

Fundamentals of Chemistry II			
Registration Code	0054321	Credits	2.0
Course Category	Sciences Basic		
Term (Semester) / Day / Period	G-II (1st year, Spring Semester) / Thu. / 3 (13:00~14:30)		
Instructor	SHIN Jiyoung		
Target Schools (Programs)	Sc(P·C·B)·En(P·C·Au)·Ag(B)		
<p>●Goals and Objectives of the Course The main goal of this course is to grasp what chemistry is all about and to learn the respective key principles and elementary knowledge in different subjects of chemistry. Fundamentals of Chemistry II begins with chemical kinetics and equilibrium, advances to thermodynamics and electronics, and finishes with chemical structures, properties, and reactions. On the basis of the knowledge, educated following the course contents, the students will be able to solve chemistry problems in each subject of physical, electro-, nuclear, inorganic, solid-state, organic, and biological chemistries, from simple to complex and hybrid.</p> <p>●Course Prerequisites Fundamentals of Chemistry I</p> <p>●Course Contents/Plan</p> <p><u>Class 1. Chemical Kinetics</u> (Ch.13 in the textbook) --- Rate Law & Reaction Order; Determination Method of Initial Rates; Integrated Rate Law (Zeroth, First, and Second Ordered); Arrhenius Equation; Reaction Mechanisms and Elementary Reactions; Rate Determining Step; Catalysis</p> <p><u>Class 2. Chemical Equilibrium</u> (Ch.14 in the textbook) --- Equilibrium State and Equilibrium Constant; Le Châtelier's Principle and Altering Factors for Equilibrium Mixture</p> <p><u>Class 3. Aqueous Equilibria: Acids and Bases</u> (Ch. 15 in the textbook) --- Concept of Acid & Base and the Descriptions, Strengths of Acid and Base and Their pH; Equilibrium Constants (K_a and K_b)</p> <p><u>Class 4. Applications of Aqueous Equilibria</u> (Ch.16 in the textbook) --- Neutralization Reactions Depended on the Acid and Base Strengths; Buffer Solution and Hederson-Hasselbalch Equation; Titration Progress and the pH Titration Curves; Titration of Polyprotic Acid with Strong Base; Solubility and Precipitation Equilibria for Ionic Compound</p> <p><u>Class 5. Summary and Evaluation for the Classes 1-4</u> with Practice Problems and the Solution Process</p> <p><u>Class 6. Thermodynamics: Entropy, Free Energy, and Equilibrium</u> (Ch. 17 in the textbook) --- Spontaneous Reactions and Their Enthalpy and Entropy; Standard Entropies, Enthalpy, Gibbs Free-Energy; Three Laws of Thermodynamics; Reactions und Nonstandard-State Conditions</p> <p><u>Class 7. Electrochemistry</u> (Ch. 18 in the textbook) --- Half-Reactions and the Overall Redox Reactions; Galvanic Cells; Shorthand Notation for Galvanic Cells; Cell Potentials and Free-Energy Changes; Nonstandard-State Redox Reaction and Nernst Equation; Electrochemical Determination and pH; Standard Cell Potentials and Equilibrium Constants; Batteries; Corrosion; Electrolytic Cells</p> <p><u>Class 8. Nuclear Chemistry</u> (Ch. 19 in the textbook) --- Nuclear Reactions; Radioactivity; Nuclear Stability; Radioactive Decay Rates; Nuclear Fission and Fusion; Radioactivity Determination</p> <p><u>Class 9. Transition Elements and Coordination Chemistry</u> (Ch. 20 in the textbook) --- Electron Configurations, Properties, and Oxidation States of Transition Elements; Coordination Compounds and the Nomenclature; Ligation Feature of Transition Metal Complexes; Isomers; Valence Bond Theory; Crystal Field Theory; Ligand-Strength and Energy Splitting; Diamagnetic and Paramagnetic Metal Complexes</p> <p><u>Class 10. Summary and Evaluation for the Classes 6-9</u> with Practice Problems and the Solution Process</p> <p><u>Class 11. Metals and Solid-State Materials</u> (Ch. 21 in the textbook) --- Metallic Elements; Metallurgy; Bonding</p>			

Aspects of Metals; Insulators, Semiconductors, and Conductors; Doped Semiconductors and Their Diode Systems; Solar Cells; Superconductors and Meissner Effect

Class 12&13. The Main-Group Elements (Ch. 22 in the textbook) --- General Properties & Periodic Trends; Properties of the Second-Row Elements; Properties of Group 1A Elements (Hydrogen & Alkali Metals); Properties of 2A (Alkaline-Earth Metals); Properties of Group 3A, 4A, 5A, and 6A; Properties of Group 7A (Halogens); Group 8A (Noble Gases); Magnetic Property of Oxygen (Oxide, Peroxide, and Superoxide)

Class 14. Organic and Biological Chemistry (Ch. 23 in the textbook) --- Organic Molecules and Their Structures (Formation of Molecule (Hybridization and Valence Bond Theory); Alkane, Alkene, and Alkyne); Functional Groups and Nomenclature of Organic Compounds; Isomers; Formal Charge and Oxidation State; Conjugated System and Resonances; Simple Reactions of Organic Molecules; Metabolism and Catabolism in Biological Chemistry; Amino Acids, Peptides, and Proteins; Carbohydrates; Nucleic Acids; Transfer of Genetic Information

Class 15. Summary and Evaluation for the Overall Classes (1-14) with Practice Problems and the Solution Process

●Course Evaluation Methods

Examination [total 70%: two midterms (20% for each) and one Final (30%)], Attendance and Assignments (30%).

Grading System: GPA (Grade Point Average) grading system is based on 'five-step' grade scale: S, A, B, C, and F (S: $x \geq 90$, A: $90 > x \geq 80$, B: $80 > x \geq 70$, C: $70 > x \geq 60$, and F: $60 > x$). No attendance of the final examination leads to (W) 'Withdrawal (W)*' grade.

●Notice for Students

Course withdrawal and failure: *Students need to submit a Course Withdrawal Request Form when requesting course withdrawal. In the cases of any unavoidable reasons such as sickness, accident, or no attendance school, student(s) may get a grade of 'Withdrawal (W)' through the judgment of the course-instructor and the students, when the student(s) submit a 'Course Withdrawal Request Form' to receive the 'Withdrawal (W)' grade. No submission of sickness/absence reports and lack of attendance score will result in 'F' grade, if the student takes the final examination. It is for the protection of other attendances in the course from frequent absences of specific/uncertain student(s).

Cautious information: Whoever provides any suspicious action in any exam will lose his/her entire credits of all coursework in the current semester, based on the University law.

Textbook	Chemistry (John E. McMurry, Robert C. Fay, and Jill K. Robinson), Seventh Edition: Global edition, 2016 (ISBN 10: 9781292092751)
Reference Book	General Chemistry: Principles and Modern Applications (Ralph, H. Petrucci, F. Geoffrey Herring, Jeffrey D. Madura, Carey Bissonnette), 11 th Edition, Toronto, Pearson Canada, 2016 (ISBN 10: 0132931281)
Reference website	https://ct.nagoya-u.ac.jp/portal/
Message	Students can communicate with the course instructor face-to-face either in the class or through appointment. Communication through email (instructor's email: jyshin@chembio.nagoya-u.ac.jp) also available.