

The Chinese University of Hong Kong
Faculty of Science
Science Academy for Young Talent

Summer Courses 2024
Course Outline

*SAYT1001 Bonding in Organic Compounds, and
Reactivity and Selectivity of Organic Reactions*
有機化合物的鍵合，與有機反應的活性及選擇性

Introduction: This course is designed to allow students to have a basic understanding of the bonding and structures of organic molecules and ions, their influences on the molecular properties of organic compounds, and the reactivity and selectivity of some organic reactions. This course will focus on the stability of reaction intermediates, and the reactivity and selectivity of addition reactions, nucleophilic substitutions, and eliminations.

本課程設計旨在讓同學對有機分子及離子的鍵合及結構，及它們在有機分子的特性和有機反應的活性及選擇性的影響上有基礎的理解。本課程將會集中討論各類反應中間體的穩定性，及加成反應、親核取代反應和消除反應的活性及選擇性。

Medium of Instruction: Cantonese supplemented with English
粵語主講及輔以英語

Organising Unit: Department of Chemistry, Faculty of Science, CUHK

Teachers:



Dr. MAK Kin Wah Kendrew (麥建華博士)

Senior Lecturer

Department of Chemistry, CUHK

Rm. 355, Science Centre South, CUHK

Tel: 3943 8136, Email: kendrewmak@cuhk.edu.hk

Course Content:

29 July 2024 (Monday) 9:30 am – 12:30 pm	<p>Lecture (1): Electronic Structure of Atoms</p> <ul style="list-style-type: none"> The atomic line spectrum of hydrogen The energy states of the hydrogen atom and the Bohr's atomic model Wave behaviour of electrons Atomic orbitals (<i>s</i>, <i>p</i>, and <i>d</i>-orbitals) Energies of orbitals in multi-electron atoms Electron configurations of atoms and ions <p>Assessment: Multiple-choice and short-answer questions assignment</p>
31 July 2024 (Wednesday) 9:30 am – 12:30 pm	<p>Lecture (2): Shapes of Molecules, Orbital Hybridization, and Chemical Bonding</p> <ul style="list-style-type: none"> Shapes of molecules (the Valence Shell Electron Pair Repulsion Theory) Sigma (<i>s</i>) and pi (<i>p</i>) bonds Hybridization of atomic orbitals Orbital hybridization and bonding Orbital hybridization and shapes of molecules <p>Assessment: Multiple-choice and short-answer questions assignment</p>
2 August 2024 (Friday) 9:30 am – 12:30 pm	<p>Lecture (3): Properties of Organic Acids and Bases, Electron Delocalization, and Resonance Stabilization</p> <ul style="list-style-type: none"> Basic concepts about acids and bases Definitions of the acid dissociation constant (K_a) and pK_a How the structure of an acid affects its pK_a value Electron flow in a reaction (reaction mechanism) Electron delocalization and resonance structures Resonance stabilization <p>Assessment: Multiple-choice and short-answer questions assignment</p>
5 August 2024 (Monday) 9:30 am – 12:30 pm	<p>Lecture (4): Reactions of Alkanes and Alkenes: Addition and Substitution Reactions</p> <ul style="list-style-type: none"> Radical substitution of alkanes Reaction mechanism of radical substitution reactions Stability of radicals and reaction selectivity Nucleophiles and Electrophiles Addition reactions of alkenes – Markovnikov's rule Reaction mechanism of addition reactions Reaction selectivity, carbocation stability, and carbocation rearrangement Nucleophilic substitutions: S_N1 and S_N2 mechanisms <p>Assessment: Multiple-choice and short-answer questions assignment</p>
7 August 2024 (Wednesday) 9:30 am – 12:30 pm	<p>Lecture (5): Nucleophilic Substitution and Elimination Reactions: Reactivity and Selectivity</p> <ul style="list-style-type: none"> Reactivity and selectivity of S_N1 and S_N2 reactions Elimination reactions: E1 and E2 mechanisms Reactivity and selectivity of E1 and E2 reactions Competitions between S_N1, S_N2, E1, and E2 <p>Assessment: Short-answer test</p>
9 August 2024* (Friday) 9:30 am – 12:30 pm	Make-up class

Date	29, 31 July 2, 5, 7, 9* August 2024 (15 hours)				
Time	9:30 am – 12:30 pm				
Teaching Mode	Face to Face (The Chinese University of Hong Kong)				
Enrollment	30 – 50				
Expected Applicants	Students who are promoting to or studying S4 – S6				
Tuition Fee	HKD 3,000.00				
Credit	1 University Unit(s) <i>Students who complete the course and meet its requirement can opt for credit exemption when studying at CUHK.</i>				
Grading Methods	Certificate	Assessment	Attendance	Credit(s)	
	A to A-	<i>Certificate of Distinction</i>	<i>Excellent</i>	<i>>75%</i>	<i>1</i>
	B+ to D	<i>Certificate of Merit</i>	<i>Pass</i>	<i>>75%</i>	<i>1</i>
	Attended	<i>Certificate of Attendance</i>	<i>Fail</i>	<i>>75%</i>	<i>0</i>
	F	<i>N/A</i>	<i>Fail</i>	<i>N/A</i>	<i>0</i>

* This date is reserved for make-up classes in case there is any cancellation of classes due to unexpected circumstances.