科目ナンバリング	U-LAS13 10006 LE60				
授業科目名<英訳>	Basic Physical Chemistry (quantum theory)-E2 Basic Physical Chemistry (quantum theory)-E2	担当者所属職名・氏名	工学研究科　講師　Nguyen Thanh Phuc		
群	自然科学科目群	分野(分類)	化学(基礎)	使用言語	英語
旧群	B群	単位数	2単位	週コマ数	1コマ	授業形態	講義（対面授業科目）
開講年度・開講期	2026・前期	曜時限	水1	配当学年	主として1・2回生	対象学生	理系向

[授業の概要・目的]

Physical chemistry is the discipline that studies the basic concepts and principles of the formation of molecules and substances, the nature and characteristics of chemical bonds and molecular structures, chemical equilibrium, and reaction rates.
This course is designed as the introductory physical chemistry, specifically aims to learn and understand the principles of quantum mechanics and its applications to the formation of atoms and molecules, the basic constituents of substances. The knowledge learned from this course will be the foundation for learning all areas of chemistry, including advanced-level physical chemistry, organic chemistry, and inorganic chemistry.

[到達目標]

- To understand the principles of quantum mechanics
- To understand the descriptions of atoms and molecules based on quantum mechanics
- To be able to use quantum mechanics to solve for the electronic wavefunctions in atoms and molecules
- To understand the description of chemical bonds based on the concept of molecular orbitals

[授業計画と内容]

The following topics will be covered. The order of topics and subtopics and the number of weeks allocated to each topic is subject to change, depending on the students' understanding.

1. Introduction to quantum mechanics [1 week]
The breakdown of classical mechanics and the birth of quantum mechanics
2. Quantum mechanical principles [1~2 weeks]
Energy quantization, wave-particle duality, the Born interpretation of the wavefunction
3. Examples of Schrodinger equation [1~2 weeks]
A particle in a box, tunneling, vibrational and rotational motions
4. Hydrogen atom [1~2 weeks]
Atomic orbitals and their energies
5. Multi-electron atoms [1~2 weeks]
Electron spin, the Pauli exclusive principle, the periodic table
6. Diatomic and polyatomic molecules [1~2 weeks]
Molecular orbitals, linear-combination-of-atomic-orbital (LCAO) approximation
7. Chemical bonds [1~2 weeks]
Covalent and ionic bonds
8. Interactions between molecules [1~2 weeks]
9. Final paper (report)
10. Feedback [1 week]
Total：14 classes, 1 Feedback session

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[履修要件]

特になし

[成績評価の方法・観点]

The evaluation will be based on a final paper (report) (86 points) and class attendance and active participation (14 points).

[教科書]

使用しない

[参考書等]

（参考書）

P. Atkin, J. D. Paula, J. Keeler 『Atkin’s Physical Chemistry, 11th Edition』（Oxford University Press）
ISBN:0198769865

D. W. Oxtoby, H. P. Gillis, L. J. Butler 『Principles of Modern Chemistry, 8th Edition』（Cengage Learning）
ISBN:1305079116

[授業外学修（予習・復習）等]

Students are responsible for the preparation and review of each class.

[その他（オフィスアワー等）]

It is advisable to ask questions and make comments willingly during the class.

Instructor: Nguyen Thanh Phuc (email: nthanhphuc@moleng.kyoto-u.ac.jp)

Office hour: appointment by email (Katsura campus, A4-205)

[主要授業科目（学部・学科名）]

理学部