

SABANCI UNIVERSITY

Faculty of Eng. & Natural Sci.

BIO-321 Biochemistry I

Instructor(s)

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FENS-1031

Course Content

Chemical nature of cellular components; enzymes and mechanism of enzyme activity; energy interconversions and biosynthetic reactions, including template dependent reactions, and some aspects of control mechanisms. Weekly laboratory session introduces the major experimental tools used in modern biology. Also part of the "core course" pools for the BIO, MAT degree programs.

Lab Experiments

1. Lab safety, pipetting and calibration
2. Buffer preparation techniques
3. DNA isolation
4. PCR, Restriction digestion and DNA Gel electrophoresis
5. Amino acid titration
6. Protein precipitation
7. CHAPS and protein isolation (Chemical, mechanical and enzymatic)
8. SDS-PAGE
9. Enzyme kinetics – photometrically determined
10. Total carbon hydrate determination
11. ELISA
12. Thin layer chromatography, affinity chromatography and Size exclusion chromatography
13. Bioinformatics (tools such as NEB cutter, Expasy, PDB, Jcat, Pymol, SnapGene...)

Learning Outcomes

Identify the fundamental concepts of biochemistry

Describe the structures and functions of amino acids.

Describe the structure and biological function relationship of proteins.

Describe the basic aspects of Michelis-Menten enzyme kinetics and catalysis.

Describe the main aspects of the structures and functions of carbohydrates, nucleotides and lipids.

Develop a general understanding to approach essential facts and theories of biochemistry.

Identify the key features of amino acids, proteins, enzymes, carbohydrates, nucleotides and lipids and use these features in frame of a biochemical experimental design and method in a laboratory context, with some guidance. With some guidance, analyze, interpret and report biochemically derived data, which have lowered level of complexity than the ones gained from real world experimentations, in details. Evaluate the main aspects of the biochemistry with reference to the textbook. (Lehninger. Principles of Biochemistry, Fifth Edition, D. Nelson and M. Cox, Freeman, 2009) Express basic biochemical concepts effectively by written means in homeworks, quizzes, examinations and lab notebooks. With some guidance, identify the covered concepts in the text book and study autonomously. With some guidance, collect specific information about biochemically important molecules from the text book and understand their roles in a biochemical laboratory method.

Course Policies

Course requirements:

Be prepared for any pop-quizzes and stay awake and alert for any questions. You will be assigned to make oral presentations (15 mins) on selected topics.

Lab requirements:

Lab experiment sheets will be given to you beforehand and you are expected to have read them before attending the lab class and should be ready for pop-quizzes. Although you will be working in pairs, everyone will be graded independently and your grade will be based on your performance. We encourage collaboration on experiments and discussion of data between pairs but your notebooks and quizzes are your own. Identical tables of results and copies of graphs are OK, but word-by-word identity in the conclusions is not. We want you to write things up in your own words. The quality of your data per se, while important, will not be a big factor in the grade. Interpretation is as important as the experimental data themselves.

Notebooks:

The notebook is very important as it is key to good experimental practice. The TAs will grade these notebooks each week. Each lab partner should keep his or her own notebook which will eventually contain all the data collected. In this way each partner can consider the results independently. Your notebook should be a complete record of all your experiments as they were actually performed. A good notebook will enable you to reconstruct exactly what you did and why. Your laboratory notebook should be bound with numbered pages. In the notebook you should write down, as you go along, what was actually done. Experimental results, tables, graphs should be written directly in your notebook and photographs taped to the pages for a permanent record. Your notebook should include the following information: Table of contents. Leave extra pages at the beginning of your notebook for the table of contents. The table of contents should include a short title of each experiment that is numbered and dated.

A short summary of the reasoning for the experiment. Often a single sentence of the title will be enough. You should include a summary of the method you will use. All the relevant information about the preparation of the experiment. Much of this can be accomplished by suitable cross references to previous experiments. The first time a solution is introduced, its origin should be noted. If you made it yourself, then you should note its

composition and the way you made it. The same should apply to bacterial strains. The actual series of events as performed. Especially important here are, any changes in procedure, any unusual observations you have made, etc. If you write down what actually happened, you can often interpret an experiment even though many mistakes were made. The results and conclusions. Include raw data in the form in which you collect it and write a few sentences as the conclusions of the experiment. A brief summary of your results will also be helpful when you review your experiment at a later date. The TAs will check the notebooks for completeness once a week. They must be current. You are responsible for having the lab sessions entries completed by the following day. Thus, you should plan your day accordingly. Please note that homework handed in later than the specified time will not be graded at all.