國立台灣大學生物技術研究中心新開課程計劃

陳長謙 博士

課程名稱: 生物物理化學在生命科學之應用

Course Plan

Biotechnology Research Center, National Taiwan University

by

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Title: Biophysical Chemistry for Life Scientists

Credit: 3

Course Description:

This course is designed for students who are pursuing careers in the life sciences, and who are interested in applying biophysical methods to solve problems in their own research. The students enrolling in this course should have completed a course in biochemistry, have some fundamental knowledge about biological macromolecules, and have had some preliminary exposure to elementary physical chemistry. Nevertheless, the principles of physical chemistry will be briefly reviewed in a "user-friendly" or "pictorial" way before the relevant methods are applied to biochemical and biological problems. After the students have completed this course, they should be prepared to know when and under what circumstances biophysical methods could be applied to various biochemical and biological problems. They should also be in the position to read the literature involving papers where biophysical methods are used to derive structural and functional information about the biochemical and biological system. This course will meet three hours per week, with 2 hours devoted to lectures and 1 hour devoted to discussions/problems solving/demonstration. The lectures will be given in English.

Course Materials

1. Handouts and lecture notes will be provided.
2. Recommended books for further reading:
   a. J. A. Glasel and Murray P. Deutscher (editors), " Introduction to Biophysical

13	Enzyme kinetics	Interactions between enzyme and substrates. Inhibitors.
14	Methods for the following of rapid kinetics. Deployment of picosecond and femtosecond laser pulses.	Stopped-flow. Perturbed equilibrium and relaxation: T-jump; pH-jump; pressure jump. Flow-flash. "Caged" substrates.

Biophysical Chemistry for Life Scientists

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Problem Set 1
Date: Monday, October 16, 2000
Due date: Monday October 23, 2000/10/16

(1) Look up anywhere, web-site, journal articles, textbooks, and reproduce the DNA double helix.
   a. Is the helix of each strand right-handed or left-handed?
   b. What is the pitch of the helix?
   c. Identify the major and minor grooves of the DNA.
   d. Sketch the Watson-Crick A-T and G-C basepairs and identify the hydrogen-bonds.
   e. What is the approximate distance between the adjacent stacked basepairs?

(2) Repeat (1) for an alpha-helix of a polypeptide.
   a. What is the pitch of the helix?
   b. Identify the hydrogen-bonds that are important for

stabilizing the alpha-helix.

(3) Repeat (2) for an anti-parallel beta-sheet of a polypeptide.
   a. Identify the hydrogen-bonds that are important for stabilizing the beta-sheet structure.
   b. What is the approximate distance between adjacent hydrogen-bond in the structure.
   c. Turns are often crucial in the nucleation and formation of beta-sheet structures. Why? Of the 20 odd amino acids, which residues do you think are most likely to promote turns?