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| Anan College | | Year | 2024 | | Course Title | Physical Chemistry 3 | |
| Course Information | | | | | | | |
| Course Code | 1414D11 | | | Course Category | Specialized / Compulsory | | |
| Class Format | Lecture | | | Credits | Academic Credit: 2 | | |
| Department | Course of Chemical Engineering | | | Student Grade | 4th | | |
| Term | Second Semester | | | Classes per Week | 後期:2 | | |
| Textbook and/or Teaching Materials | Textbook: Professional Engineering Library Butsurikagaku, Fukuchi (Zikkyosyuppan) | | | | | | |
| Instructor | Nakamura Atsunobu | | | | | | |
| Course Objectives | | | | | | | |
| 1. Understand electrical conduction phenomena of electrolyte solutions. 2. Understand the behavior of ions in electric fields and the ionization equilibrium. 3. Understand redox reactions that occur at battery electrodes 4. Understand the standard electrode potential and the electromotive force. | | | | | | | |
| Rubric | | | | | | | |
| | Ideal Level | | | Standard Level | | Minimum Level | |
| Achievement 1 | Explain electrical conduction phenomenon of aqueous electrolyte solutions and perform related calculations. | | | Explain an electrical conductivity for aqueous electrolyte solutions. | | Calculate an electrical conductivity of aqueous electrolyte solution. | |
| Achievement 2 | Explain the behavior of ions in electric fields and ionization equilibrium, and perform related calculations. | | | Explain the behavior of ions in an electric field and the ionization equilibrium. | | Calculate ionization equilibrium constants. | |
| Achievement 3 | Explain redox reactions that occur at battery electrodes, and perform related calculations. | | | Explain redox reactions that occur at battery electrodes. | | Determine the change in oxidation number for redox reactions that occur at battery electrodes. | |
| Achievement 4 | Explain the standard electrode potential and the electromotive force, and perform related calculations. | | | Explain the standard electrode potential and the electromotive force. | | Calculate an electromotive force from a standard electrode potential. | |
| Assigned Department Objectives | | | | | | | |
| 学習・教育到達度目標 D-1 | | | | | | | |
| Teaching Method | | | | | | | |
| Outline | Electrochemistry considers electrical phenomena in chemical changes. This field has been applied to various fields such as batteries and energy conversion. In this lecture, the basics of electrochemistry will be explained with exercises. | | | | | | |
| Style | Lectures will be given according to the textbook, but the missing parts will be supplemented with exercises. We will solve exercises as much as possible during class, but if there is no time, solve them yourself. There will be quizzes at the end of each unit, so please review thoroughly in advance. | | | | | | |
| Notice | The knowledge about redox reactions and electrolysis learned in the lower grades of chemistry will be used as the basis for this class, so be sure to review it thoroughly in advance. Reference book: Ippankagaku, Atkins (Tokyokagakudouzin) | | | | | | |
| Characteristics of Class / Division in Learning | | | | | | | |
| <input type="checkbox"/> Active Learning | | <input type="checkbox"/> Aided by ICT | | <input type="checkbox"/> Applicable to Remote Class | | <input type="checkbox"/> Instructor Professionally Experienced | |
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| Course Plan | | | | | | | |
| | | | Theme | | Goals | | |
| 2nd Semester r | 3rd Quarter | 1st | Ionization of electrolytes | | Calculate the degree of ionization in electrolytes. | | |
| | | 2nd | Electrical conductivity of ions | | Calculate molar conductivity. | | |
| | | 3rd | Ion mobility and transport number | | Calculate ion transport numbers. | | |
| | | 4th | Arrhenius theory of ionization | | Understand Arrhenius theory of ionization. | | |
| | | 5th | Activity coefficients in electrolyte solutions | | Express physical quantities using Activity coefficients. | | |
| | | 6th | Ionic strength | | Calculate values of ionic strength. | | |
| | | 7th | Ionization equilibria of acids and bases | | Calculate ionization constants. | | |
| | | 8th | Midterm exam | | | | |
| | 4th Quarter | 9th | Basics of battery | | Write chemical equations for half-cells. | | |
| | | 10th | Redox reaction 1 | | Calculate oxidation numbers and write simple redox equations. | | |
| | | 11th | Redox reaction 2 | | Derive redox equations. | | |
| | | 12th | Gibbs free energy and electromotive force | | Calculate electromotive forces and equilibrium constants of sparingly soluble salts. | | |
| | | 13th | Battery and electrolysis | | Understand the mechanism of practical batteries and perform calculations related to electrolysis. | | |
| | | 14th | Colloid | | Calculate the motion of colloidal particles. | | |
| | | 15th | Surface tension and adsorption | | Solve problems related to surface tension, and understand the characteristics of adsorption isotherms. | | |

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| | | 16th | Final exam | | | |
| Evaluation Method and Weight (%) | | | | | | |
| | Examination | Quiz | Portfolio | Presentation/Attitude | Other | Total |
| Subtotal | 60 | 10 | 30 | 0 | 0 | 100 |
| Basic Proficiency | 20 | 0 | 10 | 0 | 0 | 30 |
| Specialized Proficiency | 40 | 10 | 20 | 0 | 0 | 70 |
| Cross Area Proficiency | 0 | 0 | 0 | 0 | 0 | 0 |