

## Enquiry for Course Details

<b>CHEM1043 General chemistry II (6 credits)</b>		Academic Year	2022														
Offering Department	Chemistry	Quota	280														
Course Co-ordinator	Dr A P L Tong, Chemistry < apltong@hku.hk >																
Teachers Involved	(Dr A P L Tong, Chemistry) (Dr S K Lee, Chemistry) (Prof D L Phillips, Chemistry)																
Course Objectives	This course is a continuation of CHEM1042 General Chemistry I. It aims to further consolidate some of the important fundamentals of chemistry that underlie many topics and principles across the physical sciences. The course prepares students to pursue a major in chemistry or in other aspects that require a good foundation in chemistry.																
Course Contents & Topics	<p>1. Gases Simple gas laws; ideal gas equation; gases in chemical reactions; mixture of gases; kinetic-molecular theory of gases; diffusion and effusion; non-ideal gases.</p> <p>2. Structure and Bonding: The Delocalized Approach: Molecular Orbital Theory Bonding in homonuclear and heteronuclear diatomic molecules of first and second period of elements; bonding in some simple polyatomic molecules; bonding in metals (band theory).</p> <p>3. Solutions and their Properties Types of solutions; intermolecular forces and the solution process; solution formation and equilibrium; solubilities of gases; vapor pressures of solutions; osmotic pressure; freezing-point depression and boiling-point elevation of nonelectrolyte solutions; solutions of electrolytes; colloidal mixtures.</p> <p>4. Solubility and Complex-Ion Equilibria Solubility product constant; relationship between solubility and <math>K_{sp}</math>; common-ion effect in solubility equilibria; limitations of the <math>K_{sp}</math> concept; precipitation; solubility and pH; equilibria involving complex ions; qualitative cation analysis.</p> <p>5. Entropy &amp; Gibbs Energy A quick review on entropy and the second &amp; third laws of thermodynamics. Standard Gibbs energy change; Gibbs energy change and equilibrium; coupled reactions.</p> <p>6. Electrochemistry Electrode potentials and their measurement; standard electrode potentials; <math>E_{cell}</math>, <math>\Delta G</math>, and <math>K</math>; <math>E_{cell}</math> as a functions of concentrations; batteries; corrosion; electrolysis; industrial electrolysis processes.</p>																
Course Learning Outcomes	<p>On successful completion of this course, students should be able to:</p> <table border="1"> <tr> <td>CLO 1</td> <td>demonstrate a knowledge and understanding of the properties and behavior of gases and apply gas laws and kinetic-molecular theory to processes involving gases</td> </tr> <tr> <td>CLO 2</td> <td>demonstrate a knowledge and understanding in relation to solutions and their properties, solubility and complex-ion equilibria, and also electrochemistry</td> </tr> <tr> <td>CLO 3</td> <td>apply molecular orbital theory to explain the formation and properties of diatomic molecules of first and second period of elements and of some simple polyatomic molecules</td> </tr> <tr> <td>CLO 4</td> <td>demonstrate a knowledge and understanding of the relationship between free energy and spontaneity of reaction</td> </tr> <tr> <td>CLO 5</td> <td>apply the theories and concepts introduced in the course to solve problems, perform calculations, make predictions and rationalize trends</td> </tr> <tr> <td>CLO 6</td> <td>organize and present chemical ideas in a clear, logical and coherent way</td> </tr> <tr> <td>CLO 7</td> <td>demonstrate awareness of the relevant applications of chemistry in society and in everyday life</td> </tr> </table>			CLO 1	demonstrate a knowledge and understanding of the properties and behavior of gases and apply gas laws and kinetic-molecular theory to processes involving gases	CLO 2	demonstrate a knowledge and understanding in relation to solutions and their properties, solubility and complex-ion equilibria, and also electrochemistry	CLO 3	apply molecular orbital theory to explain the formation and properties of diatomic molecules of first and second period of elements and of some simple polyatomic molecules	CLO 4	demonstrate a knowledge and understanding of the relationship between free energy and spontaneity of reaction	CLO 5	apply the theories and concepts introduced in the course to solve problems, perform calculations, make predictions and rationalize trends	CLO 6	organize and present chemical ideas in a clear, logical and coherent way	CLO 7	demonstrate awareness of the relevant applications of chemistry in society and in everyday life
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Pre-requisites (and Co-requisites and Impermissible combinations)	Pass in CHEM1042																

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 Molecular Biology & Biotechnology (Intensive) ( Core/Compulsory ) 2022 Minor in Chemistry ( Core/Compulsory ) 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 Molecular Biology & Biotechnology (Intensive) ( Core/Compulsory ) 2021 Minor in Chemistry ( Core/Compulsory ) 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 Molecular Biology & Biotechnology (Intensive) ( Core/Compulsory ) 2020 Minor in Chemistry ( Core/Compulsory ) 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 Molecular Biology & Biotechnology (Intensive) ( Core/Compulsory ) 2019 Minor in Chemistry ( Core/Compulsory ) 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 Molecular Biology & Biotechnology (Intensive) ( Core/Compulsory ) 2018 Minor in Chemistry ( Core/Compulsory )													
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 Molecular Biology & Biotechnology (Intensive) < PLO 1,3,4,5 > 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 Molecular Biology & Biotechnology (Intensive) < PLO 1,3,4,5 > 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 Molecular Biology & Biotechnology (Intensive) < PLO 1,3,4,5 > 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 Molecular Biology & Biotechnology (Intensive) < PLO 1,3,4,5 > 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 Molecular Biology & Biotechnology (Intensive) < PLO 1,3,4,5 >													
Offer in 2022 - 2023	Y	1st sem	2nd sem	Examination Dec May										
Offer in 2023 - 2024	Y													
Course Grade	A+ to F													
Grade Descriptors	<table border="1"> <tr> <td data-bbox="389 1572 491 1675">A</td> <td data-bbox="499 1572 1485 1675">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. Apply highly effective organizational and presentational skills.</td> </tr> <tr> <td data-bbox="389 1675 491 1778">B</td> <td data-bbox="499 1675 1485 1778">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. Apply effective organizational and presentational skills.</td> </tr> <tr> <td data-bbox="389 1778 491 1881">C</td> <td data-bbox="499 1778 1485 1881">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. Apply moderately effective organizational and presentational skills.</td> </tr> <tr> <td data-bbox="389 1881 491 1984">D</td> <td data-bbox="499 1881 1485 1984">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. Apply limited or barely effective organizational and presentational skills.</td> </tr> <tr> <td data-bbox="389 1984 491 2047">Fail</td> <td data-bbox="499 1984 1485 2047">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. Organization and presentational skills are minimally effective or ineffective.</td> </tr> </table>				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. 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. 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. 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. 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. Organization and presentational skills are minimally effective or ineffective.
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Course Type	Lecture-based course													

Course Teaching & Learning Activities	<b>Activities</b>		<b>Details</b>	<b>No. of Hours</b>
	Lectures			36
	Tutorials			12
	Reading / Self study			100
Assessment Methods and Weighting	<b>Methods</b>	<b>Details</b>	<b>Weighting in final course grade (%)</b>	<b>Assessment Methods to CLO Mapping</b>
	Assignments		30	CLO 1,2,3,4,5,6,7
	Examination		50	CLO 1,2,3,4,5,6,7
	Test		20	CLO 1,2,3,4,5,6,7
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; Stolfus: Chemistry - The Central Science, latest edition, Pearson.			
Course Website				
Additional Course Information				