

# Analytical Chemistry

Syllabus Number

5D259

Special Subjects

Elective 2 credit

YANAGIHARA, Naohisa

## 1. Course Description

Analytical chemistry focuses on the separation and analysis of materials using chemical techniques. Since chemistry is the science dealing with the characteristics and structure of all matter, analytical chemistry is the basis of all chemical disciplines. High-performance instrumental analysis is becoming mainstream for chemical analysis; once you have a sample, analytical instruments will do many of the analyses automatically. However, it is critical that you know how to prepare the sample for analysis, including any pretreatments required prior to instrumental analysis. Therefore, lectures covering the foundations of analytical chemistry are indispensable.

This is a lecture course that emphasizes quantitative chemical analysis and its underlying principles. The objective is to introduce fundamental concepts so that you develop the necessary skills to perform chemical quantification.

Although this class will be mainly conducted in a lecture form focusing mainly on board work, short discussions will be carried out in question form as appropriate for exercise problems or lecture contents within lecture time.

This course corresponds to DP1 and DP2 of the Department of Biosciences.

## 2. Course Objectives

We aim to thoroughly acquire various concentration calculations indispensable for the handling of quantitative analysis. In addition, we will learn basic statistical processing method of numerical data obtained by experiments.

- (1) You can get how to calculate the solution concentration.
- (2) By understanding the handling of analysis data, you can acquire knowledge of statistical processing.
- (3) By understanding the concept of acid-base equilibrium, you can acquire the computational ability on stoichiometry.
- (4) By understanding the concept of sedimentation equilibrium, you can acquire the computational ability on stoichiometry.

## 3. Grading Policy

- (1) Attendance confirmation is taken in each time, and students who do not attend more than 2/3 classes are not allowed to take the regular exam.
- (2) In this lecture, we will perform exercises at the end of every lecture. Detailed explanation and answer on this exercise will be posted on LMS by the day before the lecture of next week. Please refer to the commentary and answers of LMS and review the contents of the exercise question by yourself.
- (3) Regular tests are scheduled to be conducted separately during the test period, and the periodic test result is taken as the only evaluation criterion (100%). The results of the short exercise will not be included in the final evaluation.
- (4) A retest will not be done.

## 4. Textbook and Reference

Textbook

Masao Sugawara Exercises of Basic Analytical Chemistry

Sankyo Shuppan

Reference

R. A. Day and A. L. Underwood

Co-translation by Yasuo Torii and Ko Tomoki Quantitative Analysis Chemistry Baifukan

## 5. Requirements(Assignments)

- (1) A scientific calculator is required. Please prepare by yourself as much as possible.
- (2) Please be sure to enter the room at least within 30 minutes. Students who are late more than 30 minutes are allowed to attend, but will be considered as absent.
- (3) Attendance for the past year students will not be taken. However, not taking attendance does not mean that you do not have to attend the lecture. Please also actively attend lectures as past year students.
- (4) Eating and drinking during lectures and unnecessary entry and exit are not permitted.
- (5) It is prohibited to shoot the content written on the blackboard or taking the video material of PowerPoint with a mobile phone or smartphone.

## 6. Note

## 7. Schedule

- |     |   |
|-----|---|
| [1] | Concentration of Solution (1): Concept of the Amount of Substance (mol) |
| [2] | Concentration of Solution (2): Definition of Various Concentrations     |
| [3] | Concentration of Solution (3): Quantitative Calculation                 |
| [4] | Handling of Experimental Data (1): Basic Theory of Errors               |
| [5] | Handling of Experimental Data (2): Precision and Effective Figures      |
| [6] | Handling of Experimental Data (3): Basics of Statistical Processing     |
| [7] | Chemical Equilibrium (1): Stoichiometry of Solution                     |
| [8] | Chemical Equilibrium (2): Equilibrium Constant                          |

[9]	Acid-Base Equilibrium (1): Definition of Acid and Base
[10]	Acid-Base Equilibrium (2): Stoichiometry of Equilibrium
[11]	Acid-Base Equilibrium (3): Weak Acid and Weak Base
[12]	Acid-Base Equilibrium (4): Buffer Solution
[13]	Acid-Base Equilibrium (5): Stoichiometry of Acid-Base Equilibrium
[14]	Solubility Equilibrium: Solubility Products
[15]	Least Square Method