COURSE OUTLINE: CHM191 - CHEMISTRY II

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Course Code: Title	CHM191: CHEMISTRY II FOR PADD
Program Number: Name	3065: PRE-HEALTH DIP DGR
Department:	PRE-HEALTH
Academic Year:	2025-2026
Course Description:	In this course, students will apply fundamental concepts and skills from CHM190 to further examine chemical reactions and systems. Topics include energy changes in chemical and physical processes, reaction rate, equilibrium systems, acids and bases, and organic chemistry. This course approaches chemistry from a health perspective and will highlight the connections of chemistry to health and the human body. 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:	70
Prerequisites:	CHM190
Corequisites:	There are no co-requisites for this course.
Substitutes:	CHM171
Vocational Learning Outcomes (VLO's) addressed in this course: **Please refer to program web page for a complete listing of program outcomes where applicable.**	**3065 - PRE-HEALTH DIP DGR** VLO 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. VLO 6 Investigate health sciences and science-related questions, problems and evidence using the scientific method.
Essential Employability Skills (EES) addressed in this course:	EES 3 Execute mathematical operations accurately. EES 4 Apply a systematic approach to solve problems. EES 5 Use a variety of thinking skills to anticipate and solve problems. EES 6 Locate, select, organize, and document information using appropriate technology and information systems. EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others. EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.

	EES 10 Manage the use of time and other resources to complete projects. EES 11 Take responsibility for ones own actions, decisions, and consequences.
Course Evaluation:	Passing Grade: 50%, D A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.
Other Course Evaluation & Assessment Requirements:	Students must achieve an average of 50% on tests, independent of other components, to obtain a passing grade in this course.
Books and Required Resources:	General, Organic, and Biological Chemistry: Structures of Life by Karen C. Timberlake Publisher: Pearson Edition: 6 ISBN: 9780134730684 or Ebook 9780134763071 Lab coat and safety glasses

Course Outcomes and Learning Objectives:

Course Outcome 1	Learning Objectives for Course Outcome 1
1. Analyze and calculate energy changes in physical and chemical processes.	1.1 Apply the appropriate terminology to describe energy changes. 1.2 Explain how the mass, specific heat capacity, and change in temperature determine the amount of heat gained or lost by a substance or object. 1.3 Use the heat equation to calculate the heat lost or gained during a temperature change. 1.4 Use the enthalpies of vaporization and fusion to determine heat absorbed or released during a change of state. 1.5 Relate the quantity of reactants to energy change using the enthalpy value from a thermochemical equation. 1.6 Compare and calculate energy changes in endothermic and exothermic processes. 1.7 Relate heat and energy changes to healthcare applications.
Course Outcome 2	**Learning Objectives for Course Outcome 2**
2. Analyze reaction rates and explain the factors that affect the rate of a reaction.	2.1 Apply appropriate terminology when describing reaction rates. 2.2 Investigate and calculate the rate of a chemical reaction. 2.3 Explain the kinetics of a chemical change and the relative energy transformations that occur using potential energy diagrams and the particle theory of matter. 2.4 Explain the factors that affect the rate of a chemical reaction through the use and application of the collision theory and potential energy diagrams. 2.5 Illustrate how a catalyst such as an enzyme accelerates the rate of reaction.
Course Outcome 3	**Learning Objectives for Course Outcome 3**

3. Analyze chemical equilibrium systems and solve qualitative and quantitative problems.	3.1 Use appropriate terminology to describe equilibrium systems. 3.2 Explain the concept of dynamic equilibrium in physical and chemical systems. 3.3 Analyze chemical systems in the human body that involve a chemical equilibrium (ex. blood buffer systems). 3.4 Apply Le Chatelier`s principle to predict the effect of a variety of stresses (adding/removing a substance, changing pressure, changing temperature) on a system at equilibrium. 3.5 Write expressions for common equilibrium constants (keq, ksp, ka, kb, kw). 3.6 Solve problems involving concentrations and equilibrium constants.
Course Outcome 4	**Learning Objectives for Course Outcome 4**
4. Analyze acid-base reactions and solve problems involving pH.	4.1 Describe and compare the characteristics of acids and bases. 4.2 Identify strong acids, strong bases, weak acids, weak bases, and conjugate acid-base pairs. 4.3 Describe neutralization reactions using balanced chemical equations. 4.4 Investigate and solve quantitative problems involving neutralization reactions. 4.5 Define pH and explain how pH relates to hydronium concentration. 4.6 Calculate the hydronium concentration, hydroxide concentration, pH, and pOH of a solution. 4.7 Compare the relative strength of weak acids and weak bases based on their equilibrium constants. 4.8 Analyze acid-base equilibria and solve quantitative problems involving concentration, pH, pOH, Ka, Kb, and Kw. 4.9 Predict whether an aqueous solution of a given salt will be acidic, basic, or neutral. 4.10 Describe how buffers stabilize the pH of a solution and calculate the pH of buffer systems.
Course Outcome 5	**Learning Objectives for Course Outcome 5**
5. Classify and represent organic compounds by name, structure, and chemical formula.	5.1 Write IUPAC names and structural formulae for saturated, unsaturated, linear, and cyclic hydrocarbons. 5.2 Draw structural formulae for different isomers, including cis-trans isomers. 5.3 Recognize some common names for alkanes, alkenes, and alkynes. 5.4 Describe the resonance in benzene and draw structural formulas for other important aromatic compounds. 5.5 Write IUPAC (and some common) names and structural formulas for alcohols, phenols, thiols, amines, aldehydes, ketones, carboxylic acids, esters, and amides. 5.6 Classify alcohols and amines as primary, secondary or tertiary. 5.7 Identify the functional groups and components of a variety of biomolecules such as carbohydrates, phospholipids, amino

	acids, nucleotides, ATP, cholesterol, and triglycerides. 5.8 Recognize amino acids based on their functional groups.
Course Outcome 6	**Learning Objectives for Course Outcome 6**
6. Analyze the properties and reactions of organic compounds and explain their biological, medical, or environmental significance.	6.1 Explain isomerism in organic compounds and how different isomers can have dramatically different properties. 6.2 Relate some common uses of hydrocarbons (such as solvents and fuels) to their physical and chemical characteristics. 6.3 Relate the length of the carbon chain of a carboxylic acid to its solubility in water. 6.4 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). 6.5 Relate some structural characteristics of biomolecules to their function in organisms (such as the hydrophilic and hydrophobic parts of phosphoglycerides. 6.6 Compare the physical properties and chemical behaviour of families of organic compounds. 6.7 Use structural equations to predict the products of hydration, dehydration, condensation, hydrolysis, and redox reactions involving organic and biological compounds. 6.8 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). 6.9 Define oxidation and reduction in organic reactions and explain the roles of oxygen and hydrogen in biochemical redox reactions. 6.10 Identify the oxidizing and reducing agents in biochemical redox reactions. 6.11 Identify oxidation and reduction reactions in metabolic pathways and describe the concept of metabolism based on the oxidation sequence of alcohol to aldehyde to carboxylic acid to carbon dioxide.
Course Outcome 7	**Learning Objectives for Course Outcome 7**
7. Investigate health sciences and science-related questions, problems, and evidence using the scientific method.	7.1 Plan and conduct laboratory experiments to investigate science questions using appropriate scientific techniques. 7.2 Test a hypothesis by gathering, organizing, and documenting research data, analyzing the results, and determining if the results support the hypothesis. 7.3 Portray scientific data using statistical methods, graphs, charts, tables, and appropriate statistical language. 7.3 Use scientific reasoning to draw conclusions that explain investigation results. 7.4 Report on the objectives, methods, results, and conclusions of scientific investigations.

Evaluation Process and Grading System:

Evaluation Type	Evaluation Weight

	Labs	30%
	Unit Tests	70%
Date:	December 12, 2025	
Addendum:	Please refer to the course outline addendum on the Learning Management System for further information.	