Advanced Biophysical Chemistry

2 units (selection)

Hitoshi Matsuki · Professor / Biological Functions, Biological Science and Technology, Earth and Life Environmental Engineering

Target〉 Treatments of solutions containing biomolecules and analytical methods for interactions between biomolecular aggregates and physiologically active substances by means of the treatments are described.

Outline〉 The former part of this lecture describes solutions in which biomolecules reveal their actions from the macroscopic, microscopic and electrochemical viewpoints. The latter part deals with ligand partitioning into lipid bilayer membranes as examples of interactions between molecular aggregates formed by biomolecules and physiologically active substances. The molecular mechanisms of anesthesia until now are reviewed on the basis of the above subjects. Further industrial application of the interactions such as drug delivery systems is also explained. This lecture deals with industrial subjects.

Style〉 Lecture

Keyword〉 ***solution, molecular aggregate, ligand, interaction, mechanism of anesthesia***

Fundamental Lecture〉 "**Physical Chemistry 2**"(1.0), "**Biophysical Chemistry 2**"(1.0)

Relational Lecture〉 "**Biochemical Thermodynamics**"(0.5)

Requirement〉 Students are required to have a good understanding of undergraduate-level physical chemistry and biophysical chemistry and related subjects.

Goal〉

1. To understand the macroscopic, microscopic and electrochemical treatments of solutions.
2. To understand the partitioning modes of ligands into biomacromolecules and molecular mechanisms of anesthesia.

Schedule〉

1. Solution chemistry of bio-related substances (1) thermodynamics of solutions 1: basic equations of thermodynamics
2. Solution chemistry of bio-related substances (2) thermodynamics of solutions 2: theory of phase diagrams
3. Solution chemistry of bio-related substances (3) thermodynamics of solutions 3: equilibrium of solutions with gases, liquids and solids
4. Solution chemistry of bio-related substances(4) thermodynamics of solutions 4: interfacial phenomena
5. Solution chemistry of bio-related substances (5) statistical thermodynamics of solutions 1: basic equations of statistical mechanics
6. Solution chemistry of bio-related substances (6) statistical thermodynamics of solutions 2: ideal and regular solutions
7. Solution chemistry of bio-related substances (7) electrochemistry of solutions 1: ionic equilibrium
8. Solution chemistry of bio-related substances (8) electrochemistry of solutions 2: electrode reaction
9. Interactions between biomacromolecules and physiologically active substances (1) ligand partitioning into lipid membranes 1: nonspecific binding
10. Interactions between biomacromolecules and physiologically active substances (2) ligand partitioning into lipid membranes 2: specific binding
11. Interactions between biomacromolecules and physiologically active substances (3) effect of dissociation equilibrium of ligand
12. Interactions between biomacromolecules and physiologically active substances (4) mechanisms of anesthesia 1: introduction
13. Interactions between biomacromolecules and physiologically active substances (5) mechanisms of anesthesia 2: lipid membrane theories
14. Interactions between biomacromolecules and physiologically active substances (6) mechanisms of anesthesia 3: protein receptor theories
15. Interactions between biomacromolecules and physiologically active substances (7) action mechanisms of local anesthetics
16. Summary, inquiry and report preparations

Evaluation Criteria〉 More than 80% percentage of attendance and reports (100%).

Textbook〉 To be distributed materials adequately in the class.

Reference〉

- ◇ 本村欣士著「溶液化学」朝倉書店
- ◇ J. S. Rawlinson and F. L. Swinton "Liquids and Liquid Mixtures" Butterworths Scientific

Contents〉 http://cms.db.tokushima-u.ac.jp/cgi-bin/toURL?EID=216738

Student〉 Able to be taken by only specified class(es)

Contact〉

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(Office Hour: Friday 16:20-17:50)

Note〉

- ◇ When you take this class, it is necessary to do preparation for 2h and review for 2h everry 2h class for your understanding and taking credit.
- ◇ Goal 1 is related to schedules 1-8 and goal 2 is related to schedules 9-15.