams.
Illustrate how a catalyst such as an enzyme accelerates the rate of reaction.

Course Outcome 7.

Analyze chemical equilibrium processes and solve qualitative and quantitative problems involving equilibria.

Learning Objectives 7.

Apply the appropriate terminology associated with chemical systems and equilibrium.
Explain the concept of dynamic equilibrium in physical and chemical systems.
Predict, using Le Chatelier's principle, the effect of a variety of stresses (adding/removing a substance, changing pressure, changing temperature) on a system at equilibrium.
Describe a variety of systems (with special focus on the human body) that involve a chemical equilibrium (ex. the blood buffer systems).
Write expressions for common equilibrium constants (keq, ksp, ka, kb, kw).
Solve problems involving concentrations and equilibrium constants.
Solve problems involving solubility and ksp.

Course Outcome 8.

Analyze acid-base reactions and perform calculations involving pH and acid-base equilibria.

Learning Objectives 8.

Describe and compare the characteristics of acids and bases.
Identify strong acids, strong bases, weak acids, weak bases, and conjugate acid-base pairs.

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	Explain neutralization and write a balanced chemical equation to describe a neutralization reaction. Calculate pH and hydrogen ion concentration of a solution. Use kw to calculate [H3O+], [OH-], pH, and pOH in solutions and solve problems involving neutralization reactions. Analyze acid-base equilibria and solve problems involving pH, pOH, ka, kb, kw, and concentration. Compare the relative strength of weak acids and weak bases based on their equilibrium constants. Predict whether an aqueous solution of a given salt will be acidic, basic, or neutral. Describe how buffers stabilize the pH of a solution and calculate the pH of buffer systems. **Course Outcome 9.** Investigate health sciences and science-related questions, problems, and evidence using the scientific method. **Learning Objectives 9.** Formulate research questions by defining a problem, developing a hypothesis, and making predictions. Plan and conduct laboratory experiments to investigate science questions using appropriate scientific techniques. Test a hypothesis by gathering, organizing, and documenting research data, analyzing the results, and determining if the results support the hypothesis. Portray scientific data using statistical methods, graphs, charts, tables, and appropriate statistical language. Use scientific reasoning to draw conclusions that explain investigation results. Report on the objectives, methods, results, and conclusions of scientific investigations.
Date:	Wednesday, August 30, 2017
	Please refer to the course outline addendum on the Learning Management System for further information.