SULTAN QABOOS UNIVERSITY

COURSE OUTLINE

PROGRAM: MEDICINE & HEALTH SCIENCES

1. Course Code	CHEM2110	
2. Course Title	CHEMISTRY FOR MEDICINE	
3. Credits	4	
4. Pre-requisite Course(s)	FPMT0105	
5. Co-requisite Course(s)	None	
6. Equivalent Course(s)	None	
7. Incompatible Course(s)	CHEM1071, CHEM2101	
8. Course Category	☐ University Requirement	☐ University Elective
	☐ College Requirement	☐ College Elective
	☐ Department Requirement	☐ Department Elective
	☐ Specialization Requirement	☐ Specialization Elective
	☒ Other (specify): Core course in degree programs in Medicine & Health Sciences	
9. Course Owner	College: SCIENCE	Department: CHEMISTRY
10. Course Type	☐ Lecture	☐ Lecture/Lab
	☐ Lecture/Seminar	☐ Lecture/Studio
	☐ Lecture/Tutorial	☒ Lecture/Lab/Tutorial or Seminar
	☐ Tutorial	☐ Laboratory (Practical)
	☐ Field or Work Placement	☐ Studio
	☐ Seminar	☐ Internship
	☐ Workshop	☐ Project
11. Language of Instruction	English	

12. Course Description

This course seeks to provide medical students with a sound understanding of fundamental concepts and principles in general chemistry and introductory organic chemistry. Emphasis is placed on chemical applications in medicine and the allied health sciences. The practical work in the laboratory component does not only reinforce the lecture material, but it also helps students develop manipulative and organizational skills, and make guided discoveries. E-learning employing the Moodle platform promotes pro-active learning. The main topics include classification of matter, physical and chemical properties and processes, measurement and analyses of data, the Periodic Table of the elements and periodic trends, biological roles of elements, compounds, chemical reactions & equations, stoichiometry, aqueous solutions, acid-base equilibria and buffer solutions, electromagnetic radiation and its applications, Bohr model and quantum mechanics, atomic structure and periodicity, chemical bonding, classes of organic compounds and medical applications, isomerism, functional groups and characteristic reactions, introduction to amino acids, intermolecular forces and physical properties of organic compounds.

13. Teaching/Learning Strategies

Lectures, class discussions, E-learning, tutorials, textbook problem-solving, demonstrations of experiments, lab work

14. Assessment Components and Weight [%]

☒ Quizzes 10%	☒ Practical 10%	☒ Other (specify):
☐ Homework assignments	☐ Project	
☒ In-term examination(s) 40%	☒ Final examination 40%	

15. Grading Method

☒ A-F Scale ☐ Pass/Not passed

16. Textbook(s) and Supplemental Material

General, Organic and Biochemistry, Blei & Odian, 2nd Edition, Freeman, New York, 2006; Handouts; Moodle

17. Matching Course Objectives with Program Outcomes and SQU Graduate Attributes		
SQU Graduate Attributes		
A. SQU graduates should be able to: 1. apply the knowledge and skills relevant to the specialization 2. communicate effectively and use information and communication technologies 3. critically analyze complex information and present it in simple clear manner	**B. SQU graduates possess** 1. interpersonal communication skills and alignment with culture of international labour market to assist them in practical life and in living successfully 2. skills and motivation for independent learning and engagement in lifelong learning and research 3. work ethics and positive values, and intellectual independence and autonomy 4. teamwork skills and display potential leadership qualities	**C. SQU graduates should** relish good citizenship qualities, be conscious of their national identity and be socially responsible, engage in community affairs and be mindful of contemporary issues.

#	Intended Student Learning Outcome /Course Learning Objective	Relevant Program Outcome(s)	Applicable Attribute(s)
1.	Carry out scientific measurements and perform mathematical operations applying rules of significant figures; be able to convert usits using dimensional analysis		A1A1
2.	Analyze critically the quality of experimental data in terms of accuracy and precision/reproducibility and recognize types of errors (systematic/determinate & random/indeterminate)		A1, A3
3.	Define and classify matter; identify chemical and physical properties of matter		A1
4.	Distinguish between chemical reactions and physical processes, and exemplify them		A1
5.	Name the elements in the periodic table, write their chemical symbols properly, and recognise their specific biological roles; describe the periodic trends		A1
6.	Write chemical formulae and names of anydrous and hydrated ionic/organic compounds, classify acids & bases qualitatively as weak or strong; carry out chemical reactions, make observations, draw conclusions, write relevant chemical equations; apply solubility rules to salts		A1
7.	Determine empirical and chemical formulae of compounds using the mole concept; solve problems involving mass, number of moles and Avogadro's number		A1
8.	Carry out stoichiometric calculations for chemical reactions including determining percent yield		A1
9.	Prepare standard solutions, be familiar with different expressions of concentrations, perform dilutions and analyze compositions of substances in solution		A1
10.	Identify types of reactions in solution and in the human body; perform volumetric analyses such as titrations		A1
11.	Discuss the medical and everyday applications of electromagnetic radiation; explain the dual nature of light		A1
12.	Enumerate and explain the theories and principles that led to the development of atomic structure		A1
13.	Draw and describe atomic orbitals, and assign them quantum numbers; write electron configurations		A1

	applying the Aufbau principle, Pauli exclusion principle and Hund's rules		
14.	Draw Lewis dot symbols and structures, explain resonance; determine bond orders & correlate them with bond distances and energies; correlate electronegativity difference with bond polarity and bond types bond polarity; predict molecular shapes and bond angles; assign molecular polarity; explain chemical bonding using hybrization of atomic orbitals		A1
15.	Classify organic compounds and readily identify their characteristic functional groups; be familiar with typical chemical reactions and reaction mechanisms of classes of organic cmpounds		A1
16.	Explain and identify different types of isomerism in organic compounds; correlate physical properties of organic compounds with intermolecular forces		A1
17.	Apply organic concepts and principles to the biochemistry of the human body; identify functional groups in amino acids and types of chemical bonds and noncovalent interactions in proteins		A1
18.	Distinguish between acidity/basicity of a solution (pH/pOH) and strength of an acid/base (pKa/pKb), and perform pertinent calculations; explain and apply the concept of buffer solutions		A1
19.	Explain ideal gas behaviour using the gas laws; use mathematical expressions and graphs to correlate gas properties; discuss gaseous mixtures and derive expresions of a mole fraction		A1
20.	Apply safety rules and regulatiions while working in the chemical laboratory; use scientifc equipment competently, interpret data and judge the quality of measurements; work efficiently in a team in group experiments		A1, A2,A3,B4,

16. Student Responsibilities

It is the student's responsibility to know and comply with all University Academic Regulations relevant to participation in this course. These regulations specifically include attendance requirement and students` academic code of conduct.

For attendance, it is the student's responsibility to be punctual and to attend all classes.

Students are expected to perform their work with honesty and avoid any academic misconduct, which is defined as the use of any dishonest or deceitful means to gain some academic advantage or benefit. This can take many forms, including but not limited to, the following: copying, plagiarism, collusion and forging documents. For full details, please refer to the Undergraduate Academic Regulations and to the Student Academic Misconduct Policy.

Additionally, this course requires that you:

COURSE INFORMATION			
Course Code	CHEM2110	**Course Title**	Chemistry for Medicine
Semester/ Year	FL & SP	**Section(s)**	Two or One
Day, Time, and Place	From Sunday to Wednesday; 08:00-17:05; Lecture Theatres and Teaching Laboratory (Lab B)		

Course Coordinator	Prof. Musa S.Shongwe		
Office Location	Dept of Chem; SCI	**Office Hours**	
Office Tel. Ext.	2376	**Email**	musa@squ.edu.om

Tentative Schedule			
Week	**Lecture #**	**Topic/Material to be covered**	**Assessment**
1		Matter: classification, physical states and their interconversion Physical and chemical properties of matter; physical and chemical processes Atomic structure, chemical symbols, isotopes, monatomic and polyatomic ions	
2		Allotropes, molecules, chemical bonds, formulae (chemical, molecular & empirical) Periodic Table of the Elements: classification into periods and groups; monatomic anions; roles of ions of elements in the human body Metal cations, types of compounds, acids and conjugate bases, ionic compound	
3		Hydrated compounds, covalent compounds, chemical reactions and reaction types Chemical equations, acids & bases, solubility rules, precipitations reactions Oxidation states, redox reactions, redox equations, enzymatic catalysis	
4		Measurement: units and some laboratory equipment, uncertainty in measurement Temperature scales, density, specific gravity, dimensional analysis Accuracy and precision, significant figures	
5		Mathematical operations, scientific notation; atomic mass unit, the mole concept & Avogadro's number Isotopes & average atomic masses, mass spectrometry, molecular masses, molar masses, application of the mole concept to problem-solving Percentage composition by mass; empirical and molecular formulae	Quiz 1
6		Stoichiometry: limiting reactants and yields of reactions Properties of gases, gas laws The ideal gas law, gas stoichiometry, Dalton's law of partial pressures	
7		Electromagnetic radiation and the nature of light Bohr model and quantum mechanical model Quantum numbers and atomic orbitals, electron spin	Test 1
8		Electron configurations, valence orbitals, valence electrons Lewis dot symbols, Lewis structures, bond order, bond types, formal charges, resonance Electronegativity, types of bonds, bond polarity	
9		Orbital shape, VSEPR model, molecular shape, polarity of molecule Hybridisation of orbitals; σ and π bonds in organic molecules Non-covalent intra- and intermolecular forces: H-bonding, dispersion & dipole-dipole	
10		Introduction to organic chemistry and classification of organic compounds Nomenclature of aliphatic hydrocarbons: alkanes, alkenes and alkynes Isomerism in alkanes and alkenes	Quiz 2
11		Types of reagents and types of organic reactions Characteristic reactions of alkanes, alkenes and alkynes The structure of benzene, aromaticity, aromatic compounds, characteristic reactions	

12		Functional groups, characteristic reactions, functional groups in biological systems Stereoisomerism and medical applications Amino acids and condensation polymerisation; the nature of the peptide bond	
13		The structure and classification of proteins Water as a solvent, chemical behaviours of solutes in water Standard solutions and dilutions	Test 2
14		Various expressions of concentration Chemical reactions in aqueous solution & stoichiometric calculations Acid-base reactions & titrations	
15		Weak and strong acids and bases (pKa and pKb values) pH measurement, hydrolysis of salts The concept of buffers, physiological buffers	Lab Exam
16		Revision & Consultation	
17		Final Exam	Final Exam

APPENDIX A: INSTRUCTORS OF MULTIPLE SECTIONS					
Section	**Instructor**	**Day, Time, and Place**	**Office Location and Extension**	**Email**	**Office Hours**

APPENDIX B: ADDITIONAL INFORMATION