Enquiry for Course Details

CHEM1042 General chemistry I (6 credits)		Academic Year	2022
Offering Department	Chemistry	Quota	450
Course Co-ordinator	Dr A P L Tong, Chemistry < apltong@hku.hk >		
Teachers Involved	(Dr A P L Tong,Chemistry)		
Course Objectives	The course aims to provide students with a solid foundation of the basic principles and concepts of chemistry. It also provides students with hands-on training of basic laboratory skills and techniques including volumetric analysis, preparation, purification and characterization of chemical substances and some basic instrumental methods. Students will be equipped with a good foundation of theoretical and practical knowledge and skills for further studies in Chemistry.		
Course Contents & Topics	1. Atoms: the quantum world Electromagnetic radiation and matter; Planck's quantum theory; the Bohr model of the hydrogen atom; the quantum mechanical model of the atom; quantum numbers, energy levels, and atomic orbitals; shapes of atomic orbitals; electron configurations; periodic trends: atomic radii, ionic radii, ionization energies, and electron affinities. 2. Chemical bonding and structures Review on covalent, ionic and metallic bond. Covalent bonds and molecular structures (VSEPR, VB theory). 3. Thermodynamics Heat, work, internal energy and enthalpy; the First Law of thermodynamics; entropy; the Second and Third Laws of Thermodynamics; spontaneity of changes. 4. Chemical kinetics Reaction rate; factors that influence reaction rate; rate laws: differential and integrated rate laws; temperature and reaction rate; reaction mechanisms. 5. Acid-base equilibria Acid-base concepts; equilibria in solutions of weak acids/bases; ionization constants; molecular properties and acid strength; acid-base properties of salt solutions; buffer solutions; acid-base titrations.		
Course Learning Outcomes	On successful completion of this course, students should be able to:		
	CLO 1 demonstrate a basic knowledge and understanding of the microscopic nature of atomic structure and concepts of chemical bonding and their relationships with the bulk properties of matter CLO 2 demonstrate knowledge and understanding in relation to thermodynamics and kinetics of reactions as well as aqueous equilibria including acid-base equilibria CLO 3 apply the theories and concepts introduced in the course to solve problems, perform calculations, make predictions and rationalize trends CLO 4 carry out chemical experiments with proper procedures, record experimental oberservations accurately, and interpret and evaluate the experimental data CLO 5 organize and present chemical ideas in a clear, logical and coherent way CLO 6 demonstrate awareness and appreciation of the relevant applications of chemistry in society and in everyday life		
Pre-requisites (and Co-requisites and Impermissible combinations)	Level 3 or above in HKDSE Chemistry or equivalent or a pass in CHEM1041. Not for students having taken any level 1 Chemistry course (except for CHEM1041) or above or any equivalent Chemistry course.		

Course Status with Related Major/Minor /Professional Core	2022 Major in Biochemistry (Core/Compulsory) 2022 Major in Biological Sciences (Intensive) (Core/Compulsory) 2022 Major in Chemistry (Core/Compulsory) 2022 Major in Chemistry (Intensive) (Core/Compulsory) 2022 Major in Ecology & Biodiversity (Intensive) (Disciplinary Elective) 2022 Major in Environmental Science (Core/Compulsory) 2022 Major in Food & Nutritional Science (Disciplinary Elective) 2022 Major in Molecular Biology & Biotechnology (Intensive) (Core/Compulsory) 2022 Minor in Chemistry (Core/Compulsory) 2022 Minor in Environmental Science (Disciplinary Elective) 2021 Major in Biochemistry (Core/Compulsory) 2021 Major in Biological Sciences (Intensive) (Core/Compulsory) 2021 Major in Chemistry (Core/Compulsory) 2021 Major in Chemistry (Intensive) (Core/Compulsory) 2021 Major in Ecology & Biodiversity (Intensive) (Disciplinary Elective) 2021 Major in Environmental Science (Core/Compulsory) 2021 Major in Food & Nutritional Science (Disciplinary Elective) 2021 Major in Molecular Biology & Biotechnology (Intensive) (Core/Compulsory) 2021 Minor in Chemistry (Core/Compulsory) 2021 Minor in Environmental Science (Disciplinary Elective) 2020 Major in Biochemistry (Core/Compulsory) 2020 Major in Biological Sciences (Intensive) (Core/Compulsory) 2020 Major in Chemistry (Core/Compulsory) 2020 Major in Chemistry (Intensive) (Core/Compulsory) 2020 Major in Ecology & Biodiversity (Intensive) (Disciplinary Elective) 2020 Major in Environmental Science (Core/Compulsory) 2020 Major in Food & Nutritional Science (Disciplinary Elective) 2020 Major in Molecular Biology & Biotechnology (Intensive) (Core/Compulsory) 2020 Minor in Chemistry (Core/Compulsory) 2020 Minor in Environmental Science (Disciplinary Elective) 2019 Major in Biochemistry (Core/Compulsory) 2019 Major in Biological Sciences (Intensive) (Core/Compulsory) 2019 Major in Chemistry (Core/Compulsory) 2019 Major in Chemistry (Intensive) (Core/Compulsory) 2019 Major in Ecology & Biodiversity (Intensive) (Disciplinary Elective) 2019 Major in Environmental Science (Core/Compulsory) 2019 Major in Food & Nutritional Science (Disciplinary Elective) 2019 Major in Molecular Biology & Biotechnology (Intensive) (Core/Compulsory) 2019 Minor in Chemistry (Core/Compulsory) 2019 Minor in Environmental Science (Disciplinary Elective) 2018 Major in Biochemistry (Core/Compulsory) 2018 Major in Biological Sciences (Intensive) (Core/Compulsory) 2018 Major in Chemistry (Core/Compulsory) 2018 Major in Chemistry (Intensive) (Core/Compulsory) 2018 Major in Ecology & Biodiversity (Intensive) (Disciplinary Elective) 2018 Major in Environmental Science (Core/Compulsory) 2018 Major in Molecular Biology & Biotechnology (Intensive) (Core/Compulsory) 2018 Minor in Chemistry (Core/Compulsory) 2018 Minor in Environmental Science (Disciplinary Elective)

Course to PLO Mapping	2022 Major in Biochemistry < PLO 1,2,3,4,5 > 2022 Major in Biological Sciences (Intensive) < PLO 1,2 > 2022 Major in Chemistry < PLO 1,2,4,5 > 2022 Major in Chemistry (Intensive) < PLO 1,2,4,5 > 2022 Major in Ecology & Biodiversity (Intensive) < PLO 4 > 2022 Major in Environmental Science < PLO 1,2 > 2022 Major in Food & Nutritional Science < PLO 1,2,3 > 2022 Major in Molecular Biology & Biotechnology (Intensive) < PLO 1,2,3,4 > 2021 Major in Biochemistry < PLO 1,2,3,4,5 > 2021 Major in Biological Sciences (Intensive) < PLO 1,2 > 2021 Major in Chemistry < PLO 1,2,4,5 > 2021 Major in Chemistry (Intensive) < PLO 1,2,4,5 > 2021 Major in Ecology & Biodiversity (Intensive) < PLO 4 > 2021 Major in Environmental Science < PLO 1,2 > 2021 Major in Food & Nutritional Science < PLO 1,2,3 > 2021 Major in Molecular Biology & Biotechnology (Intensive) < PLO 1,2,3,4 > 2020 Major in Biochemistry < PLO 1,2,3,4,5 > 2020 Major in Biological Sciences (Intensive) < PLO 1,2 > 2020 Major in Chemistry < PLO 1,2,4,5 > 2020 Major in Chemistry (Intensive) < PLO 1,2,4,5 > 2020 Major in Ecology & Biodiversity (Intensive) < PLO 4 > 2020 Major in Environmental Science < PLO 1,2 > 2020 Major in Food & Nutritional Science < PLO 1,2,3 > 2020 Major in Molecular Biology & Biotechnology (Intensive) < PLO 1,2,3,4 > 2019 Major in Biochemistry < PLO 1,2,3,4,5 > 2019 Major in Biological Sciences (Intensive) < PLO 1,2 > 2019 Major in Chemistry < PLO 1,2,4,5 > 2019 Major in Chemistry (Intensive) < PLO 1,2,4,5 > 2019 Major in Ecology & Biodiversity (Intensive) < PLO 4 > 2019 Major in Environmental Science < PLO 1,2 > 2019 Major in Food & Nutritional Science < PLO 1,2,3 > 2019 Major in Molecular Biology & Biotechnology (Intensive) < PLO 1,2,3,4 > 2018 Major in Biochemistry < PLO 1,2,3,4,5 > 2018 Major in Biological Sciences (Intensive) < PLO 1,2 > 2018 Major in Chemistry < PLO 1,2,4,5 > 2018 Major in Chemistry (Intensive) < PLO 1,2,4,5 > 2018 Major in Ecology & Biodiversity (Intensive) < PLO 4 > 2018 Major in Environmental Science < PLO 1,2 > 2018 Major in Molecular Biology & Biotechnology (Intensive) < PLO 1,2,3,4 >
Offer in 2022 - 2023	Y 1st sem 2nd sem — Examination: Dec May
Offer in 2023 - 2024	Y
Course Grade	A+ to F

Grade Descriptors

A	Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show thorough grasp of the subject. Demonstrate strong analytical and critical abilities and logical thinking, with ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Show highly effective lab skills and techniques. Apply highly effective organizational and presentational skills.
B	Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show substantial grasp of the subject. Demonstrate evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Show effective lab skills and techniques. Apply effective organizational and presentational skills.
C	Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show general but incomplete grasp of the subject. Demonstrate evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Show moderately effective lab skills and techniques. Apply moderately effective organizational and presentational skills.
D	Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show partial but limited grasp, with retention of some relevant information, of the subject. Demonstrate evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Demonstrate partially effective lab skills and techniques. Apply limited or barely effective organizational and presentational skills.
Fail	Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Show evidence of little or no grasp of the knowledge and understanding of the subject. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Demonstrate minimally effective or ineffective lab skills and techniques. Organization and presentational skills are minimally effective or ineffective.

Course Type	Lecture with laboratory component course

Course Teaching & Learning Activities

Activities	Details	No. of Hours
Laboratory		24
Lectures		24
Tutorials		6
Reading / Self study		100

Assessment Methods and Weighting

Methods	Details	Weighting in final course grade (%)	Assessment Methods to CLO Mapping
Examination		50	CLO 1,2,3,5,6
Laboratory reports	including lab-class performance & pre-lab assignments	30	CLO 1,2,3,4,5,6
Test		20	CLO 1,2,3,5,6

Required/recommended reading and online materials	Petrucci; Herring; Madura; Bissonnette: General Chemistry: Principles and Modern Applications, latest edition, Pearson. Zumdahl; Decoste: Chemical Principles, latest edition, Cengage. Brown; LeMay; Bursten; Murphy; Woodward; Stolzfus: Chemistry - The Central Science, latest edition, Pearson.
Course Website	NIL
Additional Course Information	Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.